Sabina
GOLD & SILVER CORP.

The BACK RIVER PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

February 2017

Submitted to:
Nunavut Impact Review Board
PO Box 1360
Cambridge Bay, NU X0B 0C0

Plain Language Summary

Sabina Gold & Silver Corp. (Sabina) is focused on the responsible development of the Back River Project (or the Project) in the Kitikmeot Region of Nunavut. Sabina commenced the Environmental Assessment of the Back River Project on June 14, 2012 with the submission of a Project Proposal to the Nunavut Impact Review Board (NIRB). The NIRB provided Project Guidelines for the production of an Environmental Impact Statement on April 30, 2013 and Sabina subsequently submitted a conformant Draft Environmental Impact Statement to the NIRB on January 20, 2014. Technical Meetings, a Community Round-Table and Pre-Hearing Conference on the Draft Environmental Impact Statement were completed on November 20, 2014. Following the receipt of the NIRB's Pre-Conference Hearing Report (December 19, 2014) Sabina submitted the Final Environmental Impact Statement on November 23, 2015 which was deemed conformant to the Project Guidelines. The Technical Meeting and Final Hearing concluded on April 30, 2016 with the Kitikmeot Inuit Association, Government of Nunavut, and all selected representatives of the Kitikmeot communities recommending that the Project should be allowed to proceed. In addition, the departments of Indigenous and Northern Affairs Canada, Fisheries and Oceans Canada and the Canadian Coast Guard, Environment and Climate Change Canada, Natural Resources Canada, and Transport Canada all confirmed that they had no outstanding issues to be addressed at the Environmental Assessment phase. On June 15, 2016 the NIRB released their Final Hearing Report to the Minister of Indigenous and Northern Affairs Canada (the Minister) which recommended that the Project should not be approved to proceed at this time. On January 12, 2017 the Minister directed the NIRB to reconsider the Project under section 12.5.7(e) of the Nunavut Agreement due to deficiencies in the NIRB Final Hearing Report.

Sabina has prepared this Addendum of the Final Environmental Impact Statement for the proposed development of the Back River Project. The Addendum addresses outstanding concerns of the NIRB as contained in their Final Hearing Report as well as the Ministers' referral letter. It supplements the Final Environmental Impact Statement and identifies what has since been added or clarified and otherwise has changed. This includes new and updated information on community and government engagement, caribou and terrestrial wildlife, freshwater aquatic environment, marine environment, water quality, and climate and meteorology amongst other topics. This Addendum is submitted to the NIRB, KIA, government and community stakeholders for review and comment as defined by the NIRB.

Plain Language Summary (Inuktituk Kivalliq)

ᓴᐃᓇ ᔨᓗ ᐊᓚᓗ ᓴᕆᓐᓄᑦ ᑯᐊᐳᓵᓴᓴᑯᑦ (ᓴᐃᓇ) ᑕᐅᔭᓴᖅᑐᑦ ᐱᔪᓴᐅᑎᓴᖅᑐᕆᑯᑦ ᐱᖅᑭᒡᓕᐊᓂᖅᖢᓂᐅᒃ Back River ᐱᓕᓚᐊᖏᑦ (ᐅᖅᔨᒋᓕ ᐱᓕᓚᐊᖅ) ᖃᑎᖏᑕᐅᓂ ᓄᓇᕗᒻᒥᑦ. ᓴᐃᓇ ᐊᖅᑎᓕᓚᓂᖏᒃ ᖁᑉᐸᓴᐃᓂᓂᖁᓕᓕᐅᖅᑐᑦ Back River ᐱᓕᓚᐊᖏᑦ ᔪᑦ 14, 2012-ᒥᑦ ᑐᓂᐅᑎᑎᓕᔪ ᐱᓕᓚᐊᖏᓪᓗᑦ ᑐᓴᓯᐅᑎ ᓄᓇᕗᒻᒥ ᐊᖅᑎᓕᓚᓵᓴᑯᓐᓄᑦ (NIRB). ᐊᖅᑎᓕᓚᓵᓴᑯᑦ ᑐᓂᓯᓕᐅᖅᑐᑦ ᐱᓕᓚᐊᖏᓪᓗᑦ ᒪᓕᖅᑕᐅᔪᓴᒥᑦ ᐊᖅᑎᑎᒃ ᐊᓴᖅᓯᓂᖏᓪᓗᑦ ᑎᑎᖅᑲᓕᐅᖅᓂᖏᓪᓗᑦ ᐃ>ᓚ 30, 2013-ᒥᑦ ᐊᓚᓗ ᓴᐃᓇᓴᑯᑦ ᑐᓂᓯᓕᖅᖢᓂᐅᒃ ᒪᓕᓐᓂᖏᓪᓗᑦ ᐅᓴᕆᐅᑎᑎᒃ ᐊᖅᑎᑎᒃ ᐊᓴᖅᓯᓂᖏᓪᓗᑦ ᑎᑎᖅᑲᓕᐅᖅᓂᖅᓄᑦ ᖃᓄᐅᔪᓚᓐ 20, 2014-ᒥᑦ. ᑲᑎᒪᓂᑦ, ᓄᓇᓕᖓᒥᑦ ᑲᑎᒪᔨᐊᓪᓚᑦ ᐊᓚᓗ ᑐᐃᓴᐅᓂᐊᖅᑎᓕᓗᑦ ᑲᑎᒪᓂᑦ ᐱᔾᔪᑎᖅᖢᓂᐅᒃ ᐊᖅᑎᑎᒃ ᐊᓴᖅᓯᓂᖏᓪᓗᑦ ᑎᑎᖅᑲᓕᐅᖅᓂᖅᓄᑦ ᐱᐊᓂᕕᐅᓕᐅᖅᓂᑦ ᓄᓇᕗᑦ 20, 2014-ᒥᑦ. ᐱᖅᐅᓕᐅᖅᑎᓕᓗᑐ ᐊᖅᑎᓕᓚᓵᓴᑯᓂᓂ ᑐᐃᓴᐅᓂᐊᖅᑎᓕᓗᑐ ᐅᓂᒃᑲᖅ (ᑎᓯᐊᓚ 19, 2014) ᓴᐃᓇᓴᑯᑦ ᑐᓂᓯᓕᐅᖅᑐᑦ ᑭᖑᓪᓕᖅᐸᖅ ᐊᖅᑎᑎᒃ ᐊᖅᑐᖅᓯᓂᖏᓪᓗᑦ ᑎᑎᖅᑲᓕᐅᖅᓂᑦ ᓄᓇᕗᒻᒥᑦ ᐃ>ᓚ 23, 2015-ᒥᑦ ᒪᓕᓴᑐᓴᓴᐅᓕᐅᖅᑐᖅᓄᖅ ᐱᓕᓚᐊᖏᓪᓗᑦ ᒪᓕᖅᑕᐅᔪᓴᒧᓐᓄᑦ. ᑲᑎᒪᑎᑎᓂᖅ ᐊᖅᑎᓗ ᑭᖑᓪᓕᖅᐸᖅ ᑐᐃᓴᐅᓂᐊᖅᑎᓕᓗᖅ ᐃ>ᓚ 30, 2016-ᒥᑦ ᑲᑎᒪᖅᑎᑎᓕᐅᑦ ᖃᑎᖏᑕᐅᓂ ᐃᓄᐅᖅᑎᑎᒃᑯᑦ, ᓄᓇᕗᑦ ᒪᓂᒪᓐᓂ, ᐊᖅᑎᓗ ᓂᕈᐊᖅᑕᐅᔪᓚᐅᑦᑐᑦ ᑭᒍᓕᖅᑐᐃᓐᓇᑦ ᖃᑎᖏᑕᐅᓂ ᐃᓄᐅᖅᑎᑎᒃᑯᑦᓂᖅᓄᑦ ᐃᒪᓐᓇᖅᑐᖅᓄᑦ ᐱᓕᓚᐊᖅ ᑲᔪᓯᑎᒃᓴᓂᐅᑉ. ᐊᖅᑎᓗ, ᑲᓇᑕᒥᑦ ᓄᓇᖅᑲᑲᖅᑐᖅᓂᓂᒃ ᐊᖅᑎᓗ ᐅᑭᐅᖅᑕᖅᑐᑕᓚᓵᓴᑯᑦ, ᑲᓇᑕᒥᑦ ᐃᖅᑲᓕᓚᓵᓴᑯᑦ ᐊᖅᑎᓗ ᑲᓇᑕᒥᑦ ᑕᓚᐅᑦ ᓯᓚᖓᔅᓴᓂᑦ ᒥᐊᓂᖅᓯᓚᓵᓴᑯᑦ, ᑲᓇᑕᒥᑦ ᓄᓇᕗᒻᒥᑦ ᐱᖓᓱᐊᓯᓚᓵᓴᑯᑦ, ᑲᓇᑕᒥᑦ ᐃᖓᕐᕿᐊᓯᓚᓵᓴᑯᑦ ᑕᒪᕐᒃ ᓇᓗᐃᔅᑕᓚᓵᓴᑯᑦ ᐊᖅᑎᓗ ᑲᓇᑕᒥᑦ ᐃᖓᕐᕿᐊᓯᓚᓵᓴᑯᑦ, ᑲᓇᑕᒥᑦ ᓄᓇᕗᒻᒥᑦ ᐱᖓᓱᐊᖅᑐᓚᓵᓴᑯᑦ ᐊᖅᑎᓗ ᑲᓇᑕᒥᑦ ᐃᖓᕐᕿᐊᓯᓚᓵᓴᑯᑦ ᑕᒪᕐᒃ ᓇᓗᐃᔅᑕᐅᔪᓴᒥᑦ ᐱᓕᓚᐊᖏᓪᓗᑦ ᐊᖅᑎᓕᓚᓵᓴᑯᑦ ᖃᑎᖏᑕᐅᓂ ᐱᖓᓱᐊᖅᑐᓚᓵᓴᑯᑦ. ᔪᑦ 15, 2016-ᒥᑦ ᐊᖅᑎᓕᓚᓵᓴᑯᑦ ᓴᓴᖅᑭᑎᓕᐅᖅᑐᑦ ᑭᖑᓪᓕᖅᐸᖅ ᑐᐃᓴᐅᓂᐊᖅᑎᓕᓗᑦ ᐅᓂᒃᑲᒥᑦ ᒥᓂᔅᑎᑦᑐᔾᔪᑦ ᑲᑎᒪᖅᑎᑎᓕᐅᑦ ᐃᓄᐅᖅᑎᑎᒃᑯᑦᓂᖅᓄᑦ ᐊᖅᑎᓗ ᐅᑭᐅᖅᑕᖅᑐᑕᓚᓵᓴᑯᑦ (ᒥᓂᔅᑕ) ᐃᒪᓐᓇᖅᑐᐃᓐᓇᐅᖅᑐᖅᓄᖅ ᐃᓐᓇᐅᔾᔪᑯᑦ ᐱᓕᓚᐊᖅ ᓇᓱᒪᑎᐅᖅᓯᒪᓕᖅᓱᓪᓗᑎᒃ ᐃᓕᓴᕐᓂᖅᓯᓚᓵᓴᑯᓪᓗ ᒪᓕᓐᓗᑎ ᐃᓕᒥᑎᐅᖅᑕᐅᔪᓴᒥᑦ ᐱᓕᓚᐊᖅ 12.5.7(e) ᓄᓇᕗᒻᒥ ᐊᖓᕆᖅᑎᑎᑲᒥᑦ ᐊᖅᑎᓕᓚᓵᓴᑯᑦ ᑭᖑᓪᓕᖅᐸᖅ ᑐᐃᓴᐅᓂᖏᓪᓗᑦ ᐅᓂᒃᑲᖓᔅᓂᑦ ᐋᖅᑭᐅᒪᖓᔅᓂᐅᔾᔨᑦ ᐱᔾᔪᑎᑲᓂᑦ.

ᓴᐃᓇᓴᑯᑦ ᐃᓕᒥᑎᐅᓂᐊᖅᑐᒃ ᑎᑎᖅᑲᓕᐅᓕᐅᖅᑐᑦ ᑭᖑᓪᓕᖅᐸᖅ ᐊᖅᑎᑎᒃ ᐊᖅᑐᖅᓯᓂᖏᓪᓗᑦ ᑎᑎᖅᑲᒍᑦ ᑐᓴᓯᐅᑎᑎᓕᐅᖅᑐᑦ ᐱᖅᑭᒡᓕᐊᓂᖅᖢᓂᐅᒃ Back River ᐱᓕᓚᐊᖅ. ᑎᑎᖅᑲᖅᓱᖅ ᐃᓕᒥᑎᐅᖅᓯᖅ ᐅᖅᑲᐅᓯᖅᑐᖅᓄᖅ ᐊᖓᕆᔨᓂᐅᑉ ᐃᓯᒪᓕᐅᕐᔨᓂᐅᑉ ᐊᖅᑎᑎᒃᑯᑦᓂᖅᓄᑦ ᐃᓗᐊᓂᐅᑎᑦ ᑭᖑᓪᓕᖅᐸᖅ ᐅᓂᒃᑲᒥᑦ ᐊᖅᑎᑎᒃ ᒥᓂᔅᑎᑦᑐᔾᔪᑦ ᐃᓄᐅᖅᑎᑎᒃᑯᑦᓂᖅᓄᑦ ᐊᖅᑎᓗ ᐊᓯᐊᖏᓪᓗᑎᒃᓴᓂᐅᑉ. ᐃᓕᓴᕐᓂ ᓄᑦᓴᖅ ᐊᖅᑎᓗ ᐅᓪᓗᒥᒃᑐᓂᖅᓯᓚᓵᓴᑯᓪᓗ ᑐᓴᓯᐅᑎᑎᓕᐅᖅᑐᑦ, ᑐᐃᑐᐃᑦ ᓄᓇᒥᓗ ᐃᓕᓴᕐᓂᐅᑉ, ᐃᒪᖃᑦᑕᐅᑦ ᐊᖅᑎᑎᒃ, ᑕᓚᐅᖃᑦᑕᐅᑦ, ᐃᒪᕐᒃ ᖁᓚᐃᓐᓇᐅᓂᖅ, ᐊᖅᑎᓗ ᓯᓚᐃᑦ ᐃᓕᓴᕐᓂᐅᑉ ᐱᔾᔪᑎᒃᓴᓂᐅᑉ ᐊᖅᑎᓗ ᐊᓯᐊᖏᓪᓗᑎᒃᓴᓂᐅᑉ ᐊᖅᑎᓗ ᐊᓯᐊᖏᓪᓗᑎᒃᓴᓂᐅᑉ ᐊᖅᑎᓗ ᐃᓕᓴᕐᓂᐅᑉ ᐃᓕᒥᑎᐅᖅᑕᐅᔪᓴᒥᑦ ᐱᓕᓚᐊᖅ ᐃᓕᒥᑎᐅᖅᑕᐅᔪᓴᒥᑦ ᐊᖅᑎᓗ

Plain Language Summary (Inuinnaqtun)

Sabina Gold unalu Silver Kuapuriisingit (Sabina) ihumagillualiqtaa munariniqmut pivallianiq uuminnga Hanningayuq Havauhikhaq (Havauhikhaqluuniit) Kitikmeotmi Nunavunmi. Sabina aullaqtiliqtaa Avatiliriniqmut Naunaiyainiq uumani Hanningayuq Havauhikhaq June 14, 2012mi tuniplugu una Havauhikhaq tukhiutinik Nunavut Avatilirinirmut Katimayiinginnut (NIRB). NIRB-kut tuniyuq Havauhikhaq Maliktakhangit piliurninnganut Avatiliriniqmut Ayurhautigiyauyuq Titiraq April 30, 2013mi Sabina talvannga tuniyuq maliktuq Inirhimaittuq Avatiliriniqmut Ayurhautigiyauyuq Titiraq NIRB-kunnut January 20, 2014mi. Ayurnaittumik Katimapkaiyuq, Nunallaani Katimaniq unalu Katimatinnagit Katimayut Inirhimaittumut Avatiliriniqmut Ayurhautigiyauyuq Titiraq iniqtauyuq November 20, 2014mi. Talvannga pigamitku NIRB-kut Katimatinnagit Katimaniqmut Taiguagakhaqmik (December 19, 2014mi) Sabina tuniyuq Kingulliqpaanganik Avatiliriniqmut Ayurhautigiyauyuq Titiraq November 23, 2015 ihumagiyauyuq maliktuq uumunnga Havauhikhaq Maliktakhangit. Tamna Ayurnaittumik Katimapkainiq unalu Kingulliqpaanga Katimayut April 30, 2016 Kitikmeot Inuit Katimayiitkunnut, Nunavut Kavamanga, tamaitalu tikkuaqtauyut havaktingit Kitikmeonmi nunallaangit pitquiyuq tamna Havauhikhaq piyukhaq. Unalu, havakvinga Inuuliriyiitkut Kaanatami, Imarmiutaliriyiitkut Kaanatami unalu Kaanatami Hikuirutiliriyiitkut Umiaq, Avatinganut Hilaup Aadlangurninnga Kaanatami, Nunamiingaqhimayut Maniliurahuarutit Kaanatami, unalu Ingilrayuliriyiitkut Kaanatami tamaita naunaiqtaat atugaittut ihumaalutiqangittut uqaqtauyukhaq uumani Avatiliriniqmut Naunaiyainiq piliqqagu. June 15, 2016mi NIRB-kut naunaipkaqtait Kingulliqpaaq Katimadjutimut Taiguagakhaq Ministamut Inuuliriyiitkut Kaanatami (tamna Ministanga) pitquyait Havauhikhaq angiqtakhaungittuq pigiami talvani. January 12, 2017mi tamna Minista pitquyait NIRB-kut ihumagiffaarumitku tamna Havauhikhaq titiraqhimayumi ilangani 12.5.7(e) Nunavut Angirutingani piqalluanginmat NIRB-kut Kingulliqpaaq Katimadjutimut Taiguagakhaq.

Sabina piliuliqtaa Naunairvinga Kingulliqpaap Avatiliriniqmut Ayurhautigiyauyuq Titiraq piliurumayanginnut una Hanningayuq Havauhikhaq. Naunairvinga naunaiqtaa akhuraaluk atuganginnik ihumaalutigiyangit NIRB-kut titiraqhimayuq uumani Kingulliqpaaq Katimadjutimut Taiguagakhaq unalu Ministaup pitquyautininnganut titiranga. Ilaliutigiyaa Kingulliqpaaq Avatiliriniqmut Ayurhautigiyauyuq Titiraq ilitariyaillu talvannga kitut ilaliutihimayuq naunaiyarhimayuqluuniit aadlanguqhimayuqluuniit. Una ilaliutiyuq nutaamik nutaangurhimayuqlu naunaitkutaq nunallaanut kavamatkunnullu ilaliutiniq, tuktut nunamiutallu huradjangit, imaqmi avatinganik, tariuq avatinga, imaq qanurittaakhaanik, hilalu unalu hilauplu qanurittaakhaanik aadlanit uqaqtakhanginnik. Una Ilaliutiyuq tuniyauyuq NIRB-kunnut, KIA-tkunnut, kavamatkunnut nunallaanilu tigumiaqtuuqatauyunut ihivriuqtakhangit qanurlu ihumagiyanginnik naunaiqhimayuq NIRB-kunnit.

FEIS Addendum Introduction

BACKGROUND

Sabina Gold & Silver Corp. (Sabina) is focused on the responsible development of the Back River Project (or the Project) in the Kitikmeot Region of Nunavut. Sabina commenced the Environmental Assessment of the Project on June 14, 2012 with the submission of a Project Proposal to the Nunavut Impact Review Board (NIRB or the Board). The NIRB provided Project Guidelines for the production of an Environmental Impact Statement on April 30, 2013 and Sabina subsequently submitted a conformant Draft Environmental Impact Statement to the NIRB on January 20, 2014. Technical Meetings, a Community Round-Table and Pre-hearing Conference on the Draft Environmental Impact Statement were completed on November 20, 2014. Following the receipt of the NIRB's Pre-hearing Conference Report (December 19, 2014) Sabina submitted the Final Environmental Impact Statement on November 23, 2015 which was deemed conformant to the Project Guidelines. The Technical Meeting and Final Hearing concluded on April 30, 2016 with the Kitikmeot Inuit Association, Government of Nunavut, and all selected representatives of the Kitikmeot communities recommending that the Project should be allowed to proceed. In addition, the departments of Indigenous and Northern Affairs Canada, Fisheries and Oceans Canada and the Canadian Coast Guard, Environment and Climate Change Canada, Natural Resources Canada, and Transport Canada all confirmed that they had no outstanding issues to be addressed at the Environmental Assessment phase. On June 15, 2016 the NIRB released their Final Hearing Report to the Minister of Indigenous and Northern Affairs Canada (the Minister) which recommended that the Project should not be approved to proceed at this time. On January 12, 2017 the Minister directed the NIRB to reconsider the Project under section 12.5.7(e) of the Nunavut Agreement due to deficiencies in the NIRB Final Hearing Report.

INTRODUCTION

This Addendum of the Final Environmental Impact Statement (the FEIS Addendum) is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information as amendments and additions to the original FEIS. As described in the NIRB's Direction Letter, the addenda will address:

- Issues where the Board noted a lack of clear evidence or assurance in proposed mitigation measures in the Final Hearing Report;
- Direction provided in the NIRB's Guidelines for the Preparation of an Environmental Impact Statement for Sabina Gold & Silver Corp.'s Back River Project (EIS Guidelines, April 2013); and
- Address the particular issues highlighted within the Ministers' enclosed January 12, 2017 referral letter.

The FEIS Addendum addresses concerns of the NIRB as outlined in their Final Hearing Report, as well as the Ministers' Referral Letter. It supplements the Final Environmental Impact Statement and identifies what has since been added or clarified and otherwise has changed. This includes new and updated information on community and government engagement, caribou and terrestrial wildlife, freshwater aquatic environment, marine environment, water quality, and climate and meteorology amongst other topics.

Responses are generally based on the presentation of further clarification or new or updated information to be considered by the Board. Responses focused on further clarification identify information that was previously publicly available but which may not have been identified or thoroughly considered as part of the Final Hearing Report. Responses with new or updated information are primarily focused on providing greater confidence within the various effect assessments or increasing mitigation and monitoring of potential effects. In all cases this new or updated information is meant to generate a higher degree of confidence and generally does not effect other FEIS sections such as effect assessments, transboundary, cumulative effects, etc.

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21). New, updated, or clarifications of previously provided information can be found in the respective volume section of the FEIS Addendum.

The following designators are assigned to each update:

Change Designator	Description
Addenda	Additional information to that provided in FEIS. This is in the form of Sabina's response to a specific issue or concern raised in the NIRB's Final Hearing Report.
General updates	Additional information to that provided in FEIS. These are general in the form of updated statistics respecting community consultation and government engagement.
New	New information to that provided in FEIS. This is in the form of standalone documents, either appendices or management plans, that did not exist in the FEIS.
Revised	New or updated information to that provided in FEIS. This is in the form of standalone documents, either appendices or management plans, that have been revised since FEIS.
Significantly Revised	New or updated information to that provided in FEIS. This is in the form of management plans that have been revised so significantly since FEIS that the Addendum does not resemble the original document in respect of either format or content.

The following table summarizes the inclusions in the FEIS Addendum along with their respective types of change. A Volume Addenda Summary is provided at the beginning of each FEIS Addendum Volume which describes the included updates.

Addendum	Title	Description	Change
1	**Volume 1 Addenda: Main Volume**		
Addendum Appendix V1-1A	Table of Conformity	Table of Conformity (Amendments and Additions)	Revised
Addendum Appendix V1-9	Party-Recommended Terms & Conditions and Commitments		New
2	**Volume 2 Addenda: Project Description and Alternatives**		General updates
3	**Volume 3 Addenda: Public Consultation, Government Engagement, and TK**		General updates
3.3	Traditional Activity and Knowledge (TK)	NIRB Response 5.6: Traditional Activity and Knowledge (TK)	Addenda
Addendum Appendix V3-1A	Record of Meetings with Community and Stakeholder Groups		Revised
Addendum Appendix V3-1B	Record of Attempted Meetings with Community and Stakeholder Groups		Revised
Addendum Appendix V3-1C	Community and Stakeholder Group Meeting Minutes and Public Comment Forms		Addenda
Addendum Appendix V3-1F	Record of Donations		Revised
Addendum Appendix V3-1H	Draft Terms of Reference Inuit Environmental Advisory Committee		New
Addendum Appendix V3-2A	Record of Meetings with Government Officials		Revised
4	**Volume 4 Addenda: Atmospheric Environment**		
4.3	Climate and Meteorology	NIRB Response 4.2: Climate and Meteorology (Climate Change)	Addenda
Addendum Appendix V4-3D	Climate Change Memo		New
Addendum Appendix V4-3E	Climate Change Expert Third Party Review		New
5	**Volume 5 Addenda: Terrestrial Environment**		
5.3	Landforms and Soils	NIRB Response 4.5: Geological Features, Surficial and Bedrock Geology, and Geochemistry (CC)	Addenda
5.4	Vegetation and Special Landscape Features	NIRB Response 4.10: Vegetation	Addenda
5.5	Caribou	NIRB Response 4.11: Terrestrial Wildlife and Wildlife Habitat (Caribou)	Addenda
5.5	Potential Cumulative Effects Assessment	NIRB Response 6.4: Cumulative Effects (Caribou)	Addenda
5.5	Transboundary Effects	NIRB Response 6.7: Transboundary Effects (Caribou)	Addenda
Addendum Appendix V5-5I	Expert Third Party Review of Wildlife Mitigation and Monitoring Program Plan 1 - Golder		New
Addendum Appendix V5-5J	Expert Third Party Review of Wildlife Mitigation and Monitoring Program Plan 2 - EDI		New

(continued)

Addendum	Title	Description	Change
Addendum Appendix V5-5K	Sabina Note to the Record – Expert Third Party Review Comments		New
6	**Volume 6 Addenda: Freshwater Environment**		
6.1	Surface Hydrology	NIRB Response 4.6: Hydrological Features and Hydrogeology (Closure)	Addenda
6.4	Freshwater Water Quality	NIRB Response 4.7: Groundwater and Surface Water Quality (SSWQO) (AEMP)	Addenda
6.6	Freshwater Fish/Aquatic Habitat	NIRB Response 4.9: Freshwater Aquatic Environment (TK)	Addenda
Addendum Appendix V6-4C	Site Specific Water Quality Objectives Memo		New
Addendum Appendix V6-6F	Rascal Stream Fishway Memo		New
Addendum Appendix V6-6G	Winter Ice Road Fish Habitat Memo		New
Addendum Appendix V6-6H	Bernard Harbour Report and Baseline		New
7	**Volume 7 Addenda: Marine Environment**		
7.4	Marine Fish/Aquatic Habitat	NIRB Response 4.13: Marine Environment	Addenda
7.5	Marine Fish Community	NIRB Response 4.14: Marine Wildlife	Addenda
Addendum Appendix V7-2B	Marine Monitoring Supplemental Information		New
8	**Volume 8 Addenda: Human Environment**		
8.3	Socio-economics	NIRB Response 5.4: Contracting and Business Opportunities (Closure, IIBA)	Addenda
8.3	Socio-economics	NIRB Response 5.9: Health and Well-Being	Addenda
8.6	Human Health and Environmental Risk Assessment	NIRB Response 5.11: Human Health and Safety	Addenda
Addendum Appendix V8-3C	Communities and Diamonds: 2015 Annual Report		New
Addendum Appendix V8-3D	Measuring Success 2014: NWT Diamond Mines Continue to Create Benefits		New
9	**Volume 9 Addenda: Methodology, Effects of Environment on Project, Accidents and Malfunctions**		
9.3	Accidents and Malfunctions	NIRB Response 6.2: Accidents and Malfunctions Assessment	Addenda
10	**Volume 10 Addenda: Management Plans**		
Vol. 10 Ch. 4	Fuel Management Plan		Revised
Vol. 10 Ch. 5	Spill Contingency Plans		Revised
Vol. 10 Ch. 6	Oil Pollution Emergency Plan		Revised
Vol. 10 Ch. 19	Aquatic Effects Management Plan		Significantly Revised
Vol. 10 Ch. 20	Wildlife Mitigation and Monitoring Program Plan		Significantly Revised
Vol. 10 Ch. 21	Conceptual Fish Offsetting Plan		Revised
Vol. 10 Ch. 30	Vegetation Monitoring Plan		New
Vol. 10 Ch. 31	Conceptual Fish-out Plan		New

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the NIRB's EIS Guidelines for the Back River Project with respect to the new or updated information provided with the FEIS Addendum. An updated Table of Conformity is included in FEIS Addendum Volume 1, Appendix Addendum V1-1A. This Table replaces the FEIS Table V1-1A.

BACK RIVER PROJECT
FEIS ADDENDUM

Table of Contents

Plain Language Summary i

Plain Language Summary (Inuktituk Kivalliq) ii

Plain Language Summary (Inuinnaqtun) iii

FEIS Addendum Introduction iv

Table of Contents ix

1. Volume 1 Addenda: Main Volume 1-1
   - Volume Addenda Summary 1-1
   - Addendum Appendix V1-1A: Table of Conformity (addenda)
   - Addendum Appendix V1-9: Party-Recommended Terms & Conditions and Commitments (New)

2. Volume 2 Addenda: Project Description and Alternatives 2-1
   - Volume Addenda Summary 2-1

3. Volume 3 Addenda: Public Consultation, Government Engagement, and Traditional Knowledge 3-1
   - Volume Addenda Summary 3-1
   - 3.3 Traditional Activity and Knowledge (TK) (Addenda) 3-8
   - Addendum Appendix V3-1A: Record of Meetings with Community and Stakeholder Groups (Revised)
   - Addendum Appendix V3-1B: Record of Attempted Meetings with Community and Stakeholder Groups (Revised)
   - Addendum Appendix V3-1C: Community and Stakeholder Group Meeting Minutes and Public Comment Forms (Addenda)
   - Addendum Appendix V3-1F: Record of Donations (Revised)
   - Addendum Appendix V3-1H: Draft Terms of Reference Inuit Environmental Advisory Committee (New)
   - Addendum Appendix V3-2A: Record of Meetings with Government Officials (Revised)

4. Volume 4 Addenda: Atmospheric Environment 4-1
   - Volume Addenda Summary 4-1
   - 4.3 Climate and Meteorology (Addenda) 4-3
   - Addendum Appendix V4-3D: Climate Change Memo (New)
   - Addendum Appendix V4-3E: Climate Change Expert Third Party Review (New)

5. Volume 5 Addenda: Terrestrial Environment 5-1
Volume Addenda Summary 5-1
5.3 Landforms and Soils (Addenda) 5-5
5.4 Vegetation and Special Landscape Features (Addenda) 5-13
5.5 Caribou (Addenda) 5-21
Addendum Appendix V5-5I: Expert Third Party Review of Wildlife Mitigation and Monitoring Program Plan 1 - Golder (New)
Addendum Appendix V5-5J: Expert Third Party Review of Wildlife Mitigation and Monitoring Program Plan 2 - EDI (New)
Addendum Appendix V5-5K: Sabina Note to the Record – Expert Third Party Review Comments (New)

6. Volume 6 Addenda: Freshwater Environment 6-1
Volume Addenda Summary 6-1
6.1 Surface Hydrology (Addenda) 6-4
6.4 Freshwater Water Quality (Addenda) 6-10
6.6 Freshwater Fish/Aquatic Habitat (Addenda) 6-16
Addendum Appendix V6-4C: Site Specific Water Quality Objectives Memo (New)
Addendum Appendix V6-6F: Rascal Stream Fishway Memo (New)
Addendum Appendix V6-6G: Winter Ice Road Fish Habitat Memo (New)
Addendum Appendix V6-6H: Bernard Harbour Report and Baseline (New)

7. Volume 7 Addenda: Marine Environment 7-1
Volume Addenda Summary 7-1
7.4 Marine Fish/Aquatic Habitat (Addenda) 7-4
7.5 Marine Fish Community (Addenda) 7-8
Addendum Appendix V7-2B: Marine Monitoring Supplemental Information (new)

8. Volume 8 Addenda: Human Environment 8-1
Volume Addenda Summary 8-1
8.3 Socio-economics (Addenda) 8-3
8.6 Human Health and Environmental Risk Assessment (Addenda) 8-10
Addendum Appendix V8-3C: Communities and Diamonds: 2015 Annual Report (New)
Addendum Appendix V8-3D: Measuring Success 2014: NWT Diamond Mines Continue to Create Benefits (New)

9. Volume 9 Addenda: Methodology, Effects of Environment on Project, Accidents and Malfunctions 9-1
Volume Addenda Summary 9-1
9.3 Accidents and Malfunctions (Addenda) 9-3

10. Volume 10 Addenda: Management Plans 10-1
Volume Addenda Summary 10-1
4. Fuel Management Plan (Revised)
5. Spill Contingency Plans (Revised)

6. Oil Pollution Emergency Plan (Revised)
19. Aquatic Effects Management Plan (Significantly Revised)
20. Wildlife Mitigation and Monitoring Program Plan (Significantly Revised)
21. Conceptual Fish Offsetting Plan (Revised)
30. Vegetation Monitoring Plan (New)
31. Conceptual Fish-out Plan (New)

1. Volume 1 Addenda: Main Volume

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 4) with respect to the new information provided on the topic of presenting the Final Environmental Impact Statement and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

INTRODUCTION (FEIS VOLUME 1, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

PUBLIC CONSULTATION AND ENGAGEMENT AND GOVERNMENT ENGAGEMENT (FEIS VOLUME 1, CHAPTER 2)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. See FEIS Addendum Volume 3 Addenda Summary for a summary of the updated information related to public consultation and engagement and government engagement.

PROJECT DESCRIPTION (FEIS VOLUME 1, CHAPTER 3)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

TRADITIONAL KNOWLEDGE (FEIS VOLUME 1, CHAPTER 4)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

EXISTING ENVIRONMENT AND BASELINE INFORMATION (FEIS VOLUME 1, CHAPTER 5)

Since the FEIS Final Hearing, Sabina has continued to advance baseline studies at Bernard Harbour. See FEIS Addendum Volume 6 Addenda Summary for a summary of the updated information related to existing environment and baseline information for the freshwater environment.

POTENTIAL EFFECTS ASSESSMENT (FEIS VOLUME 1, CHAPTER 6)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

MITIGATION AND ADAPTIVE MANAGEMENT (FEIS VOLUME 1, CHAPTER 7)

A new commitment, not previously stated in the FEIS, is for performance monitoring to be conducted to measure freeze encapsulation of the tailings and waste rock covers during Operations and through Closure to inform adaptive management. See FEIS Addendum Volume 4 Addenda Summary for a summary of the updated information related to mitigation and adaptive management for the atmospheric environment.

POTENTIAL CUMULATIVE EFFECTS ASSESSMENT (FEIS VOLUME 1, CHAPTER 8)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

RECLAMATION AND CLOSURE (FEIS VOLUME 1, CHAPTER 9)

Since the FEIS Final Hearing, Sabina has advanced the Mine Closure and Reclamation to address NIRB's concerns raised in the Final Hearing Report and to support future water licence submissions. See FEIS Addendum Volume 5 Addenda Summary for a summary of the new or updated information related to progressive reclamation.

MONITORING AND MANAGEMENT PLANS (FEIS VOLUME 1, CHAPTER 10)

Since the FEIS Final Hearing, Sabina has advanced several monitoring and management plans to address NIRB's concerns raised in the Final Hearing Report and to support future water licence submissions. See FEIS Addendum Volume 10 Addenda Summary for a summary of the updated information related to monitoring and management plans.

SUMMARY OF COMMITMENTS (FEIS VOLUME 1, CHAPTER 11)

A new, unsolicited commitment, not previously stated in the FEIS, is for performance monitoring to be conducted to measure freeze encapsulation of the tailings and waste rock covers during Operations and through Closure to inform adaptive management. See FEIS Addendum Volume 4 Addenda Summary for a summary of the updated information related to this commitment.

A new, unsolicited commitment, not previously stated in the FEIS, is for a vegetation assessment of the portion of the winter ice road north of Tahikafflok Lake (Bathurst Lake) that was realigned and lies outside of the FEIS local study area. See FEIS Addendum Volume 5 Addenda Summary for a summary of the updated information related to this commitment.

CONCLUSIONS (FEIS VOLUME 1, CHAPTER 12)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

APPENDICES (FEIS VOLUME 1)

FEIS Appendix	Title	Summary of Change
Appendix V1-1	Tables of Concordance	Revised - Addendum Appendix V1-1A Table of Conformity
Appendix V1-2	List of Permits, Licences, and Authorizations Required for Project	No changes
Appendix V1-3	Land and Water Interests	No changes
Appendix V1-4	List of Consultants Contributing to FEIS	No changes
Appendix V1-5	List of Agencies, Organizations, and Persons for FEIS Distribution	No changes
Appendix V1-6	Commitments Table	No changes
Appendix V1-7	FEIS Document Index	No changes
Appendix V1-8	FEIS Complete Table of Contents	No changes
Appendix V1-9	Party-Recommended Terms & Conditions and Commitments	New

Sabina has reviewed the NIRB's EIS Guidelines for the Project with respect to the new or updated information provided within the FEIS Addendum. An updated Table of Conformity in FEIS Addendum Volume 1, Appendix Addendum V1-1A has been provided to reflect the changes. This Table replaces the FEIS Table V1-1A.

FEIS Addendum Appendix V1-9 Party-Recommended Terms & Conditions and Commitments is a newly created list of project certificate terms and conditions recommended to NIRB by federal and territorial agencies and the KIA during the April 2016 NIRB Public Hearings.

None of the additional information presented in the FEIS Addendum affects the conclusions presented in the Main Volume (FEIS Volume 1).

ADDENDUM APPENDIX V1-1A: TABLE OF CONFORMITY (ADDENDA)

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
2.0 GUIDING PRINCIPLES	2.1 NIRB'S IMPACT REVIEW PRINCIPLES		An ecosystem-based approach must be adopted for the review - In order to gain an adequate understanding of the effects of the Project, an ecosystem-based approach must be adopted to ensure that the review addresses both the direct impacts that the Project will have on the various ecosystem components, as well as the interactions that will occur between components.		4, 5, 6, 7, 8	All	-	All
2.0 GUIDING PRINCIPLES	2.1 NIRB'S IMPACT REVIEW PRINCIPLES		Socio-economic issues, such as giving consideration to the potential for the Project to affect economic development within the region, must be included in the review - Members of the community constitute a critical part of the environment, and their concerns relating to the Project need to be assessed by the NIRB. As such, adverse and beneficial effects of the Project on members of the community with respect to health, recreation, and other aspects of social well-being need to be addressed in the EIS, in order to ensure a culturally holistic understanding of the Project's effects.		8	All	-	All
2.0 GUIDING PRINCIPLES	2.1 NIRB'S IMPACT REVIEW PRINCIPLES		An understanding of past and potential future environmental, economic, and social trends in the region potentially affected by the proposed Project, and how the Project will influence these trends is required - The inclusion of a time perspective on all phases of the Project, from the early planning stages through operations and closure including post-closure and maintenance phases where appropriate. It is important to include all phases of the Project in order to provide the NIRB with a full understanding of the cumulative environmental effects in combination with other past, present and reasonably foreseeable projects.		4, 5, 6, 7, 8, 9	All	-	All
2.0 GUIDING PRINCIPLES	2.1 NIRB'S IMPACT REVIEW PRINCIPLES		The well-being of residents of Canada outside the Nunavut Settlement Area must be taken into account - Significant transboundary biophysical and socio-economic effects directly related to this Project must be included in the EIS in order to ensure the NIRB's assessment of the well-being of Canadians outside of the NSA.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4 ,5, 6, 7 1, 3, 4, 5 1	X.7 X.7 X.7 X.7 X.7 1.4	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70, 7-57 2-41, 3-32, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 1-51 to 1-53
2.0 GUIDING PRINCIPLES	2.2 PUBLIC PARTICIPATION AND ENGAGEMENT		In preparing its EIS, the Proponent is required to engage potentially affected communities, its residents, Inuit Organizations, Aboriginal groups, and other governments or other organizations, including where relevant, adjacent jurisdictions outside of the Nunavut Settlement Area. Refer to the NIRB's Guide 6B: A Proponent's Guide to Conducting Business Consultation for the NIRB Environmental Assessment Process when preparing to consult with the general public. Public participation is required when: - Identifying current and historical patterns of land and resource use, - Acquiring traditional knowledge (TK), - Identifying VECs and VSECs, - Evaluating the significance of potential impacts, - Deciding upon mitigating measures, and - Identifying and implementing monitoring measures, including post-project audits.	Yes	3 Addendum 3	1, 2, 3 1	1.3, 1.4, 1.5, 1.6, Table 1.6-1, 1.7, Appendices ~~V3-1A, V3-1B, V3-1C,~~ V3-1E, V3-1G, 2.1, 2.2, 2.3, 2.4, ~~Appendix V3-2A~~, 3.2, 3.3, Appendices V3-3A, V3-3B, V3-3D Addendum Appendices V3-1A, V3-1B, V3-1C, V3-2A	1-5 to 1-48, All 2-1 to 2-7, ~~All~~ 3-44 to 3-53, All All
2.0 GUIDING PRINCIPLES	2.2 PUBLIC PARTICIPATION AND ENGAGEMENT		Another objective of the NIRB review process is to involve potentially affected Nunavummiut to address concerns regarding any changes that the Project may cause in the environment and the resulting effects of any such changes on the traditional and contemporary use of land/ice and resources. The Proponent must ensure that Nunavummiut have the information that they require in respect to the Project and on how the Project may impact them.	Yes	3 Addendum 3	1, 3 3	1.3, 1.4, 1.5, 1.6, Table 1.6-1, 1.7, Appendices ~~V3-1A, V3-1B, V3-1C,~~ V3-1E, V3-1G 3.2, 3.3, Appendices V3-3A, V3-3B, V3-3D Addendum Appendices V3-1A, V3-1B, V3-1C	1-5 to 1-48, All 3-44 to 3-53, All All
2.0 GUIDING PRINCIPLES	2.2 PUBLIC PARTICIPATION AND ENGAGEMENT		The NIRB Review process requires the development of a public participation and awareness program to initiate engagement of the public during the initial stages of the Review, and to facilitate meaningful consultation with those communities potentially affected by a proposed project.		3	1	1.3, 1.4, 1.5, 1.6, Table 1.6-1, 1.7, Appendices V3-1A, V3-1B, V3-1C, V3-1E, V3-1G	1-5 to 1-48, All
2.0 GUIDING PRINCIPLES	2.2 PUBLIC PARTICIPATION AND ENGAGEMENT		The Proponent must provide the highlights of any public engagement within the EIS, including the methods used, the results, and the ways in which the Proponent intends to address the concerns identified.	Yes	3 Addendum 3	1 1	1.3, 1.4, 1.5, 1.6, Table 1.6-1, 1.7, Appendices ~~V3-1A, V3-1B,~~ V3-1G Addendum Appendices V3-1A, V3-1B	1-5 to 1-48, All All
2.0 GUIDING PRINCIPLES	2.3 TRADITIONAL KNOWLEDGE		The Proponent shall not only incorporate TK into the baseline collection and methodologies, but further outline where management strategies, mitigation and monitoring plans, and/or operational considerations employ values of the Inuit Qaujimajatuqangit.		3	3	3.1.3, Table 3.1-1, Table 3.1-2, 3.3	3-2 to 3-43, 3-50 to 3-53
2.0 GUIDING PRINCIPLES	2.3 TRADITIONAL KNOWLEDGE		The Proponent must incorporate into the EIS the TK to which it has access or the TK that it may reasonably be expected to acquire through appropriate due diligence, in keeping with appropriate ethical standards and without breaching obligations of confidentiality.		3	3	Table 3.1-1, 3.2, Appendices V3-3A, V3-3B, V3-3C, V3-3D	3-3 to 3-42, 3-44 to 3-50, All
2.0 GUIDING PRINCIPLES	2.4 PRECAUTIONARY PRINCIPLE		The Proponent must demonstrate that the proposed Project is examined in a manner consistent with the precautionary principle in order to ensure that they do not cause serious or irreversible damage to the environment.		2 9	2 1	2.1.4 1.2.3, 1.3.4	2-2 to 2-3 1-4 to 1-17, 1-39 to 1-49
2.0 GUIDING PRINCIPLES	2.4 PRECAUTIONARY PRINCIPLE		The Proponent must outline the assumptions made about the effects of the proposed Project and the approaches to minimize these effects, including assumptions that are developed where scientific uncertainty exists		1 9 10	1, 10 1, 2 1	1.4.1, 10.1, 10.2 1.2.4.3, 1.3.5.1, 1.3.5.2, All 4.1, 4.3	1-5, 10-1 to 10-3, 10-3 1-20 to 1-27, 1-49 to 1-50, 1-50, All 5 to 6, 6 to 7

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
2.0 GUIDING PRINCIPLES	2.4 PRECAUTIONARY PRINCIPLE		The Proponent must identify any follow-up and monitoring activities planned, particularly in areas where scientific uncertainty exists in the prediction of effects	Yes	1 9 ~~10~~ 10 Addendum 10	10 1 ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All 1.2.3.1, 1.2.4.4, 1.3.5.3 ~~All~~ All All	All 1-5 to 1-16, 1-27, 1-50 to 1-51 All All All
2.0 GUIDING PRINCIPLES	2.4 PRECAUTIONARY PRINCIPLE		The Proponent must present public views on the acceptability of these effects.		3	1 3	1.6.2.3, 1.6.3, Appendix V3-1C 3.3.3	1-38, 1-39 to 1-47, All 3-52
2.0 GUIDING PRINCIPLES	2.5 SUSTAINABLE DEVELOPMENT		The EIS should clearly demonstrate how the Project preserves ecosystem integrity, including the capability of natural systems (local and regional) to maintain their structure and functions and to support biological diversity.		2	2	2.1.3	2-2
2.0 GUIDING PRINCIPLES	2.5 SUSTAINABLE DEVELOPMENT		The EIS should clearly demonstrate how the Project respects intergenerational equity. That is, the right of future generations to the sustainable use of renewable and non-renewable resources depends on our commitment to those resources today.		9 10	1 1	1.2.4 3	1-18 to 1-35 3 to 5
2.0 GUIDING PRINCIPLES	2.5 SUSTAINABLE DEVELOPMENT		The EIS should clearly demonstrate how the Project attains durable social and economic benefits, particularly in Nunavut.		2	1	1.8, 2.1.7	1-10 to 1-17, 2-4 to 2-5
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.5		The EIS will contain a Project description, including the purpose and need for the Project.		2	All	All	All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.6		The EIS will contain anticipated ecosystemic and socio-economic impacts of the Project.	Yes	4, 5, 6, 7, 8, 9, ~~10~~ 10 Addendum 10	All ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All ~~All~~ All All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.7		The EIS will contain anticipated effects of the environment on the Project		9	2	All	All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.8		The EIS will contain steps which the Proponent proposes to take, including any contingency plans, to avoid and mitigate adverse impacts.	Yes	1 4 5 6 7 8 ~~10~~ 10 Addendum 10	7, 10, 11 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1. 3, 4, 5 ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All All All All All All ~~All~~ All All	All All All All All All ~~All~~ All All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.9		The EIS will contain steps which the Proponent proposes to take to optimize benefits of the Project, with specific consideration being given to expressed community and regional preferences as to benefits.		2 3	2 1	2.1.7, 4.1.5, 4.1.6 1.6.3	2-4 to 2-5, 4-2 to 4-3 1-39 to 1-48
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.10		The EIS will contain steps which the Proponent proposes to take to compensate interests adversely affected by the Project.		2 9	5 1	5.8 1.2.4.3	5-3 1-20 to 1-27
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.11		The EIS will contain the monitoring program that the Proponent proposes to establish with respect to ecosystemic and socio-economic impacts.	Yes	1 ~~10~~ 10 Addendum 10	10 ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All All All All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.12		The EIS will contain the interests in land and waters which the Proponent has secured, or seeks to secure.		1	Appendix V1-3	All	All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.13		The EIS will contain options for implementing the proposal.		2	4	4.1, 4.2, 4.3	4-1 to 4-29
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.14		The EIS will contain any other matters that NIRB considers relevant.		3	1 3	1.5.1 3.2.6	1-19 to 1-20 3-49 to 3-50
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.15		The EIS will demonstrate whether the project would enhance and protect the existing and future well-being of the residents and communities of the Nunavut Settlement Area, taking into account the interests of other Canadians		2 10	1 23, 26	1.8 3, All	1-10 to 1-17 2 to 3, All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.16		The EIS will demonstrate whether the project would unduly prejudice the ecosystemic integrity of the Nunavut.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5, X.6, X.7	1-15 to 1-31, 2-11 to 2-25 4-26 to 4-62, 5-131 to 5-242, 6-37 to 6-82, 7-18 to 7-63, 8-32 to 8-94, 9-30 to 9-58, 10-22 to 10-54 1-41 to 1-56, 4-26 to 4-59, 5-14 to 5-38, 6-44 to 6-70, 7-34 to 7-57 2-16 to 2-41, 3-12 to 3-33, 4-40 to 4-52, 5-22 to 5-34, 6-20 to 6-50, 7-15 to 7-37 1-15 to 1-29, 3-42 to 3-124, 4-33 to 4-82, 5-23 to 5-61
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.17		The EIS will demonstrate whether the proposal reflects the priorities and values of the residents of the Nunavut Settlement Area.		1 10	1 26,28	1.4 All	1-3 to 1-5 All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.18		The EIS will demonstrate steps which the proponent proposed to take to avoid and mitigate adverse impacts.	Yes	1 4 5 6 7 8 ~~10~~ 10 Addendum 10	7, 10, 11 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1. 3, 4, 5 ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All All All All All All ~~All~~ All All	All All All All All All ~~All~~ All All
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.19		The EIS will demonstrate steps which the Proponent proposes to take, or that should be taken, to compensate interests adversely affected by the project.		3	1	1.3.1.1, 1.5.3.3	1-5 to 1-6, 1-28 to 1-36
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.20		The Proponent will post performance bonds.		10	29	1.6.1, 1.7	2 to 5, 7 to 9
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.21		The EIS will contain the monitoring program that the Proponent proposes to establish, or that should be established for ecosystemic and socio-economic impacts.	Yes	1 ~~10~~ 10 Addendum 10	10 ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All All All All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
3.0 SCOPE OF THE NIRB ASSESSMENT	3.1 NLCA - SECTIONS 12.5.2 AND 12.5.22		The EIS will contain steps which the Proponent proposes to take, or that should be taken, to restore ecosystemic integrity following project abandonment.		1 2 10	9 8 29	All All 3, 4, 5, 6	All All 14 to 29
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.1 PRESENTATION		The Proponent shall provide an EIS that is complete and which provides sufficient information to identify, describe and determine the significance of potential impacts to the ecosystemic and socio-economic environments that could arise from the Project. The EIS should include scientific works, subject-specific studies and all other sources of information covering all aspects of the Project in regards to ecosystemic and socio-economic perspectives.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.1 PRESENTATION		For clarity and ease of reference, the EIS should be presented in the same order as the EIS Guidelines. However, the NIRB recognizes that flexibility in the arrangement of the document may be required and the Proponent is encouraged to use its judgment and best practices in designing a document that is arranged and formatted to facilitate ease of reviewing while ensuring that all the information requested in these Guidelines are provided. In the interest of brevity, the EIS should make reference to, rather than repeat, information that may be presented in other sections of the document.		All	All	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.1 PRESENTATION		An index of the EIS document is also required and must provide a reference to the locations of required information by volume, section, sub-section, and page number.		1	Appendices V1-7, V1-8	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.1 PRESENTATION		The EIS shall be made available to the NIRB electronically on searchable CD-ROM and/or memory stick, as well as in hard copy. If the Proponent chooses to submit the EIS via memory stick only, it shall be responsible to provide CD-ROM versions of the EIS if requested by the NIRB or parties.		-	-	-	N/A
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.1 PRESENTATION		For purposes of uploading distribution, individual file sizes should be no larger than 5 MB in size (using only low resolution images). If the Proponent determines that certain files are better presented with larger resolution, then these files should be submitted to the NIRB, however it should be noted that these files may only be distributed by the NIRB upon request, and that in this case, the Proponent may be required to provide hard copy mailings of such items.		-	-	-	N/A
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.1 PRESENTATION		Where certain volumes or sections of the EIS may exceed the 5 MB limit, the Proponent is required to break these files into manageable sizes for submission to the NIRB, in a manner that facilitates parties' ease of navigation of such files.		-	-	-	N/A
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.2 CONFORMITY		The EIS shall contain a concordance table directing reviewers to the location (volume/document, section, sub-section, and page number) where specific information addressing the Guidelines and the NIRB's Minimum EIS Requirements may be found.		1	Appendix V1-1	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.2 CONFORMITY		For each item in the concordance table, the Proponent is also requested to provide a reference to the appropriate EIS Guideline section for the ease of parties' review.		1	Appendix V1-1	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.2 CONFORMITY		This concordance table shall further include, where applicable, an indication of what information, details, or data the Proponent has deferred from its current submission and which it plans to include in the Final EIS. Where the Proponent is unable to provide information until submission of a Final EIS, it shall further provide within the concordance table, its rationale for deferring the inclusion of such information.		1	Appendix V1-1	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.2 CONFORMITY		It is possible that the EIS Guidelines include matters that, in the judgement of the Proponent, are not relevant or significant to the Project. If that definition of such matters results in omissions from the EIS, those instances must be clearly indicated and the Proponent should explain and justify its reasoning for each omission identified, so that the public and other interested parties have an opportunity to comment on this judgement. Where any differences in direction are encountered between the NIRB's most recent guidance on the preparation of EIS documentation (Guide 7 (NIRB, 2006b) or any subsequent replacement Guide in force at the time the EIS is being prepared) and the EIS Guidelines issued pursuant to the NLCA Section 12.5.2, the Proponent may be required to provide the additional information. The Proponent is advised to consult with the NIRB on any direction presented within these Guidelines on which it plans significant deviation.		Noted	-	-	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.3 LENGTH		The Proponent's EIS Main Document (i.e., Volume I) shall be concise and not exceed 150 pages without permission from the NIRB. The 150 page limit shall not include: the Title Page, Executive Summary, Popular Summary, Glossary, Table of Contents, Concordance Table, Consultants and Organizations, Appendix, and References.		1	All	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.3 LENGTH		Any data of a detailed nature shall be contained in separate volumes as appendices and technical reports submitted in support of the main document.	Yes	2, 3, 4, 5, 6, 7, 8, 9, ~~10~~ 10 Addendum 10	All ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All ~~All~~ All All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.3 LENGTH		The Proponent must submit a list of all documents, supporting maps, figures, documents, and tables used as reference materials throughout the EIS.		1	Appendices V1-7, V1-8	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall have sections numbered and be presented in a fully functional PDF format which supports electronic linkages between and among the Table of Contents and associated sections within the EIS document(s).		All	All	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The digital EIS document must be fully indexed and searchable using keywords.		All	All	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a cover sheet with a Project description.		1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Cover	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain an executive summary (in English, Inuinnaqtun and Inuktitut).		1	Executive Summary	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a plain language summary/popular summary (in English, Inuinnaqtun and Inuktitut).		1	Plain Language Summary	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a glossary (in English, Inuinnaqtun and Inuktitut).		1	Glossary	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a Table of Contents.		All	Table of Contents	-	N/A
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a concordance table which lists each of the Guideline requirements and the associated location of each within the EIS.		1	Appendix V1-1	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a purpose of, and need for, the Project.		2	1	1.8	1-10 to 1-17
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a detailed Project description including potential future development.		2	2 3 6 7 8	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain alternatives considered in the development of the Project proposal.		2	4	4.1, 4.2, 4.3	4-1 to 4-29
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a discussion of the public consultation initiatives with the communities potentially affected by the Project. Provide the results of the public consultation, as well as evidence that community concerns were addressed in the planning of the Project activities.	Yes	3 Addendum 3	1 1	1.3, 1.4, 1.5, 1.6, Table 1.6-1, 1.7, Appendices ~~V3-1A, V3-1B, V3-1C~~, V3-1E, V3-1G Addendum Appendices V3-1A, V3-1B, V3-1C	1-5 to 1-48, All All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain baseline information and studies of the existing ecosystem and socio-economic environment.		4 5 6 7 8	All	X.1	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain anticipated ecosystemic and socio-economic impacts of the Project proposal, including potential impacts on the VECs and VSECs (and as identified through the public consultation process).		3 4 5 6 7 8	1 1, 2 4, 5, 6, 7, 8, 9, 10 1, 3, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1. 3, 4, 5	1.6.2 All All All All All	1-37 to 1-38 All All All All All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain anticipated effects of the environment on the Project.		9	2	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain anticipated cumulative effects of the Project on the region/regions.	Yes	4 ~~5~~ 6 7 8 Addendum 5	1, 2 4, ~~5~~, 6, 7, 8, 9, 10 1, 3, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 5	X.6 X.6 X.6 X.6 X.6 5.5	1-29 to 1-31, 2-23 to 2-25 4-55 to 4-62, 5-197 to 5-1242, 6-69 to 6-82, 7-50 to 7-63, 8-70 to 8-94, 9-55 to 9-58, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37 to 5-38, 6-70, 7-56 to 7-57 2-39 to 2-41, 3-30 to 3-32, 4-50 to 4-52, 5-232 to 5-34, 6-35 to 6-39 to 6-48, 7-36 1-29, 3-104 to 3-120, 4-60 to 4-78, 5-61 5-21 to 5-59

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain anticipated transboundary effects.	Yes	4 5 6 7 8 Addendum 5	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 5	X.7 X.7 X.7 X.7 X.7 5.5	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 5-21 to 5-59
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain anticipated accidents and malfunctions, and potential effects on the environment, include contingency plans and mitigation measures.	Yes	9 ~~10~~ 10 Addendum 10	3, Appendix V9-3A ~~3~~ ~~6~~ ~~14~~ ~~15~~ 3 14 15 6	All, All ~~4.1, 4.3~~ ~~8, 9~~ ~~8.4~~ ~~9~~ 4.1, 4.3 8.4 9 10, 11	All, All ~~13 to 17, 27 to 35~~ ~~23 to 31~~ ~~19 to 21~~ ~~16 to 18~~ 13 to 17, 27 to 35 19 to 21 16 to 18 10-1 to 10-6, 11-1 to 11-4
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain steps which the Proponent proposes to take to avoid and/or mitigate adverse impacts, including contingency plans (spills, fires, floods, etc.) and adaptive management strategies.	Yes	1 4 5 6 7 8 ~~10~~ 10 Addendum 10	7, 10, 11 1, 2 4, 5, 6, 7, 8, 9,10 1, 3, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1. 3, 4, 5 ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All All All All All All ~~All~~ All All	All All All All All All ~~All~~ All All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a statement of residual impacts and significance.		1 4 5 6 7 8	6, 8 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All 1.5.5, 1.10, 2.5.5, 2.10 4.5, 6.5, 7.5, 8.5, 9.5, 10.5 1.5.5, 1.9, 4.5.5, 4.10, 5.5.5, 5.10, 6.5.5, 6.10, 7.5.5, 7.10 2.5.5, 2.10, 3.5.5, 3.10, 4.5.4, 4.10, 5.5.5,, 5.10, 6.5.5, 6.10, 7.5.4, 7.10 1.5.5, 1.10, 3.5.6, 3.10, 4.5.5, 4.10, 5.5.5, 5.10	All 1-28 to 1-29, 1-33, 2-23, 2-27 4-26 to 4-55, 5-131 to 5-197, 6-37 to 6-69, 7-18 to 7-50, 8-22 to 8-70, 9-30 to 9-55, 10-51 1-52 to 1-55, 1-57, 4-56 to 4-57, 4-63, 5-35 to 5-37, 5-42, 6-70, 6-74, 7-56, 7-61 2-39, 2-45, 3-30, 3-36, 4-49, 4-54, 5-22 to 5-32, 5-37, 6-20 to 6-36, 6-55, 7-36, 7-42 1-26 to 1-29, 1-31, 3-101 to 3-104, 3-130, 4-57 to 4-60, 4-85, 5-61, 5-62
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain steps which the Proponent intends to undertake in order to restore the area affected by the Project activities during operation and upon project closure, reclamation and relinquishment of leased land to original landowners.		1 2 10	9 8 29	All All 3, 4, 5, 6	All All 14 to 29
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain steps which the Proponent proposes to take to optimize benefits of the Project, with specific consideration being given to expressed community and regional interests.		2 3	5 1	All 1.6.3	All 1-39 to 1-48
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain the monitoring program that the Proponent proposes to establish.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain the interests in lands and waters which the Proponent has secured, or seeks to secure.		1	Appendix V1-3	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain lists of permits, licences and authorizations required to undertake the Project proposal.		1	Appendix V1-2	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a list of consultants or individuals who assisted in preparation of the EIS.		1	Appendix V1-4	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain a list of agencies, organizations, and persons to whom copies of the EIS will be sent.		1	Appendix V1-5	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain an index.		1	Appendix V1-7	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.4 FORMAT		The EIS shall contain supporting documentation and appendices, including a commitments table that summarizes the proposed mitigation and other company commitments with cross reference to environmental issues or potential impacts.		1	Appendix V1-6	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.5 DATA PRESENTATION		The Proponent shall provide charts, diagrams, photographs, and maps (each of which clearly defines land ownership, provides a scale and indicates a north arrow) within the EIS document.	Yes	1, 2, 3, 4, 5, 6, 7, 8, 9, ~~10~~ 10 Addendum 10	All ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All ~~All~~ All All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.5 DATA PRESENTATION		The Proponent shall include maps or diagrams showing all project related infrastructure and/or activities (e.g., RSA, LSA, camp sites, drilling activities, dock sites, fuel storage and laydown areas, mine site and infrastructure, transportation routes including ground transport, marine shipping and air transport, borrow pits and quarry sites, etc.). It is recommended that maps be scaled appropriately to best present materials and where feasible, to be of a common scale and projection to facilitate comparison.	Yes	1, 2, 3, 4, 5, 6, 7, 8, 9, ~~10~~ 10 Addendum 10	All ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All ~~All~~ All All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.5 DATA PRESENTATION		All charts, diagrams, photographs, and maps must be clearly referenced in the text of the EIS, especially where these may be included in a separate volume to the main EIS document.	Yes	1, 2, 3, 4, 5, 6, 7, 8, 9, ~~10~~ 10 Addendum 10	All ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All ~~All~~ All All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.6 SUMMARIES	4.6.1 Executive Summary (in English, Inuinnaqtun, and Inuktitut)	The Proponent shall prepare an Executive Summary that describes the key Project elements and key findings of the EIS, with particular reference to the overall conclusions of the assessment, and a clear rationale relating those conclusions to the predicted impacts and the measures proposed to address them. The Executive Summary shall focus on items of known or expected public concern and the significant potential impacts of the Project and the methods proposed to address them. It shall also address outstanding issues and the strategies proposed to address them. The Executive Summary shall form part of the EIS, but it shall also be made available as a stand-alone document and must be provided in English, Inuinnaqtun and Inuktitut.		1	Executive Summary	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.6 SUMMARIES	4.6.2 Popular Summary (in English, Inuinnaqtun, and Inuktitut)	The Popular Summary shall have the same general structure and objectives as the Executive Summary, but is to be written in non-technical language and include such things as a glossary and additional explanatory text to assist non-specialists in appreciating the content of the EIS as a whole. Maps indicating major project components including shipping and ground transportation route(s), as well as the potentially affected communities shall be included, and the summary is to be provided in English, Inuinnaqtun and Inuktitut. The Popular Summary shall form part of the EIS, but it shall also be made available as a stand-alone document.		1	Plain Language Summary	All	All
4.0 GUIDANCE ON THE PRESENTATION OF THE ENVIRONMENTAL IMPACT STATEMENT	4.7 TRANSLATION		In addition to the Executive Summary, Popular Summary and Glossary being presented in English, Inuinnaqtun and Inuktitut within the EIS, the summary for each thematic volume shall also be translated into Inuinnaqtun and Inuktitut. If these summaries are included in a separate binder, this binder must be referenced within the EIS and be compiled for ease of reference. Maps shall indicate common and accepted place-names usually referred to by the local populations in their own language(s), in addition to official toponyms, especially where traditional Inuit place-names have been made official through the process outlined in Section 33.9 of the NLCA.		2, 3, 4, 5, 6, 7, 8, 9	Executive Summary	-	N/A
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify itself and explain current and proposed ownership of rights and interests in the Project, operational arrangements, and corporate and management structures.		2	1	1.1, 1.3	1-1, 1-2
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall specify the mechanisms used to ensure that corporate policies are respected.		2	1	1.1	1-1
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall present its environmental policy and shall specify how it applies to all businesses for which the Proponent has an operational responsibility (i.e., employees, contractors, subcontractors and suppliers), as well as describe its environmental reporting systems.		2	9	All	All
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall provide complete contact information, including telephone and fax numbers, postal and email addresses, and shall include, where necessary, separate addresses for its corporate, operations, or other relevant offices.		2	1	1.1 1.5.3.3	1-1 1-28
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall describe its past and/or present experience in the activities being proposed for the Project (e.g. exploration, open pit and underground mining, transportation networks involving air shipping, marine shipping, and winter and all-weather road components, etc.).		2	1	1.1, 1.7	1-1, 1-6 to 1-10
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify its record of compliance with governmental policies and regulations pertaining to environmental and socio-economic issues in past operations.		2	1	1.1	1-1
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify its operation safety, major accidents, spills and emergencies, and corresponding responses.		2	1	1.1	1-1
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify its record in honouring commitments on environmental and socio-economic matters in the event of planned or premature Project closure, whether temporary or permanent, or due to change of ownership.		2	1	1.1, 1.5	1-1, 1-2
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify its relations with Aboriginal peoples, including prior experience with any Impact and Benefits Agreements if appropriate.		2	1	1.1, 1.8	1-1, 1-10 to 1-17
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify its operations in Arctic and Sub-arctic regions.		2	1	1.2	1-2

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify its record in incorporating environmental and socio-economic considerations into construction, operations, maintenance, temporary closure (care & maintenance), final closure (decommission & reclamation), and post-closure.		2	1	1.1	1-1
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify corrective actions undertaken in the past, distinguishing between those taken voluntarily and those taken at the insistence of a third party.		2	1	1.1	1-1
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall identify and describe any obligations or requirements that it must meet to post a bond or other forms of financial security to ensure payment of compensation in the event of accidents that directly or indirectly result in major damage by the Project to the environment, as well as to cover the cost of planned or premature closure, whether temporary or permanent.		2	1	1.1	1-1
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		The Proponent shall provide information on the current status of Project financing, and financial preparedness to meet the requirements for reclamation and security should the Project proceed.		2	1, 8	1.1, 8.2, 8.3	1-1, 8-2, 8-2 to 8-4
5.0 INTRODUCTION	5.1 PROPONENT INFORMATION		If the Proponent does not have prior experience in exploration, mining, or transportation networks, particularly within this region, discussion should include how the experience will be obtained (e.g., other northern projects) and it shall explain the safeguards that it intends to put in place to compensate for a lack of experience.		1	Exec. Summary, 1	Exec. Summary, 1.1	lxi, 1-2
5.0 INTRODUCTION	5.2 REGULATORY REGIME		The Proponent shall present its understanding of the applicable regulatory regime by identifying the requirements of all relevant federal, territorial, and local environmental and socio-economic standards, laws, regulations, policies, guidelines and fiscal regimes relating to Project approval, construction, operations, maintenance and monitoring, temporary closure (care & maintenance), final closure (decommission & reclamation), and post-closure activities. This section should also explain how the requirements would be met and what specific governmental permits and approvals would be required. A list of currently held and required permits and licences, including dates of issue and expiry (as applicable), shall be appended. Requirements imposed by Article 12 of the NLCA may be excluded from this discussion.		2	1, 2	1.5, 2.3	1-2, 2-6 to 2-7
5.0 INTRODUCTION	5.3 REGIONAL CONTEXT		The Proponent shall describe in general terms the regional biophysical and socio-economic environments of the Kitikmeot Region and Nunavut as a whole, including: ecological land classifications, ecological processes and relationships, the location of other base and precious metal finds and other existing and potential developments, and current and future land use plans.		2 8	1 3	1.2 3.1, 3.6.2	1-2 3-1 to 3-25, 3-112
5.0 INTRODUCTION	5.4 LAND TENURE		The Proponent shall delineate on a map of suitable scale the legal boundaries of any areas to which it will acquire rights through lease or other tenure arrangements, including Crown land, Inuit Owned Land, and Commissioner's land. It shall further describe those areas by providing such information including, but not limited to, file numbers, start and end dates, fees, name of right holder and any post-authorization amendments and/or renewals. Ongoing exploration activities should be discussed wherever applicable to the discussion of Project land tenure.		2	1	1.3	1-2
5.0 INTRODUCTION	5.5 ANALYSIS OF NEED AND PURPOSE OF THE PROJECT		The Proponent will address general feasibility from an economic perspective, including how this Project will benefit communities in Nunavut, either directly or indirectly.		2 8	1, 5 3	1.8, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9 All	1-10 to 1-17, 5-1 to 5-4 All
5.0 INTRODUCTION	5.5 ANALYSIS OF NEED AND PURPOSE OF THE PROJECT		The Proponent will assess the longer term strategic implications of the Project, and how it may affect or lend to transportation networks (existing and proposed) in Nunavut.		2	1	1.8	1-10 to 1-17
5.0 INTRODUCTION	5.5 ANALYSIS OF NEED AND PURPOSE OF THE PROJECT		The Proponent will identify past, current and potential future users of the local study area (LSA), regional study area (RSA), and project infrastructure, including commercial, government, public, and private.		2 8	1, 2 3	1.8, 2.1.9 3.6	1-10 to 1-17, 2-5 to 2-6 3-104 to 3-120
5.0 INTRODUCTION	5.5 ANALYSIS OF NEED AND PURPOSE OF THE PROJECT		The Proponent will analyze the overall net benefit of the Project in terms of Nunavut and of Canada as a whole, which includes considerations that are not related to economics.		2 8	1, 5 3	1.8, 5.1, 5.2, 5.3, 5.4, 5.5 3.10	1-10 to 1-17, 5-1 to 5-3 3-130
5.0 INTRODUCTION	5.5 ANALYSIS OF NEED AND PURPOSE OF THE PROJECT		Discussions addressing the preceding four points shall be supported by an analysis of the positive and negative social and economic effects on existing industries, markets, and communities over the life of the Project.		8	1, 3, 4, 5	1.6, 3.6, 4.6, 5.6	1-29, 3-104 to 3-120, 4-60 to 4-78, 5-61
5.0 INTRODUCTION	5.5 ANALYSIS OF NEED AND PURPOSE OF THE PROJECT		The analysis should also indicate the distribution and magnitude of benefits and/or losses to specific socio-economic groups in the relevant study area.		2 8	5 1, 3, 4, 5	5.1, 5.2, 5.3, 5.4, 5.5, 5.7 1.6,3.6,4.6,5.6	5-1 to 5-3 1-29, 3-104 to 3-120, 4-60 to 4-78, 5-61
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall include an explanation of how the biophysical environment has influenced the design of the Project. This should include consideration of relevant geographical, geological, meteorological, hydrological, hydrogeological and oceanographic conditions.		9	2	All	All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall include a discussion on how the potential of climate change based on current knowledge and its effects on the physical environment (e.g. hydrological regime, permafrost, coastal processes) has influenced the design, planning and management of the Project components and activities. Identification of Project sensitivity to changes in specific climate-related parameters should also be included.		2 9	2 2	2.1.2 2.15, 2.16	2-1 2-18 to 2-19, 2-19
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall include a discussion of how design, engineering, and management plans will maintain/enhance the existing eco-systemic integrity, focusing on various wildlife habitats, including freshwater habitat, marine habitat, and terrestrial habitat.	Yes	~~10~~ 10 Addendum 10	~~1~~ ~~20~~ 1 20	~~1~~ ~~6~~ 1 6	~~1-1 to 1-3~~ ~~7 to 47~~ 1-1 to 1-3 6-1 to 7-1
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall include a discussion of how the Proponent has applied the precautionary principle in its Project planning, design and management.		2 10	2 1	2.1.4 4.1	2-2 to 2-3 5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall include a discussion of how potential impacts to workers and the public under both normal operations and potential accident and malfunction situations have influenced the design of the Project.		9 10	3 25	All All	All All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall describe how potential impacts to wildlife (e.g., caribou, polar bear and peregrine falcons) have influenced the design of the Project, indicating methods designed to minimize impacts to wildlife, including the geographical location of project components. Special attention should be paid to the influence of raptor habitat on the selection of borrow pits and quarry sites (where applicable).		5 7	5, 6, 7, 8, 9, 10 6, 7	X.5.3, 5.5.8 6.5.3, 7.5.3	5-77 to 5-79, 5-147 to 5-152, 6-30 to 6-31, 6-76 to 6-81, 7-15 to 7-15, 7-61 to 7-64, 8-28 to 8-29, 8-88 to 8-92, 9-28 to 9-29, 9-56 to 9-60, 10-17 to 10-18, 10-50 to 10-54 6-36 to 6-39, 7-34 to 7-36
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall describe how regional socio-economic conditions have influenced the Project design. For example, how local preferences and labour capacity, have influenced the design of work rotations, pace of construction, employment policy, etc.		2 8 10	2, 4 3, 4 28	2.1.7, 4.1.6 All 7.1.3, 7.1.4, 7.1.5, 7.2, 7.3	2-4 to 2-5, 4-3 All 10 to 18
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall describe how the distribution of archaeological resources, sacred sites, and soapstone quarries have influenced project design.		2 5 8	2 1 1	2.1.8 1.2 1.5, Appendix V8-1A	2-5 1-14 to 1-15 1-15 to 1-29, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall describe how current land use activities such as harvesting, camping, and tourism, as well as protected areas (i.e. Bird and Wildlife Sanctuaries) have influenced project design.		5 7 8	5, 6, 7, 8, 9, 10 5, 6, 7 4	X.5.3, 5.5.8 5.5.3, 6.5.3, 7.5.3 4.1, 4.2, 4.3	5-145, 5-147, 6-56, 7-40, 8-58, 9-50, 10-45 5-29 to 5-31, 6-36 to 6-39, 7-34 to 7-36 4-1 to 4-33
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall describe how public consultation and TK have influenced the planning and design of the Project.		3	1, 3	1.6.2, 1.6.3, 3.1, 3.3	1-37 to 1-38, 1-39 to 1-47, 3-1 to 3-43, 3-50 to 3-53
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		The EIS shall include considerations for future development.		2	3	All	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.1 PROJECT DESIGN		All assumptions underlying design features which are relevant to environmental assessment should be explicitly identified.		2 4 5, 6, 7, 8 9	2 1, 2, 3 X 2	2.1 1.1, 1.2, 1.5.2.2, 2.1.1, 3.4.1.2 X.8 X.8 X.8 X.8 All	1-31 to 1-33, 2-1, 3-41 1-1 to 1-11, 1-22 to 1-27, 2-1, 3-34 to 3-36, 4-62 to 4-63, 5-242 to 5-246, 6-82 to 6-88, 7-63 to 7-66, 8-94 to 8-98, 9-58 to 9-62, 10-54 to 10-57, 1-56 to 1-57, 4-59 to 4-62, 5-38 to 5-41, 6-71 to 6-74, 7-57 to 7-60 2-41 to 2-45, 3-33 to 3-36, 4-52 to 4-54, 5-34 to 5-37, 6-50 to 6-53, 7-37 to 7-40, 1-29 to 1-30, 3-124 to 3-128, 4-82 to 4-84, 5-61 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.2 PROJECT PHASES		The Proponent is required to present an overall development plan describing the Project development phases (site preparation, construction, operation, maintenance, any potential modifications, temporary closure, final closure, and post-closure), relevant timeframes, works and undertakings associated with each of these phases.		2	2	2.2, All	2-6, 6-1 to 8-10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.2 PROJECT PHASES		The plan must consideration for temporary closure, or care & maintenance in the possibility that operations are unexpectedly suspended.		10	29	3	14 to 17
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.2 PROJECT PHASES		The Proponent should identify all associated monitoring and/or mitigation plans to be implemented in each of the development phases to eliminate or minimize adverse effects that might occur at various project stages for each Project element.		10	1	13	15 to 20
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.3 FUTURE DEVELOPMENT		The Proponent shall describe its plans for development of the Project, and shall further, evaluate any foreseeable expansions of the current Project, needs for required or additional infrastructure and the associated eco-systematic and socio-economic impacts.		2	3	All	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.3 FUTURE DEVELOPMENT		The Proponent shall evaluate the potential for development of additional ore deposits in the Project area in accordance with previous and current exploration activities. Such an evaluation should be based on the Proponent's business and strategic plans for the Project, other predictions and the comparable development realized by projects of a similar nature.		2	3	All	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.3 FUTURE DEVELOPMENT		The Proponent shall discuss how their foreseeable future developments scenarios have been taken into consideration when designing the infrastructure and ancillary utilities for the Back River project.		2	3	All	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.3 FUTURE DEVELOPMENT		The Proponent's assessment of cumulative impacts of the Project shall also include their future development outlined in the preceding scenarios.		1 9	8 1	All 1.3.4.1, 1.3.4.2	All 1-39 to 1-49

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		The EIS shall include an explicit analysis of all alternative means of carrying out the Project components or activities, including a "no-go" alternative, the identification and application of criteria used to determine the technical feasibility and economic viability of the alternatives to the Project (e.g. transportation, natural, social, economic and cultural environment).		2	4	4	4-1 to 4-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		This analysis must be done to a level of detail which is sufficient to allow the NIRB and the public to compare the Project with the alternatives in terms of the economic and environmental costs, as well as the social and economic impacts and/or benefits.		2	4	4	4-1 to 4-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		The Proponent must include reasons for selection of the Project as the preferred alternative, and the reasons for the rejection of other alternatives.		2	4	4	4-1 to 4-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		The reasoning should outline the environmental and social impacts and benefits in addition to the economic costs of non-viable or rejected alternatives.		2	4	4	4-1 to 4-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		Through the course of its alternative assessment, if the preferred option changes, the Proponent should consult with the NIRB to determine whether this proposed change would result in a change to the scope of the Project as filed with the Board.		2	4	4	4-1 to 4-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		The EIS shall present alternatives for all Project components. The Proponent is encouraged to refer to Environment Canada's Guidelines for the Assessment of Alternatives for Mine Waste Disposal (September 2011), when assessing and presenting alternatives for mine waste management, including tailings and waste rock storage options, with a focus on the following:		2	4	4	4-1 to 4-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		i. Options proposed for the transportation of supplies to the Project site via air and marine shipment,		2	4	4.2.2	4-4 to 4-8
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		ii. The location of tank farm(s) and storage facilities on site,		2	4	4.3.9	4-27
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		iii. Options for proposed airstrips,		2	4	4.2.2.1, 4.2.2.2	4-4 to 4-5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		iv. Options for quarry sites,		2	4	4.3.2	4-23 to 4-24
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		v. Options for water sources,		2	4	4.3.4.1	4-24 to 4-25
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		vi. Access to all identified ore deposits by underground or open pit methods and include potential infrastructure layouts,		2	4	4.2.3, 4.2.7	4-8 to 4-9, 4-18
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		vii. Alternative road access to all identified ore deposits for transportation or ore and equipment required at each deposit,		2	4	4.2.2.4, 4.2.2.5, 4.2.3	4-7 to 4-9
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		viii. Alternatives for processing the ore,		2	4	4.2.4	4-9 to 4-11
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		ix. Alternatives for cyanide,		2	4	4.2.4.2, 4.2.9.5	4-10, 4-21
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		x. Alternatives for tailings storage,		2	4	4.2.5	4-11 to 4-16
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		xi. Alternatives to diesel power generation, including solar energy, wind energy, hydro and geothermal energy, etc.,		2	4	4.2.10	4-21 to 4-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		xii. Closure and reclamation options,		2	4	4.2.11	4-22 to 4-23
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		xiii. Mine waste management and disposal,		2	4	4.2.6	4-16 to 4-18
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		xiv. Waste rock storage/disposal alternatives,		2	4	4.2.5.5, 4.2.6	4-16 to 4-18
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		xv. Methods for site water treatment (i.e., mill, sewage, tailings, storm water, etc.), and		2	4	4.2.9, 4.3.7	4-19 to 4-21, 4-27
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		xvi. Methods for mine de-watering.		2	4	4.2.9, 7.2.4.4, 7.2.5.6, 7.10	4-19 to 4-21, 7-19 to 7-20, 7-23 to 7-24, 7-42 to 7-48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		The Proponent shall provide a detailed assessment of alternatives to the preferred option of a Proponent-owned all-weather road from the Back River site to a laydown area at Bathurst Inlet, including consideration for other potential users of such facilities at any point in the project lifecycle (public users, other development proponents, etc).		2	4	4.2.2.3	4-6 to 4-7
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		The Proponent shall also examine alternative options facilitating the transportation of materials,,for example, alternative port locations, road options (routing, winter vs. all-season) and ownership scenarios. Specifically, the Proponent shall describe any plans to utilize the proposed Bathurst Inlet Port and Road (BIPR) project infrastructure (NIRB File No. 03UN114) rather than a purpose-built road owned by the Proponent. In any instance where there is more than one preferred option identified, the Proponent must be prepared to support each with an appropriate level of impact assessment.		2	4	4.2.2, 4.2.8	4-4 to 4-8, 4-18 to 4-19
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		In all cases, the Proponent must provide adequate supporting assessment to justify the discounting of technical feasible options or alternatives for project components. If at any point the Proponent wishes to change the preferred option to an identified alternative, this must be formally submitted to the NIRB for consideration and the possible amendment of these EIS Guidelines.		2	4	4, Appendix V2-4A, Appendix V2-4C	4-1 to 4-29, All, All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		In its assessment of the economic viability for each alternative option, the Proponent shall give due consideration to the vulnerability of the arctic ecosystem, as well as the potential for extension of the life of the Project. The criteria used to evaluate alternative means should reflect the potential concern for both the short-term (during construction and operations) and long-term (after decommissioning and reclamation), physical/chemical stability and environmental impacts of the Project.		2	4	4.1, Appendix V2-4A, Appendix V2-4C	4-1 to 4-3, All, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		The potential for impacts from each alternative under consideration should be discussed within the context of potential interactions with other past, present and reasonably foreseeable developments in the RSA (i.e. cumulative effects), in accordance with Section 7.11. The potential cumulative effects for each alternative should be presented in enough detail so as to be comparable with the assessment for the identified "preferred alternative".		2 9	4 1	All 1.3.4, 1.3.5	4-1 to 4-29 1-39 to 1-51
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.4 ALTERNATIVES		As indicated in the public consultation section (Section 7.1), public opinions and preferences shall also be taken into consideration as a criterion in the assessment for all of the alternative options. Therefore, the alternative analyses shall include a discussion on how public consultation has influenced Project design and planning, and how public preferences have been considered by the Proponent in determining the preferred project alternatives.		2 3	4 1	4.1.5, 4.1.6, Appendix V2-4A, Appendix V2-4C 1.6	4-2 to 4-3, All, All 1-36 to 1-48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		The EIS shall include a description of the various economic components of the Project and its interactions with the over-arching economic and governing environments, including:		-	-	-	-
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		i. Non-confidential information pertaining to the potential taxation revenue to be contributed to the Federal and Territorial governments as well as anticipated royalties to be paid to NTI,		8	3	3.5.2, Appendix V8-3B	3-46 to 3-48, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		ii. Estimates of initial property value as well as projections that incorporate the Proponent's expected timeline for expansions (i.e., tank farms, plans, additional mines, etc.),		2 8	5, 6 3	5.1, 6.7 3.5.3.1	5-1, 6-40 3-48 to 3-61
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		iii. Potential employment available directly through the Project in terms of available labour and employment rates within the project RSA,		8	3	3.1.2.2, 3.3.1, Appendix V8-3B	3-3 to 3-6, 3-27 to 3-29, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		iv. An evaluation of the positive impacts that may result from increasing revenues accruing through taxes to governments as resulting from the Project,		8	3	3.5	3-42 to 3-104
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		v. An annual and project-life total estimate of the volume of fuel that is expected to be sourced from the GN and/or from other sources,	Yes	~~10~~ Addendum 10	4 4	~~6.2, 6.3, 6.4, 6.5~~ 6.2, 6.3, 6.4, 6.5	~~4 to 11~~ 6-1 to 6-8
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		vi. An estimate of total payroll tax to be paid each year and associated cost of living tax credit, taking into account: total remuneration per year paid to employees, an estimate of the number of employees (number of individuals and number of full-time equivalents), average wages paid to employees, and expected number of Project employees who will file taxes in the territory,		8	3	3.5.3.1, 3.5.3.3	3-48 to 3-61, 3-64 to 3-80
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		vii. An estimate of annual personal income tax based on: expected number of employees who will file taxes in Nunavut, and estimated salaries for these employees,		8	3	3.5.3.1, 3.5.3.3	3-48 to 3-61, 3-64 to 3-80
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		viii. An estimate of corporate income tax including: estimates of commodity prices and production, estimated number of years of production before initial corporate income tax payment, and an explanation of how the Proponent expects to allocate its corporate taxable income to permanent establishments in Nunavut,		8	3	3.5.2.2, Figure 3.5-2, Figure 3.5-4, Figure 3.5-5	3-47 to 3-48, 3-53, 3-58, 3-59
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		ix. Capital costs, estimated operating costs, and the total expected revenues (using a range of market values),		8	3	3.5.3.1	3-48 to 3-61
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		x. The number of person years of work, broken down by Project life cycle stage including the number and types of jobs and required skills (using a recognized classification system) including training requirements for each position as well as an estimate of jobs created indirectly by the Project (i.e., local business and supply contracting),		8	3	3.5.3.2, 3.5.3.3, 3.5.3.4	3-61 to 3-84
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		xi. Information on benefits that might be expected by employees and whether these benefits will extend to contractor employees (e.g., training, skill enhancement, cultural support, wellness programs),		10	28	7.1, 7.3	9 to 13, 15 to 18
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		xii. Contracting and procurement information including, an estimate of the number and types of jobs that will be done by contractors and what, if any, the contractor obligations to employees will be,		8	3	3.5.3.2, 3.5.3.3	3-61 to 3-80
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		xiii. Employee housing, including number of employees expected to be residing onsite or in workers' camp(s), on-site services and facilities for workers, transportation to/from work and proposed work schedule,		2	5	5.6	5-2
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		xiv. A discussion of the commuting arrangements for locally hired employees, and how the Proponent plans to support the fly-in/fly-out workforce with in-community liaison workers,		2 10	5 26	5.6 4, Table 7.1-1	5-2 to 5-3 4, 5

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		xv. An outline the scope, progress, and potential success of the development of an Inuit Impact and Benefit Agreement (IIBA) with the Kitikmeot Inuit Association. Discussion of potential IIBA negotiations should consider all potentially impacted communities within the RSA,		2	5	5.8	5-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		xvi. For issues within the IIBA that are not made public, the Proponent should outline how they will facilitate cooperation while maintaining any confidentiality, and		2 3	5 1	5.8, 5.9 1.5.3.3	5-3 1-33
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		xvii. Any issues related to compensation required as a result of the Project.		2	5	5.9	5-3 to 6.1
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		While some details relating to tax estimates and corporate profits are highly sensitive and it is recognized that certain information may be confidential and not be publicly available, the Proponent is encouraged to engage with the GN in order to share what information it can as it relates to the mechanics behind its corporate tax estimates (e.g. forecasts of commodity prices, assumptions regarding profits, etc.). The NIRB requests that information which may be available in other areas of the EIS be clarified as to the Proponent's estimation of any related tax impacts for clarity and ease of analysis.		8	3	3.5.2.2, Figure 3.5-2, Figure 3.5-4, Figure 3.5-5	3-47 to 3-48, 3-53, 3-58, 3-59
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		With respect to overall operating environment, many governance structures or other social components relating to community and territorial leadership can come to bear upon an operator such as Sabina. It is important to understand the Project in terms of the environment in which it operates. The Proponent shall therefore provide the following as it relates to governance and leadership in terms of the Project development:		2	5	5.9	5-3 to 6.1
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		i. A description of the current social and governmental regimes in the Project region, structure and functions of the governments, Inuit organizations, other co-management organizations and interactions among those organizations,		8	3	Appendix V8-3A	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		ii. A discussion of how potential conflict of interest will be managed in current governance regime during Project development,		2	5	5.9	5-3 to 6.1
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		iii. A discussion of how Project planning meets the needs of regional economic development plans (community wellness initiatives, Hamlet programs, housing etc.), where applicable, and which are managed by Federal and territorial governments agencies and Inuit organizations,		8	3	Appendix V8-3A	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		iv. A description of the Proponent's understanding on the roles that governments play in the process of the Project development, and associated requirements and obligations for proponents by policies and regulations,		8	3	Appendix V8-3A	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		v. A description of the roles of the various parties in socio-economic monitoring programs and the Kitikmeot Socio-Economic Monitoring Committee, and a description of how the Proponent anticipates contributing to this framework,		10	23	4	3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		vi. A discussion of efforts to be made by the Proponent within existing regulatory framework and government initiatives, in terms of education and skill training, community facility development, and other initiatives planned by the Proponent, and		10	28	7.3	15 to 18
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.5 ECONOMIC AND OPERATING ENVIRONMENT		vii. Other social and economic responsibilities of governments in the Project impacted regions.		2	5	5.9	5-3 to 6.1
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION		The Proponent shall describe the Project components and all activities associated with each component in a systematic way. This description shall encompass all phases of development in sufficient detail to allow the Proponent to predict potential adverse environmental effects and address public concerns about the Project, from site preparation through to construction, operations, maintenance, any potential modifications and/or expansions that may be required during the operations phase based on exploration results, temporary closure, final closure, and post closure activities.		2	All	All	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION		The description must include an approximate timeline for each Project component and all activities associated with each component, where applicable.		2	2	2.3.1, 4.2, 6.7, 6.6.13.5, 7.2.3, 7.2.4, 8.1	2-7, 4-3 to 4-23, 6-40, 7-14 to 7-20, 8-1 to 8-2
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION		The description shall also include changes that may occur in the vicinity as a consequence of the Project.		2 10	2 8	2.1 5, Appendix B	2-1 to 2-6 20 to 27, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION		Where specific codes of practice, guidelines, and/or policies may apply to items to be addressed, and particularly where these may involve thresholds and quantitative limits to be applied, those documents must be cited and may be included as appendices to the EIS.	Yes	2 ~~10~~ 10 Addendum 10	All ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All ~~All~~ All All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION		For greater clarity, the detailed description of Project components and activities, where appropriate, shall cross-reference the impact assessment, environmental management and overall development plan sections of the EIS.		2	2	2.1	2-1 to 2-6 8-2 to 8-6

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1 Mine Sites on Goose Property and George Property			2	6	All	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	The Proponent shall describe the ore resources at each of the proposed mine sites, including where appropriate:		2	7	7.1	7-1 to 7-13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	i. Deposit locations, including detailed maps of the mine site areas using latitude and longitude coordinates,		2	7	7.1	7-1 to 7-13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	ii. Detailed structural geology maps,		2	7	7.1	7-1 to 7-13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	iii. The bedrock lithology and mineralogy in the Project area,		2	7	7.1	7-1 to 7-13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	iv. A description of the overburden including texture/grain size, moisture/ice content, and occurrence of ice lenses and implications for the Project,		2	6, 7	6.6.4, 6.6.13.3, 7.1.3, 7.14, 7.1.5	6-24 to 6-25, 6-34 to 6-38, 7-7 to 7-8, 7.8 to 7-13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	v. Fractures and their implications to the Project,		2	7	7.1.2.2, 7.1.3, 7.1.5	7-6, 7-7 to 7-8, 7-10 to 7-13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	vi. Types of the deposits and associated bedrocks,		2 5	2 1	2.1 1.1	2-1 to 2-6 1-1 to 1-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	vii. Average and range of ore grades estimated for the deposits,		2	7	7.1.2, 7.2.3, 7.2.8.1	7-5 to 7-7, 7-14 to 7-15, 7-28 to 7-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	viii. The nature, depth, and thickness of the ore deposits to be mined,		2	7	7.1.2	7-5 to 7-7
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	ix. The mineralogy and geochemistry of ore and waste rock including acid rock drainage (ARD) and metal leaching (ML) potential as well as the acid neutralizing potential, and		2 5	2, 7 2	2.1, 7.2.7.5, 7.2.8.3	2-1 to 2-6, 7-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.1 Geology/Mineralogy of the Ore Deposit	x. Ore body delineation.		2	7	7.1.2	7-5 to 7-7
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	The Proponent shall describe the ore mining, transportation and processing associated with the Project, using maps and diagrams whenever applicable, including the following details:		2	4, 7	4.2.5, 7.2, 7.9	4-11 to 4-16, 7-13 to 7-20, 7-40 to 7-42
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	i. A mining plan indicating the sequence of development for the proposed open pits and underground mines at Goose and George properties,		2	7	7.2.3	7-14 to 7-15
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	ii. A description of the open pits and underground mine design, mining methods, operation, and processing including site layout, mine water management, anticipated production rate, designed production capacity, production schedule, equipment selection, energy consumption and energy efficiency measures,		2	4, 7	6.6, 7.2, 7.3, 7.4, 7.10	6-19 to 6-40, 7-13 to 7-33, 7-42 to 7-48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	iii. Provision and description of flow sheets depicting ore processing, material flow and waste stream, energy consumption and water consumption,		2	7	7.8	7-35 to 7-40
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	iv. A description of the hydrogeological conditions (i.e. permeability of geological formations, hydraulic head and groundwater flow direction,) of the open pits and the underground mines, including estimates of the variance in permeability and groundwater flow, and implications of geological anomalies such as fault zones, weak rock formations or areas of higher than expected groundwater flow on the design of the open pits and underground mining facilities and implications of hydrological conditions on nearby surface waters,		2	7	7.1.3, 7.1.4, 7.2.4.3, 7.2.4.4, 7.2.5.4, 7.2.6, Appendix V2-7A	7-7 to 7-10, 7-18 to 7-19, 7-22, 7-24 to 7-26, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	v. A discussion on how permafrost conditions (seasonal thawing, taliks, degradation due to mining disturbances) were considered in the design of the open pits and underground mining facilities,		2	7	7.2.4, 7.2.5	7-15 to 7-24
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	vi. A stability analysis of the pit slopes and underground mine works and provision of adequate ground control measures where necessary,		2	7	7.2.4, 7.2.5	7-15 to 7-24
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	vii. Design of the impoundment/retention structures and measures for run-off and seepage control,		2	7	7.2.4.4, 7.2.8.4	7-19 to 7-20, 7-29 to 7-30

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	viii. Design of the mine ventilation for the underground mine,		2	7	7.2.5.3	7-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	ix. Daily and yearly average extraction rate(s) and quantities of ore and waste rock produced,		2	7	7.2.3	7-16 to 7-15
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	x. Cut-off grades in grams per tonne for precious metals (i.e. gold and silver) and in percent for any base metals (i.e. copper), for ore and low grade material that could be processed at some point in the future, based on current economic conditions or reasoned projections,		2	7	7.2.3.1	7-15
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	xi. The means of drilling, blasting, extraction, loading and transport of ore,		2	7	7.2.4.1, 7.2.5.2	7-15 to 7-18, 7-20 to 7-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	xii. Design, location and capacity of run-of the mine stockpile, if any, and ore stockpile facilities,		2 10	7 8	7.2.8.1, 7.2.8.2 3	7-28 to 7-29 8-2 to 8-6
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	xiii. Dust suppression technologies and dust suppressants to be used in mining, loading, transportation, storage, crushing and other processes where dust might be generated,		2	7	7.2.8.2	7-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	xiv. A review of similar operations elsewhere in similar settings, with a discussion of the results of research on the long-term stability of the underlying permafrost and frozen materials, as well as the implications to Project planning and design,		2	7	7.2.1	7-13 to 7-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	xv. Measures and plans to control natural hazards and/or mitigate their impacts on the Project, such as rock falls and collapses, extreme climate events, and other geological or geomorphological events (e.g., storm, flooding, and earthquake),		2	7	7.2.2, 7.2.4.1, 7.2.4.2, 7.2.5.2, 7.2.5.3	7-14, 7-15 to 7-18, 7-20 to 7-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	xvi. Provision of a comprehensive description of the proposed mill design, including: facilities and structures include plant layout plans, mill process and operations for ore processing, reagents used, water management strategies (including methods to maximize water re-use, minimize takings of natural waters and energy consumption), and		2	7	7.8, 7.9, 7.10	7-35 to 7-48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.2 Mining, Transport and Processing	xvii. A discussion of proposed options for transporting the final gold product off site.		2	7	7.8.9	7-39
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.3 Ore Stockpile Facilities	The Proponent shall, in connection with its Ore Storage Management Plan (Subsection 9.4.5), present details on the ore stockpile facilities associated with the Project, using maps and diagrams whenever applicable, and include the following:		2 10	7 8	7.2.8.1, 7.2.8.2 3	7-28 to 7-29 2 to 6
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.3 Ore Stockpile Facilities	i. Anticipated quantities and grade of ore extracted, including daily and yearly average extraction rates,		2	7	Table 7.2.1	7-16
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.3 Ore Stockpile Facilities	ii. A description of the ore grade handling, including the design, locations and capacities of the stockpile site(s). The Proponent shall include references to similar operations in comparable conditions, applicable modelling information, and the results of research on the short and long-term thermal stability of the underlying permafrost and frozen materials,		2 10	7 8	7.2.8 3.4	7-28 to 7-30 4 to 5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.3 Ore Stockpile Facilities	iii. A description of the physical and chemical stability of the ore material to be stored, with regard to the long-term ARD and ML potential of the ore material. Consideration should be given to the latest monitoring results from mines in the same general climatic conditions,		10	8	3.1, 3.2	2, 2
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.3 Ore Stockpile Facilities	iv. Explanation of the relationship between the timing of ARD/ML and permafrost encapsulation in cold weather conditions, with consideration for potential climate change, and		2 10	7 22	Appendix V2-7D, Appendix V2-7E 3, 4	All, All 2 to 10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.3 Ore Stockpile Facilities	v. A description of run-off and seepage prevention/control structures.		2	7	7.2.8.4	7-29
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	The Proponent shall present the details on all water supply and water treatment facilities associated with the Project, including the facilities at the mine site(s), Marine Laydown Area including tank farm(s) and laydown area(s). The Proponent should include the following:		2 10	6, 7, 8 7	6.4.11, 6.4.12, 6.6.1, 6.7, 7.8.8, 7.10, 8.11 3.2 , 3.3, 3.4	6-12 to 6-13, 6-20 to 6-21, 6-39, 7-36, 7-42 to 7-48,8-7 7-9 to 7-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	i. Identification and description of water supply sources (waterbodies and/or watercourses) and intake sources and facilities, and projections of volumes of water required from each source, including the frequency and timing of withdrawals,		2 10	6, 7, 8 7	6.4.11, 6.4.12, 6.6.1, 6.7, 7.8.8, 7.10, 8.11 3.2 , 3.3, 3.4	6-12 to 6-13, 6-20 to 6-21, 6-39, 7-36, 7-42 to 7-48,8-7 7-9 to 7-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	ii. A description of water uses and volumes including those for camp sites, open pit and underground mines, dock facility, mill processing facility, dust suppression, firefighting reserves, workshops and maintenance facilities as well as drilling activities, etc.,		2 10	6, 7, 8 7	6.4.11, 6.4.12, 6.6.1, 6.7, 7.8.8, 7.10, 8.11 3.2 , 3.3, 3.4	6-12 to 6-13, 6-20 to 6-21, 6-39, 7-36, 7-42 to 7-48,8-7 7-9 to 7-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	iii. A description of water treatment process methods for all fresh water use (i.e. mill processing and domestic water), including the design of the facility(ies),		2	7	Appendix V2-7H (5.4)	35 to 36

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	iv. Design features to prevent the impingement or entrapment of fish at water intakes,		2 10	7 7	7.10.1 3.2.1	7-42 to 7-43 4 to 5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	v. A plan for ensuring mine operations and safety during times of low water availability (winter, and in years of exceptionally low precipitation),		2	7	7.10.2.2, 7.10.3	7-44, 7-48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	vi. A description of the facilities for washing mine trucks and other equipment, as well as any treatment of water to be used for such activities, and		2	6	6.6.1.6	6-21
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.4 Water Supply and Water Treatment Facilities	vii. A description of plans to recycle or re-use water resources.		2	9	9.2.2	9-4
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.5 Natural Drainage Diversion	The Proponent shall present, in connection with its Site Water Management Plan (Subsection 9.4.4), the details on any required alteration of drainage patterns and diversions, including:		2	7	7.10.2.3, 7.10.3	7-44, 7-48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.5 Natural Drainage Diversion	i. A description of any planned alteration of drainage patterns and/or diversions of natural drainage from mine site and Project facilities, and estimation of the flows to be diverted,		2	7	7.10.2.3, 7.10.3	7-44, 7-48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.5 Natural Drainage Diversion	ii. A discussion of measures to prevent or mitigate sedimentation within these diverted flows,	Yes	~~10~~ Addendum 10	~~19~~ 19	~~6.1.2~~ 5.2.6	~~4 to 8~~ 5-5 to 5-6
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.5 Natural Drainage Diversion	iii. A discussion of potential challenges anticipated in constructing drainage diversions including seasonal effects (e.g. melting ice lenses),		10	7	3.5.4	23
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.5 Natural Drainage Diversion	iv. A discussion of the potential for mobilizing sediments, generating erosion and disturbances to terrain/landforms, and		6	4, 5	4.5.1.1, 4.5.2.6, 4.5.3, 4.5.4.1, 5.5.4.3	4-29 to 4-31, 4-37, 4-38 to 4-45, 4-45, 5-33 to 5-55
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.5 Natural Drainage Diversion	v. A discussion of potential environmental impacts caused by altered drainage patterns, including the extent and location of areas to be flooded seasonally as well as plans for maintaining drainage systems during seasonal extreme conditions such as spring freshet.		6	1, 4	1.5, 1.9, 4.5.4.2, 4.5.4.3, Appendix V6-4A	1-41 to 1-55, 1-57 to 1-58, 4-46 to 4-47, 4-47 to 4-56, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.6 Mine De-Watering	The Proponent shall present, in connection with its Site Water Management Plan (Subsection 9.4.4), details on mine de-watering required for the Project, including the following:		2	7	7.2.4.3, 7.2.4.4, 7.2.5.5	7-18 to 7-20, 7-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.6 Mine De-Watering	i. A description of proposed de-watering methods and design of the mine water handling system for the open pits and underground mine including a discussion of the potential uses for the mine water,		2	7	7.2.4.3, 7.2.4.4, 7.2.5.5	7-18 to 7-20, 7-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.6 Mine De-Watering	ii. A description of proposed de-watering methods including a discussion of the potential uses for the water and disposal method(s) should there be a need to dispose of any water resulting from de-watering,		2	7	7.2.4.3, 7.2.4.4, 7.2.5.5	7-18 to 7-20, 7-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.6 Mine De-Watering	iii. A description of proposed geotechnical works, the areas that may be affected, the quantities of bottom sediment requiring disposal, and the proposed disposal methods,		2	7	7.2.4.4	7-19
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.6 Mine De-Watering	iv. Estimates of average mine water volumes, methods used to calculate volumes, and discussion of potential uses for mine water,		2	7	7.2.4.4, Appendix V2-7H, Appendix V2-7I	7-19 to 7-20, All, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.6 Mine De-Watering	v. A prediction of the maximum inflow into the open pits and the underground mine during mining, including estimates of variance and likelihood of estimates. The pumping capacity should be designed by taking into consideration the predicted maximum inflow. Measurements for controlling any necessary inflow should be discussed, in addition to describing the groundwater monitoring program, and		2 10	7 7	Appendix V2-7A (6.2), Appendix V2-7I (3.3) 8.2	20 to 21, 11 to 12 48
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.1.6 Mine De-Watering	vi. Anticipated salinity and general characterization of water from each pit and underground mine, including estimates of the variance of water quality.		2	7	Appendix V2-7A (6.2, 6.4)	20 to 22, 24 to 25
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	The Proponent shall provide the following information regarding Project components and activities for the proposed establishment of the Marine Laydown Area at Bathurst Inlet, tank farms and storage facilities, with site maps, diagrams, and general arrangement drawings provided for reference purposes where deemed useful, specifically addressing:		2	6	6.4	6-5 to 6-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	i. A discussion of how the precautionary approach has been incorporated into the design of storage facilities and the proposed Marine Laydown Area, to account for the challenges of the Project area including considerations for extreme temperatures, variations in ice thickness, seismic hazards, and water level change, nearshore sediment mobility and alongshore drift in the layout and structure of various facilities and design features (where applicable),		2 10	2 1	2.1.4, Appendix V2-7C 4 6	2-2 to 2-3, All 5 to 9 4 to 11
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	ii. A discussion of the study results related to bathymetry, rock and sediment geotechnical properties, and sediment thickness and sub-sea permafrost depth and thickness and quality for the proposed dock site (if required),		2	4, 6	4.3.2.3, 6.4.4	4-17, 6-8

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	iii. A description of any transfer sites of materials from ships to barges,		2	4, 6	4.3.2.3, 6.3.3.2	4-17, 6-4 to 6-5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	iv. A description of all facilities proposed to be constructed at the storage facility, including discussion on the wharf storage facility, administration facility, land-based or water- based navigational aids, etc. (where applicable),		2	6	6.3.3.3, 6.4	6-5, 6-5 to 6-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	v. A discussion of all potential uses of the port site and storage facilities, including predicted non-project and/or private uses,		2	6	6.4	6-5 to 6-14
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	vi. A description of all facilities associated with the transfer and handling of fuel and any hazardous products,		2	6	6.4.6	6-11 to 6-12
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	vii. A description of the types and anticipated volumes/quantities of materials and equipment to be transported to and from the port, including hazardous/dangerous goods cargo,		2	6	6.4.3, 6.4.5.6	6-7 to 6-8, 6-11
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	viii. A description of spill contingency plans for the port and tank farm/storage facility,		2	6	6.4.7, 6.5.4	6-12, 6-18
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	ix. A description of the communication system and power generation unit to be employed,		2	6	6.4.9, 6.6.10	6-12, 6-32
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	x. A discussion of plans for storage facility security management, and		2	6	6.4.10	6-12
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.2 Mine Site Tank Farms, Marine Laydown Area and Storage Facilities	xi. Discussion of the reclamation and closure of the facilities upon completion of the project.		2	8	8.12, 8.13, 8.14	8-7 to 8-8
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3 Waste Management Facilities	The Proponent shall describe the sources, types and quantities of waste predicted to be generated by the Project, and the on-site processes for the collection, handling and disposing of wastes generated by the Project including any off-site disposals. The Proponent shall include the following with cross referencing to applicable management plans (Section 9.4) where appropriate:		2 10	6, 7 9, 10, 11, 12	All All	All All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.1 Waste Rock Facilities	i. An inventory of waste rock generated during construction and operation of the Project including overburden, waste rock, low grade mineralized material, processing wastes, excavated material, and any other related wastes if applicable,		2 10	7 9	7.12 3	7-48 to 7-52 2 to 10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.1 Waste Rock Facilities	ii. A description of overburden and waste rock handling, including the design, locations and capacities of the stockpiles sites, describing the options for each type of waste rock. The Proponent shall include references to similar operations in comparable conditions, applicable modelling information (i.e. general climatic conditions and climate trends and their consideration in the design of the facility), and the results of research on the long- term thermal stability of the underlying permafrost and frozen materials,		10	9	3.4	6 to 8
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.1 Waste Rock Facilities	iii. A description of the physical and chemical stability of the types of materials to be stored and those to be used for containment construction, with regard to the short and long-term ARD and ML potential of the waste rock. Consideration should be given to the latest monitoring results from mines in the same general climatic conditions,		2 10	7 22	7.2.6, Appendix V2-7D 3.2, 3.3, 8	7-24 to 7-26, All 5 to 6, 12 to 13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.1 Waste Rock Facilities	iv. Details regarding the ARD and ML characterization of waste rock, the method of testing in terms of both static and kinetic tests, the number of samples and sampling protocols, the company and personnel to carry out the tests, and implications to possible use and disposal,		2	7	Appendix V2-7D	7-24 to 7-26, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.1 Waste Rock Facilities	v. A description, in qualitative and quantitative terms of the chemistry of frozen groundwater from joints and fractures in the waste rock disposal area,		2	7	Appendix V2-7H	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.1 Waste Rock Facilities	vi. An explanation of the relationship between the timing of ARD and ML and permafrost encapsulation in cold weather conditions, with consideration for potential climate change, and		2 10	7 22	Appendix V2-7D, Appendix V2-7E 3, 4	All, All 2 to 10

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.1 Waste Rock Facilities	vii. An estimation of the quantities of potential acid generating (PAG) and non-PAG materials that will be generated and details of the methodology used in classifying PAG and non- PAG.		2 10	7 22	7.2.6 to 7.2.7 6	7-24 to 7-28 22-4 to 22-8
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.2 Tailings Management Facilities	i. A description of the tailings management facilities design,		2	6, 7	6.6.13, Appendix V2-7G	6-33 to 6-40, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.2 Tailings Management Facilities	ii. A description of how geotechnical factors, geological characteristics (weak rock formations, fault zones and their hydrogeological characteristics), and permafrost conditions (seasonal thawing, taliks, degradation due to tailings disposal, and long-term evolution) were considered in the design of the tailings management facility(ies),		2 10	6 9	6.6.13, Appendix V2-7G, Appendix V2-7A 2.4.1	6-33 to 6-40, All, All 2-21 to 2-22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.2 Tailings Management Facilities	iii. A description of how the general climate conditions including climate trends were considered in the design of the tailings management facilities (e.g., prevention of ice formation),		2 9	6 2	6.6.13 2.2, 2.16 Appendix V4-3B, Appendix V4-3C	6-33 to 6-40 2-1 to 2-7, 2-19 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.2 Tailings Management Facilities	iv. A description of the proposed process and operations of the tailings management facilities during both operations and post-closure. The Proponent shall include a contingency plan in the event that discharges from the containment area do not meet licensing criteria,		10	22 29	3.1 2.3, 5.3, 5.6	2 to 4 11, 21 to 22, 23 to 24
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.2 Tailings Management Facilities	v. A description of seepage and run-off prevention and control structures and designs, and		2	7	Appendix V2-7I (3.5.1, 3.5.2, 3.5.3, 3.5.4, Appendix A)	14 to 15, 15, 15 to 17, 17, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.2 Tailings Management Facilities	vi. A description of the tailings chemistry, physical properties (rheology, solid content, consolidation density, slurry temperature, volume estimates), mineralogical characteristics and long and short-term ARD and ML potential.		2 2	7 2	7.9 Appendices V2-7D,Appendix V2-7F	7-40 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.3 Waste Water Treatment Facilities	i. A description of the water treatment process for all major sources of water from the Project, including process effluent, open pit water, underground mine water, site, waste facilities and stockpile drainage/runoff, and sewage/grey waste water,		2 10	4, 6 7	4.3.3.3, 6.4.13, 6.6, 6.7, 8.11 3.0	4-19 to 4-20, 6-13, 6-19 to 6-42, 8-7 3 to 42
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.3 Waste Water Treatment Facilities	ii. A description of proposed mine water (i.e. process effluent, open pit water, underground mine water, site and stockpile drainage/runoff) treatment facility to be used, to include amount of treatment sludge production and its management/storage,		2 10	6 9	6.6.13 3.2.2, 3.3, 3.6	6-33 to 6-40 5, 13 to 14, 26 to 35
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.3 Waste Water Treatment Facilities	iii. A discussion related to the treated effluent discharge methods, including the design of the facility, identification of discharge points, the anticipated water quality and quantities to be disposed of, and conservation and recycling methods. Specific mention should be given to modifications that may be related to operating in arctic conditions. Include associated implications for regulatory compliance,		2	6	6.4.13, 6.6.8.1	6-13, 6-29 to 6-30
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.3 Waste Water Treatment Facilities	iv. A description of proposed sewage/grey water treatment facilities to be used, including a discussion of the technology to be employed, the design and locations of the facilities, point(s) of discharge, solids (sludge) disposal methods, and the quality and quantities to be disposed of, as well as the applicable discharge standards,		2	6	6.4.13, 6.6.8.1	6-13, 6-29 to 6-30
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.3 Waste Water Treatment Facilities	v. Contingency measures for the disposal of effluent and sewage/grey water during periods of facility malfunction and/or disturbances, with details regarding the associated disposal and treatment technologies and facilities,		2	6	6.4.13, 6.6.8.1	6-13, 6-29 to 6-30
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.3 Waste Water Treatment Facilities	vi. A description of the receiving environment including the spatial extent and magnitude of alteration of the receiving waters, how the Proponent will ensure non-toxicity, the spatial extent of the mixing zone and modelling predictions for concentrations of all parameters of concern, including the equations and assumptions on which the modeling predictions were based, at key points between the discharge point and return to baseline water quality conditions, and		2	6	6.4.13, 6.6.8.1	6-13, 6-29 to 6-30
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.3 Waste Water Treatment Facilities	vii. A description of the on-site processes for the collection, handling and disposing of contaminated water wastes (including melt water) to be generated by the Project.		2	6	6.4.13, 6.6.8.1	6-13, 6-29 to 6-30
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.4 Landfill Facilities	i. Research results for effectiveness of similar landfill operation facilities in comparable geological regions and climate condition,		10	10	7.3.2	11
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.4 Landfill Facilities	ii. Locations of any landfill facilities, with estimates of containment capacities, associated design criteria and considerations to minimize impact on the surrounding environment. Include engineering features and facility layout drawings in relation to nearby roads, watercourses and waterbodies,		10	10	6.2, 7.3.1, 7.3.2	8, 10 to 11
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.4 Landfill Facilities	iii. An inventory of the types and volumes of non-combustible, non-hazardous industrial wastes to be generated and landfilled over the life of the Project,		2	6	6.4.14, 6.6.8	6-13, 6-28 to 6-32
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.4 Landfill Facilities	iv. An inventory of the types and volumes of hydrocarbon contaminated wastes to be generated and sent south over the life of the Project,		10	12	7.3.5, 7.3.6, Table 8-1	20 to 21, 23 to 27
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.4 Landfill Facilities	v. A description of the proposed collection, handling, storage, treatment, and/or disposal methods of contaminated ice, snow, soil, seepage and/or surface runoff, and		10	7 10	3.3, 3.4, 3.7.8. 7.4	13 to 19, 42 12

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.4 Landfill Facilities	vi. A description of any proposed use of municipal waste facilities or other treatment options for hydrocarbon, organic wastes.		10	10 12	7 2	9 to 15 1 to 3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.5 Hazardous Waste	i. An inventory of the types and predicted volumes/quantities of hazardous wastes to be generated or produced by the Project activities, including shipping operations,		10	12	12.8, Table 8-1	29, 23 to 27
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.5 Hazardous Waste	ii. A description of proposed storage, transport, handling and disposal methods to be employed for hazardous waste generated,		2	6, 7, 8, 9	6.6.7, 6.6.8.6, 7.7, 8.12, 9.2.3	6-27, 6-31, 7-35, 8-7, 9-4
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.5 Hazardous Waste	iii. A description of measures to minimize use of hazardous materials and to reduce generation of hazardous waste,		2 10	6, 7, 8, 9 12	6.6.7, 6.6.8.6, 7.7, 8.12, 9.2.3 2	6-27, 6-31, 7-35, 8-7, 9-4 1
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.5 Hazardous Waste	iv. Details regarding the destinations for each type of hazardous waste, including the disposal of containers used to transport or store hazardous materials, and		2 10	6, 7, 8, 9 12	6.6.7, 6.6.8.6,7.7, 8.12, 9.2.3 7.3	6-27, 6-31, 7-35, 8-7, 9-4 12 to 21
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.5 Hazardous Waste	v. A description of training for employees tasked with the handling of hazardous waste materials.		2 10	6, 7, 8, 9 12	6.6.7, 6.6.8.6, 7.7, 8.12, 9.2.3 6.3	6-27, 6-31, 7-35, 8-7, 9-4 11
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.6 Camp Waste	i. A description of the facilities, technologies and equipment to be used for incineration of domestic waste,		2	6	6.4.14, 6.6.8.3	6-13, 6-30
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.6 Camp Waste	ii. An inventory of domestic waste to be incinerated, including both land-based and ship-based generated wastes,		2	6	6.4.14, 6.6.8	6-13, 6-28 to 6-32
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.6 Camp Waste	iii. A description of the methods for disposal of incineration ash, and		2 10	6 11	6.4.14, 6.6.8.2, 6.6.8.3 7.5	6-13 to 6-14, 6-30 8
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.3.6 Camp Waste	iv. A description of wildlife deterrent programs that may be implemented to reduce depredation and prevent access to food sources by predators such as bears and wolverines.		2 10	2 10	2.1.6 6.1.1, Appendix A	2-4 6 to 7, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	The Proponent shall describe all ground transportation options, including all-weather and winter roads (including various access roads, mine haul roads, site service roads, in-pit haul roads, roads used to facilitate maintenance of infrastructure and facilities, etc.).		2 10	4, 6, 7 14	6.3.2, 6.4.3, 6.6.2, 7.11 1	6-3 to 6-4, 6-7 to 6-8, 6-21to 6-24, 7-48 1 to 2
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	The EIS shall describe and discuss the following in connection with the Roads Management Plan (Subsection 9.4.10), including relevant maps and drawings where useful as such pertain to roads as proposed within the scope of the Project:		2 10	6, 7 14	6.3.2, 6.4.3, 6.6.2, 7.11 All	6-3 to 6-4, 6-7 to 6-8, 6-21to 6-24, 7-48 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	i. Design specification and features of all roads, including construction methods and schedule, laydown areas, temporary works and construction camps, estimates, sources, and types of materials required for construction and maintenance, water crossings and diversions of watercourses,		2 10	6, 7 14	6.3.2, 6.4.3, 6.6.2, 7.11 4	6-3 to 6-4, 6-7 to 6-8, 6-21to 6-24, 7-48 9 to 13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	ii. How all aspects of proposed roads including components such as bridges and culverts, will be managed and maintained for the life of the Project,		2 10	6, 7 14	6.3.2, 6.4.3, 6.6.2, 7.11 7	6-3 to 6-4, 6-7 to 6-8, 6-21to 6-24, 7-48 14 to 17
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	iii. Plans to address additional traffic on any separately constructed road network that may require consideration, should the development of the Back River Project be granted pursuant to NLCA Section 12.5.12,		2	6	6.5	6-14 to 6-19
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	iv. Description of any infilling of lake, wetland or stream habitats associated with road construction where applicable for the Project,		2	6	6.4.3, 6.6.2	6-7 to 6-8, 6-21 to 6-24
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	v. Design features and structures planned to protect and facilitate wildlife movement (e.g. caribou crossings and migration routes) and humans that may cross Project roads during operations (including ATVs and snowmobiles), including a discussion of plans to prevent/minimize wildlife and human collision-related mortalities,		2 5	6 5	6.4.3, 6.6.2 XX 9	6-7 to 6-8, 6-21 to 6-24 5-1 to 5-249 21 to 22
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	vi. Design features and structures planned to protect and facilitate fish movement and migration,		2	6, 7	All	All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	vii. Dust suppression, methods and types of dust suppressants as well as mitigation methods for sedimentation during construction and operations,		2	7	7.2.9	7-30
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	viii. How TK has been considered in the selection of the ground transportation network,		2 3	2 3	2.1.10 3.3	2-6 3-50 to 3-53
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	ix. The relationship of ground transportation with existing hunting and travelling routes (including those routes in close proximity or intersecting planned ground transportation roads), and		2	2, 6	2.1.9, 6.6.2	2-5, 6-21 to 6-24
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.4 Ground Transportation and Associated Water Crossings	x. The duration, frequency and extent of use of all Project facilities, including consideration given to public access for traditional and/or non-traditional pursuits.		2	2, 6	2.1.9 to 2.1.12, 6.5.1, 6.6.2.2	2-5 to 2-6, 6-16, 6-13, 6-39

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	The Proponent shall describe all marine shipping associated with the Project, in connection with the Shipping Management Plan (Subsection 9.4.11), including relevant maps and drawings where useful.		2	4, 6	4.2.2.1, 4.2.2.3, 6.3.3	4-4 to 4-5 , 4-6 to 4-7, 6-4 to 6-5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	The description of marine infrastructure and shipping must include the following:		2	4, 6	4.2.2.1, 4.2.2.3, 6.3.3	4-4 to 4-5 , 4-6 to 4-7, 6-4 to 6-5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	i. A description of the proposed marine shipping vessels (types, sizes, draft, and numbers of vessels to be used, and the vessel's intended purpose), including any accommodations barges to be utilized, associated frequency and timeframe for the shipping season for all project activities during each phase of the Project. Include a discussion on the existing marine traffic volumes along the proposed shipping route(s) in terms of the marine traffic network of the region,		2 10	4, 6 15	4.2.2.1, 4.2.2.3, 6.3.3 4	4-4 to 4-5 , 4-6 to 4-7, 6-4 to 6-5 7 to 9
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	ii. A clear description and an analysis of the proposed shipping route(s), including route characteristics and navigability, corresponding maps and details regarding bathymetry, navigational aids, other marine traffic using these routes, channel and berthing manoeuvres, anchorage components, etc.,		2 10	4, 6 15	4.2.2.1, 4.2.2.3, 6.3.3 1.2	4-4 to 4-5 , 4-6 to 4-7, 6-4 to 6-5 2
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	iii. A description of the transit time and delay review of alternative marine routes,		2	4, 6	4.2.2.3, 6.3.3.1, 6.3.3.2, Appendix V2-6A	4-6 to 4-7, 6-4 to 6-5, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	iv. A discussion on the potential for ice breaking during the planned shipping season (including the potential for such during break-up in the spring season and during freeze- up in the fall season),		2 10	4, 6 15	4.2.2.1, 4.2.2.3, 6.3.3 1	4-4 to 4-5 , 4-6 to 4-7, 6-4 to 6-5 1 to 6
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	v. A description of any plans to overwinter fuel and discuss measures to ensure compliance with the requirements of the Canada Shipping Act, 2001, Arctic Waters Pollution Prevention Act, any associated regulations or relevant guidelines,		2 10	4, 6 15	4.2.2.1, 4.2.2.3, 6.3.3 4	4-4 to 4-5 , 4-6 to 4-7, 6-4 to 6-5 7 to 9
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	vi. Details on the relationship of marine shipping routes and seasons with existing hunting and travelling routes,		8	5	5.2.3, 5.5.3.5	5-18 to 5-19, 5-35
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	vii. A descripton of procedures for avoiding the disturbance of marine mammals, and for undertaking the monitoring of marine mammal occurrence and behaviour along shipping routes,	Yes	2 7 ~~10~~ Addendum 10	4, 6 7 ~~20~~ 20	6.3.3.1, 6.3.3.2 7.5.2.2, 7.5.3, 7.8 ~~6.3, 6.4, 6.5, 7.2.8, 7.2.11, 7.3.8~~ 7.1.9, 8.1.7, 9.1.7, 10.1.7, 11.1.7, 12.1.7, 7.1.5.10, 9.1.3.7, 7.1.5.6, 7.1.5.7, 8.1.3.2, 8.1.3.3, 9.1.3.4, 9.1.3.5, 10.1.3.4, 10.1.3.5, 11.1.3.3, 13.1.3.4, 14.1.3.2, 11.2.1.1, 14.2	6-4 to 6-5 Vol 7: 7-22 to 7-28, 7-34 to 7-36, 7-37 to 7-40 ~~13 to 22, 68 to 69, 75 to 76, 110 to 112~~ 7-26, 8-5, 9-5, 10-4, 11-4, 12-2, 7-23, 9-4, 7-20, 7-20, 8-2, 8-3, 9-3, 9-3, 10-3, 10-3, 11-3, 13-3, 14-2, 11-4, 14-3 to 14-4
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	viii. A discussion of how TK has been considered in the selection of the shipping routes, timing of shipping activities, and design of monitoring plans,		2	6	2.1.10, 6.3.3.1, V2-6A	2-6, 6-4, All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	ix. A description of the results from bathymetric studies undertaken along the proposed shipping routes. Additional discussion of study results should also be included for identified areas where shallow waters and/or strong current exist, with consideration given to the size of barges/vessels, and the implications for shipping safety,		2 7	4 3, 4	4.2.2.3, 4.2.8 3.1, 4.1.1, 4.1.6	4-6 to 4-7, 4-18 3-1, 4-1, 4-20 to 4-26
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	x. Identification of all parties responsible for ensuring safe shipping beyond the immediate port/docking site,		10	15	4.21, 9.1, 12.1, 12.2	7, 16 to 17, 20 to 21
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	xi. Estimates of the volume of goods/supplies, dangerous goods, fuel, explosives and equipment to be transported and associated protocols with shipping these goods,		2	6	6.4.5, 6.4.6 All	6-8 to 6-12 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	xii. A description of loading and offloading procedures for material and supplies, dangerous goods, fuel, and explosives, including consideration of the anticipated use/reliance on policing services, and		2	6	6.4.5, 6.4.6	6-8 to 6-12
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.5 Marine Shipping & Associated Facilities	xiii. A discussion of how shipping of project-related materials, supplies, and fuel will be handled during times that community and outpost camp resupply cargo and/or existing community use are being handled or undertaken, including any shared use of existing marine infrastructure.		2	6	6.3.3.1	4-2
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.6 Air Transportation	The Proponent shall describe all air transportation associated with the Project including the following:		2	4, 6, 8	4.2.2.2, 6.3.1	4-5, 6-2 to 6-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.6 Air Transportation	i. A description of all potential air transportation including air traffic, types of aircraft to be used, and the proposed use of municipal airports in the Kitikmeot region,		2	4, 6, 8	4.2.2.2, 6.3.1	4-5, 6-2 to 6-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.6 Air Transportation	ii. A description of all facilities and infrastructure proposed for air transportation, including construction methods and schedule, transfer and handling of any required fuel, etc.,		2	4, 6, 8	4.2.2.2, 6.3.1	4-5, 6-2 to 6-3

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.6 Air Transportation	iii. Estimates of the number of flights on a daily or weekly basis covering all phases of the Project, including estimated flight schedules (times and days),		2	4, 6, 8	4.2.2.2, 6.3.1	4-5, 6-2 to 6-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.6 Air Transportation	iv. The duration, frequency, and extent of use of each airport facility/airstrip/landing area,		2	4, 6, 8	4.2.2.2, 6.3.1	4-5, 6-2 to 6-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.6 Air Transportation	v. A description of the anticipated use/reliance on security and emergency services, during normal operations and emergency situations, and		2	4, 6, 8	4.2.2.2, 6.3.1	4-5, 6-2 to 6-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.6 Air Transportation	vi. Details regarding the proposed procedures for accident, malfunction and incident management and reporting for the transfer of hazardous material.		2	4, 6, 8	4.2.2.2, 6.3.1	4-5, 6-2 to 6-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	The Proponent shall provide information on all borrow pits and quarry sources required for the Project, in combination with the Borrow Pits and Quarry Management Plan (Subsection 9.4.12), and include:		2 10	4, 6 16	Table 6.4-1, 6.4.2, 6.6.4 All	6-6 tp 6-7, 6-34 to 6-25 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	i. Maps for all sites that are to be used for borrow pits or quarries, indicating the ownership (Inuit Owned Land and Crown Land) of lands and principle geographic features (e.g., on or near eskers and other unique landscapes, the proximity to waterbodies and watercourses),		2 10	4, 6 16	Table 6.4-1, 6.4.2, 6.6.4 3.5	6-6 tp 6-7, 6-34 to 6-25 7
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	ii. A discussion of how the borrow pits and quarry material will be extracted,		2 10	4, 6 16	Table 6.4-1, 6.4.2, 6.6.4 3.4	6-6 tp 6-7, 6-34 to 6-25 6 to 7
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	iii. A discussion of how the precautionary principle has been incorporated in the design of the borrow pits and quarries in terms of minimizing potential effects to the environment, including wildlife and wildlife habitats, including fish habitat where sites are in close proximity to waterbodies and watercourses,		2 10	4, 6 16	Table 6.4-1, 6.4.2, 6.6.4 6, 8	6-6 tp 6-7, 6-34 to 6-25 9 to 13
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	iv. Characterization of the materials at potential borrow pit and quarry site locations including ARD and ML potential, the ground ice conditions and occurrences of massive ice,		2 10	4, 6 16	Table 6.4-1, 6.4.2, 6.6.4 6.1	6-6 tp 6-7, 6-34 to 6-25 9 to 10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	v. Estimates of the quantities of materials that will be extracted from each borrow pit and quarry site,		2 10	6 16	6.6.4 3.2	6-24 3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	vi. Estimates of quantities of materials required to build the ground transportation and site infrastructure for the Project,		2 10	6 16	6.6.4 3.2	6-24 3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	vii. Annual estimates of quantities required for maintenance associated with ground transportation, site infrastructure, and the port site, and		10	12	8, Table 8-1	29, 23 to 27
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.7 Borrow Pits and Quarry Sites	viii. A description of proposed sediment, dust control and erosion measures in the design of the borrow pits and quarry sites.		2 10	4, 6 16	Table 6.4-1, 6.4.2, 6.6.4 6	6-6 to 6-7, 6-34 to 6-25 9 to 11
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.8 Power Generation	The Proponent shall provide the following information in conjunction with its Air Quality Monitoring and Management Plan (Subsection 9.4.14):		2	4, 6, 7	4.2.10, 6.4.9, 6.6.11, 7.4, 7.8.8 All	4-21 to 4-22, 6-12, 6-32, 7-33, 7-39 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.8 Power Generation	i. The energy balance for the proposed Project, including strategies for optimization and conservation,		2	4, 6, 7	4.2.10, 6.4.9, 6.6.11, 7.4, 7.8.8 All	4-21 to 4-22, 6-12, 6-32, 7-33, 7-39 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.8 Power Generation	ii. A discussion on how greenhouse gas emissions will be reduced,		2	4, 6, 7	4.2.10, 6.4.9, 6.6.11, 7.4, 7.8.8 All	4-21 to 4-22, 6-12, 6-32, 7-33, 7-39 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.8 Power Generation	iii. The type of power generation and associated infrastructure (i.e. power lines) that will be used over the Project lifespan,		2	4, 6, 7	4.2.10, 6.4.9, 6.6.11, 7.4, 7.8.8 All	4-21 to 4-22, 6-12, 6-32, 7-33, 7-39 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.8 Power Generation	iv. Locations (positioning) of power generation plants/stations relative to prevailing winds and other infrastructure,		2	4, 6, 7	4.2.10, 6.4.9, 6.6.11, 7.4, 7.8.8 All	4-21 to 4-22, 6-12, 6-32, 7-33, 7-39 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.8 Power Generation	v. A description of diesel power generation facilities, including sources, volumes of fuel to be used, transportation methods for fuel and associated transfer points, information regarding secondary containment measures to be employed and equipment and facilities for emergency clean-up, and		2	4, 6, 7	4.2.10, 6.4.9, 6.6.11, 7.4, 7.8.8 All	4-21 to 4-22, 6-12, 6-32, 7-33, 7-39 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.8 Power Generation	vi. Proposed accident/incident management and reporting.		2	4, 6, 7	4.2.10, 6.4.9, 6.6.11, 7.4, 7.8.8 All	4-21 to 4-22, 6-12, 6-32, 7-33, 7-39 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.9 Fuel and Explosives Facilities	The Proponent shall describe the following information, in conjunction with its Spill Contingency Plans, (Subsection 9.4.2), Hazardous Materials Management Plan (Subsection 9.4.8) and Explosives Management Plan (Subsection 9.4.13):	Yes	2 ~~10~~ Addendum 10	4, 6, 7, 8, 9 ~~4, 5~~ 4, 5	4.3.9, 6.4.6, 6.4.7, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 7.6, 8.14, 9.2.3 ~~All~~ All	4-27 to 4-28, 6-11 to 6-12, 6-25 to 6-32, 7-34 to 7-35, 8-8, 9-4 ~~All~~ All All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.9 Fuel and Explosives Facilities	i. The location and characteristics of fuel and explosives storage and/or manufacturing infrastructure and facilities (e.g. explosives and detonator magazines, fuel storage, ammonium nitrate storage, maintenance/wash area, process trucks and their parking area, any offices, warehouses, buildings) as well as methods of secondary containment to be employed. This will include setback distances to vulnerable features (i.e. dwellings, roads, camps, bodies of water, etc.), and between explosives facilities and fuel storage/handling areas,		2	4, 6, 7, 8, 9	4.3.9, 6.4.6, 6.4.7, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 7.6, 8.14, 9.2.3 All	4-27 to 4-28, 6-11 to 6-12, 6-25 to 6-32, 7-34 to 7-35, 8-8, 9-4 All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.9 Fuel and Explosives Facilities	ii. Types and estimate of quantities of all fuel types, explosives, and other similar materials required for the duration of the Project,		2	4, 6, 7, 8, 9	4.3.9, 6.4.6, 6.4.7, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 7.6, 8.14, 9.2.3 All	4-27 to 4-28, 6-11 to 6-12, 6-25 to 6-32, 7-34 to 7-35, 8-8, 9-4 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.9 Fuel and Explosives Facilities	iii. Proposed measures to ensure the fuel used for mine related activities conforms with Canadian regulations (Government of Canada, 1990, 1991, 1997, 1999b, 1999c, and 2002b),	Yes	2 ~~10~~ Addendum 10	4, 6, 7, 8, 9, 4 4	4.3.9, 6.4.6, 6.4.7, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 7.6, 8.14, 9.2.3 ~~4.0, 7.0~~ 3.0, 7.0	4-27 to 4-28, 6-11 to 6-12, 6-25 to 6-32, 7-34 to 7-35, 8-8, 9-4 ~~2 to 3, 11 to 16~~ 3-1, 7-1 to 7-5
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.9 Fuel and Explosives Facilities	iv. Operational plans including Oil Pollution Prevention and/or Emergency Plans in connection with the Spill Contingency, and Oil Handling Facility Contingency Plan, and	Yes	2 ~~10~~ 10 Addendum 10	4, 6, 7, 8, 9 ~~3, 4, 5~~ 3 4, 5	4.3.9, 6.4.6, 6.4.7, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 7.6, 8.14, 9.2.3 ~~All~~ All All	4-27 to 4-28, 6-11 to 6-12, 6-25 to 6-32, 7-34 to 7-35, 8-8, 9-4 ~~All~~ All All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.9 Fuel and Explosives Facilities	v. Methods of fuel transfer and transportation from sources to and around site.	Yes	2 10 Addendum 10	4, 6, 7, 8, 9 4 ~~6~~ 4 6	4.3.9, 6.4.6, 6.4.7, 6.6.5, 6.6.6, 6.6.7, 6.6.8, 7.6, 8.14, 9.2.3 ~~6.0~~ ~~4, 7, 9.3.2~~ 6.0 6, 9, 11.3.2	4-27 to 4-28, 6-11 to 6-12, 6-25 to 6-32, 7-34 to 7-35, 8-8, 9-4 ~~4 to 11~~ ~~9, 17 to 23, 30~~ 6-1 to 6-8 6-1, 9-1 to 9-7, 11-3
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	The Proponent shall provide the following information for ongoing exploration:					
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	i. Areas proposed for ongoing geotechnical investigations and mineral exploration, including drilling, over the duration of the various Project areas,		2	1, 2, 3	1.4, 1.5, 1.6, 3, 6.6.13	1-2 to 1-5, 3-1 to 3-2, 6-33 to 6-40
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	ii. A description of any exploration activities occurring on or near waterbodies and the mitigation measures that will be implemented to prevent impacts to aquatic life including fish and fish habitat as defined in the Fisheries Act,		2 5	3, 7 1	3, 7.1.1 1	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	iii. A description of any seismic activities to be undertaken, including a clear delineation of the location of such activities in proximity to water bodies and the anticipated effects of such activities on aquatic life, as well as proposed measures to mitigate identified impacts,		2 5	3, 7 1	3, 7.1.1 1	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	iv. Temporary field facilities, equipment to be used, and required ground and air transport frequencies,		2 5	3, 7 1	3, 7.1.1 1	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	v. Proposed wildlife mitigation and monitoring measures associated with exploration program (e.g., compliance with the minimum flight altitudes if aerial surveys are planned or conducted, timing and type of surveys, etc.),		2 5	3, 7 1	3, 7.1.1 1	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	vi. Proposed mitigation to reduce interaction with other current land users, such as Tourism Operators or harvesters,		2 5 8	3, 7 1 4	3, 7.1.1 1 4.6.2	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10 4-68 to 4-71
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	vii. A description of any exploration activities occurring near or interacting with other current land users, such as Tourism Operators or harvesters,		2 5 8	3, 7 1 4	3, 7.1.1 1 4.6.2	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10 4-68 to 4-71
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	viii. Proposed mitigation and monitoring measures designed to protect archaeological and cultural resources from being impacted by ongoing exploration, and		2 5 10	3, 7 1 27	3, 7.1.1 1 All	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10 All
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.10 Exploration	ix. Management plans for drilling waste disposal and drill site reclamation.		2 5	3, 7 1	3, 7.1.1 1	3-1 to 3-2, 7-3 to 7-5 1-1 to 1-10
6.0 PROJECT COMPONENTS AND ACTIVITIES	6.6 DETAILED PROJECT PROPOSAL DESCRIPTION	6.6.11 Ancillary Project Facilities and Infrastructure	The Proponent shall describe any other relevant project facilities and infrastructure not detailed in Section 6.6, including those related to logistics coordination, site administration or personnel accommodations, for example.		NA	NA	NA	NA
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		As identified in Section 2.2, the Proponent shall provide highlights of any public consultation and/or engagement undertaken in the EIS in order to address concerns of the general public regarding the anticipated or potential environmental effects of the Project.	Yes	3 Addendum 3	1 1	1.3, 1.4, 1.5, 1.6, ~~Appendices V3-1A, V3-1B~~ Addendum Appendices V3-1A, V3-1B	1-5 to 1-47 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		The Proponent shall also describe how communication was facilitated with the public through accommodating regional languages/dialects, not only through translation but through interpretation at any community or public meetings held.		3	1	1.5.1, 1.5.3	1-19 to 1-20, 1-20 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		A summary of key dialogues and identified issue areas from pre-consultation and consultation activities, along with any commitments made by the Proponent to communities during these discussions. This information must be presented in the EIS and will enable responsible agencies and the NIRB to:	Yes	3 Addendum 3	1 1	1.6.3, Table 1.6-1, Appendices ~~V3-1C,~~ V3-1E, V3-1G Addendum Appendix V3-1C	1-39 to 1-47, ~~All,~~ All, All All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		i. Assess the transparency, meaningfulness and completeness of community consultation efforts,	Yes	3 Addendum 3	1 1	1.3, 1.4, 1.5, 1.6, Appendices ~~V3-1A, V3-1B, V3-1C,~~ V3-1E Addendum Appendices V3-1A, V3-1B, V3-1C	1-5 to 1-47, All All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		ii. Understand messages communicated within the process of dialogue,	Yes	3 Addendum 3	1 1	1.6.3, Table 1.6-1, Appendices ~~V3-1C,~~ V3-1E, V3-1G Addendum Appendix V3-1C	1-39 to 1-47, All All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		iii. Obtain an increased understanding of the expectations held within communities based upon responses to specific issues raised, and	Yes	3 Addendum 3	1 1	1.6.3, Table 1.6-1, Appendices ~~V3-1C,~~ V3-1E, V3-1G Addendum Appendix V3-1C	1-39 to 1-47, All All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		iv. Assess how public participation has influenced the development of the Project with an analysis of community support for, and opposition to, the Project.		3	1	1.6.2, 1.6.3, Table 1.6-1, 1.7	1-37 to 1-38, 1-39 to 1-47, 1-48
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		The Proponent is expected to address concerns that are voiced regarding its own meaningful consultation and is required to:		3	1	Table 1.6-1	1-41 to 1-42

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		i. Continue to provide up-to-date information describing the Project to the public, particularly residents of communities likely to be most affected by the Project,		3	1	1.1.2, 1.2.3, 1.7	1-1 to 1-2, 1-4 to 1-5, 1-48
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		ii. Involve the public in determining how best to deliver that information, (i.e. the types of information required, translation and interpreting needs, timing of consultations, different formats, the possible need for community meetings), and		3	1	1.5.3, 1.6.3.1, 1.7	1-20 to 1-35, 1-40, 1-48
7.0 IMPACT ASSESSMENT METHODOLOGY	7.1 PUBLIC CONSULTATION		iii. Explain the findings documented within the EIS in a clear and direct manner to make the issues comprehensible to as wide an audience as possible.		3	1	1.6.3, Table 1.6-1, Appendix V3-1G	1-39 to 1-47, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		The Proponent shall, with reference to Section 2.3, present and justify its definition of TK and shall explain the methodology used to collect TK, including:		3	3	3.1.2, 3.2, 3.3	3-1 to 3-2, 3-44 to 3-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		i. The format and location of meetings, interviews, and other data gathering efforts,		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3C, Appendix V3-3D	3-44 to 3-50, All, All, All, All,
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		ii. A description of background information provided to informants,		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3D	3-44 to 3-50, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		iii. The level of community participation and composition of participants,		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3D	3-44 to 3-50, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		iv. The design of TK studies, including lists of interview questions posed to informants or other tools used in the study,		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3D	3-44 to 3-50, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		v. The selection process for participants in such studies, including participants residing outside of the NSA,		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3D	3-44 to 3-50, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		vi. Types of TK collected, and		3	3	3.2, 3.3, Appendix V3-3A, Appendix V3-3B, Appendix V3-3C, Appendix V3-3D	3-44 to 3-50, 3-50 to 3-53, All, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		vii. Associated issues related to any proprietary status of TK used.		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3D	3-44 to 3-50, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		The Proponent shall summarize what kinds of TK were collected and describe the roles and responsibilities of all concerned individuals and organizations in collecting, analyzing, interpreting and synthesizing the TK data.		3	3	3.1, Table 3.1-1, 3.2, 3.3, Appendix V3-3A, Appendix V3-3B, Appendix V3-3C, Appendix V3-3D	3-1 to 3-3, 3-3 to 3-42, 3-44 to 3-50, 3-50 to 3-53, All, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		The Proponent shall also indicate whether special efforts were made to collect TK from Inuit Elders, women, youth, special groups, and harvesters familiar with the Project area.		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3D	3-44 to 3-50, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		Any measures to protect the anonymity and to secure the informed consent of TK providers should be outlined as well as any special restrictions on uses of certain types of TK as stipulated by TK holders.		3	3	3.2, Appendix V3-3A, Appendix V3-3B, Appendix V3-3D	3-44 to 3-50, All, All, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		In all sections of the EIS, the Proponent shall discuss how it weighed and incorporated TK in areas such as baseline data collection, impact prediction, significance assessment and the development of mitigation and monitoring programs.		3	3	Table 3.1-1, 3.3	3-3 to 3-42, 3-50 to 3-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		The Proponent shall explain how it integrated TK and popular science, including the manner in which it reconciled any apparent discrepancies between the two types of knowledge.		3	3	3.1.2, 3.1.3, 3.3	3-1 to 3-43, 3-50 to 3-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.2 TRADITIONAL KNOWLEDGE		The Proponent shall include a discussion on how it dealt with discrepancies within TK (variation between individuals) and describe how and where TK is being used to address gaps in currently available scientific data.		3	3	3.3.5	3-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		The Proponent shall present baseline data, including TK, in relation to the existing biophysical and socio-economic environments relevant to the assessment of potential impacts from the Project for all proposed phases. Potential for changes in baseline conditions due to exploration activities and any potential NLCA 12.10.2 exception applications, if applicable and as may be related to the Project, must be taken into consideration.		4 5 6 7 8 9	1, 2 5, 6, 7, 8, 9, 10, 11 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.1, X.2 X.1, X.2 X.1, X.2 X.1, X.2 X.1, X.2 1.2.2	1-1 to 1-11, 2-1 to 2-7 5-1 to 5-125, 6-1 to 6-33, 7-1 to 7-16, 8-1 to 8-30, 9-1 to 9-28, 10-1 to 10-17 1-1 to 1-31, 4-1 to 4-25, 5-1 to 5-13, 6-1 to 6-42, 7-1 to 7-32 2-1 to 2-15, 3-1 to 3-11, 4-1 to 4-37, 5-1 to 5-20, 6-1 to 6-18, 7-1 to 7-11 1-1 to 1-12, 3-1 to 3-26, 4-1 to 4-26, 5-1 to 5-19 1-2
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		The Proponent shall explain methodologies for baseline data collection, evaluation of the adequacy of data, confidence levels associated with baseline data, and identification of significant gaps in knowledge and understanding. The associated uncertainties and the steps to be taken to fill information gaps should be discussed.		3 4 5 6 7 8 9	3 All All All All All 1	3.2, 3.3.1, 3.3.5 X.1 X.1 X.1 X.1 X.1 1.2.2	3-44 to 3-50, 3-50 to 3-51, 3-53 1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		The Proponent should consider other available information containing baseline data related to the Project region, including a review of published literature, technical scientific reports, and peer-reviewed scientific literature to present a complete picture of baseline conditions.		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		To identify natural fluctuations and trends including cyclical and other recurrent phenomena, the Proponent shall collect baseline data to reflect sufficient time, depth and geographic broadness of both temporal and spatial scale (e.g. populations and distributions of wildlife VECs are known to fluctuate in cyclic trends over extensive time periods and geographic ranges).		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13 1-2 to 1-4

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		In order to understand the natural ecological conditions and the potential impacts from the Project on these conditions, the Proponent should consider the design of all biophysical environmental monitoring programs to ensure that the baseline data required is useful in understanding the relationship between the natural ecological conditions and the potential Project impacts on these conditions. This would improve interpretation of monitoring data in order to differentiate between natural variability and project-specific impacts.		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		Furthermore, to ensure post-monitoring impact analysis is not confounded by temporal variation, the Proponent should incorporate reference site sampling as part of its routine baseline sampling.	Yes	4 5 6 7 8 9 ~~10~~ Addendum 10	All All All All All 1 ~~20~~ 20	X.1 X.1 X.1 X.1 X.1 1.2.2 ~~All~~ All	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13 1-2 to 1-4 ~~All~~ All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		The Proponent shall make any linkages explicit and describe the trade-offs. For example, deficiencies in baseline data increase uncertainties in the prediction of potential impacts, and consequently require an intensification of corresponding monitoring and mitigation programs (Section 9.3), and follow up and adaptive management plans (Section 9.7).		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 All	X.5.1, X.5.4 X.5.1, X.5.4 X.5.1, X.5.4 X.5.1, X.5.4 X.5.1, 1.5.4, 3.5.5, 4.5.4, 5.5.4 All	1-15 to 1-20, 1-28, 2-11 to 2-14, 2-22 to 2-23 4-26 to 4-28, 4-32 to 4-50, 5-131 to 5-143, 5-191 to 5-1195, 6-37 to 6-40, 6-64 to 6-67, 7-18 to 7-22, 7-46 to 7-48, 8-32 to 8-37, 8-65 to 8-68, 9-30 to 9-35, 9-54 to 9-55, 10-22 to 10-25, 10-48 to 10-51 1-41 to 1-43, 1-46 to 1-52, 4-26 to 4-31, 4-45 to 4-56, 5-14 to 5-19, 5-31 to 5-35, 6-44 to 6-47, 6-70, 7-34 to 7-37, 7-56 2-16 to 2-20, 2-33 to 2-39, 3-12 to 3-16, 3-217to 3-30, 4-40 to 4-43, 4-49, 5-22 to 5-25, 5-31, 6-20 to 6-25, 6-38 to 6-39, 7-15 to 7-18, 7-36 1-15 to 1-16, 1-26, 3-42 to 3-46, 3-98 to 3-101, 4-33 to 4-38, 4-55 to 4-57, 5-23 to 5-25, 5-36 to 5-61 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.3 BASELINE INFORMATION COLLECTION		The description of the existing baseline and the environmental trends should include a consideration of past projects and activities carried out by the Proponent and/or others within the RSA.		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-1 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.4 USE OF EXISTING INFORMATION		In preparing its EIS, the NIRB expects that the Proponent will rely on the use of existing information and available results of surveys and studies completed in the Project region or in Nunavut by other developers, government agencies, organizations, institutions, regional authorities and individual researchers as such may lend information as pertaining to the Project and/or the environment. For example, 'lessons learned' already exist in relation to previous and/or currently active projects in Nunavut (e.g. the Meadowbank Gold Mine, the Jericho Diamond Mine, the Doris North Gold Mine, Ekati and Diavik Diamond Mines, etc.) and this information should be captured by the Proponent.		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-1 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.4 USE OF EXISTING INFORMATION		When using existing information to meet the requirements of various sections of the EIS Guidelines, the Proponent should either include the information directly in the EIS with clear references indicating the source of information (i.e. document, section, and page numbers), or use cross-references to direct reviewers (the document, section and page number) to where they may obtain the information within the EIS or its supporting documents.		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.4 USE OF EXISTING INFORMATION		The Proponent must also clarify how representative the data are, clearly separating factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from them.		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-1 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.4 USE OF EXISTING INFORMATION		If conflicting information is encountered from either scientific based or TK sources, it is suggested that these conflicting viewpoints be identified and presented in a balanced manner along with the Proponent's conclusions.		3 4 5 6 7 8 9	3 All All All All All 1	3.3.5 X.2 X.2 X.2 X.2 X.2 1.2.2	3-53 1-10 to 1-11, 2-6 to 2-7, 3-30 to 3-33 1-14 to 1-15, 2-22 to 2-23, 3-21 to 3-23, 4-18 to 4-19, 5-122 to 5-125, 6-22 to 6-33, 7-14 to 7-16, 8-25 to 8-30, 9-25 to 9-28, 10-15 to 10-17 1-29 to 1-31, 2-20 to 2-21, 3-14 to 3-19, 4-23 to 4-25, 5-12 to 5-13, 6-35 to 6-42, 7-25 to 7-32 1-31 to 1-32, 2-14 to 2-15, 3-10 to 3-11, 4-30 to 4-37, 5-11 to 5-20, 6-15 to 6-18, 7-9 to 7-11 1-11 to 1-12, 2-1 to 2-7, 3-25 to 3-27, 4-22 to 4-26, 5-15 to 5-20, 6-13 to 6-18 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.4 USE OF EXISTING INFORMATION		The EIS must clearly document any information or knowledge gaps encountered in the existing literature or other information sources, and discuss how these gaps might affect the ability to draw conclusions and the reliability of those conclusions drawn in the assessment.		4 5 6 7 8 9	All All All All All 1	X.1, X.2 X.1, X.2 X.1, X.2 X.1, X.2 X.1, X.2 1.2.2	1-1 to 1-11, 2-1 to 2-7, 3-1 to 3-33 1-1 to 1-15, 2-1 to 2-23, 3-1 to 3-33, 4-1 to 4-19, 5-1 to 5-125, 6-1 to 6-33, 7-1 to 7-16, 8-1 to 8-30, 9-1 to 9-28, 10-1 to 10-17 1-1 to 1-31, 2-1 to 2-21, 3-1 to 3-19, 4-1 to 4-25, 5-1 to 5-13, 6-1 to 6-42, 7-1 to 7-32 2-1 to 2-15, 3-1 to 3-11, 4-1 to 4-37, 5-1 to 5-20, 6-1 to 6-18, 7-1 to 7-11 1-1 to 1-12, 2-1 to 2-7, 3-1 to 3-27, 4-1 to 4-26, 5-1 to 5-20, 6-1 to 6-18 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	The spatial boundaries of the assessment of the Project, and its components, shall be determined on the basis of the Project's potential impacts on the particular biophysical, social and/or economic environment being addressed.		4 5 6 7 8 9	All All All All Al 1	X.1 X.1 X.1 X.1 X.1 1.2.3.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13 1-16 to 1-18

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	In accordance with the NIRB's definition of local and regional study areas, the Proponent shall consider the following criteria when establishing spatial boundaries for the assessment of the Project:		-	-	-	-
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	i. The physical or socio-economic extent of project activities,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4 X.4 X.4 X.4 X.4 1.2.3.2	1-12 to 1-15, 2-8 to 2-11 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	ii. The extent of ecosystems potentially affected by the Project,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4 X.4 X.4 X.4 X.4 1.2.3.2, 1.3.4.3	1-12 to 1-15, 2-8 to 2-11, 3-33 to 3-42 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18, 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	iii. The extent to which traditional and contemporary land and resource use, including protected areas, and other harvesting activities could potentially be affected by the Project, and		8	4	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	iv. The size, nature and location of past, present, and reasonably foreseeable projects and activities which could interact with the items listed above.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.6.1 X.6.1 X.6.1 X.6.1 X.6.1 1.3.4	1-29 to 1-31, 2-23 to 2-25 4-56, 5-197 to 5-205, 6-69 to 6-70, 7-50 to 7-51, 8-70 to 8-71, 9-55 to 9-57, 10-51 to 10-53 1-56, 4-57 to 4-59, 5-37, 6-70, 7-56 2-39, 3-30, 4-50, 5-32, 6-39, 7-36 1-29, 3-104 to 3-112, 4-60 to 4-68, 5-61 1-39 to 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	The EIS shall define the spatial boundaries of the maximum area potentially affected by the Project, based on the boundaries for each individual type of impact, taking into account other relevant factors such as the migratory and/or life cycle of wildlife species where applicable, the socio-economic or other economic indicators.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4, X.6.1 X.4, X.6.1 X.4, X.6.1 X.4, X.6.1 X.4, X.6.1 1.2.3.2, 1.3.4.3	1-12 to 1-15, 1-29 to 1-31, 2-8 to 2-11, 2-23 to 2-25 4-26, 4-56, 5-128 to 5-131, 5-197 to 5-205, 6-34 to 6-37, 6-69 to 6-70, 7-17 to 7-18, 7-50 to 7-51, 8-31 to 8-33, 8-70 to 8-71, 9-29 to 9-30, 9-55 to 9-57, 10-18 to 10-22, 10-51 to 10-53 1-32 to 1-41, 1-56, 4-25 to 4-26, 4-57 to 4-59, 5-13 to 5-14, 5-37, 6-43 to 6-44, 6-70, 7-33 to 7-34, 7-56 2-15 to 2-16, 2-39, 3-11 to 3-12, 3-30 to 3-33, 4-32 to 4-35, 4-50, 5-18 to 5-21, 5-32, 6-19 to 6-20, 6-39 to 6-42, 7-15, 7-36 1-12 to 1-15, 1-29, 3-41 to 3-42, 3-104 to 3-112, 4-33, 4-60 to 4-68, 5-20 to 5-23, 5-61 1-16 to 1-18, 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	Identification of spatial boundaries should also take into account various impact pathways such as pollutant transport and bioaccumulation mechanisms.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4, X.5.1 X.4, X.5.1 X.4, X.5.1 X.4, X.5.1 X.4, X.5.1 1.2.3.2, 1.3.4.3	1-12 to 1-15, 2-8 to 2-11 4-26 to 4-28, 5-128 to 5-134, 6-34 to 6-40, 7-17 to 7-22, 8-31 to 8-37, 9-29 to 9-35, 10-18 to 10-25 1-32 to 1-41, 4-25to 4-29, 5-13 to 5-19, 6-43 to 6-47, 7-33 to 7-37 2-15 to 2-20, 3-11 to 3-16, 4-39 to 4-43, 5-21 to 5-25, 6-19 to 6-25, 7-12 to 7-18 1-12 to 1-16, 3-41 to 3-46, 4-33 to 4-38, 5-20 to 5-25 1-16 to 1-18, 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	Traditional and contemporary land use and occupancy for the past, present, and future, should be considered in addition to other factors when determining spatial boundaries for the impact assessment of the Project.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 1.2.3.2, 1.3.4.3	1-10 to 1-11, 1-12 to 1-20, 1-29 to 1-31, 2-6 to 2-7, 2-8 to 2-14, 2-23 to 2-25 4-18 to 4-19, 4-26 to 4-28, 4-56, 5-122 to 5-125, 5-128 to 5-134, 5-197 to 5-205, 6-22 to 6-33, 6-34 to 6-40, 6-69 to 6-70, 7-14 to 7-16, 7-17 to 7-22, 7-50 to 7-51, 8-25to 8-30, 8-31 to 8-37, 8-70 to 8-71, 9-25 to 9-28, 9-29 to 9-35, 9-55 to 9-57, 10-15 to 10-18, 10-18 to 10-25, 10-51 to 10-53 1-29 to 1-31, 1-32 to 1-43, 1-56, 4-23 to 4-31, 4-57 to 4-59, 5-12 to 5-19, 5-37, 6-35 to 6-47, 6-70, 7-25 to 7-37, 7-56 2-14 to 2-20, 2-39 to 2-40, 3-10 to 3-12, 3-12 to 3-16, 3-30 to 3-32, 4-30 to 4-40, 4-40 to 4-43, 4-50, 5-11 to 5-22, 5-21 to 5-25, 5-32, 6-15 to 6-24, 6-39 to 6-42, 7-9 to 7-18, 7-36 1-11 to 1-12, 1-12 to 1-16, 1-29, 3-25 to 3-27, 3-41 to 3-46, 3-104 to 3-112, 4-22 to 4-26, 4-33 to 4-38, 4-60 to 4-68, 5-15 to 5-20, 5-20 to 5-25, 5-61 1-16 to 1-18, 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	The Proponent is not required to provide a comprehensive baseline description of the environment at each of the above scales, but must provide sufficient detail to address the relevant environmental and cumulative effects of the Project. For example, the spatial boundaries for archaeological studies related to burial grounds in the Project area might reasonably be expected to differ from those for studies on migration of caribou in the area.		4 5 6 7 8 9	All All All All All 1	X.1 X.1 X.1 X.1 X.1 1.2.2	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-1 to 6-13 1-2 to 1-4
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	The boundaries for the assessment of socio-economic impacts shall be based on an analysis of the socio-economic effects directly and indirectly associated with the Project. In all cases, priority focus shall be directed to potential impacts within Nunavut, but the EIS shall also consider potential impacts outside of Nunavut, wherever there is reason to anticipate that they might occur.		8	3	3.4, 3.6.1.1	3-41 to 3-42, 3-105
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	The EIS must contain a justification and rationale for all spatial boundaries and scales chosen.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4, X.6.1 X.4, X.6.1 X.4, X.6.1 X.4, X.6.1 X.4, X.6.1 1.2.3.2, 1.3.4.3	1-12 to 1-15, 1-29 to 1-31, 2-8 to 2-11, 2-23 to 2-25 4-26, 4-56, 5-128 to 5-131, 5-197 to 5-205, 6-34 to 6-37, 6-69 to 6-70, 7-17 to 7-18, 7-50 to 7-51, 8-31 to 8-33, 8-70 to 8-71, 9-29 to 9-30, 9-55 to 9-57, 10-18 to 10-22, 10-51 to 10-53 1-32 to 1-41, 1-56, 4-25 to 4-26, 4-57 to 4-59, 5-13 to 5-14, 5-37, 6-43 to 6-44, 6-70, 7-33 to 7-34, 7-56 2-15 to 2-16, 2-39, 3-11 to 3-12, 3-30 to 3-33, 4-32 to 4-35, 4-50, 5-18 to 5-21, 5-32, 6-19 to 6-20, 6-39 to 6-42, 7-15, 7-36 1-12 to 1-15, 1-29, 3-41 to 3-42, 3-104 to 3-112, 4-33, 4-60 to 4-68, 5-20 to 5-23, 5-61 1-16 to 1-18, 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	The following general spatial boundaries are suggested, noting that the LSAs and RSAs may vary between disciplines and between VECs/VSECs, as they represent the likely distribution of project effects on individual VECs/VSECs:		-	-	-	-

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	i. Local Study Area (LSA): the Local Study Area shall be defined as that area where there exists the reasonable potential for immediate impacts due to Project activities, ongoing normal activities, or to possible abnormal operating conditions. The Local Study Area includes the Project facilities, buildings and infrastructure, and all areas proposed for Project activities, including entire proposed shipping routes in the NSA.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	 X.4 1.2.3.2	 1-12 to 1-15, 2-8 to 2-11 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.1 Spatial Boundaries	ii. Regional Study Area (RSA): the Regional Study Area shall be defined as the area within which there exists the potential for direct, indirect, and/or cumulative biophysical and socio-economic effects. This area includes lands, communities, and portions of Nunavut and other regions of Canada that may be relevant to the assessment of wide- spread effects of the Project. The Proponent is advised to duly consider the transboundary implications of impacts to identified VECs/VSECs as results of air transportation and marine shipping for the Project.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4 X.4 X.4 X.4 X.4 1.2.3.2	1-12 to 1-15, 2-8 to 2-11 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.2 Temporal Boundaries	The EIS shall determine the temporal boundaries separately for the construction, operation, maintenance, temporary closure, final closure, and post-closure periods, including planned exploration to be undertaken in conjunction with the Project. A temporary closure period (i.e. care & maintenance) is understood to encompass the period of un-timely closure of the Project and specifies care and maintenance activities while the final closure period would include decommissioning and reclamation activities. The post-closure period covers the timespan after the Project has been decommissioned and abandoned, once the site has been reclaimed and returned as much as possible to its natural state. The temporal boundaries of the post-closure period may encompass many years, depending on the site, the type of Project and the methods of closure.)		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4 X.4 X.4 X.4 X.4 1.2.3.2	1-12 to 1-15, 2-8 to 2-11 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.2 Temporal Boundaries	The Proponent shall also consider, where applicable, the temporal bounds of Project alternatives under assessment, noting where they differ from those for the preferred option.		2 4 5 6 7 8 9	4 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	Appendix V2-4C X.4 X.4 X.4 X.4 X.4 1.2.3.2	All 1-12 to 1-15, 2-8 to 2-11 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.2 Temporal Boundaries	As is the case for the determination of spatial boundaries, the temporal boundaries must indicate the range of appropriate scales at which particular baseline descriptions and the assessment of environmental effects are presented.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4 X.4 X.4 X.4 X.4 1.2.3.2	1-12 to 1-15, 2-8 to 2-11 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.2 Temporal Boundaries	For all temporal boundaries, the EIS shall give a rationale and justification for the boundaries chosen, including a description of any consultation with members of the public or technical experts. In doing so, the Proponent shall give consideration to climate change, including warming trends, which might influence some of the impact assessment. This may include, for example, where there may be no immediate danger of permafrost degradation, but taking climate change into consideration would have the Proponent incorporate the future possibility of this risk into the discussion of Project design where applicable.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.4 X.4 X.4 X.4 X.4 1.2.3.2	1-12 to 1-15, 2-8 to 2-11 4-26, 5-128 to 5-131, 6-34 to 6-37, 7-17 to 7-18, 8-31 to 8-32, 9-29 to 9-30, 10-18 to 10-22 1-32 to 1-41, 4-25 to 4-26, 5-13 to 5-14, 6-43 to 6-44, 7-33 to 7-34 2-15 to 2-16, 3-11 to 3-12, 4-39 to 4-40, 5-21 to 5-22, 6-19 to 6-20, 7-12 to 7-15 1-12 to 1-15, 3-41 to 3-42, 4-33, 5-20 to 5-23 1-16 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.5 ASSESSMENT BOUNDARIES	7.5.2 Temporal Boundaries	The Proponent shall also give due consideration to traditional and contemporary land use and occupancy (past, present, and future), in addition to other factors to be considered in its determination of temporal boundaries for the Project.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 X.2, X.4, X.5.1, X.6.1 1.2.3.2, 1.3.4.3	1-10 to 1-15, 1-29 to 1-31, 2-6 to 2.7, 2.8 to 2-14, 2-23 to 2-25 4-18 to 4-19, 4-26 to 4-28, 4-56, 5-122 to 5-125, 5-128 to 5-134, 5-197 to 5-205, 6-22 to 6-33, 6-34 to 6-40, 6-69 to 6-70, 7-14 to 7-16, 7-17 to 7-22, 7-50 to 7-51, 8-25to 8-30, 8-31 to 8-37, 8-70 to 8-71, 9-25 to 9-28, 9-29 to 9-35, 9-55 to 9-57, 10-15 to 10-18, 10-18 to 10-25, 10-51 to 10-53 1-29 to 1-31, 1-32 to 1-43, 1-56, 4-23 to 4-31, 4-57 to 4-59, 5-12 to 5-19, 5-37, 6-35 to 6-44, 6-70, 7-33 to 7-34, 7-56 2-14 to 2-20, 2-39 to 2-40, 3-10 to 3-12, 3-12 to 3-16, 3-30 to 3-32, 4-30 to 4-40, 4-40 to 4-43, 4-50, 5-11 to 5-22, 5-21 to 5-25, 5-32, 6-15 to 6-24, 6-39 to 6-42, 7-9 to 7-18, 7-36 1-11 to 1-12, 1-12 to 1-16, 1-29, 3-25 to 3-27, 3-41 to 3-46, 3-104 to 3-112, 4-22 to 4-26, 4-33 to 4-38, 4-60 to 4-68, 5-15 to 5-20, 5-20 to 5-25, 5-61 1-16 to 1-18, 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		The EIS shall include a clear listing of those VECs and VSECs, processes, and interactions between the VECs and VSECs that are likely to be affected by the Project as well as those identified in these Guidelines.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.2 X.5.2 X.5.2 X.5.2 1.5.2, 3.5.3, 4.5.2, 5.5.2 1.2.3.1	1-20 to 1-27, 2-14 to 2-20 4-28 to 4-30, 5-134 to 5-187, 6-40 to 6-61, 7-22 to 7-43, 8-37 to 8-62, 9-35 to 9-51, 10-25 to 10-46 1-43, 4-31 to 4-38, 5-19 to 5-25, 6-47 to 6-61, 7-37 to 7-46 2-20 to 2-26, 3-16 to 3-22, 4-43 to 4-46, 5-25 to 5-29, 6-25 to 6-36, 7-17 to 7-34 1-16 to 1-24, 3-48 to 3-95, 4-38 to 4-53, 5-25 to 5-31 1-5 to 1-16

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		If relevant, the location of these VECs/VSECs should be indicated on maps or charts, indicating to whom these components are valued and the reasons why, including ecosystemic, social, economic, recreational, tourism, aesthetic or other considerations.		4, 5, 6 ,7, 8	All	X.1	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-1 to 6-13
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		The Proponent should also indicate the specific geographical areas or ecosystems that are of particular concern, and their relation to the broader regional environment and economy.		4, 5, 6, 7, 8	All	X.1	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-14, 2-1 to 2-22, 3-1 to 3-21, 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 2-1 to 2-20, 3-1 to 3-14, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-1 to 6-13
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		The Proponent shall explain and justify methods used to predict potential adverse and beneficial effects of the Project on each VEC and VSEC, the interactions among these components, and the relations of these components with the environment. In particular, the Proponent must describe how the VECs were selected and what methods were used to predict and assess the adverse environmental effects of the Project on these components. The value of a component should be considered not only in relation to its role in the ecosystem as a VEC, but also the value placed on it by humans for traditional use and cultural connection as a VSEC. This should be considered not only for components of the environment but also the land directly affected by the Project.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.2 X.5.1, X.5.2 X.5.1, X.5.2 X.5.1, X.5.2 X.5.1, X.5.2 1.2.3.1	1-15 to 1-27, 2-11 to 2-16 4-26 to 4-30, 5-131 to 5-187, 6-37 to 6-61, 7-18 to 7-34, 8-32 to 8-62, 9-30 to 9-51, 10-22 to 10-46 1-41 to 1-43, 4-26 to 4-38, 5-14 to 5-25, 6-44 to 6-61, 7-34 to 7-46 2-16 to 2-26, 3-12 to 3-22, 4-40 to 4-46, 5-22 to 5-29, 6-20 to 6-36, 7-15 to 7-34 1-15 to 1-24, 3-42 to 3-48, 4-33 to 4-53, 5-23 to 5-31 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		The Proponent shall provide a rationale for the selection of communities and relevant studies for which baseline data relating to or supporting the discussion and analysis of VECs and VSECs are provided.		8	3, 4	3.1, 3.4, 3.5.3, 4.1, 4.4, 4.5.3	3-1 to 3-24, 3-41 to 3-42, 3-48 to 3-95, 4-1 to 4-22, 4-33, 4-53 to 4-55
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		The Proponent must validate the selected VECs/VSECs, especially those VECs/VSECs that will be used to assess the significance of Project component interactions, through consultation with the potentially affected communities. Any uncertainties in the validation must be documented. (The NIRB strongly recommends that the Proponent continue to seek input from communities, government agencies and other parties, as well as to incorporate the use of TK to identify the VECs and VSECs.)		3 4 5 6 7 8 9	1, 3 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	1.6.2.2, 3.3.2 X.5.1, X.5.2 X.5.1, X.5.2 X.5.1, X.5.2 X.5.1, X.5.2 X.5.1, X.5.2 1.2.3.1	1-38, 3-51 1-15 to 1-27, 2-11 to 2-20 4-26 to 4-30, 5-131 to 5-187, 6-37 to 6-61, 7-18 to 7-34, 8-32 to 8-62, 9-30 to 9-51, 10-22 to 10-46 1-41 to 1-43, 4-26 to 4-38, 5-14 to 5-25, 6-44 to 6-61, 7-34 to 7-46 2-16 to 2-26, 3-12 to 3-22, 4-40 to 4-46, 5-22 to 5-29, 6-20 to 6-36, 7-15 to 7-34 1-15 to 1-24, 3-42 to 3-48, 4-33 to 4-53, 5-23 to 5-31 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		All VECs and VSECs used in the assessment should have clearly identified indicators as outlined in Section 7.13.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5.1, X.5.2	1-15 to 1-27, 2-11 to 2-20 4-26 to 4-30, 5-131 to 5-187, 6-37 to 6-61, 7-18 to 7-34, 8-32 to 8-62, 9-30 to 9-51, 10-22 to 10-46 1-41 to 1-43, 4-26 to 4-38, 5-14 to 5-25, 6-44 to 6-61, 7-34 to 7-46 2-16 to 2-26, 3-12 to 3-22, 4-40 to 4-46, 5-22 to 5-29, 6-20 to 6-36, 7-15 to 7-34 1-15 to 1-24, 3-42 to 3-48, 4-33 to 4-53, 5-23 to 5-31
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		The Proponent is expected to identify the components and activities of the Project that are anticipated to interact in adverse or beneficial ways with the selected VECs/VSECs and the interaction. These components and activities could be grouped into the following categories:					
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		i. Components and activities related to construction, operation, temporary closure, final closure and post-closure of the Project, and		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.2 X.5.2 X.5.2 X.5.2 1.5.2, 3.5.3, 4.5.2, 5.5.2 1.2.4.1	1-20 to 1-27, 2-14 to 2-20 4-28 to 4-30, 5-134 to 5-187, 6-40 to 6-61, 7-22 to 7-43, 8-37 to 8-62, 9-35 to 9-51, 10-25 to 10-46 1-43, 4-31 to 4-38, 5-19 to 5-25, 6-47 to 6-61, 7-37 to 7-46 2-20 to 2-26, 3-16 to 3-22, 4-43 to 4-46, 5-25 to 5-29, 6-25 to 6-36, 7-17 to 7-34 1-16 to 1-24, 3-48 to 3-95, 4-38 to 4-53, 5-25 to 5-31 1-19
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		ii. Components and activities induced by the Project development, which may occur in the reasonably foreseeable future.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.2 X.5.2 X.5.2 X.5.2 1.5.2, 3.5.3, 4.5.2, 5.5.2 1.2.4.1	1-20 to 1-27, 2-14 to 2-20 4-28 to 4-30, 5-134 to 5-187, 6-40 to 6-61, 7-22 to 7-43, 8-37 to 8-62, 9-35 to 9-51, 10-25 to 10-46 1-43, 4-31 to 4-38, 5-19 to 5-25, 6-47 to 6-61, 7-37 to 7-46 2-20 to 2-26, 3-16 to 3-22, 4-43 to 4-46, 5-25 to 5-29, 6-25 to 6-36, 7-17 to 7-34 1-16 to 1-24, 3-48 to 3-95, 4-38 to 4-53, 5-25 to 5-31 1-19
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS		The Proponent should consider the following list in the selection of VECs and VSECs (this list is not meant to be comprehensive nor exhaustive, abut should give the Proponent an appropriate starting point for the identification of relevant VECs and VSECs):		-	-	-	-
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	i. Air quality,		4 9	1 1	1.3.2 1.2.3.1	1-12 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	ii. Climate and Meteorology,		4 9	3 1	3.3.2 1.2.3.1	3-33 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	iii. Noise and vibration,		4 9	2 1	2.3.2 1.2.3.1	2-8 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	iv. Terrestrial environment, including terrestrial ecology, landforms and soils, and permafrost and ground stability,		5 9	2, 3, 4 1	2.3, 3.3, 4.3 1.1, 1.2, 1.3, 1.4	2-23, 3-33, 4-19 to 4-26 1-1 to 1-53

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	v. Geological features including discussion of surficial and bedrock geology and geochemistry,		5 9	1 1	All 1.1, 1.2, 1.3, 1.4	All 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	vi. Hydrological features (including water quantity) and discussion of hydrogeology,		6 9	1, 2 1	1.3, 2.3 1.1, 1.2, 1.3, 1.4	1-31 to 1-33, 2-21 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	vii. Groundwater and surface water quality,		6 9	2, 4 1	2.3, 4.3 1.1, 1.2, 1.3, 1.4	2-21, 4-25 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	viii. Sediment quality,		6 9	5 1	5.3 1.1, 1.2, 1.3, 1.4	5-13 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	ix. Freshwater aquatic environment, including aquatic ecology, aquatic biota (including representative fish as defined in the Fisheries Act, benthic invertebrates, and other aquatic organisms), habitat (including fish habitat as defined in the Fisheries Act), and commercial, recreational and Aboriginal fisheries as defined in the Fisheries Act,		6 9	3, 4, 5, 6, 7 1	3.3, 4.3, 5.3, 6.3, 7.3 1.1, 1.2, 1.3, 1.4	3-19, 4-25, 5-13, 6-42 to 6-43, 7-32 to 7-33 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	x. Vegetation,		5 9	4 1	4.3 1.1, 1.2, 1.3, 1.4	4-19 to 4-26 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	xi. Terrestrial wildlife and wildlife habitat (including representative terrestrial mammals to include caribou, caribou habitat and behaviour, muskoxen, wolverine, polar bears, brown bears (including both brown and grizzly), wolves, and less conspicuous species that may be maximally exposed to contaminants), and wildlife migration routes and crossings,		5 9	5, 6, 7, 8 1	5.3, 6.3, 7.3, 8.3 1.1, 1.2, 1.3, 1.4	5-125 to 5-128, 6-33 to 6-34, 7-16 to 7-17, 8-30 to 8-31 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	xii. Birds and their habitat including raptors, migratory birds, and seabirds,		5 7 9	9, 10 6 1	9.3, 10.3 6.3 1.1, 1.2, 1.3, 1.4	9-28 to 9-29, 10-17 to 10-18 6-18 to 6-19 1-1 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	xiii. Marine environment, including marine ecology, marine water and sediment quality, marine biota (including fish and Species at Risk), marine habitat, and commercial, recreational and Aboriginal fisheries as defined in the Fisheries Act, and		7 9	1, 2, 3, 4, 5 1	X.3 1.2.3.1	1-32, 2-15, 3-11, 4-37 to 4-38, 4-37 to 4-38, 5-20 to 5-21 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.1 Valued Ecosystem Components	xiv. Marine wildlife, including marine mammals such as whales and seals.		7 9	6, 7 1	6.3, 7.3 1.2.3.1	6-18 to 6-19, 7-11 to 7-12 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	i. Economic development and opportunities,		8 9	3 1	3.3 1.2.3.1	3-27 to 3-41 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	ii. Employment,		8 9	3 1	3.3 1.2.3.1	3-27 to 3-41 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	iii. Education and training,		8 9	3 1	3.3 1.2.3.1	3-27 to 3-41 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	iv. Contracting and business opportunities,		8 9	3 1	3.3 1.2.3.1	3-27 to 3-41 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	v. Population demographics,		8 9	3 1	3.3 1.2.3.1	3-27 to 3-41 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	vi. Traditional activity and knowledge including land use and mobility, food security, language, and cultural and commercial harvesting,		3 8 9	3 4 1	3.3.2 4.3 1.2.3.1	3-51 4-26 to 4-33 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	vii. Non-traditional land use and resource use,		8 9	4 1	4.3 1.2.3.1	4-26 to 4-33 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	viii. Heritage resources including archaeology, palaeontology, and cultural resources,		8 9	1, 2 1	1.3, 2.3 1.2.3.1	1-12, 2-7 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	ix. Health and well-being including individual and community wellness, family and community cohesion, and potential indirect effects of project on frequency and types of crime incidents,		8 9	3 1	3.3 1.2.3.1	3-27 to 3-41 1-5 to 1-16

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	x. Community infrastructure and public service, including housing, and		8 9	3 1	3.3 1.2.3.1	3-27 to 3-41 1-5 to 1-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.6 VALUED ECOSYSTEM AND SOCIO-ECONOMIC COMPONENTS	7.6.2 Valued Socio-Economic Components	xi. Health and safety including worker and public safety.	Yes	8 ~~10~~ Addendum 10	6 ~~5~~ 5	6.3, 6.4 ~~All~~ All	6-18 to 6-178 ~~All~~ All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY		In describing the study methodologies, the Proponent shall explain how scientific, engineering, traditional, community, and any other knowledge was used to construct its studies and reach its conclusions.		3 4 5 6 7 8	1, 3 All All All All All	1.6.1, 3.2 X.1, X.2 X.1, X.2 X.1, X.2 X.1, X.2 X.1, X.2	1-36 to 1-37, 3-44 to 3-50 1-1 to 1-11, 2-1 to 2-7, 3-1 to 3-33 1-1 to 1-15, 2-1 to 2-23, 3-1 to 3-33, 4-1 to 4-19, 5-1 to 5-125, 6-1 to 6-33, 7-1 to 7-16, 8-1 to 8-30, 9-1 to 9-28, 10-1 to 10-17 1-1 to 1-31, 2-1 to 2-21, 3-1 to 3-19, 4-1 to 4-25, 5-1 to 5-13, 6-1 to 6-42, 7-1 to 7-32 2-1 to 2-15, 3-1 to 3-11, 4-1 to 4-37, 5-1 to 5-20, 6-1 to 6-18, 7-1 to 7-11 1-1 to 1-12, 2-1 to 2-7, 3-1 to 3-27, 4-1 to 4-26, 5-1 to 5-20, 6-2 to 6-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY		The Proponent shall identify and justify all assumptions and substantiate all conclusions presented.		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY		All data, models, and studies must be documented so that the analyses are transparent and reproducible.		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY		All data collection methods shall be specified, and the uncertainty, reliability and sensitivity of methods and models used to reach conclusions shall also be indicated.		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY		Where any study is presented as an independent appendix in the EIS, the Proponent should also provide an overview of the study in the main document, including the methodology used, assumptions made, interpretation of the results, limitations, and provide appropriate cross-referencing to the specific study as necessary.	Yes	2, 3, 4, 5, 6, 7, 8, 9, ~~10~~ 10 Addendum 10	All ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	All ~~All~~ All All	All ~~All~~ All All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY		To support the main conclusions presented in its EIS, the Proponent shall broadly identify significant gaps of knowledge and understanding, the steps taken by the Proponent to address these gaps, and how these gaps impacted those conclusions.		2, 3, 4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY		Where the conclusions drawn from scientific and technical knowledge are in conflict with the conclusions drawn from community and/or TK sources, the EIS shall contain a balanced presentation of the issues and a statement of the Proponent's conclusions.		3 4, 5, 6, 7, 8	3 All	3.3.5 All	3-53 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.1 Acquisition Methodology and Documentation	The Proponent shall specify and justify all sampling protocols and statistical processes employed in both the biophysical and social contexts.		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.1 Acquisition Methodology and Documentation	The scope and reliability of the results, the possibility of reproducing the analyses, and quality control of laboratory analyses shall be analyzed. All data that is based on environmental sampling involves some variability, which must be determined in order to assess the scope and reliability of the data.		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.1 Acquisition Methodology and Documentation	The Proponent shall specify and justify all sampling protocols and statistical processes employed in both the biophysical and social context.		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.1 Acquisition Methodology and Documentation	The reliability and scope of the results, the possibility of reproducing the analyses, and quality control of laboratory analyses shall be analyzed.		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.1 Acquisition Methodology and Documentation	The Proponent shall, for all data obtained from environmental sampling, provide a dispersion or variability coefficient (variance, standard deviation, confidence interval, etc.) and justification for sample size used.		4 5 6 7 8	All	X.1	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-15, 2-1 to 2-24, 3-1 to 3-35, 4-1 to 4-17, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-13, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-31, 2-1 to 2-20, 3-1 to 3-19, 4-1 to 4-23, 5-1 to 5-13, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.1 Acquisition Methodology and Documentation	When designing data collection or baseline studies, it is recommended that the Proponent coordinate its programs with relevant developments, government organizations, regional authorities, and researchers, as the design of any study or collection of data may be relevant to ongoing programs established or supported by the Nunavut General Monitoring Program (NGMP), as per Section 12.7.6 of the NLCA.		4 5 6 7 8	All	X.1	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-15, 2-1 to 2-24, 3-1 to 3-35, 4-1 to 4-17, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-13, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-31, 2-1 to 2-20, 3-1 to 3-19, 4-1 to 4-23, 5-1 to 5-13, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.2 Data Analysis and Presentation	Use of qualitative criteria to describe the environment, compare various design and development options, or assess impacts, requires each criteria to be defined, their relative importance stated, and the differences between the categories (e.g. desirable, acceptable, unacceptable) indicated and justified.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5.1	1-15 to 1-20, 2-11 to 2-14 4-26 to 4-28, 5-131 to 5-134, 6-37 to 6-40, 7-18 to 7-22, 8-32 to 8-37, 9-30 to 9-35, 10-22 to 10-25 1-41 to 1-43, 4-26 to 4-31, 5-14 to 5-19, 6-44 to 6-47, 7-34 to 7-37 2-16 to 2-20, 3-12 to 3-16, 4-40, 5-22 to 5-25, 6-20 to 6-25, 7-15 to 7-18 1-15 to 1-16, 3-42 to 3-46, 4-33 to 4-38, 5-23 to 5-25
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.2 Data Analysis and Presentation	The Proponent shall corroborate all analyses, interpretations of results, and conclusions with a review of relevant literature, providing direct references with an indication of their public availability.		4, 5, 6, 7, 8	All	All	All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.2 Data Analysis and Presentation	Any TK references shall be indicated and sources identified, or referenced appropriately in cases where TK proprietary or confidentiality concerns exist.		3 4 5 6 7 8	3 All All All All All	3.1, 3.2, 3.3, Appendices V3-3A, V3-3B, V3-3C, V3-3D X.2 X.2 X.2 X.2 X.2	3-1 to 3-53, All, All, All, All 1-10 to 1-11, 2-6 to 2-7, 3-30 to 3-33 1-14 to 1-15, 2-22 to 2-23, 3-21 to 3-33, 4-18 to 4-19, 5-122 to 5-125, 6-22 to 6-33, 7-14 to 7-16, 8-25 to 8-30, 9-25 to 9-28, 10-15 to 10-17 1-29 to 1-31, 2-20 to 2-21, 3-14 to 3-19, 4-23 to 4-25, 5-12 to 5-13, 6-35 to 6-42, 7-25 to 7-32 1-31 to 1-32, 2-14 to 2-15, 3-10 to 3-11, 4-30 to 4-37, 5-11 to 5-20, 6-15 to 6-18, 7-9 to 7-11 1-11 to 1-12, 2-1 to 2-7, 3-25 to 3-27, 4-22 to 4-26, 5-15 to 5-20, 6-13 to 6-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.7 STUDY STRATEGY AND METHODOLOGY	7.7.2 Data Analysis and Presentation	The Proponent shall correlate its conclusions about impact significance with relevant guidelines or regional policies, discussing, with direct references, any thresholds referred to or adopted from these documents.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5.1, X.5.5, X.10	1-15 to 1-20, 1-28 to 1-29, 1-33, 2-11 to 2-14, 2-23, 2-27 4-26 to 4-28, 4-50 to 4-55, 4-63 to 4-65, 5-131 to 5-134, 5-195 to 5-197, 5-249 tp 5-250, 6-37 to 6-40, 6-67 to 6-69, 6-90, 7-18 to 7-22, 7-48 to 7-50, 7-69 to 7-70, 8-32 to 8-37, 8-68 to 8-70, 8-100 to 8-101, 9-30 to 9-35, 9-55, 9-63 to 9-64, 10-22 to 10-25, 10-51, 10-58 to 10-59 1-41 to 1-43, 1-52 to 1-55, 1-57, 4-26 to 4-31, 4-56 to 4-57, 4-63, 5-14 to 5-19, 5-35 to 5-37, 5-42, 6-44 to 6-47, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-61 2-16 to 2-20, 2-39, 2-45, 3-12 to 3-16, 3-30, 3-36, 4-40, 4-50, 4-54, 5-22 to 5-25, 5-22 to 5-32, 5-37, 6-20 to 6-25, 6-39, 6-55, 7-15 to 7-18, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-31, 3-42 to 3-46, 3-101 to 3-104, 3-130, 4-33 to 4-38, 4-57 to 4-60, 4-85, 5-23 to 5-25, 5-61, 5-62
7.0 IMPACT ASSESSMENT METHODOLOGY	7.8 IMPACT ASSESSMENT APPROACH		The required impact assessment, including the significance analysis, shall describe the effect considered, the significance of the effect and justification for that determination, and how the effect fits into a cumulative effects analysis and transboundary effects analysis. In this assessment, emphasis shall be placed on significant impacts to VECs and VSECs and the interactions between VECs and VSECs, extending across all Project phases as applicable.		1 4 5 6 7 8	Executive Summary, 5, 8, 12 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All X.5, X.6, X.7 X.5, X.6, X.7 X.5, X.6, X.7 X.5, X.6, X.7 X.5, X.6, X.7	All 1-15 to 1-31, 2-11 to 2-25 4-26 to 4-62, 5-131 to 5-242, 6-37 to 6-82, 7-18 to 7-63, 8-33 to 8-94, 9-30 to 9-58, 10-22 to 10-54 1-41 to 1-56, 4-26 to 4-59, 5-14 to 5-38, 6-44 to 6-71, 7-34 to 7-57 2-16 to 2-41, 3-12 to 3-33, 4-40 to 4-52, 5-22 to 5-34, 6-20 to 6-50, 7-15 to 7-37 1-15 to 1-29, 3-42 to 3-124, 4-33 to 4-82, 5-23 to 5-61
7.0 IMPACT ASSESSMENT METHODOLOGY	7.8 IMPACT ASSESSMENT APPROACH		The biophysical elements and socio-economic elements potentially impacted by the Project components, activities and undertakings shall be referred to in the categories listed in Section 8.0. Based on the predicted potential adverse effects, the proposed mitigation measures shall be addressed in the main document following the relevant impact assessment of each VEC, and cross referenced to the specific management plan where detailed information is located as listed in Section 9.0.		1 4 5 6 7 8	Executive Summary, 5, 8, 12 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All X.5.3, X.8 X.5.3, X.8 X.5.3, X.8 X.5.3, X.8 X.5.3, X.8	All 1-27 to 1-28, 1-31 to 1-33, 2-20 to 2-22, 2-25 to 2-26 4-30 to 4-32, 4-62 to 4-63, 5-187 to 5-191, 5-242 to 5-246, 6-61 to 6-64, 6-82 to 6-88, 7-43 to 7-46, 7-63 to 7-68, 8-62 to 8-65, 9-88 to 8-92, 9-51 to 9-54, 9-58 to 9-62, 10-46 to 10-48, 10-54 to 10-57 1-43 to 1-46, 1-56 to 1-57, 4-38 to 4-45, 4-59 to 4-62, 5-25 to 5-31, 5-28 to 5-41, 6-61 to 6-70, 6-71 to 6-74, 7 46 to 7-56, 7-57 to 7-60 2-26 to 2-33, 2-41 to 2-45, 3-22 to 3-27, 3-33 to 3-36, 4-47 to 4-50, 4-52 to 4-54, 5-29 to 5-31, 5-34 to 5-37, 6-36 to 6-38, 6-50 to 6-53, 7-34 to 7-36, 7-37 to 7-40, 1-24 to 1-26, 1-29 to 1-30, 3-95 to 3-98, 3-124 to 3-128, 4-53 to 4-55, 4-82 to 4-84, 5-31 to 5-36, 5-61
7.0 IMPACT ASSESSMENT METHODOLOGY	7.8 IMPACT ASSESSMENT APPROACH		The impact assessment for each biophysical and socio-economic element can be linked to a list of project components and activities deemed responsible for the potential impacts. Vice versa, a project component or activity can also be linked to various environment elements, in particular VECs and VSECs, on which it might potentially have impacts. A matrix or a comparable tool should be employed to identify all linkages between environmental elements, project components and activities and potential impacts, highlighting significant interactions between them.		4 5 6 7 8 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 2	X.5.2 X.5.2 X.5.2 X.5.2 1.5.2, 3.5.3, 4.5.2, 5.5.2 All	1-20 to 1-27, 2-14 to 2-20 4-28 to 4-30, 5-134 to 5-187, 6-40 to 6-61, 7-22 to 7-44, 8-37 to 8-62, 9-35 to 9-51, 10-25 to 10-46 1-43, 4-31 to 4-38, 5-19 to 5-25, 6-47 to 6-61, 7-37 to 7-46 2-20 to 2-26, 3-16 to 3-22, 4-43 to 4-46, 5-25 to 5-29, 6-25 to 6-36, 7-17 to 7-34 1-16 to 1-24, 3-48 to 3-95, 4-38 to 4-53, 5-25 to 5-31 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		The Proponent shall explain and justify the methods used for impact prediction, including: mathematical or numerical modeling, statistical modeling (e.g. variance and correlation analyses), analysis of sequential series, expert opinion, previous experiences, and the prediction from known tendencies and TK if applicable.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5.1, X.6.1	1-15 to 1-20, 1-29 to 1-31, 2-11 to 2-14, 2-23 to 2-25 4-26 to 4-28, 4-56, 5-131 to 5-134, 5-197 to 5-203, 6-37 to 6-40, 6-69 to 6-70, 7-18 to 7-22, 7-50 to 7-51, 8-32 to 8-37, 8-70 to 8-71, 9-30 to 9-35, 9-55 to 9-57, 10-22 to 10-24, 10-51 to 10-54 1-41 to 1-43, 1-56, 4-26 to 4-31, 4-57 to 4-59, 5-14 to 5-19, 5-37 to 5-38, 6-44 to 6-47, 6-70, 7-34 to 7-37, 7-56 2-16 to 2-20, 2-39, 3-12 to 3-16, 3-30, 4-40, 4-50, 5-22 to 5-25, 5-32, 6-20 to 6-25, 6-41, 7-15 to 7-18. 7-36 1-15 to 1-16, 1-29, 3-42 to 3-46, 3-104, 4-33 to 4-38, 4-60 to 4-68, 5-23 to 5-25, 5-61
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		All studies used in the prediction of impacts must be specified, the original authors identified, and the studies made public.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		All statements based on public consultation shall be justified and the sources and methodology specified.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		The choice of methodologies and interpretation of results shall be justified in light of current theories, knowledge and standards.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5, X.6 X.5, X.6 X.5, X.6 X.5, X.6 X.5, X.6 1.2, 1.3	1-15 to 1-31, 2-11 to 2-25 4-26 to 4-62, 5-131 to 5-242, 6-37 to 6-82, 7-18 to 7-63, 8-32 to 8-94, 9-30 to 9-58, 10-22 to 10-54 1-41 to 1-56, 4-26 to 4-59, 5-14 to 5-38, 6-44 to 6-70, 7-34 to 7-57 2-16 to 2-41,3-12 to 3-32, 4-40 to 4-52, 5-22 to 5-34, 6-20 to 6-48, 7-15 to 7-37 1-15 to 1-29, 3-42 to 3-120, 4-33 to 4-78, 5-23 to 5-61 1-2 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		The Proponent shall assess the direct, indirect, short-term, and long-term impacts of the Project on the biophysical and socio-economic environments, and the interactions between them, focusing on the anticipated response of the VECs and VSECs.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All	All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		The Proponent shall also assess the degree of uncertainty associated with each predicted effect. Where potential cumulative effects are identified, a discussion should be provided related to the CEA as outlined in Section 7.11 of these Guidelines.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.6.1 X.5.1, X.6.1 X.5.1, X.6.1 X.5.1, X.6.1 X.5.1, X.6.1 1.3	1-15 to 1-20, 1-29 to 1-31, 2-11 to 2-14, 2-23 to 2-25 4-26 to 4-28, 4-56, 5-131 to 5-134, 5-197 to 5-203, 6-37 to 6-40, 6-69 to 6-70, 7-18 to 7-22, 7-50 to 7-51, 8-32 to 8-37, 8-70 to 8-71, 9-30 to 9-35, 9-55 to 9-57, 10-22 to 10-24, 10-51 to 10-54 1-41 to 1-43, 1-56, 4-26 to 4-31, 4-57 to 4-59, 5-14 to 5-19, 5-37 to 5-38, 6-44 to 6-47, 6-70, 7-34 to 7-37, 7-56 2-16 to 2-20, 2-39, 3-12 to 3-16, 3-30, 4-40, 4-50, 5-22 to 5-25, 5-32, 6-20 to 6-25, 6-41, 7-15 to 7-18. 7-36 1-15 to 1-16, 1-29, 3-42 to 3-46, 3-104, 4-33 to 4-38, 4-60 to 4-68, 5-23 to 5-25, 5-61 1-35 to 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		The Proponent shall identify potential impacts resulting from each Project phase, including impacts arising from accidental events and malfunctions, with accepted practices used to draw impact predictions.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 3	X.5.1, X.5.2, X.6.1 X.5.1, X.5.2, X.6.1 X.5.1, X.5.2, X.6.1 X.5.1, X.5.2, X.6.1 X.5.1, X.5.2, X.6.1 All	1-15 to 1-20, 1-20 to 1-27, 1-29 to 1-31, 2-11 to 2-16, 2-23 to 2-25 4-26 to 4-30, 4-56, 5-131 to 5-187, 5-197 to 5-203, 6-37 to 6-61, 6-69 to 6-70, 7-18 to 7-43, 7-50 to 7-51, 8-32 to 8-62, 8-70 to 8-71, 9-30 to 9-51, 9-55 to 9-57, 10-22 to 10-46, 10-51 to 10-54 1-41 to 1-43, 1-56, 4-26 to 4-38, 4-57 to 4-59, 5-14 to 5-25, 5-37 to 5-38, 6-44 to 6-61, 6-70, 7-34 to 7-46, 7-56 2-16 to 2-26, 2-39 to 2-41, 3-12 to 3-22, 3-30 to 3-32, 4-40 to 4-46, 4-50 to 4-52, 5-22 to 5-29, 5-32, 6-20 to 6-36, 6-39 to 6-42, 7-15 to 7-34, 7-36 1-15 to 1-24, 1-29, 3-42 to 3-46, 3-48 to 3-95, 3-104 to 3-112, 4-33 to 4-53, 4-60 to 4-68, 5-23 to 5-31, 5-61 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		Predictions shall be presented with appropriate explanations and justification, and the Proponent shall:		-	-	-	-
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		i. Explain how scientific, engineering, community and TK was used,		3 4, 5, 6, 7, 8 9	1, 3 All 1	1.6.2.2, 3.3.2 All 1.2.4	1-38, 3-51 All 1-18 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		ii. Document model assumptions, study methodologies and sensitivity analyses,		4, 5, 6, 7, 8 9	All 1	All 1.2.4	All 1-18 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		iii. Document data collection methods and limitations thereof,		4, 5, 6, 7, 8	All	X.1	1-1 to 1-10, 2-1 to 2-6, 3-1 to 3-30 1-1 to 1-15, 2-1 to 2-24, 3-1 to 3-35, 4-1 to 4-17, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-13, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-31, 2-1 to 2-20, 3-1 to 3-19, 4-1 to 4-23, 5-1 to 5-13, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 2-1 to 2-2, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15, 6-2 to 6-13
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		iv. Support analyses, interpretation of results and conclusions with reference to appropriate literature,		4, 5, 6, 7, 8	All	All	All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		v. Describe how uncertainty in impact predictions have been dealt with,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.4 X.5.4 X.5.4 X.5.4 1.5.4, 3.5.5, 4.5.4, 5.5.4 1.2.4.4, 1.2.4.5	1-28, 2-22 to 2-23 4-32 to 4-55, 5-191 to 5-197, 6-64 to 6-69, 7-46 to 7-48, 8-65 to 8-70, 9-54 to 9-55, 10-48 to 10-51 1-45 to 1-52, 4-45 to 4-57, 5-31 to 5-37, 6-70, 7-56 2-33 to 2-39, 3-27 to 3-30, 4-49, 5-31, 6-38 to 6-39, 7-36 1-26 to 1-28, 3-98 to 3-101, 4-55 to 4-57, 5-36 to 5-61 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		vi. Specify and reference sources for any contributions based on TK,		3 4 5 6 7 8	3 All All All All All	3.1.1, Table 3.1-1, 3.2, 3.3 X.2 X.2 X.2 X.2 X.2	3-1 , 3-3 to 3-42, 3-44 to 3-53 1-10 to 1-11, 2-6 to 2-7, 3-30 to 3-33 1-14 to 1-15, 2-22 to 2-23, 3-21 to 3-33, 4-18 to 4-19, 5-122 to 5-125, 6-22 to 6-33, 7-14 to 7-16, 8-25 to 8-30, 9-25 to 9-28, 10-15 to 10-17 1-29 to 1-31, 2-20 to 2-21, 3-14 to 3-19, 4-23 to 4-25, 5-12 to 5-13, 6-35 to 6-42, 7-25 to 7-32 1-31 to 1-32, 2-14 to 2-15, 3-10 to 3-11, 4-30 to 4-37, 5-11 to 5-20, 6-15 to 6-18, 7-9 to 7-11 1-11 to 1-12, 2-1 to 2-7, 3-25 to 3-27, 4-22 to 4-26, 5-15 to 5-20, 6-13 to 6-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		vii. Identify which studies included the assistance of communities and individuals, who was involved (if the information can be made public), and how participants were selected,		3 8	1, 3 3, 4	1.5.3, 1.6.1, 3.2 3.1, 4.1, Appendix V8-3A	1-20 to 1-35, 1-36 to 1-37, 3-44 to 3-50 3-1 to 3-25, 4-1 to 4-22, All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		viii. Identify all proposed mitigation measures and adaptive management strategies, if applicable, and	Yes	4 5 6 7 8 ~~10~~ 10 Addendum 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 ~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	X.5.3, X.8 X.5.3, X.8 X.5.3, X.8 X.5.3, X.8 X.5.3, X.8 ~~All~~ All All	1-27 to 1-28, 1-31 to 1-33, 2-20 to 2-22, 2-25 to 2-26 4-30 to 4-32, 4-62 to 4-63, 5-187 to 5-191, 5-242 to 5-246, 6-61 to 6-64, 6-82 to 6-88, 7-43 to 7-46, 7-63 to 7-68, 8-62 to 8-65, 9-88 to 8-92, 9-51 to 9-54, 9-58 to 9-62, 10-46 to 10-48, 10-54 to 10-57 1-43 to 1-46, 1-56 to 1-57, 4-38 to 4-45, 4-59 to 4-62, 5-25 to 5-31, 5-28 to 5-41, 6-61 to 6-70, 6-71 to 6-74, 7 46 to 7-56, 7-57 to 7-60 2-26 to 2-33, 2-41 to 2-45, 3-22 to 3-27, 3-33 to 3-36, 4-47 to 4-50, 4-52 to 4-54, 5-29 to 5-31, 5-34 to 5-37, 6-36 to 6-38, 6-50 to 6-53, 7-34 to 7-36, 7-37 to 7-40, 1-24 to 1-26, 1-29 to 1-30, 3-95 to 3-98, 3-124 to 3-128, 4-53 to 4-55, 4-82 to 4-84, 5-31 to 5-36, 5-61 ~~All~~ All All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.9 IMPACT PREDICTION		ix. Describe the potential residual effects and explain their significance.		1 4 5 6 7 8 5 7 8	6, 8, 12 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 4, 5, 6, 7, 8 5, 6 1, 3, 4	All X.5.4, X.5.5, X.10 X.5.4, X.5.5, X.10 X.5.4, X.5.5, X.10 X.5.4, X.5.5, X.10 1.5.4,1.5.5, 3.5.5, 4.5.4,4.5.5, 5.5.4, 5.5.5, X.10 X.6.4, X.6.5 X.6.4, X.6.5 X.6.4, X.6.5	All 1-28 to 1-29, 1-33, 2-22 to 2-23, 2-27 4-32 to 4-55, 4-63 to 4-65, 5-191 to 5-197, 5-249 to 5-250, 6-64 to 6-69, 6-90, 7-46 to 7-50, 7-69, 8-65 to 8-70, 8-100 to 8-101, 9-54 to 9-55, 9-63, 10-48 to 10-51, 10-58 to 10-59 1-45 to 1-55, 1-57, 4-45 to 4-57, 4-63, 5-31 to 5-37, 5-42, 6-70, 6-74, 7-56, 7-61 2-33 to 2-39, 2-45, 3-27 to 3-30, 3-36, 4-49 to 4-50, 4-54, 5-31 to 5-32, 5-37, 6-38 to 6-39, 6-55, 7-36 , 7-42 1-26 to 1-29, 1-31, 3-98 to 3-101, 3-130, 4-55 to 4-60, 4-85, 5-36 to 5-61, 5-62 4-59 to 4-62, 5-239 to 5-240, 6-80 to 6-82, 7-61 to 7-63, 8-89 to 8-94 5-34, 6-47 to 6-48 1-29, 3-116 to 3-120, 4-27 to 4-78

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		The Proponent shall discuss the potential impacts of the environment on the Project, considering such factors as geotechnical hazards (including slope and underground instability, differential or thaw settlement, frost heave, ice scour coastal erosion, and seismic activity), unfavourable geological conditions (weak zones and/or faults), permafrost (ground instability related to permafrost thaw and artesian groundwater pressure due to permafrost confinement), hydrological conditions (low precipitation years, low flow conditions in rivers etc.), severe weather events (extreme precipitation events, flooding, storm surges etc.), sea ice conditions, ice-ride-up and pile-up, sea level trends, vertical motion of land/subsidence and global climate change.		9	2	2.2	2-1 to 2-7
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		The discussion on global climate change must describe and assess, on the basis of current knowledge, how potential climate change could affect permafrost and soils with high ice content, the hydrological regime, freshwater and groundwater regimes, and the long-term impacts of such changes on Project infrastructure (i.e., water diversions and impoundment structures, waste water treatment structures, fuel and chemical storage areas, solid waste sites, road structures, waste management facilities, tailings facility, etc.).		5 6 7 9	2, 5, 7, 8, 10 1, 4, 5 6, 7 2	2.1.2.4, 5.5.2.8, 7.5.4.3, 7.6.4.3, 8.6.4.4, 10.5.2.8 1.1.5, 4.1.1 6.5.2.5. 6.5.4.2, 6.6.2.2, 6.6.4.2, 7.5.2.6 2.11, 2.15	2-21 to 2-22, 5-170 to 5-178, 7-47 to 7-48, 7-62, 8-91 to 8-92, 10-45 to 10-46 1-26 to 1-29, 4-1 6-34, 6-39, 6-44, 6-40, 6-47, 7-33 to 7-34 2-14 to 2-15, 2-18 to 2-19
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		The Proponent shall identify the Project sensitivity to changes in specific climate-related parameters. The discussion on global climate change should include:		-	-	-	-
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		i. Effects of climate on the Project, with a focus on the design and planning of Project components and activities including: access road network and related water crossings, tank farm(s) and storage facilities, open pit mines, underground mines, waste rock stockpiles, ore stockpiles, and tailings impoundment areas,		9	2	2.15	2-18 to 2-19
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		ii. Impacts of extreme meteorological events on the Project, and related considerations for Project design and planning, including, but not limited to, the following: extreme temperature and precipitation events, high winds and waves, ice-ride up and pile-up events, extreme ocean water levels (high and low), and severe fog or white out conditions. Potential changes to the timing of ice formation, active layer thickness, and frequency of storms shall also be taken into consideration,		9	2	2.14	2-17 to 2-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		iii. Consideration of sea level decline and shoaling caused by emergence/uplift of the land, including potential impacts to port site offloading area design and access, shipping route navigability, safety, and how this is addressed in the design of baseline studies and monitoring plans for relevant project components,		9	2	2.8, 2.9	2-13 to 2-14
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		iv. Design and apply multiple scenarios on impacts assessment, where these scenarios span the range of possible future climates, rather than designing and applying a single “best guess” scenario. It is recommended that the range of future climates considered by the Proponent include scenarios used in the Arctic Climate Impact Assessment report (ACIA 2005) as well as those in the relevant Intergovernmental Panel on Climate Change assessments for polar regions (IPCC, 2007),		4 9	3 2	Appendix V4-3C 2.1	All 2-14
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		v. Impacts from climate change on sensitive ecosystem features within the terrestrial, freshwater and marine ecosystems,		5 7 9	2, 5, 7, 8, 10 6, 7 2	2.1.2.4, 5.5.2.8, 7.5.4.3, 7.6.4.3, 8.6.4.4, 10.5.2.8 6.5.2.6, 6.5.4.2, 6.6.2.2, 6.6.4.2, 7.5.2.6 2.11, 2.12	2-21 to 2-22, 5-170 to 5-178, 7-47 to 7-48, 7-62, 8-91 to 8-92, 10-45 to 10-46 6-34, 6-39, 6-44, 6-40, 6-47, 7-33 to 7-34 2-14 to 2-16
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		vi. Predicted effects of climate change on mean and extreme climate parameters, and meteorological phenomena including flooding, storms, etc.,		9	2	2.13	2-16 to 2-17
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		vii. Potential effects of climate change on permafrost thawing in the Project area, with discussion of the related implications on the stability of project components (e.g. waste management facilities) and sensitive land features (e.g. Canadian Heritage Rivers, territorial or national parks), including waste management facilities, and		5 9	3 2	3.1.3 2.4, 2.11.1	3-6 to 3-21 2-7 to 2-8, 2-14
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		viii. Uncertainties related to climate change predictions, and the related effect on other predictions in the EIS, including water quantity and permafrost thawing.		4 9	3 2	Appendix V4-3C 2.1	All 2-1
7.0 IMPACT ASSESSMENT METHODOLOGY	7.10 IMPACTS OF THE ENVIRONMENT ON THE PROJECT		Longer-term effects of climate change must also be discussed up to the projected closure phase of the Project. The sensitivity of the Project to long-term climate variability and effects shall be identified and discussed. The Canadian Environmental Assessment Agency Procedural Guide, “Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners” (CEAA, 2003) provides guidance for incorporating climate change considerations into an environmental assessment, and may be useful for the Proponent.		9	2	2.16	2-19
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		The Proponent is expected to carry out its CEA with consideration for the following factors:		-	-	-	-

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		i. A larger spatial boundary (RSA rather than LSA): This will enable the Proponent to assess the project impacts in relation to other activities (including other projects and exploration) in the geographical region, and implies that spatial assessment boundaries may cross jurisdictional boundaries for a better understanding of additive and interactive pathways of different types of cumulative effects (NIRB, 2007),		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.6, X.7 X.6, X.7 X.6, X.7 X.6, X.7 X.6, X.7 1.3.4.3	1-29 to 1-31, 2-23 to 2-25 4-62 to 4-68, 5-197 to 5-242, 6-69 to 6-82, 7-50 to 7-63, 8-70 to 8-94, 9-55 to 9-58, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37 to 5-38, 6-70 to 6-71, 7-56 to 7-57 2-39 to 2-41, 3-30 to 3-33, 4-50 to 4-52, 5-32 to 5-34, 6-39 to 6-50, 7-36 to 7-37 1-29, 3-104 to 3-124, 4-60 to 4-82, 5-61 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		ii. A longer temporal scale (as defined in Subsection 7.5.2): This will enable the Proponent to consider all activities from past developments into the present time and the reasonably foreseeable future for a more accurate analysis of variability and significant long-term effects,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.6, X.7 X.6, X.7 X.6, X.7 X.6, X.7 X.6, X.7 1.3.4.3	1-29 to 1-31, 2-23 to 2-25 4-62 to 4-68, 5-197 to 5-242, 6-69 to 6-82, 7-50 to 7-63, 8-70 to 8-94, 9-55 to 9-58, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37 to 5-38, 6-70 to 6-71, 7-56 to 7-57 2-39 to 2-41, 3-30 to 3-33, 4-50 to 4-52, 5-32 to 5-34, 6-39 to 6-50, 7-36 to 7-37 1-29, 3-104 to 3-124, 4-60 to 4-82, 5-61 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		iii. Alternatives analysis: CEA requires the explicit creation of alternative development scenarios and analysis of potential cumulative effects associated with each option (Greig et al., 2002). Therefore, the Proponent should endeavour to ensure its CEA addresses the alternatives presented under Section 6.4 of these Guidelines,		9	1	1.3	1-35 to 1-36
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		iv. Consideration of effects on VECs and VSECs: An effective CEA will allow the Proponent to more accurately assess how the interaction of impacts from the various Project components and activities, and those from other past, present and reasonably foreseeable projects (including exploration), might impact in a cumulative fashion on selected VECs/VSECs, and		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.6, X.7 X.6, X.7 X.6, X.7 X.6, X.7 X.6, X.7 1.3.4	1-29 to 1-31, 2-23 to 2-25 4-62 to 4-68, 5-197 to 5-242, 6-69 to 6-82, 7-50 to 7-63, 8-70 to 8-94, 9-55 to 9-58, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37 to 5-38, 6-70 to 6-71, 7-56 to 7-57 2-39 to 2-41, 3-30 to 3-33, 4-50 to 4-52, 5-32 to 5-34, 6-39 to 6-50, 7-36 to 7-37 1-29, 3-104 to 3-124, 4-60 to 4-82, 5-61 1-39 to 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		v. Evaluation of significance: Effective CEA requires identifying and predicting the likelihood and significance of potential cumulative effects, including direct, indirect and residual impacts. The Proponent shall consider and determine the significance of the cumulative effects using the criteria described in Section 7.14.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4 1	X.6.1 X.6.1 X.6.1 X.6.1 X.6.1 1.3.5	1-29 to 1-31, 2-23 to 2-25 4-61, 5-197 to 5-203, 6-69 to 6-70, 7-50 to 7-51, 8-70 to 8-71, 9-55 to 9-57, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37, 6-70, 7-56 2-39, 3-30, 4-50, 5-32, 6-39, 7-36 1-29, 3-104 to 3-112, 4-60 to 4-68 1-49 to 1-51
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		As per the identified objectives and methodologies for a CEA, the Proponent shall:		-	-	-	-
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		i. Justify the environmental components that will constitute the focus of the CEA. The Proponent's assessment should emphasize the cumulative effects on the main VECs/VSECs that could be affected by the Project,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.6 X.6 X.6 X.6 X.6 1.3	1-29 to 1-31, 2-23 to 2-25 4-62 to 4-68, 5-197 to 5-242, 6-69 to 6-82, 7-50 to 7-63, 8-70 to 8-94, 9-55 to 9-58, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37 to 5-38, 6-70, 7-56 to 7-57 2-39 to 2-41, 3-30 to 3-32, 4-50 to 4-52, 5-232 to 5-34, 6-35 to 6-39 to 6-48, 7-36 1-29, 3-104 to 3-120, 4-60 to 4-78, 5-61 1-35 to 1-51
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		ii. Present a justification for the spatial and temporal boundaries for the CEA. It should be noted that these boundaries can vary depending on the VECs or VSECs assessed. The Proponent shall give due consideration to the potential for cumulative effects that may be transboundary in nature,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4 1	X.6.1 X.6.1 X.6.1 X.6.1 X.6.1 1.3.4	1-29 to 1-31, 2-23 to 2-25 4-61, 5-197 to 5-203, 6-69 to 6-70, 7-50 to 7-51, 8-70 to 8-71, 9-55 to 9-57, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37, 6-70, 7-56 2-39, 3-30, 4-50, 5-32, 6-39, 7-36 1-29, 3-104 to 3-112, 4-60 to 4-68 1-39 to 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		iii. Discuss and justify the choice of projects, components and selected activities for the CEA. These shall include past activities and projects, those currently being carried out and any reasonably foreseeable project or activity. Activities should not be limited to exploration and mining-related activities but include other factors not related to mining (e.g., wildfires, roads/airstrips developed for non-mining activities, etc.), and		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4 1	X.6.2 X.6.2 X.6.2 X.6.2 X.6.2 1.3.4	1-31, 2-25 4-56 to 4-58, 5-203 to 5-238, 6-70 to 6-80, 7-51 to 7-61, 8-71 to 8-89, 9-57 to 9-58, 10-53 to 10-54 1-55 to 1-56, 4-59, 5-37 to 5-38, 6-70, 7-56 to 7-57 2-41, 3-32 to 3-33, 4-50 to 4-52, 5-32, 6-39, 7-36 to 7-37 1-29, 3-112 to 3-113, 4-68 to 4-71 1-39 to 1-49
7.0 IMPACT ASSESSMENT METHODOLOGY	7.11 CUMULATIVE EFFECTS ASSESSMENT		iv. Discuss the mitigation measures that are technically and economically feasible, and determine the significance of the cumulative effects. If any impact is identified and verified beyond the Proponent's sole responsibility or capacity, the Proponent shall make best efforts to identify how its mitigation measures may contribute toward any collective mitigation undertaken by other responsible parties.		5 7 8 9	4, 5, 6, 7, 8 5, 6 1, 3, 4 1	4.6.3, 5.6.3, 6.6.3, 7.6.3, 8.6.3 5.6.3, 6.6.3 1.6.3, 3.6.3, 4.6.3 1.3.5.2	4-58 to 4-59, 5-238 to 5-239, 6-80, 7-61, 8-89 5-32 to 5-34, 6-47 1-29, 3-114 to 3-116, 4-71 1-50
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		For the purpose of the current Guidelines, transboundary impacts (as defined in the Glossary) must be considered, and will include consideration of direct, indirect, and residual effects of the Project activities (occuring within the NSA) that may occur across provincial, territorial, and international boundaries outside of the NSA.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.7 X.7 X.7 X.7 X.7 1.4	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32 to 3-33, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 1-51 to 1-53
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		The Proponent shall give due consideration to the potential for transboundary impacts which may be a result from interactions between the effects of the Project in the NSA, and the effects of projects located outside the NSA.		4 5 6 7 8 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 2	X.7 X.7 X.7 X.7 X.7 All	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32 to 3-33, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		The potential for transboundary impacts related to cumulative effects associated with this Project must also be addressed.		4 5 6 7 8 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 2	X.7 X.7 X.7 X.7 X.7 All	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32 to 3-33, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		Where possible, transboundary impacts should be included within the discussion of various VECs and VSECs as such are identified.		4 5 6 7 8 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 2	X.7 X.7 X.7 X.7 X.7 All	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32 to 3-33, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		The Proponent is also required to present an overall discussion of the potential for transboundary impacts, including predictions, impact assessment and proposed mitigation and monitoring plans.		4 5 6 7 8 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 2	X.7 X.7 X.7 X.7 X.7 All	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32 to 3-33, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		Where feasible, the potential for transboundary impacts should be considered for all VECs and VSECs identified by the Proponent. In particular, and without limitation, the Proponent should ensure that the potential for transboundary impacts identified by the Minister of Aboriginal Affairs and Northern Development in his letter referring the Project Proposal to the NIRB for review (December 17, 2012) should be addressed, which included that:		4 5 6 7 8 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 2	X.7 X.7 X.7 X.7 X.7 All	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32 to 3-33, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		i. Impacts associated with the proposed Project infrastructure (including any associated transportation) on wildlife species such as caribou that have a large migration range, and the resulting socio-economic impacts to communities and groups that rely on these wildlife resources,		5 8	5 3	5.6 3.6	5-197 to 5-242 3-104 to 3-120
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		ii. Impacts to the local, regional and territorial health system of the Northwest Territories as a result of reliance on medical services, and		8	3	3.6	3-104 to 3-120
7.0 IMPACT ASSESSMENT METHODOLOGY	7.12 TRANSBOUNDARY IMPACTS		iii. Impacts to employment and business within the region affected by the Project.		8	3	3.6	3-104 to 3-120
7.0 IMPACT ASSESSMENT METHODOLOGY	7.13 INDICATORS AND CRITERIA		The Proponent shall identify the indicators and/or criteria selected for assessing the potential impacts of the Project, including any cumulative and transboundary impacts, and shall justify their selection. In doing so, the Proponent shall describe the role played by consultation with members of the public (TK) and technical experts.		3 4 5 6 7 8	1, 2, 3 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	1.6.2, 2.2, 3.3 X.2, X.5, X.6, X.7 X.2, X.5, X.6, X.7 X.2, X.5, X.6, X.7 X.2, X.5, X.6, X.7 X.2, X.5, X.6, X.7	1-37 to 1-38, 2-3 to 2-4, 3-50 to 3-53 1-10 to 1-11, 1-15 to 1-31, 2-6 to 2-7, 2-11 to 2-25 4-18 to 4-19, 4-26 to 4-62, 5-122 to 5-125, 5-131 to 5-242, 6-22 to 6-33, 6-37 to 6-82, 7-14 to 7-16, 7-18 to 7-63, 8-25 to 8-30, 8-32 to 8-94, 9-25 to 9-28, 9-30 to 9-58, 10-15 to 10-17, 10-22 to 10-54 1-29 to 1-31, 1-41 to 1-56, 4-23 to 4-25, 4-26 to 4-59, 5-12 to 5-13, 5-14 to 5-38, 6-35 to 6-42, 6-44 to 6-71, 7-25 to 7-32, 7-34 to 7-57 2-14 to 2-15, 2-16 to 2-41, 3-10 to 3-11, 3-12 to 3-33, 4-30 to 4-37, 4-40 to 4-52, 5-11 to 5-20, 5-22 to 5-34, 6-15 to 6-18, 6-20 to 6-50, 7-9 to 7-11 , 7-15 to 7-37 1-11 to 1-12, 1-15 to 1-29, 3-25 to 3-27, 3-42 to 3-124, 4-22 to 4-26, 4-33 to 4-82, 5-15 to 5-20, 5-23 to 5-61
7.0 IMPACT ASSESSMENT METHODOLOGY	7.13 INDICATORS AND CRITERIA		In its discussion of indicators, the Proponent shall emphasize the linkage between those indicators and the relevant VECs or VSECs and how TK was used in the selection of indicators used to assess potential impacts of the Project. The indicators for the VECs should include sensitivity to contaminants and environmental pathways of exposure and bio-magnification.		4 5 6 7 8 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 6	X.2, X.5.1 X.2, X.5.1 X.2, X.5.1 X.2, X.5.1 X.2, X.5.1 6.4.1.9, 6.4.2.9	1-15 to 1-20, 1-29 to 1-31, 2-11 to 2-14, 2-23 to 2-25 4-26 to 4-28, 4-56, 5-131 to 5-134, 5-197 to 5-203, 6-37 to 6-40, 6-69 to 6-70, 7-18 to 7-22, 7-50 to 7-51, 8-32 to 8-37, 8-70 to 8-71, 9-30 to 9-35, 9-55 to 9-57, 10-22 to 10-24, 10-51 to 10-54 1-29 to 1-31, 1-41 to 1-43, 4-23 to 4-25, 4-26 to 4-31, 5-12 to 5-13, 5-14 to 5-19, 6-35 to 6-42, 6-44 to 6-47, 7-25 to 7-32, 7-34 to 7-37 2-16 to 2-20, 2-39, 3-12 to 3-16, 3-30, 4-40, 4-50, 5-22 to 5-25, 5-32, 6-20 to 6-25, 6-41, 7-15 to 7-18, 7-36 1-15 to 1-16, 1-29, 3-42 to 3-46, 3-104, 4-33 to 4-38, 4-60 to 4-68, 5-23 to 5-25, 5-61
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		In the process of significance determination, the Proponent is expected to communicate with potentially affected communities, including relevant individuals and organizations to solicit input and incorporate their views regarding the value it placed on a VEC or VSEC, as well as associated significance of impacts.		3	1, 3	1.6.2.2, 1.6.2.3, 3.3.2, 3.3.3	1-38, 1-38, 3-51, 3-52
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		The Proponent shall describe how it will determine the significance that different parties assigned to each impact, and how it will proceed if different parties ascribe varying significance to VECs, VSECs, the interaction between VECs and VSECs or the associated impacts. If it is impossible to attain a consensus on the significance of certain impacts, the Proponent shall present the range of viewpoints expressed and shall present and justify its preference, if any.		9	1	1.2.3	1-4 to 1-18
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		The Proponent shall describe the significance it ascribes to each effect, and justify how the significance of the effect was determined, taking into consideration and avoiding duplication of the information provided above. Furthermore, the proponent shall demonstrate how uncertainty was accounted for in their significance determination for each predicted effect.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 All	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-40, 2-45, 3-12 to 3-16, 3-27 to 3-32, 3-36, 4-40 to 4-43, 4-50, 4-54, 5-22 to 5-25, 5-32 to 5-34, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		The dynamic change of ecosystems and their components must also be considered in determining impact significance. The Proponent shall evaluate the significance of potential impacts in the light of data on the current "state of health" of ecosystems and their predictable evolution, taking into account global climate change.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5.1, X.5.4, X.5.5, X.6.1, X.10	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-34 to 2-37, 2-39 to 2-40, 2-44, 3-12 to 3-17, 3-27 to 3-31, 3-35, 4-36 to 4-39, 4-43, 4-46 to 4-47, 5-19 to 5-20, 5-25 to 5-27, 5-31 to 5-32, 6-18 to 6-22, 6-34 to 6-44, 6-50 to 6-51, 7-15 to 7-17, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		Consistent with the ecosystem approach required above, the Proponent should highlight the interactions within and between ecosystem components in an effort to increase understanding of the dynamism of the ecosystems in question and the nature and severity of the predicted impacts.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5.1, X.5.4, X.5.5, X.6.1, X.10	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-40, 2-45, 3-12 to 3-16, 3-27 to 3-32, 3-36, 4-40 to 4-43, 4-50, 4-54, 5-22 to 5-25, 5-32 to 5-34, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		The terms used to describe the level of significance, such as "low", "medium", "high", "adverse", "beneficial", "positive", "negative" must be clearly defined, where possible in quantitative terms. The following attributes defined by the NIRB shall be taken into consideration in determining the significance of each impact:		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-40, 2-45, 3-12 to 3-16, 3-27 to 3-32, 3-36, 4-40 to 4-43, 4-50, 4-54, 5-22 to 5-25, 5-32 to 5-34, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		i. Probability of effects,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-40, 2-45, 3-12 to 3-16, 3-27 to 3-32, 3-36, 4-40 to 4-43, 4-50, 4-54, 5-22 to 5-25, 5-32 to 5-34, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		ii. Direction or nature of impact (i.e. positive/beneficial versus negative/adverse),		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-40, 2-45, 3-12 to 3-16, 3-27 to 3-32, 3-36, 4-40 to 4-43, 4-50, 4-54, 5-22 to 5-25, 5-32 to 5-34, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		ii. Direction or nature of impact (i.e. positive/beneficial versus negative/adverse),		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-40, 2-45, 3-12 to 3-16, 3-27 to 3-32, 3-36, 4-40 to 4-43, 4-50, 4-54, 5-22 to 5-25, 5-32 to 5-34, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		iv. Geographic extent of effects,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 2-45, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 3-36, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 4-54, 5-22 to 5-25, 5-31 to 5-32, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		v. Frequency and/or duration of effects,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-44, 1-51 to 1-53, 4-35 to 4-38, 4-53 to 4-58, 4-62 to 4-63, 5-21 to 5-24, 5-36 to 5-41, 5-45, 6-53 to 6-54, 6-67, 6-72, 7-35 to 7-36, 7-44 to 7-46, 7-50 to 7-51 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 2-45, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 3-36, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 4-54, 5-22 to 5-25, 5-31 to 5-32, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		vi. Reversibility or irreversibility of effects, and		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-45 to 1-55, 1-56, 1-57, 4-26 to 4-31, 4-45 to 4-57, 4-57 to 4-59, 4-63, 5-14 to 5-19, 5-31 to 5-37, 5-37 to 5-38, 5-42, 6-44 to 6-47, 6-70, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 2-45, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 3-36, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 4-54, 5-22 to 5-25, 5-31 to 5-32, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		vii. Identification of potential residual effects (see Section 9.8).		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-46 to 1-56, 4-26 to 4-29, 4-45 to 4-59, 4-63, 5-1 to 5-12, 5-31 to 5-37, 5-42, 6-44 to 6-47, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 2-45, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 3-36, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 4-54, 5-22 to 5-25, 5-31 to 5-32, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		In addition, the NIRB considers other relevant attributes in assessing the significance of an impact:		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-46 to 1-56, 4-26 to 4-29, 4-45 to 4-59, 4-63, 5-1 to 5-12, 5-31 to 5-37, 5-42, 6-44 to 6-47, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 2-45, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 3-36, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 4-54, 5-22 to 5-25, 5-31 to 5-32, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		viii. Ecological or socio-economic context/value,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-46 to 1-56, 4-26 to 4-29, 4-45 to 4-59, 4-63, 5-1 to 5-12, 5-31 to 5-37, 5-42, 6-44 to 6-47, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 2-45, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 3-36, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 4-54, 5-22 to 5-25, 5-31 to 5-32, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-27 to 1-35

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		ix. The environmental sensitivity of the area likely to be affected by the Project,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 X.5.1, X.5.4, X.5.5, X.6.1, X.10 1.2.4.4, 1.2.4.5	1-15 to 1-20, 1-28 to 1-31, 1-33, 2-11 to 2-14, 2-22 to 2-25, 2-27 4-26 to 4-28, 4-32 to 4-56, 4-71, 5-83 to 5-85, 5-112 to 5-119, 5-249, 6-37 to 6-40, 6-64 to 6-70, 6-90, 7-18 to 7-22, 7-46 to 7-51, 7-69 to 7-70, 8-32 to 8-37, 8-65 to 8-71, 8-100, 9-30 to 9-35, 9-54 to 9-57, 9-63, 10-22 to 10-25, 10-48 to 10-54, 10-58 1-41 to 1-43, 1-46 to 1-56, 4-26 to 4-29, 4-45 to 4-59, 4-63, 5-1 to 5-12, 5-31 to 5-37, 5-42, 6-44 to 6-47, 6-70, 6-74, 7-34 to 7-37, 7-56, 7-61 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 2-45, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 3-36, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 4-54, 5-22 to 5-25, 5-31 to 5-32, 5-32, 5-37, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-42, 6-55, 7-15 to 7-18, 7-36, 7-42 1-15 to 1-16, 1-26 to 1-29, 1-29, 1-31, 3-42 to 3-46, 3-95 to 3-101, 3-104 to 3-112, 3-130, 4-33 to 4-38, 4-55 to 4-60, 4-61 to 4-68, 4-85, 5-23 to 5-25, 5-36 to 5-61, 5-61, 5-62 1-26 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		x. The historical, cultural and archaeological significance of the geographic area likely to be affected by the Project,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.2 X.2 X.2 X.2 X.2 All	1-10 to 1-11, 2-6 to 2-7 4-18 to 4-19, 5-122 to 5-125, 6-22 to 6-33, 7-14 to 7-16, 8-25 to 8-30, 9-25 to 9-28, 10-15 to 10-17 1-32 to 1-33, 4-30 to 4-31, 5-17 to 5-18, 6-46 to 6-49, 7-28 to 7-31 2-14 to 2-15, 3-10 to 3-11, 4-30 to 4-37, 5-11 to 5-20, 6-15 to 6-18, 7-9 to 7-11 1-11 to 1-12, 3-25 to 3-27, 4-22 to 4-26, 5-15 to 5-20 All
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		xi. The size of the affected human populations, and the size of the affected wildlife populations and related habitat,		5 8	4, 5, 6, 7, 8 3	X.5.1, X.5.4, X.5.5, X.6.1, X.6.3, X.6.4, X.6.5	4-26 to 4-28, 4-32 to 4-62, 4-58 to 4-62, 5-131 to 5-134, 5-191 to 5-203, 5-238 to 5-242, 6-37 to 6-40, 6-64 to 6-70, 6-80 to 6-82, 7-18 to 7-22, 7-46 to 7-51, 7-61 to 7-63, 8-32 to 8-37, 8-65 to 8-71, 8-89 to 8-94 3-114 to 3-120
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		xii. The extent of the effects of the project on other regional human populations and wildlife populations, including the extent of the effects on Inuit harvesting activities,		5 8	4, 5, 6, 7, 8 3	X.5.1, X.5.4, X.5.5, X.6.1, X.6.3, X.6.4, X.6.5	4-26 to 4-28, 4-32 to 4-62, 4-58 to 4-62, 5-131 to 5-134, 5-191 to 5-203, 5-238 to 5-242, 6-37 to 6-40, 6-64 to 6-70, 6-80 to 6-82, 7-18 to 7-22, 7-46 to 7-51, 7-61 to 7-63, 8-32 to 8-37, 8-65 to 8-71, 8-89 to 8-94 3-114 to 3-120
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		xiii. The potential for cumulative adverse effects given past, present and future relevant events,		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.5.1, X.5.4, X.5.5, X.6 1.2, 1.3 1-2 to 1-51	1-15 to 1-20, 1-28 to 1-31, 2-11 to 2-14, 2.22 to 2.25 4-26 to 4-28, 4-32 to 4-62, 5-131 to 5-134, 5-191 to 5-242, 6-37 to 6-40, 6-64 to 6-82, 7-18 to 7-22, 7-46 to 7-63, 8-32 to 8-37, 8-65 to 8-94, 9-30 to 9-35, 9-54 to 9-58, 10-22 to 10-25, 10-48 to 10-54 2-16 to 2-20, 2-33 to 2-39, 2-39 to 2-41, 3-12 to 3-16, 3-27 to 3-30, 3-30 to 3-32, 4-40 to 4-43, 4-49 to 4-50, 4-50 to 4-52, 5-22 to 5-25, 5-31 to 5-32, 5-32 to 5-34, 6-20 to 6-25, 6-38 to 6-39, 6-39 to 6-48, 7-15 to 7-18, 7-36 1-29, 3-114 to 3-120, 4-26 to 4-60, 5-61
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		xiv. Effects on ecosystem function and integrity,		5 8	4, 5, 6, 7, 8 3	X.5.1, X.5.4, X.5.5, X.6.1, X.6.3, X.6.4, X.6.5	4-26 to 4-28, 4-32 to 4-62, 4-58 to 4-62, 5-131 to 5-134, 5-191 to 5-203, 5-238 to 5-242, 6-37 to 6-40, 6-64 to 6-70, 6-80 to 6-82, 7-18 to 7-22, 7-46 to 7-51, 7-61 to 7-63, 8-32 to 8-37, 8-65 to 8-71, 8-89 to 8-94 3-114 to 3-120
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		xv. The effect on the capacity of resources to meet present and future needs, and		5 8	4, 5, 6, 7, 8 3	X.5.1, X.5.4, X.5.5, X.6.1, X.6.3, X.6.4, X.6.5	4-26 to 4-28, 4-32 to 4-62, 4-58 to 4-62, 5-131 to 5-134, 5-191 to 5-203, 5-238 to 5-242, 6-37 to 6-40, 6-64 to 6-70, 6-80 to 6-82, 7-18 to 7-22, 7-46 to 7-51, 7-61 to 7-63, 8-32 to 8-37, 8-65 to 8-71, 8-89 to 8-94 3-114 to 3-120
7.0 IMPACT ASSESSMENT METHODOLOGY	7.14 SIGNIFICANCE DETERMINATION		xvi. The value attached to the impacted VEC or VSEC by those who identified them.		3	1, 3	1.6.2.2, 1.6.2.3, 3.3.2, 3.3.3	1-38, 3-51 to 3-52
7.0 IMPACT ASSESSMENT METHODOLOGY	7.15 CERTAINTY		The Proponent shall assess the degree of uncertainty associated with each predicted effect. The level of certainty with predictions is related to limitations in the overall understanding of the ecosystem and limitations in accurately foreseeing future events or conditions.		4 5 6 7 8 9	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	1.5.4, 1.5.5, 2.5.4, 2.5.5 4.5.4, 4.5.5, 5.5.4, 5.5.5, 6.5.4, 6.5.5, 7.5.4, 7.5.5, 8.5.4, 8.5.5, 9.5.4, 9.5.5, 10.5.4, 10.5.5 4.5.4, 4.5.5, 5.5.4, 5.5.5, 6.5.4, 6.5.5, 7.5.4, 7.5.5 2.5.4, 2.5.5, 3.5.4, 3.5.5, 4.5.4, 4.5.5, 5.5.4, 5.5.5 1.5.4, 1.5.5, 3.5.4, 3.5.5, 4.5.4, 4.5.5, 5.5.4, 5.5.5 1.2.4.4, 1.2.4.5	1-28 to 1-29, 2-22 to 2-23 4-32 to 4-55, 5-191 to 5-197, 6-64 to 6-69, 7-46 to 7-50, 8-65 to 8-70, 9-54 to 9-55, 10-48 to 10-51 4-45 to 4-57, 5-31 to 5-37, 6-70, 7-56 2-33 to 2-39, 3-27 to 3-30, 4-40 to 4-50, 5-31 to 5-32, 6-38 to 6-39, 7-36 1-26 to 1-29, 3-95 to 3-101, 4-55 to 4-60, 5-36 to 5-61 1-27 to 1-35
7.0 IMPACT ASSESSMENT METHODOLOGY	7.15 CERTAINTY		The Proponent shall provide a reasonable description how uncertainties have been dealt with, for example, through elements of the project design, monitoring and contingency plans design, etc.		9 10	1 1	1.2.4 4.1	1.18 to 1.35 5
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	7.15 CERTAINTY		The EIS shall provide a complete analysis of the predicted effects from the Project on the biophysical and socio-economic environments (see Section 7.0), and will serve as a basis for developing various mitigation and monitoring plans to address the potential impacts of the Project.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5, X.6, X.7, X.8, X.9, X.10	1-15 to 2-1, 2-11 to 2-27 4-26 to 4-65, 5-131 to 5-249, 6-37 to 6-90, 7-18 to 7-68, 8-32 to 8-100, 9-30 to 9-63, 10-22 to 10-58 1-41 to 1-57, 4-26 to 4-64, 5-14 to 5-42, 6-44 to 6-74, 7-34 to 7-61 2-16 to 2-45, 3-12 to 3-36, 4-40 to 4-54, 5-22 to 5-37, 6-20 to 6-55, 7-15 to 7-42 1-15 to 1-31, 3-42 to 3-130, 4-33 to 4-85, 5-23 to 5-62
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent shall present relevant information pertaining to the biophysical environment and associated processes to be assessed (see Section 7.3) to serve as a baseline against which the potential impacts of the Project can be measured. Information should be presented in the form of a conceptual site model with clear links to ecological and human health risk assessment presented throughout the document. Baseline summaries should also include trends, timelines and how the environment is expected to change over the life of the Project.		4 5 6 7 8 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 6	X.1 X.1 X.1 X.1 X.1 All	1-1 to 1-10, 2-1 to 2-6 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 3-1 to 3-25, 4-1 to 4-22, 5-1 to 5-15 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		In describing the biophysical environment, the Proponent shall take an ecosystemic approach that takes into account both scientific and TK perspectives encompassing all levels of complexity found in an ecosystem, both structurally and functionally.		4, 5, 6, 7, 8	All	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		In its impact assessment, the Proponent shall identify and justify the thresholds or indicators, and further relate them to Project monitoring and follow-up measures. For each predicted negative impact in this section, associated mitigation measures are to be discussed to the extent possible, with references to project design (Section 6.1) and environmental management systems (Section 9.0).		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5, X.6, X.7, X.8, X.9, X.10	1-15 to 2-1, 2-11 to 2-27 4-26 to 4-65, 5-131 to 5-249, 6-37 to 6-90, 7-18 to 7-68, 8-32 to 8-100, 9-30 to 9-63, 10-22 to 10-58 1-41 to 1-57, 4-26 to 4-64, 5-14 to 5-42, 6-44 to 6-74, 7-34 to 7-61 2-16 to 2-45, 3-12 to 3-36, 4-40 to 4-54, 5-22 to 5-37, 6-20 to 6-55, 7-15 to 7-42 1-15 to 1-31, 3-42 to 3-130, 4-33 to 4-85, 5-23 to 5-62

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent shall also include a consideration of the temporal scale and predictions of when potential impacts to each relevant VEC could reasonably be expected to manifest.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.4, X.5, X.6, X.7, X.8, X.9, X.10	1-12 to 1-33, 2-8 to 2-27 4-26 to 4-65, 5-131 to 5-249, 6-37 to 6-90, 7-18 to 7-68, 8-32 to 8-100, 9-30 to 9-63, 10-22 to 10-58 1-32 to 1-57, 4-25 to 4-64, 5-13 to 5-42, 6-43 to 6-74, 7-33 to 7-61 2-16 to 2-45, 3-12 to 3-36, 4-40 to 4-54, 5-22 to 5-37, 6-20 to 6-55, 7-15 to 7-42 1-12 to 1-31, 3-41 to 3-130, 4-33 to 4-85, 5-20 to 5-62
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent shall include a prediction of trends relating to potential project impacts that provides for a temporal scale which encompasses all closure and reclamation activities.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.4, X.5, X.6, X.7, X.8, X.9, X.10	1-12 to 1-33, 2-8 to 2-27 4-26 to 4-65, 5-131 to 5-249, 6-37 to 6-90, 7-18 to 7-68, 8-32 to 8-100, 9-30 to 9-63, 10-22 to 10-58 1-32 to 1-57, 4-25 to 4-64, 5-13 to 5-42, 6-43 to 6-74, 7-33 to 7-61 2-16 to 2-45, 3-12 to 3-36, 4-40 to 4-54, 5-22 to 5-37, 6-20 to 6-55, 7-15 to 7-42 1-12 to 1-31, 3-41 to 3-130, 4-33 to 4-85, 5-20 to 5-62
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.1 Air Quality			-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.1.1 Baseline Information	i. Background ambient air quality data collected in the LSA and RSA including airborne dust (TSP, PM10 and PM2.5),		4	1	1.1.2	1-2 to 1-8
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Current sources of criteria air contaminants [TSP, PM10, PM2.5, NOx, SO2, volatile organic compounds (VOCs), Ozone (O3) etc.] and GHG emissions, and		4	1 3	1.1.3 3.1.1.2	1-8 to 1-10 3-1
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Seasonal variations or climatic conditions associated with variations on air quality.		4	1	1.1.4	1-10
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.1.2 Impact Assessment	The Proponent is required to present a comprehensive impact analysis for all Project components and activities on air quality. This analysis shall include the following:		4	1	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Discussion of the standards, guidelines and regulations that the Proponent will incorporate to minimize and mitigate effects to air quality,		4	1	1.5.1	1-15 to 1-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Predictions of principle pollution emission sources from the Project at various stages, including:		4	1, 3	1.5.2, All	1-20 to 1-27, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Criteria air contaminants [TSP, PM10, PM2.5, NOx, SO2, volatile organic compounds (VOCs), Ozone (O3), etc.] and GHG emissions from the fuel consumption of mobile equipment such as vehicles, marine vessels, aircraft, and stationary equipment such as diesel generators and other combustion sources,		4	1, 3	1.5.1, 1.5.2, 3.4.2.2	1-15 to 1-20, 1-20 to 1-27, 3-37 to 3-40
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Fugitive dust and gaseous emissions from construction activities and land clearing, extraction and ore processing, handling, tailings, waste rock and ore stockpiling, quarries and other Project components and works, and		4	1	1.5.2.2	1-22 to 1-27
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Fugitive dust emissions from ground transportation and wind erosion at various Project components including the all-weather road, access roads and mine hauling roads.		4	1	1.5.2.2	1-22 to 1-27
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Assessment of dispersion of Project emissions within the LSA and RSA, using appropriate modelling, and discussion of related impacts and mitigation strategies,		4	1	1.5.2.2 - 1.5.5	1-22 to 1-29
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Discussion of Project components and activities which may contribute to the potential for acidic input, and an evaluation of associated effects,		4	1	1.1.2.2, 1.5.2	1-6, 1-20 to 1-27
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Assessment of effects on air quality from Project emissions during various project stages including airborne dust (TSP, PM10 and PM2.5 and/or metals) and criteria air contaminants such as SO2, NOx, CO, VOCs, O3, etc.,		4 8	1 6	1.5.1, 1.5.2.1, 1.5.2.2 6.4.2.7, 6.4.2.10	1-15 to 1-20, 1-21 to 1-22, 1-22 to 1-27 6-104 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Assessment of the Project's GHG contributions to both Nunavut and Canada, and		4	3	3.4.2	3-37 to 3-40
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. A discussion of the potential effects of changes in air quality on human health and the environment.		8	6	6.4.1.10, 6.4.1.11, 6.4.2.10	6-94 to 6-95, 6-163 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.2 Climate and Meteorology	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.2.1 Baseline Information	i. A description of the baseline meteorological and climatic conditions at the LSA and RSA, including methods of determination including a discussion of how data from outside the project area may have been utilized and uncertainties encountered,		4	3	3.1.1.1, 3.1.2	3-1, 3-2 to 3-30
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Meteorological data including, but not limited to, air temperature, precipitation, wind directions and velocity, as well as prevailing wind directions for locations of proposed project components and along proposed shipping route(s),		4	3	3.1.2.2	3-4 to 3-30
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Annual, seasonal, monthly and daily average and mean values of above noted meteorological parameters, seasonal and yearly fluctuations and variability, and extreme climate events over the same period of time in which the data including site-specific data are collected in the RSA of the Project, and		4	3	3.1.2.2	3-4 to 3-30
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Prevalent trends related to VECs in the project area and any resulting implications to the Project.	Yes	4 Addendum 4	3 3	3.1.1.3 4.3, Addendum Appendix V4-3D, Addendum Appendix V4-3E	3-1 to 3-2 4-3 to 4-7, All, All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.2.2 Impact Assessment	The Proponent is required to present a comprehensive analysis of the impact that all components of the Project and activities may have on climate and meteorology. This analysis shall include the following:		4	3	3.4.2.1	3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. A discussion of the relationship between climate change and GHG emissions from the Project, and		4	3	3.4.2.1	3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A discussion on the climate parameters that may change due to emissions from the Project [GHGs, and criteria contaminants such as SO2, NOx, CO, VOCs, O3, etc.].		4	3	3.4.2.1	3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.3 Noise and Vibration	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.3.1 Baseline Information	i. A description of baseline noise and vibration levels in the Project area, including a discussion on variability, and if applicable, the relationship between these parameters and local weather conditions, seasonal variations, etc.,		4	2	2.1.2	2-2 to 2-6
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A review of available studies/research the potential impacts of noise and vibrations on wildlife behaviours and health in both terrestrial and marine environments, with a focus on noise from similar mining and shipping operations, in comparable climate and geographical regions if possible. Emphasis should be placed on level of noise and the identification of noise sensitive species, timing, etc., and		5 7	5, 6, 7, 8, 9, 10 6, 7	5.5.2.2, 6.5.2.2, 7.5.2.2, 8.5.2.2, 9.5.2.2, 10.5.2.2 6.5.2.2, 7.5.2.2.	5-148 to 5-162, 6-47 to 6-55, 7-30 to 7-40, 8-43 to 8-58, 9-40 to 9-47, 10-29 to 10-41 6-27 to 6-33, 7-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. A review of available studies/research on the potential impacts of noise and vibrations from blasting in or near freshwater and marine environments.		7	5	5.5.2.2	5-28 to 5-29
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.3.2 Impact Assessment	The Proponent is required to present a comprehensive analysis of the impact that all Project components and activities may have on noise and vibration. This analysis shall include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. A description of anticipated noise and vibration levels from all relevant Project equipment and activities,		4 7 8	2 5 6	2.3.1, 2.5.2.1, 2.5.2.2 5.5.2.2 6.4.3.10	2-7 to 2-8, 2-15, 5-28 to 5-29 6-172
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A discussion of the standards, guidelines, thresholds and regulations that the Proponent will comply with to minimize and mitigate impacts associated with noise and vibrations,		4	2	2.5.2.3	2-16 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential increase to atmospheric noise levels from Project activities at different project stages, including those contributions arising from:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Ground transportation, including mine traffic, other access roads and the public where applicable,		4	2	2.5.2.3	2-16 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Air transportation,		4	2	2.5.2.3	2-16 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Equipment use at mine and construction sites, including power generators, and		4	2	2.5.2.3	2-16 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Mine site operations including: blasting, drilling, crushing, screening, milling, smelting, transportation and stockpiling activities,		4	2	2.5.2.3	2-16 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential changes in marine noise levels due to shipping activities, as well as noise propagation in the marine environment, and		4 7	2 6, 7	2.5.2.1 6.5.2.2, 7.5.2.2	2-15 6-27 to 6-33, 7-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts of noise and vibration on the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Humans and human activity in close proximity to noise generating sources,		8	6	6.4.3.11.2	6-178
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Terrestrial wildlife, with a focus on caribou and migratory birds and Species at Risk,		5 7	5, 6, 7, 8, 9, 10 6	5.5.2.2, 6.5.2.2, 7.5.2.2, 8.5.2.2, 9.5.2.2, 10.5.2.2 6.5.2.2	5-148 to 5-162, 6-47 to 6-55, 7-30 to 7-40, 8-43 to 8-58, 9-40 to 9-47, 10-29 to 10-41 6-27 to 6-33
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Marine mammals, and		7	6, 7	6.5.2.2, 7.5.2.2	6-25 to 6-28, 7-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Fish in fresh water and marine environments.		7	5	5.5.2.2, 5.5.4	5-28, 5-31 to 5-32
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.4 Terrestrial Environment	For the purpose of the current Guidelines, terrestrial environment includes terrestrial ecology, landform and soils, permafrost, and ground stability.		5	All	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.4.1 Baseline Information	i. A description of existing unique or valuable landforms (e.g. eskers, fragile landscapes, wetlands), including details regarding their ecological functions and distribution in the LSA,		5	4	4.1, 4.3.2.2	4-1 to 4-18, 4-22 to 4-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of existing or proposed protected areas, special management areas, and conservation areas in the RSA,		5	4	4.1	4-1 to 4-18

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. A discussion of the landforms and topographic features at areas proposed for construction of major project components, including the type, thickness, soil stability and/or clay sensitivity, and classification and distribution of soils as applicable,		5	3	3.4.1.3, 3.4.1.4	3-34 to 3-35
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. A description of the bedrock lithology, morphology, surface geology, landform and soils (including sediments and the thermal and ground ice conditions) at proposed borrow and quarry sites, project facilities such as tailing and waste rock management facilities, roads, and other areas where earthworks are proposed. If eskers are identified as a potential source of granular material, then a description of granular material properties, including thermal condition and ice content, should also be included,		5	1, 2, 4	1.1, 2.1, 4.1	1-1 to 1-15, 2-1 to 2-22, 4-1 to 4-18
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. A discussion of the potential of geohazards, that may have an effect on the project or the occurrence of which may potentially be affected by the Project (e.g., slumping, landslides, potential slippage, seismic hazards) at areas planned for Project facilities and infrastructure,		5 9	3 2	3.4.1 2.2	3-33 2-1 to 2-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. A discussion of the relationship between permafrost processes and active layer, surface waterbodies and topography, including a description of permafrost and talik configuration in the development area and adjacent water bodies and implications for groundwater flow pathways,		5	2, 3, 4	2.4.1, 3.1, 4.1	2-23, 3-1 to 3-21, 4-1 to 4-18
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Details regarding the suitability of topsoil and overburden for use in the re-vegetation of surface-disturbed areas,		5	3	3.1.3	3-6 to 3-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. A description of permafrost distribution in the LSA, including areas of discontinuous permafrost, high ice-content soils, ice lenses, thaw-sensitive slopes, and talik zones,		5	2, 3	2.1, 3.4.1.3	2-1 to 2-22, 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. A description of permafrost temperatures at areas planned for Project facilities and infrastructure, including discussion of sensitivity to climate change, and implications for stability and safety of infrastructures, and		5	2, 3	2.1, 3.4.1.3	2-1 to 2-22, 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. Sites of paleontological or palaeobotanical significance within the LSA.		8	2	2.1	2-1 to 2-2
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.4.2 Impact Assessment	The Proponent is required to present a comprehensive analysis of the impact that all Project components and activities may have on the terrestrial environment. This analysis shall include the following:		5	All	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. The general impact on topography in the LSA as a result of Project development, borrow resource extraction, with a focus on sensitive landforms, and those serving as important vegetation and wildlife habitat,		5	4	4.5.2, 4.8.4, 4.9	4-28 to 4-30, 4-63, 4-63 to 4-65
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential impacts on the abundance and distribution of unique or valuable landforms (e.g. wetlands, eskers and fragile landscapes) from the Project,		5	4	4.5.4.1	4-33 to 4-50
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential for soil erosion, including stream bank erosion, resulting from surface disturbances associated with the Project components and activities (e.g. road embankments, water crossings, water management/diversions) during all Project phases,		5	3	3.4.1.1	3-33
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts to soil quality from compaction, the deposition of air emissions and airborne fugitive dust emissions and/or spills from the Project,		5 8	3 6	Appendix V4-1B 3.4.2 6.4.4	All 3-34 6-177
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Implications to the Project planning and design of design of project components related to terrain conditions, in particular permafrost, sensitive landforms, high ice-content soils, ice lenses, thaw-sensitive slopes, and talik zones,		5 6 9	3 2 2	3.4.3, 3.4.4 2.1.2 2.2, 2.3, 2.4	3-34 to 3-35 2-4 to 2-20 2-1 to 2-8
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential impacts on the stability of terrain, in particular the thermal stability, in the vicinity of facilities and infrastructure due to the thawing of the ice-rich permafrost soils and other sensitive landforms. Discussion should focus on the potential for impacts arising from surface disturbances due to construction (e.g. overburden stripping, mine pit creation, cuts/fills, excavation) of the facility and infrastructure,		5	3	3.4	3-33 to 3-35
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. An assessment and prediction of permafrost behaviour (degradation and its rate) beneath the pits during mining and operation of the tailings management facilities including disposing of waste rock. Long-term predictions of the thermal regime around the tailings management facilities should be conducted with the consideration of climate change. Numerical modelling should be employed for both short term and long term predictions of permafrost evolution including predictions of artesian inflow into the tailings management facilities if thawing of permafrost is envisioned,		5	2	2.1.2	2-5 to 2-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential impacts on contamination of traditional foods as a result of bioaccumulation, (i.e. food chain uptake through air, water and soil),		8	5, 6	5.5, 6.4.1.7, 6.4.2.7	5-23 to 5-61, 6-36 to 6-57, 6-104 to 6-124
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential impacts on food (i.e. contamination of country foods) including those harvested or grown for subsistence or medicinal purposes (i.e. berries, etc.),		8	5, 6	5.5, 6.4.1.7, 6.4.2.7, 6.4.2.11	5-23 to 5-61, 6-36 to 6-57, 6-104 to 6-124, 6-165

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. A discussion of whether country foods are consumed, or are expected to be consumed, in the potentially affected area,		8	5, 6	5.1, Appendix V8-5A, 6.1.8, 6.4.2.12	5-1 to 5-15, All, 6-11, 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Identification of what country foods are consumed, which parts of country foods are consumed, and their consumption frequency,		8	5	5.1, Appendix V8-5A	5-1 to 5-15, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xii. Lists all potential contaminants and a determination of whether these contaminants may persist into country foods as a result from project activities,		8	6	6.4.1.6, 6.4.1.7, 6.4.2.6, 6.4.2.10	6-35 to 6-36, 6-36 to 6-58, 6-163 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xiii. Potential impact from the loss or alteration of habitat (i.e. vegetation) due to pollutants and noise and its effects on wildlife, wildlife calving grounds and marine habitat,		5	5, 6, 7, 8, 9, 10	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xiv. A discussion on environmental receptivity including ecological, physical and/or climatic factors that influence exposure to harmful substances, and	Yes	4 Addendum 4	3 3	3.4 4.3, Addendum Appendix V4-3D, Addendum Appendix V4-3E	3-33 to 3-42 4-3 to 4-7, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xv. A discussion of the potential for the occurrence, frequency and distribution of terrain hazards, including snow drifts and snow banks, as a result of construction activities (e.g. cut/fill, extraction of construction materials).		5	3	3.4	3-33 to 3-35
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.5 Geological Features, Surficial and Bedrock Geology and Geochemistry	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.5.1 Baseline Information	i. A description of local and regional bedrock and quaternary geology. The history of the geological formations and the description of their physical, chemical and hydrogeological properties should be given. For data obtained with in-situ investigations, maps should be provided showing the location of the boreholes, with their positions relative to the planned project component,		5 6 2	1, 2 2 7	1.1, 2.1 2.1 7.1	1-1 to 1-14, 2-1 to 2-22 2-1 to 2-20 7-1 to 7-13
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of structural geology, such as fractures and faults, at major project infrastructure areas and where earthworks are proposed (e.g. mine site(s), port site, tank farm(s) and storage facilities, etc.),		5 2	1 7	1.1 7.1, Appendix V2-7C	1-1 to 1-14 7-1 to 7-13, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Typical regional and local cross-sections of the general geology should be provided showing the geological units and their elevation, groundwater table, and linear geological structures,		5 6 2	1, 2 2 7	1.1, 2.1 2.1 7.1, Appendix V2-7C	1-1 to 1-14, 2-1 to 2-22 2-1 to 2-20 7-1 to 7-13, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. A description of the geotechnical properties of bedrock and soil units, including ice content and thermal conditions of permafrost soils and rocks, as relating to slope stability, underground stability, and bearing capacity of facility foundations, and		2 5 6	7 2 2	7.1.3, 7.1.5 Appendix V2-7C 2.1 2.1, Appendix V6-2D	7-7 to 7-8, 7-10 to 7-13, All 2-1 to 2-22 2-1 to 2-20, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. An acquisition of the in-situ stress either with in-situ investigation or from other sources with reasonable confidence.		2 9	7 2	7.1.1, 7.2.5.1 2.2.1, 2.2.2, 2.3	7-3 to 7-5, 7-20 2-1 to 2-2, 2-2
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.5.2 Impact Assessment	The Proponent is required to present a comprehensive impact analysis for all Project components and activities on geology. This analysis should include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Potential geotechnical and geophysical hazards within the Project area, including potential seasonal subsidence, seismicity and faulting, risks associated with cut/fill slopes, underground excavation, and surface constructed facilities. Where appropriate, the assessment should be supplemented by analysis and illustrations such as maps, figures, cross sections and borehole logs,		2	6, 7	6.6.2.1, 7.1.1, 7.2.4.2, 7.2.5.3, Appendix V2-7C	6-21 to 6-23, 7-3 to 7-5, 7-18, 7-22, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential effects on foundation stability of major Project components from geological fractures and faults, and associated implications of these features on project planning and engineering design. Those Project components assessed shall include, but are not limited to the port facilities, major watercourse crossings, open pits, underground mine, and equipment pads, and		2 6 9 10 11	6, 7 2 2 7, 9 2	6.6.13, Appendix V2-7C, Appendix V2-7E 2.1 2.3 3.6.3 3.5	6-33 to 6-40, All, All 2-1 to 2-20 2-7 27 8
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Risk assessment and predictions, including proposed management measures.		2 5 9	7 1 2	7.1.1 1 2.3	7-3 to 7-5 1-1 to 1-10 2-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.6 Hydrological Features and Hydrogeology	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.6.1 Baseline Information	i. A description of hydrology of the LSA (e.g. streams, surface water flows, subsurface water movement, ice formation, and melt patterns),		6	1	1.1.2	1-13 to 1-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of relevant hydrological regimes, drainage basins, watershed boundaries and site water balance in the RSA,		6	1	1.1.1	1-1 to 1-13
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. A description of natural fluctuations, variability, and sources of variability in flow rates, including seasonal fluctuations and year-to-year variability, and the interactions between surface water and groundwater flow systems,		6	1, 2	1.1, 2.1	1-1 to 1-29, 2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. A description of the timing of freeze/thaw cycles, flood zones, ice cover (seasonal patterns and spatial variation), and ice conditions and typical thicknesses, formations and melt patterns,		6	1, 3	1.1, 3.1	1-1 to 1-29, 3-1 to 3- 14

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. A description of hydrological characteristics of streams, rivers, and lakes in each watershed of the RSA. Items listed should be considered within the context of the range of climate conditions expected (include both climatic variability such as potential for extreme events, seasonal changes),		6	1	1.1.1, 1.1.3	1-1 to 1-13, 1-31
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. A conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems should be presented,		6	2	2.1, 2.4.1, 2.4.2	2-1 to 2-20, 2-21 to 2-23
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Characterization of faults and fractures within the mine area, including information about occurrence, hydraulic conductivity testing and interpretation,		6	2	2.1	2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. A description of interactions between permafrost, surface water and ground water, and topography, as well as rock fractures and talik zones between different surface/ground waters,		6	2	2.1	2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. A description of permafrost/talik distribution, permeability and hydraulic conductivity of the underlying materials, and		5 6	3 2	3.1 2.1	3-1 to 3-21 2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. A description of existing groundwater regimes, distribution characteristics and flow paths in the Project area, including any instances of frozen groundwater within/around the identified deposits.		6	2	2.1	2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.6.2 Impact Assessment	The Proponent is required to present a comprehensive impact analysis for all Project components and activities, including its shipping activities where applicable, on hydrology and hydrogeology. This analysis should include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Discussion of the potential impact of variable and extreme stream-flows on Project design and planning, including how the design and size of proposed watercrossings would ensure adequate flow capacity to accomodate spring freshet and storm flows (e.g. 1 in 100 year or greater storm events). This should include migration contingencies if the watercrossing does not function as intended,		6 9	1, 4, 5 2	1.5.2, 4.5.2, 5.5.2 2.6	1-43, 4-31 to 4-38, 5-19 to 5-25 2-8 to 2-13
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential impacts to existing watersheds from surface water diversions required by mine site development and other Project components (e.g. waste rock stockpiles),		6	1	1.5	1-41 to 1-55
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Evaluation of stormwater runoff throughout the LSA, with consideration for potential impacts to receiving waters (e.g. flow rates and flow patterns),		6 9	1 2	1.1, 1.5.2 2.6	1-1 to 1-29, 1-43 2-8 to 2-13
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts to natural drainage patterns from the construction and operation of proposed mine facilities and Project infrastructure,		6	1	1.5	1-41 to 1-55
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts on terrestrial and aquatic wildlife habitat resulting from the modification or redirection of natural flows,		5	4 , 5, 6, 7, 8, 9, 10	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential for ice damming and resultant effects on other resources,		6 9 10	6.7 2 14	6.5.2, 7.5.2 2.8, 2.14.1 8.4	6-47 to 6-61, 7-37 to 7-46 2-13, 2-17 19
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. An assessment of each watercrossing and in-stream work, and potential impacts to the navigability and safety of the watercourses,	Yes	2 ~~10~~ 10 Addendum 10	6 ~~5,~~ ~~14~~ 14 5	6.4.3, 6.5, 6.6 ~~8.2.2~~ ~~4.2.3, 4.3, 7.1, 7.2~~ 4.2.3, 4.3, 7.1, 7.2 8.2.2	6.7 to 6.8, 6.14 to 6.40 ~~24~~ ~~12 to 13, 14 to 16~~ 12 to 13, 14 to 16 8-2 to 8-3
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential changes to permafrost and ground ice conditions as a result of Project activities, including an analysis of the potential for groundwater inflow into the open pit, and		2 5 6	7 2 2	Appendix V2-7C 2.4 2.4	All 2-23 to 2-24 2-21 to 2-23
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential changes to permafrost/talik distribution, groundwater distribution and flow paths.		5 6	2 2	2.4 2.4	2-23 to 2-24 2-21 to 2-23
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.7 Groundwater and Surface Water Quality	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.7.1 Baseline Information	i. Identification of all sources of drinking water (surface and groundwater), as well as water used for recreational purposes, within the area of influence of the project,		6	4	4.2, 4.11.1	4-23 to 4-25, 4-64
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of the natural hydrogeochemistry of groundwater system (i.e. pH, redox potential, total dissolved solids, isotopic composition, dissolved oxygen, dissolved metals anions and cations),		6	2	2.1	2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. A description of the physical and chemical characteristics of groundwater and surface water in the LSA, with discussion of seasonal variations of water flow and quality. Chemical characteristics should include baseline levels of contaminants and should be compared to relevant water standards/guidelines with identification of those which are naturally elevated,		6	2, 4	2.1, 4.1.5, 4.1.6	2-1 to 2-20, 4-13 to 4-23
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. A discussion of waters in the LSA of importance to local harvesting activities by surrounding communities,		6	6, 7	6.2.1, 7.2.1	6-35 to 6-41, 7-25 to 7-31
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. A description of lake bathymetry and limnology in the LSA, and		6	3, 6	3.1, 6.1	3-1 to 3-14, 6-1 to 6-35

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Provision of an outline of baseline water quality conditions within the watershed and the project area, including a summary of baseline data collected with summary statistics and detection limits identified,		6	4	4.1.4.2, 4.1.5, 4.1.6	4-4 to 4-23
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Provision of maps and cross sections of the study area indicating the extent of hydrostratigraphic units, permafrost, and lake taliks. Groundwater levels, potentiometric contours and groundwater flow directions should be included.		5 6	2 2	2.1 2.1	2-1 to 2-22 2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Provision of the location and description of all on-site groundwater monitoring wells, including well diameter and screen depth and intercepted aquifer unit. Include all baseline groundwater level data.		6	2	2.1, Appendix V6-2A, Appendix V6-2B	2-1 to 2-20, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Provision of the location and description of all on-site groundwater monitoring wells, including well diameter and screen depth and intercepted aquifer unit. Include all baseline groundwater level data.		6	2	2.1, Appendix V6-2A, Appendix V6-2B	2-1 to 2-20, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Provision of hydraulic conductivity data for hydrogeologic units in the study area.		6	2	2.1	2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. Provision of a detailed groundwater budget.		6	2	2.4.2	2-22 to 2-23
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Inclusion of a discussion of groundwater interactions with surface water bodies in the area.		6	2	2.1	2-1 to 2-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.7.2 Impact Assessment	The Proponent is required to present a comprehensive impact analysis for all Project components and activities, including its shipping activities where applicable, on groundwater and surface water quality. This analysis should include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Identification and provision of details on the specific contaminants of potential concern to the Project, the project activity to which they are related, the rationale for selecting them and for determining which will be carried forward into the impact assessment,		6 7 8	4, 5 2, 3 6	4.5.1, 4.5.2, 5.5.1, 5.5.2 2.5.1, 2.5.2, 3.5.1, 3.5.2 6.4.1.9, 6.4.2.9	4-36 to 4-38, 5-14 to 5-25 2-16 to 2-26, 3-12 to 3-22 6-73 to 6-94, 6-132 to 6-163
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Provision of predicted increases in contaminants in groundwater and surface water as a result of the Project, specifically identifying any waterbodies used as drinking water sources, for recreational purposes, that are important to local harvesting, the fish bearing status of identified waterbodies as well as specifically identifying any other fish bearing waterbodies. For any water sources identified as being current or future drinking water sources, comparison of concentrations of contaminants to relevant territorial drinking standards/guidelines and/or Health Canada Drinking Water Guidelines (Health Canada, 2010),		6 8	4, 2, 6, 7 6	4.11, 4.1, 4.2, 4.5, 2.2, 2.4.1, 6.1, 6.2, 7.1, 7.2 6.1.2, 6.1.4, 6.4.2.11	4-63 to 4-64, 4-1 to 4-25, 4-26 to 4-57, 2-20 to 2-21, 6-1 to 6-42, 7-1 to 7-32 6-3, 6-5, 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential impacts on groundwater quality and surface water quality in surrounding lakes and rivers from surface runoff and seepage, traffic on Project roads, and from dust from road traffic,		6	2, 4	2.4.1, 4.5	2-21, 4-26 to 4-57
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts on water quality due to under ice water withdrawals,		6	4	4.5.2.2, 4.5.2.5, 4.5.3.2, 4.5.3.5	4-36, 4-37, 4-41, 4-42
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts on groundwater quality and surface water quality of surrounding lakes, rivers, and streams from discharges of Project waste water treatment plants. A solute transport model based on numerical groundwater flow modelling should be used for ground water quality predictions and appropriate models selected (with rationale) to predict:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Water quality from specific sources,		6	2, 4	2.2, 2.4.2, 4.2, 4.5.2.9, 4.5.3.9	2-20 to 2-22, 4-23 to 4-25, 4-38, 4-45
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Water quality discharged to the environment, and		2 10	6 3	6.4.12, 6.4.13, 6.6.3, 7.10 3, 7	6-13, 6-24, 7-42 to 7-48 3 to 42, 43 to 47
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Dispersion, dilution and assimilation of effluent discharged to the environment,		2 10	6, 7 3	6.4.12, 6.4.13, 6.6.3, 7.10 3, 7	6-13, 6-24, 7-42 to 7-48 3 to 42, 43 to 47
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential impacts on groundwater quality and surface water quality from dust, ARD and ML resulting from waste rock stockpiles, ore stockpiles, open pit and underground mine dewatering, construction fills, embankment of roads, and open quarry sites,	Yes	6 Addendum 6	2, 4 4	2.4.1, 4.5 6.4, Addendum Appendix V6-4C	2-21, 4-16 to 4-57 6-10 to 6-15, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Potential impacts of faults on contaminant transport processes in subsurface and surface water quality,		6 9 10	2 2 7	2.1.2.2, 2.1.2.4 2.3 3.6.3, 3.6.4, 3.6.5	2-10 to 2-20, 2-20 2-7 27 to 28
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential impacts on surface water quality of nearby lakes and streams as a result of nutrient input from blasting activities,		2 6 10	6 4 16	6.4.12, 6.4.13, 6.6.3, 7.10 4.5.2.1, 4.5.2.7, 4.5.3.7 6	6-13, 6-24, 7-42 to 7-48 4-36, 4-37 to 4-38, 4-43 to 4-44 9 to 12
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential for increases in suspended sediments in waterbodies as a result of construction and maintenance of the mine facilities, all-weather road and associated water crossings,		6	4	4.5.2.1, 4.5.2.3, 4.5.2.6, 4.5.3.1, 4.5.3.3, 4.5.3.6, 4.5.4.1, 4.5.4.2, 4.5.5	4-36 to 4-37, 4-39 to 4-43, 4-56 to 4-46, 4-56

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. Potential impacts on surface/ground water quality from runoff at fuel storage facilities, with consideration for possible fuel spills and malfunctions,	Yes	6 9 ~~10~~ Addendum 10	4 3 ~~5~~ 5	4.5.2.8, 4.5.3.8 3.3 ~~8.2.2~~ 8.2.2	4-38, 4-44 to 4-45 3-6 to 3-20 ~~24~~ 8-2 to 8-3
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Potential impacts on ground and surface water quality from accidental spills of fuel and chemicals along the ground transportation routes,		6 9	4 3	4.5.2.8, 4.5.3.8 3.3, Appendix V9-3A	4-38, 4-44 to 4-45 3-6 to 3-20, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xii. Potential impacts on surface water quality from the deposition of particulate matter resulting from the incomplete combustion of wastes from incineration,		6	4	4.5.2.8, 4.5.3.8	4-38, 4-44 to 4-45
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xiii. Potential impacts on groundwater and surface water quality in relation to other site waste management activities, including: storage, handling, waste deposition in landfills, landfarming of contaminated soil or runoff, the management of historical contaminated material (e.g. previous spills, mishaps, releases), and sewage effluent discharges,		2 6	6 4	6.4.12, 6.4.13, 6.4.14, 6.6.3 ,6.6.8, 7.10, 8-12 4.5.2.3, 4.5.3.3, 4.5.4.2, 4.5.5	6-13, 6-24, 6-28 to 6-32, 7-42 to 7-48, 8-7 4-36 to 4-37, 4-42, 4-46 to 4-47, 4-56 to 4-57
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xiv. Potential impacts on surface water quality from construction and operation of camps,		6	4	4.5.2.1, 4.5.2.3, 4.5.2.8, 4.5.3.1, 4.5.3.3, 4.5.3.8, 4.5.4.1, 4.5.4.2, 4.5.5	4-36, 4-36, 4-38, 4-39 to 4-42, 4-44 to 4-47, 4-56 to 4-57
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xv. Potential impacts of erosion associated with the all-weather road on surface water quality as a result of vegetation removal, cuts/fills and other surface disturbances,		6	4	4.5.2.1, 4.5.3.1, 4.5.4.1, 4.5.5	4-36, 4-39 to 4-41, 4-45 to 4-46, 4-56 to 4-57
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xvi. Potential impact of ongoing exploration activities on surface water quality from drilling water withdrawals and returns,		6	4	4.5.2.4, 4.5.2.5, 4.5.3.4, 4.5.3.5, 4.5.4.3, 4.5.5	4-37, 4-42 to 4-43, 4-50, 4-47 to 4-57
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xvii. Outline proposed surface water quality objectives to maintain within the watershed and project area throughout life of project. Outline anticipated impacts (and cumulative effects) to surface and groundwater quality in the watershed.	Yes	6 Addendum 6	2, 4 6	2.4.1, 4.5.4, 4.5.5, 4.6, 4.8, 4.9 6.4, Addendum Appendix V6-4C	2-21 to 2-22, 4-45 to 4-63 6-10 to 6-15, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.8 Sediment Quality	Based on the proposed facilities and activities, the Proponent should identify water bodies that are potentially impacted by development under various pathways. For each water body, the Proponent should provide details on what baseline data is appropriate and if flow or dispersion modeling is required to assess impacts, then the baseline program should be designed to collect that information:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.8.1 Baseline Information	i. A description of the physical and chemical characteristics of sediment in the LSA,		6 7	5 3	5.1 3.1	5-1 to 5-12 3-1 to 3-10
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of sedimentation rates and dispersion patterns in waterbodies of the LSA, and		6	5	X.1	5-1 to 5-12
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. For the sedimentation deposition rates, flow models and sediment dispersion models should be provided which outline the rate and location of sediment deposition where relevant. Provide linkage of this baseline information with the hydrology baseline information (Subsection 8.1.6.1).		6	5	5.1	5-1 to 5-12
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.8.2 Impact Assessment	The Proponent is required to present a comprehensive impact analysis for all Project components and activities, including its shipping activities where applicable, on sediment quality. This analysis should include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Potential impacts on sediment quality in surrounding lakes and rivers from surface runoff and traffic on Project roads and dust from road traffic and other project sources,		6	5	5.5.2.1, 5.5.2.2, 5.5.2.3, 5.5.2.4, 5.5.2.6, 5.5.2.8, 5.5.3.1, 5.5.3.2, 5.5.3.3, 5.5.3.4, 5.5.3.6, 5.5.4.1, 5.5.4.2, 5.5.4.3, 5.5.5	5-23 to 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A discussion of fluvial processes and stability as related to proposed water crossings,		6	5	5.5.2.1, 5.5.3.1, 5.5.4.1, 5.5.5	5-23, 5-26 to 5-28, 5-31 to 5-32, 5-35 to 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential sedimentation and infill rates of drainage areas that might be impacted by the Project,		6	5	5.1.5	5-7 to 5-11
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts on sediment quality of lakes and rivers from discharges of Project waste water treatment plants,		6	5	5.5	5-14 to 5-36
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts on sediment quality from ARD and ML resulting from waste rock stockpiles, ore stockpiles, open pit dewatering, construction fills, embankment of roads, and open quarry sites,	Yes	6 Addendum 6	5 4	5.5.2.1, 5.5.2.2, 5.5.2.3, 5.5.2.4, 5.5.3.1, 5.5.3.2, 5.5.3.3, 5.5.3.4, 5.5.4.1, 5.5.4.2, 5.5.4.3, 5.5.5 6.4, Addendum Appendix V6-4C	5-23 to 5-24, 5-26 to 5-29, 5-31 to 5-37 6-10 to 6-15, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential impacts of erosion associated with the all-weather road on sediment quality as a result of vegetation removal, cuts/fills and other surface disturbances,		6	6	5.5.2.1, 5.5.2.3, 5.5.3.1, 5.5.3.3, 5.5.4.1, 5.5.4.3, 5.5.5	5-23, 5-24, 5-26, 5-28, 5-31 to 5-32, 5-33 to 5-35, 5-35
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Potential impacts on sediment quality of nearby lakes and streams as a result of nutrient input from blasting activities,		6	5	5.5.2.5, 5.5.3.5	5-24, 5-29 to 5-30

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential impacts on sediment from runoff at fuel storage facilities, with consideration for possible fuel spills and malfunctions,		6 9	5 3	5.5.2.6, 5.5.3.6 3.3	5-24, 5-30 to 5-31 3-6 to 3-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential impacts on sediment quality from the deposition of particulate matter resulting from the incomplete combustion of wastes from incineration,		6	5	5.5.2.6, 5.5.2.8	5-24, 5-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. Potential impacts to sediment quality in relation to other site waste management activities, including: the storage, handling, waste deposition in landfills, landfarming of contaminated soil or runoff, the management of historical contaminated material (e.g. previous spills, mishaps, releases), as well as sewage effluent discharges, and		6	5	5.5.2.2, 5.5.3.2, 5.5.4.2, 5.5.5	5-23, 5-28, 5-32 to 5-33, 5-35 to 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Potential impacts on sediment quality from construction and operation of camps.		6	5	5.5.2.1, 5.5.2.2, 5.5.2.7, 5.5.2.8, 5.5.3.1, 5.5.3.2, 5.5.3.7, 5.5.4.1, 5.5.4.2, 5.5.5	5-23 to 5-28, 5-31 to 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	*8.1.9 Freshwater Aquatic Environment*	For the purpose of the current Guidelines, freshwater aquatic environment includes aquatic ecology, aquatic biota (including representative fish as defined in the *Fisheries Act* , benthic invertebrates, and other aquatic organisms) and habitat including fish habitat as defined in the *Fisheries Act:*		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.9.1 Baseline Information	i. A description of the limnology, freshwater biota, presence of fish and other freshwater species, associated habitats and habitat distribution in the RSA and the LSA with emphasis on species that perform particularly significant ecological functions. This description should be based on the results of baseline information collected from studies, available published information and/or information resulting from community consultations,		6	6, 7	6.1.6, 6.1.7, 6.2.1, 7.1.6,7.1.7, 7.2.1	6-22 to 6-34, 6-35 to 6-41 7-15 to 7-24, 7-25 to7-31
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of the biological composition of freshwater aquatic environments in the LSA, including: trophic state, periphyton, phytoplankton, zooplankton, benthic invertebrates, fish, and the interactions and relative significance of each trophic level identified in the food chain,		6	6, 7	6.1.6, 6.1.7, 7.1.6, 7.1.7	6-22 to 6-34, 7-15 to 7-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Description and population distribution of fish species in the LSA with a focus on arctic char, lake trout, and arctic grayling, and other species identified as contributing to an Aboriginal, recreational or commercial fishery, as well as key forage fish for these species, and including baseline information on the abundance and distribution of these species,		6	7	7.1.1, 7.1.6, 7.1.7, 7.2.1	7-1 to 7-4, 7-15 to 7-24, 7-25 to 7-31
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Characterization of habitat requirements for each fish species, including areas used for spawning, rearing, feeding and over-wintering, and any sensitive times for these activities,		6	6, 7	6.1.1, 6.1.6, 6.1.7, 7.1.1	6-1, 6-22 to 6-34, 7-1 to 7-4
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Description of existing freshwater habitat in waterbodies and watercourses within the LSA including littoral zones, aquatic and riparian vegetation, lake bottom characteristics, key habitat areas (such as fish overwintering areas, spawning, migration corridors etc.) the estimated productive capacity, etc.,		6	3, 6	3.1, 6.1.6, 6.1.7	3-1 to 3-14, 6-22 to 6-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. An overview of fish species, populations, distributions and ecologies in the RSA, with emphasis on identified fish VECs and species with special designations (Species at Risk listed on Schedule 1 of the federal SARA and species with designations by the COSEWIC) or any populations of any rare or regionally unique fish species and habitats within both the LSA or RSA. This description should include reference to species having significant ecological functions, and/or importance for Inuit life and culture,		6	7	7.1, 7.2	7-1 to 7-32
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. The health of fish VEC indicator species populations and their contaminant loadings, and		6 8	7 5, 6	7.1.6, 7.1.7, 7.1.8 Appendix V8-5A, 6.1.4,6.4.1.11	7-15 to 7-25 All, 6-5 to 6-6, 6-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. A discussion of any other issues relating to freshwater aquatic species or habitat identified through public consultation.		3 6	1 6, 7	1.6.1, 1.6.3, 1.6.3.3 6.5.3, 6.8, 6.9, 7.5.3, 7.8, 7.9	1-36 to 1-37, 1-39 to 1-40, 1-41 to 1-42, 1-46 to 1-47 6-61 to 6-70, 6-71 to 6-74, 7-46 to 7-56, 7-57 to 7-61
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	*8.1.9.2 Impact Assessment*	The Proponent is required to present a comprehensive impact analysis for all Project components and activities, including its shipping activities, on the freshwater aquatic environment. This analysis should include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Potential impacts to fish, invertebrates, and freshwater habitat including potential impacts to water and sediment quality. Consideration should be given to impacts associated with the following: water withdrawals, discharge, redirection of natural flows, explosives use, nutrient and contaminant inputs, and sewage and grey water effluent discharge,	Yes	6 Addendum 6	1, 4, 5, 6, 7 4 6	1.5, 4.5, 5.5, 6.5, 7.5 6.4, Addendum Appendix V6-4C 6.6, Addendum Appendix V6-6F, Addendum Appendix V6-6G	1-41 to 1-55, 4-26 to 4-57, 5-14 to 5-36, 6-44 to 6-70, 7-34 to 7-56 6-10 to 6-15, All 6-16 to 6-27, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential direct or indirect effects on fish and invertebrate biota and habitat of both, including aquatic Species at Risk, from any changes to the aquatic or riparian environments, as a result of any in-water works or Project activities in close proximity to waterbodies,	Yes	6 Addendum 6	1, 4, 5, 6, 7 6	1.5, 4.5, 5.5, 6.5, 7.5 6.6, Addendum Appendix V6-6F, Addendum Appendix V6-6G	1-41 to 1-55, 4-26 to 4-57, 5-14 to 5-36, 6-44 to 6-70, 7-34 to 7-56 6-16 to 6-27, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential impacts to fish due to blasting in or near waterbodies, including noise and vibration impacts,		6	7	7.5.2.3, 7.5.3.3, 7.5.4, 7.5.5, 7.10	7-45, 7-54, 7-56, 7-56, 7-61
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts to fish and fish habitat from any infilling of lake, wetland or stream habitats associated with road construction(s),		6	6	6.5.2.1, 6.5.3.1, 6.5.4, 6.5.5, 6.6.2, 6.7, 6.10	6-48 to 6-59, 6-61 to 6-63, 6-70, 6-70, 6-70, 6-74

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts to freshwater fish, invertebrates and habitat from planned containment structures (e.g., sediment control structures and fuel containment structures) and potential accidental spills,		6 9	6 3	6.5.2.3, 6.5.3.3 3.3	6-59 to 6-60, 6-69 3-6 to 3-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential impacts on identified fish habitat critical for spawning, rearing, nursery and feeding, seasonal migration, winter refuges and migration corridors,	Yes	6 Addendum 6	6, 7 6	6.5.2.1, 6.5.2.2, 6.5.3.1, 6.5.3.2, 6.5.4, 6.5.5, 6.6.2, 6.7, 6.10, 7.5.2.1, 7.5.2.2, 7.5.3.1, 7.5.3.2, 7.5.4, 7.5.5, 7.6.2, 7.7, 7.10 6.6, Addendum Appendix V6-6F, Addendum Appendix V6-6G	6-48 to 6-59, 6-61 to 6-69, 6-70, 6-70, 6-74, 7-38 to 7-45, 7-56, 7-57, 7-61 6-16 to 6-27, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. An evaluation of the ability of fish to pass at water crossings along access roads taking into consideration periods of extreme low and extreme high stream flows,	Yes	6 Addendum 6	6 6	6.5.2.1, 6.5.3.1, 6.5.4, 6.5.5, 6.6.2, 6.7, 6.10 6.6, Addendum Appendix V6-6F, Addendum Appendix V6-6G	6-48 to 6-59, 6-61 to 6-63, 6-70, 6-70, 6-70, 6-74 6-16 to 6-27, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential impacts to fish health, distributions and populations especially taking in to consideration contamination and fugitive dust and potential impact to human health due to consumption of these fish,		6 8	7 5, 6	7.5.2, 7.5.3, 7.5.4, 7.5.5, 7.6.2, 7.7, 7.10 5.5.2.2, 5.5.4, 6.4.2.9.4	7-37 to 7-56, 7-56, 7-57, 7-61 5-29 to 5-30, 5-36 to 5-60, 6-132 to 6-163
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential impacts on contamination of traditional foods as a result of bioaccumulation, i.e. food chain uptake through air, water and soil, including a discussion of proposed monitoring,		6 8	7 5, 6	7.10 5.5, 5.8, 5.9, 6.4.1, 6.4.2, 6.4.4	7-61 5-23 to 5-61, 6-18 to 6-165, 6-177
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. Discussion of the management measures for minimizing/mitigation of disturbances to fish populations, including measures to reduce the potential for establishment of invasive species in the area,	Yes	6 Addendum 6	6, 7 6	6.5.3, 6.8, 7.5.3, 7.8 6.6, Addendum Appendix V6-6F, Addendum Appendix V6-6G	6-61 to 6-70, 6-71 to 6-74, 7-46 to 7-56, 7-57 to 7-60 6-16 to 6-27, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Environmental receptivity-including ecological, physical and/or climatic factors that influence exposure to harmful substances, and		6	4	4.5, 4.6	4-26 to 4-59
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xii. Quantitative assessment of the ecological risks to freshwater VECs from the potential elevated contaminant loadings as a result of the Project.		8	5, 6	5.5.4.2.2, 6.4.1.3.2, 6.4.1.4.1, 6.4.1.7.1, 6.4.1.7.2, 6.4.1.7.3, 6.4.1.7.4, 6.4.1.8, 6.4.1.9, 6.4.2.8, 6.4.2.9, 6.4.2.12	5-39 to 5-60, 6-21, 6-26, 6-36 to 6-73, 6-124 to 6-132, 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	*8.1.10 Vegetation*			-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.10.1 Baseline Information	i. A description of ecological zones, and other relevant classifications of plant associations and phenologies in the LSA,		5	4	4.1	4-1 to 4-18
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of the vegetation/plant types in the LSA, including estimated percentage cover and height for principal species, with a discussion on their particular significant ecological functions and/or their importance to wildlife and humans,		5	4	4.1	4-1 to 4-18
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. An overview of vegetation species, populations, distributions and ecologies in the RSA, with emphasis on identified vegetation VECs and species with special designations (Species at Risk listed on Schedule 1 of the federal SARA and species with designations by the COSEWIC). This description should include reference to species having significant ecological functions, and/or importance for Inuit life and culture including TK collected related to plants and plant use in the RSA,		5 8	4, 5 5	4.1, Appendix V5-4A, Appendix V5-5A 5.1.1, 5.5.2.3, 5.5.4.3	4-1 to 4-18, All, All 5-2 to 5-4, 5-30, 5-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Details regarding associations between vegetation cover types and soil types in the LSA,		5 8	4, 5 5	4.1, 4.2, 4.3, Appendix V5-4A, Appendix V5-5A 5.1.1, 5.5.2.3, 5.5.4.3	4-1 to 4-26, All, All 5-2 to 5-4, 5-30, 5-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. A presentation of available published information and/or information resulting from TK studies regarding identified VECs,		5	4	4.1, Appendix V5-4A	4-1 to 4-18, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. A discussion of the health status of plant species or communities in the LSA, including baseline information on contaminant levels (including metals) in representative species consumed by wildlife and/or humans, either directly (humans eating plants) or indirectly (humans consuming wildlife), and other vegetation that reflects sensitivity to contaminants or environmental pathways of exposure and biomagnification, and		5	4	4.1, 4.2	4-1 to 4-19
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Any other issues related to vegetation as identified through public consultation.		3 5 8	1 4 5, 6	1.6.1, 1.6.3, 1.6.3.3 4.1 5.1, Appendix V8-5A, 6.1, 6.4.1, 6.4.2	1-36 to 1-37, 1-39 to 1-40, 1-41 to 1-42, 1-46 to 1-47 4-1 to 4-18 5-1 to 5-15, All, 6-1 to 6-13, 6-18 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	*8.1.10.2 Impact Assessment*	The Proponent is required to present a comprehensive impact analysis for all Project components and activities, including its ground and marine based transportation activities, on vegetation. This analysis should include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Potential impacts to abundance and diversity of vegetation due to Project activities,		5	4	4.5	4-26 to 4-55
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential impacts to specific vegetation coverage and species composition from construction, operation, and reclamation activities in the Project area,		5	4	4.5	4-26 to 4-55
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. An assessment of the potential loss, disturbance, and/or changes to vegetation abundance, diversity, and forage quality as a result of Project components and activities, including potential effects from airborne fugitive dust fall, airborne contaminants from emission sources, and changes to water quality and quantity, permafrost, or snow accumulation,		4 8	5 6	4.5 6.1, 6.4.1	4-26 to 4-55 6-2 to 6-13, 6-18 to 6-95

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts on vegetation abundance and diversity from the transfer/introduction of invasive or exotic species into the LSA via Project equipment and vehicles, including aircraft and marine vessels,		5	4	4.5.2.2	4-29 to 4-30
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts on vegetation quality due to soil erosion, structural soil changes, soil contamination, and fugitive dust and gaseous air emissions from mining, milling and waste management activities,		4 8	5 6	4.5.2.2 6.1, 6.4.1	4-29 to 4-31 6-2 to 6-13, 6-18 to 6-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. A discussion of proposed vegetation monitoring, specifically contaminant levels in species directly consumed by wildlife (e.g. lichen) and/or humans (e.g. Labrador tea, blueberries) and/or indirectly consumed through food consumption (i.e. caribou),		5 8	4 6	4.5.2.2., 4.5.4.2 6.4.2	4-29 to 4-31, 4-50 6-95 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. A discussion of the management measures for minimizing/mitigation of disturbances to plant associations, including progressive reclamation/re-vegetation plans for disturbed areas, and measures to reduce the potential for establishment of invasive species in the area,		2 5	8 4	8 4.5.3, 4.8	All 4-30 to 4-32, 4-62 to 4-63
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential impacts on contamination of traditional foods as a result of bioaccumulation, i.e. food chain uptake through air, water and soil,		8	5, 6	5.1, Appendix V8-5A, 6.1, 6.4.1, 6.4.2	5-1 to 5-15, All, 6-1 to 6-13, 6-18 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential impact from the loss or alteration of habitat (i.e. vegetation) due to pollutants and noise and its effects on wildlife, wildlife calving grounds and marine habitat, and		5 7	4, 5, 6, 7, 8, 9, 10 6, 7	4.5.2.1, 4.5.2.2, 4.5.3, 5.5.2.1, 5.5.2.2, 6.5.2.1, 6.5.2.2, 7.5.2.1, 7.5.2.2, 8.5.2.1, 8.5.2.2, 9.5.2.1, 9.5.2.2, 10.5.2.1, 10.5.2.2 6.5.2.1, 6.5.2.2, 7.5.2.1, 7.5.2.2	4-28 to 4-32. 5-136 to 5-162, 6-43 to 6-55, 7-25 to 7-40, 8-40 to 8-58, 9-36 to 9-47, 10-27 to 10-41 6-26 to 6-33, 7-20 to 7-28
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. A discussion of the potential of invasive vegetative species (weedy species) from shipping along the shore line and from transportation along the all-weather road.		5	4	4.5.2.2	4-29 to 4-30
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.11 Terrestrial Wildlife and Wildlife Habitat	For the purpose of the current Guidelines, terrestrial wildlife and wildlife habitat includes representative terrestrial mammals including: caribou (including habitat, migration, and behaviour), muskoxen, wolverine, polar bears, brown bears (including brown and grizzly bears), wolves and less conspicuous species that may be maximally exposed to contaminants, and wildlife migration routes and crossings.		5	5, 6, 7, 8	All, Appendices V5-5A, V5-5B, V5-5C, V5-5D, V5-5E, V5-6A	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.11.1 Baseline Information	i. A description of wildlife populations, distributions and ecologies in the RSA, with emphasis on identified wildlife VECs and species with special designations (Species at Risk listed on Schedule 1 of the federal SARA and species with designations by the COSEWIC). This description should include reference to species having significant ecological functions, and/or of importance for Inuit life and culture,	Yes	5 Addendum 5	5, 6, 7, 8 5	5.1, 5.2, 6.1, 6.2, 7.1, 7.2, 8.1, 8.2 5.5	5-1 to 5-125, 6-1 to 6-33, 7-1 to 7-16, 8-1 to 8-30 5-21 to 5-59
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. A description of biodiversity within the RSA, and associated food chain relationships among terrestrial wildlife species,		5	5, 6, 7, 8	5.1.2.4, 5.1.3.4, 6.1.4, 7.1.4, 8.1.4	5-19 to 5-21, 5-91 to 5-92, 6-4 to 6-9, 7-3, 8-6 to 8-8
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Presentation of available published information and/or information resulting from TK studies regarding identified VECs, including: the relative seasonal and annual trends in abundance and distributions, the estimated productive capacity, migratory patterns and associated corridors/routes, critical habitats on or in LSA and RSA, and sensitive periods,		5	5, 6, 7, 8	5.1, 6.1, 7.1, 8.1	5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. A description of the population health of identified VECs, with a discussion of contaminant loadings in representative species important to Inuit as a food source, such as caribou,		5 7 8	5, 6, 7, 8, 9, 10 6, 7 5, 6	5.1.2.3, 5.1.3.3, 6.1.2, 7.1.2, 8.1.2, 9.1.2, 10.1.2 6.1.2, 7.1.2 5.1.1, 5.1.2, 5.1.3, Appendix V8-5A, 6.1, 6.4.1, 6.4.2, 6.4.4	5-17, 5-59, 6-1 to 6-3, 7-1 to 7-2, 8-1 to 8-3, 9-1 to 9-2, 10-1 to 10-2 6-1 to 6-2, 7-1 to 7-2 5.2 to 5.6, All, 6-2 to 6-13, 6-18 to 6-95, 6-95 to 6-165, 6-177 to 6-178
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Details regarding habitats within the LSA which are important for forage, shelter and reproduction of wildlife VECs, including terrestrial and aquatic habitats (e.g. sea ice, freshwater and marine waters),		5	5, 6, 7, 8	5.1.2.4, 5.1.3.4, Appendix V5-5A, 6.1.4, 7.1.4, 8.1.4	5-19 to 5-21, 5-91 to 5-92, All, All, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Identification of key wildlife habitats in the LSA and RSA as applicable, including: National Parks, Critical Wildlife Areas, Territorial Parks and other areas with legislated protection, eskers, caribou calving and nursing areas, denning sites, staging areas, and special locations as salt licks, insect relief habitats, and areas used by females and their young. Related discussion should also include migration routes, water course crossings, travel corridors and areas important for Inuit harvesting,		5	5 , 6 ,7, 8	5.1, 6.1.3 to 6.1.5, 7.1.3 to 7.1.5, 8.1.3 to 8.1.5	5-1 to 5-122, 6-3 to 6-22, 7-2 to 7-14, 8-5 to 8-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Identification of habitats of any rare or sensitive species, such as Species at Risk, or those with similar designations or federal and territorial status,		5	5, 6, 7, 8	5.1.2.4, 5.1.2.5, 5.1.3.4, 5.1.3.5, 5.1.4.4, 6.1.4, 6.1,5, 7.1.4, 7.1.5, 8.1.4, 8.1.5	5-19 to 5-82, 5-91 to 5-109, 5-121 to 5-122, 6-4 to 6-22, 7-3 to 7-14, 8-6 to 8-15
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. A description of the migratory patterns and routes of terrestrial wildlife VECs and the corresponding periods when these routes would be affected by the Project,		5	5, 6, 7, 8	5.1.2.2, 5.1.3.2, 5.1.4.2, 6.1.3, 7.1.3, 8.1.3	5-3 to 5-15, 5-82 to 5-91, 5-110 to 5-116 6-3 to 6-4, 7-2 to 7-3, 8-5 to 8-6
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Discussion of the relative health of VEC populations, including contaminant loading in representative wildlife VEC species (i.e. caribou),		8	5, 6	Appendix V8-5A, 6.1, 6.4.1, 6.4.2, 6.4.4	All, 6-2 to 6-13, 6-18 to 6-95, 6-95 to 6-165, 6-177 to 6-178
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. A description of the distribution and population levels of caribou in the RSA and LSA. Consideration should be given to the cyclic nature of caribou as well as the shifts in annual caribou ranges over time, with baseline information collection covering appropriate temporal and spatial scales for an accurate understanding of current population health,		5	5	5.1.2, 5.1.3, 5.1.4	5-3 to 5-122

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Details regarding available information on potential impacts to wildlife associated with noise, vibrations, and dust and dust deposition from relevant scientific research and TK, and	Yes	3 5 Addendum 5 Addendum 10	1, 3 5, 6, 7, 8 5 20	1.6.3.3, Appendices V3-1C, V3-1G, V3-3B, V3-3C 5.5.2.1, 5.5.2.2, 6.5.2.1, 6.5.2.2, 7.5.2.1, 7.5.2.2, 8.5.2.1, 8.5.2.2 5.5 7.1.5.8	1-46 to 1-47, All 5-136 to 5-162, 6-43 to 6-55, 7-25 to 7-40, 8-40 to 8-58 5-21 to 5-59 7-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xii. Discussion of other pertinent issues as identified through public consultation.		3 5	1 5	1.6 5.5.3, 5.8, 5.9	1-36 to 1-48 5-187 to 5-191, 5-242 to 5-249
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.11.2 Impact Assessment	The Proponent is required to present a comprehensive impact analysis for all Project components and activities, including its shipping activities, on terrestrial wildlife and wildlife habitat. This analysis should include the following:		5	5, 6, 7, 8	5.5, 6.5, 7.5, 8.5	5-131 to 5-197, 6-37 to 6-69, 7-18 to 7-50, 8-32 to 8-70
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Potential general impacts on terrestrial wildlife in the LSA, including: interference with migratory routes, alienation from important habitat (e.g. denning sites, calving and post- calving areas), habitat fragmentation and general disturbance or disruption caused by Project activities,		5	5, 6, 7, 8	5.5.2.2, 5.5.2.3, 6.5.2.2, 6.5.2.3, 7.5.2.2, 7.5.2.3, 8.5.2.2, 8.5.2.3	5-148 to 5-166, 6-47 to 6-56, 7-30 to 7-41, 8-43 to 8-59
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential impacts on population size, abundance, distribution and behaviour of wildlife VECs from:		5 8	5, 6, 7, 8 6	5.5, 6.5, 7.5, 8.5 6.4.1.8, 6.4.1.9, 6.4.1.10, 6.4.1.11	5-131 to 5-197, 6-37 to 6-69, 7-18 to 7-50, 8-32 to 8-70 6-58 to 6-94
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Direct and indirect loss of habitat from the presence of and use of infrastructure, the conduct of project activities and associated sensory disturbances,		5	5, 6, 7, 8	5.5.2.1, 5.5.2.2, 6.5.2.1, 6.5.2.2, 7.5.2.1, 7.5.2.2, 8.5.2.1, 8.5.2.2	5-136 to 5-162, 6-43 to 6-55, 7-25 to 7-40, 8-40 to 8-58
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Direct and indirect impacts from potential degraded water quality and ground contamination, as well as airborne contaminants resulting from project facilities and associated activities,		5 8	5, 6, 7, 8 6	5.5.2.7, 6.5.2.7, 7.5.2.7,8.5.2.7 6.4.1.8, 6.4.1.9, 6.4.1.10, 6.4.1.11	5-170, 6-58 to 6-59, 7-42, 8-60 to 8-61 6-58 to 6-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Direct and indirect impacts from potential ice-breaking (prior to spring break-up or following fall freeze-up) associated with shipping activities, and ice management at the port/dock facility,		2 10	6 15	6.3.3 4.1.1, 4.3.1,	6-4 to 6-5 7, 7 to 8
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Direct and indirect impacts from climate change, and		4 5	3 5, 6,7, 8	4.1.1, 4.3.1,	3-34 to 3-37 5-170 to 5-187, 6-66 to 6-67, 7-47 to 7-48, 8-91 to 8-92
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Where relevant, the Proponent shall take into account the alteration of normal behaviour or patterns and provide any associated outcomes for overall energy balance for the relevant VEC,		5	5, 6, 7, 8	5.5.2.8, 6.5.2.8, 7.5.2.8, 8.5.2.8	5-170 to 5-187, 6-59 to 6-61, 7-42 to 7-43, 8-61 to 8-62
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential impacts on wildlife from ground traffic and air traffic disturbance, particularly low level flights (i.e. lower than 610 metres) during critical periods (caribou calving and post-calving). For this impact assessment, a delineated flight impact zone could be useful in determining the potential impact of flights on wildlife, with a particular focus on critical life cycle periods and planned air traffic volume and routes,		5	5, 6, 7, 8	5.5.2.2, 6.5.2.2, 7.5.2.2, 8.5.2.2	5-148 to 5-162, 6-47 to 6-55, 7-30 to 7-40, 8-43 to 8-58
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts on wildlife from injury or mortality caused by Project activities, particularly the use of the all-weather road, mine hauling roads and other access roads, as well as intentional killing of wildlife to defend human life or property by mine personnel,		5	5, 6, 7, 8	5.5.2.4, 5.5.2.5, 5.5.2.6, 6.5.2.4, 6.5.2.5, 6.5.2.6, 7.5.2.4, 7.5.2.5, 7.5.2.6, 8.5.2.4, 8.5.2.5, 8.5.2.6	5-166 to 5-170, 6-56 to 6-58, 7-41 to 7-42, 8-59 to 8-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts on wildlife from increased hunting pressure resulting from improved access due to Project infrastructure,		5 8	5, 6, 7, 8 4	5.5.2.5, 6.5.2.5, 7.5.2.5, 8.5.2.5 4.7.2.1	5-168 to 5-169, 6-56, 7-41 to 7-42, 8-59 to 8-60 4-80 to 4-81
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential impacts of noise and vibration on wildlife from drilling, blasting and other activities as results of Project construction and operation,		5 Addendum 5 Addendum 10	5, 6, 7, 8 5 20	5.5.2.2, 6.5.2.2, 7.5.2.2, 8.5.2.2 5.5 7.1.5.8	5-148 to 5-162, 6-47 to 6-55, 7-30 to 7-40, 8-43 to 8-58 5-21 to 5-59 7-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Assessment of the potential for Project activities to act as an attractant to wildlife species, and associated effect/changes to behaviour and condition,		5	5, 6, 7, 8	5.5.2.6, 6.5.2.6, 7.5.2.6, 8.5.2.6	5-169 to 5-170, 6-56 to 6-58, 7-42, 8-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Evaluation of the potential for contaminants to be released into the environment as a result of the Project and to be taken up by VEC species,		5 8	5, 6, 7, 8 6	5.5.2.7, 6.5.2.7, 7.5.2.7, 8.5.2.7 6.4.1.7	5-170, 6-58 to 6-59, 7-42, 8-60 to 8-61 6-36 to 6-58
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential impacts of contamination to sources of traditional food (including those trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes) as a result of bioaccumulation (i.e. food chain uptake through air, water and soil) as well as any proposed monitoring methods to track these potential impacts,		5 8	5, 6, 7, 8 5 6	5.5.2.7, 6.5.2.7, 7.5.2.7, 8.5.2.7 5.5.2, 5.5.4, 5.8 6.4.1, 6.4.2	5-170, 6-58 to 6-59, 7-42, 8-60 to 8-61 5-25 to 5-30, 5-36 to 5-61, 5-61 6-18 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. List of all potential contaminants and a determination of whether possible uptake of these contaminants into country foods will result from project activities.		8	6	6.4.1.7, 6.4.1.9, 6.4.2.7, 6.4.2.9	6-36 to 6-58, 6-73 to 6-94, 6-104 to 6-124, 6-132 to 6-163
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Potential impacts from the loss or alteration of habitat (i.e. vegetation) due to pollutants and noise and any ancillary effects, and		5 Addendum 5	4, 5, 6, 7, 8 5	4.5.2, 5.5.2.1, 5.5.2.2, 6.5.2.1, 6.5.2.2, 7.5.2.1, 7.5.2.2, 8.5.2.1, 8.5.2.2 5.5	4-28 to 4-30, 5-136 to 5-162, 6-43 to 6-55, 7-25 to 7-40, 8-40 to 8-58 5-21 to 5-59
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xii. Evaluation of the relative health and potential for chemical toxicity for inherently sensitive wildlife species based on an analysis of exposure pathways and demographic parameters.		5 8	5, 6, 7, 8 6	5.5.2.7, 6.5.2.7, 7.5.2.7, 8.5.2.7 6.4.1.7, 6.4.1.10, 6.4.1.11, 6.4.2.7, 6.4.2.12	5-170, 6-58 to 6-59, 7-42, 8-60 to 8-61 6-36 to 6-58, 6-94 to 6-95, 6-104 to 6-124, 6-125
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.12 Birds and Bird Habitat	For the purpose of the current Guidelines, discussion relating to birds shall include raptors, migratory birds, marine birds and the associated habitat of each.		5 7	9, 10 6	All	All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.12.1 Baseline Information	i. An overview of bird species, populations, distributions and ecologies in the RSA, with emphasis on identified bird VECs and species with special designations (Species at Risk listed on Schedule 1 of the federal SARA and species with designations by the COSEWIC). This description should include reference to species having significant ecological functions, and/or importance for Inuit life and culture,		5 7	9, 10 6	9.1, 10.1 6.1	9-1 to 9-25, 10-1 to 10-15 6-1 to 6-15
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Description of current habitat use by VECs, including the use of Migratory Bird Sanctuaries, Key Migratory Bird Sites, Territorial Parks and other important habitats (e.g. breeding, nesting sites, staging areas) in the RSA and along the proposed shipping routes,		5 7	9, 10 6	9.1,10.1 6.1, 6.11	9-1 to 9-25,10-1 to 10-15 6-1 to 6-15, 6-55 to 6-62
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Description of the relative seasonal/annual abundances, distributions and trends in range or habitat use, movements and population status of bird VECs, including but not limited to population abundance, reproductive success, mortality rates, density, diversity, etc.,		5 7	9,10 6	9.1,10.1 6.1, 6.11	9-1 to 9-25, 10-1 to 10-15 6-1 to 6-15, 6-55 to 6-62
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Description of migratory patterns and routes of VECs potentially impacted by the Project, with a discussion of corresponding sensitive periods, and		5 7	9,10 6	9.1.4, 9.1.5,10.1.4, 10.1.5 6.1.4, 6.1.5, 6.11	9-4 to 9-25,10-3- to 10-15 6-1 to 6-15, 6-55 to 6-62
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Identification of key migratory bird sites along the shipping route, including those which could potentially be affected by marine spills as a result of current and/or wind patterns.		7 9	6 3	6.1, 6.11 Appendix V9-3A	6-1 to 6-13, 6-51 to 6-57 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.12.2 Impact Assessment	The Proponent is required to present a comprehensive impact analysis for all Project components and activities, including its shipping activities, on birds. This analysis should include the following:		5 7	9, 10 6	9.5, 10.5 6.5	9-30 to 9-55, 10-22 to 10-51 6-30 to 6-39
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Description of the potential loss, alteration or isolation of habitat (e.g. staging and nesting habitats) as a result of the Project development. Special consideration should be given to Species at Risk listed on Schedule 1 of the federal SARA, species with designations by the COSEWIC, species having significant ecological functions or importance for Inuit life and culture,		5 7	9, 10 6	9.5.2, 10.5.2 6.5.2	9-35 to 9-51, 10-25 to 10-46 6-25 to 6-36
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential disruption or alteration of migration routes due to Project phases or activities,		5	9, 10	9.5.2.3, 10.5.2.3	9-47, 10-41
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Where relevant, the Proponent shall account for alteration of normal behaviour or patterns and provide any associated outcomes for overall energy balance for the relevant VEC,		5 7	9, 10 6	9.5.2.8,10.5.2.8 6.5.2	9-51, 10-45 to 10-46 6-25 to 6-36
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts on birds and bird habitat use from air contamination, vegetation contamination, ground contaminants or degraded water quality,		5 7 8	9, 10 6 6	9.5.2.7,10.5.2.7 6.5.2.5 6.4.1.7, 6.4.1.11	9-51,10-45 6-34 to 6-36 6-36 to 6-58, 6-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential disturbances to birds from noise and vibrations as a result of blasting, and land and marine transportation,		5 7	9, 10 6	9.5.2.2,10.5.2.2 6.5.2.2	9-40 to 9-47, 10-29 to 10-41 6-27 to 6-33
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential impact from pre-determined Flight Impact Zones, and potential for collision with aircraft,		5 7	9, 10 6	9.5.2.2, 9.5.2.4, 10.5.2.2, 10.5.2.4 6.5.2.2, 6.5.2.3	9-40 to 9-47, 10-29 to 10-43 6-27 to 6-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Potential for Project facilities to attract wildlife such as polar bear, brown and grizzly bear, wolverine, foxes, ravens and gulls that may prey upon migratory birds and resulting impacts on the migratory bird populations,		5	9, 10	9.5.2.5, 10.5.2.5	9-49 to 9-50, 10-43
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential attraction of birds and other scavengers/predators by domestic waste at camp sites,		5	9, 10	9.5.2.6, 10.5.2.6	9-50 to 9-51, 10-43 to 10-45
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential attraction of birds to Project facilities and infrastructure for roosting and nesting sites,		5	9, 10	9.5.2.6,10.5.2.6	9-50 to 9-51, 10-43 to 10-45
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. Potential for bird mortality due to collisions with tall structures, overhead wires or guy wires,		5	9, 10	9.5.2.4, 10.5.2.4	9-47 to 9-49, 10-41 to 10-43
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xi. Potential effects of shipping on coastal and marine birds and habitat, as well as potential disturbance on key migratory bird habitat areas and sanctuaries in proximity to shipping routes in the NSA,		7	6	6.5.2.2, 6.11	6-27 to 6-33, 6-55 o 6-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xii. Incidental spills, malfunctions and other accidents associated with shipping operations and potential impacts to marine birds,		9	3	3.3, Appendix V9-3A	3-6 to 3-20, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xiii. Potential interactions, accidental injuries and mortality of marine birds directly or indirectly from proposed shipping (open water and potential ice breaking during break-up in the spring and freeze-up in the fall) activities, in particular those marine birds which congregate in areas where the shipping routes would pass through,		7	6	6.5.2.2, 6.5.2.3, 6.5.2.4, 6.5.2.5	6-27 to 6-36
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xiv. Potential direct and indirect effects on marine bird behaviour, distribution, abundance, migration patterns, species health and reproduction from marine shipping,		7	6	6.5.2.2, 6.5.2.3, 6.5.2.4, 6.5.2.5	6-27 to 6-36
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xv. Evaluation of the potential for contaminants to be released to the environment from marine shipping and taken up by marine bird VECs as a result of the Project,		7 8	2, 6 6	2.5.2, 6.5.2.5 6.4.1.7, 6.4.1.8, 6.4.1.9, 6.4.1.10	2-20 to 2-26, 6-34 to 6-36 6-36 to 6-94

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xvi. Assessment of potential cumulative effects on marine bird VECs resulting from escalated marine traffic in the RSA over the mining lifecycle, including the potentially extended minimum operation period. Consideration should be given to the possible significant increase of marine vessel traffic along shipping routes,		7	6	6.6.2.1	6-41 to 6-42
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xvii. Potential impacts of contaminant bioaccumulation via food chain uptake through air, water and soil, including specific impacts to traditional food sources including potential monitoring methods to track the progress of this potential impact, and		5 7 8	9, 10 6 5, 6	9.5.2.7, 10.5.2.7 6.5.2.5 5.5.2.2.3, 5.5.4.2.4, 5.5.4.2.5, 5.5.4.3, 5.8, 6.4.1.7.1 to 6.4.1.7.4, 6.4.1.8.6, 6.4.1.9.5, 6.4.1.11, 6.4.2.7.1 to 6.4.2.7.4, 6.4.2.8.5, 6.4.2.9.4, 6.4.2.11	9-51, 10-45 6-34 5-25 to 5-29, 5-34 to 5-35, 6-36 to 6-58, 6-58 to 6-73, 6-73 to 6-95, 6-95, 6-100 to 6-104, 6-124 to 6-132, 6-132 to 6-163, 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		xviii. Potential impacts from the loss or alteration of habitat (i.e. vegetation) due to pollutants and noise and its effects on bird and bird habitat.		5 7 8	4, 9, 10 6 6	4.3.2.1, 4.3.2.2, 4.5.2.2, 9.5.2.1, 9.5.2.2, 10.5.2.1, 10.5.2.2 6.5.2.1 6.4.1.7.1 to 6.4.1.7.4, 6.4.3.7, 6.4.3.10.1, 6.4.3.11.1	4-21 to 4-25, 4-29 to 4-30, 9-36 to 9-47, 10-27 to 10-41 6-26 to 6-27 6-36 to 6-58, 6-167, 6-172, 6-175 to 6-177
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.13 Marine Environment	For the purposes of the current Guidelines, the marine environment shall include marine ecology, marine water and sediment quality, and marine biota including fish, Species at Risk, and marine habitat.		7	All	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.13.1 Baseline Information	i. Description of marine physical processes and currents including the costal environment, biological diversity and composition, and associated interactions in the LSA and RSA, including the proposed shipping route(s) within the NSA,		7	1, 4, 5, 6, 7	All, 4.1, 5.1, 6.1, 6.11, 7.1, 7.11	All, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 6-55 to 6-60, 7-1 to 7-5, 7-42 to 7-49
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Data on seasonal ice cover including timing of ice freeze-up and break-up for the proposed shipping routes,		7	1	1.1.4, 1.1.5	1-10 to 1-27
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Presentation of available bathymetric information along the proposed shipping route(s),		7 9	1 3	1.1 (Figure 1.1-1) Appendix V9-3A	1-1 to 1-31 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Identification of sensitive habitat areas for marine fish, anadromous fish and marine mammals along the shipping route(s), and		7	4, 5, 7	4.1, 4.2, 5.1, 5.2, 7.1, 7.2, 7.11	4-1 to 4-37, 5-1 to 5-20,7-1 to 7-11, 7-42 to 7-49
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Presentation of TK collected related to coastal areas and ice conditions.		3 7	1, 3 1, 4, 5, 6, 7	Appendices V3-1C, V3-1G, V3-3A, V3-3B 1.2, 4.2, 5.2, 6.2, 7.2	All, All, All, All 1-31 to 1-32, 4-30 to 4-37, 5-11 to 5-20, 6-15 to 6-18, 7-9 to 7-11
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	*8.1.13.2 Impact Assessment*	The Proponent is required to present an impact analysis that gives consideration to the potential for Project shipping activities to impact the marine environment. This analysis shall include the following:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Potential risks and impacts to the marine ecosystem through the introduction of exotic species, including pathogens, through seasonal shipping,		7	5	5.5.2.2, 5.5.3.2, 5.5.4, 5.5.5, 5.6.2, 5.6.5, 5.7, 5.10	5-28 to 5-29, 5-30 to 5-31, 5-31 to 5-32, 5-32, 5-34, 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential impacts on marine water quality from accidental spills of fuel and chemicals along the shipping routes and from the accidental grounding/stranding of marine vessels along the shipping routes,		9	3	Appendix V9-3A	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential impacts on marine water quality and sediment quality from discharges of Project waste water treatment plants. A solute transport model based on numerical flow modelling should be used for water quality predictions and appropriate models selected, with rationale, to predict:		7	2, 3	2.5.2.6, 2.5.3.6, 3.5.2.6, 3.5.3.5	2-26, 2-33 to 2-34, 3-22, 3-26 to 3-27
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Water quality discharged to the environment, and		7	2	2.5	2-16 to 2-39
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		o Dispersion, dilution and assimilation of effluent discharged to the environment,		7 10	2 7	2.5 All	2-16 to 2-39 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. An assessment of the effects of Project activities (i.e. effluent discharge, accommodation barge, loading docks, etc.) on fish and fish habitat of Bathurst Inlet,		7	4, 5	4.5, 5.5	4-40 to 4-50, 5-22 to 5-32
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts of wake effects from shipping on the shoreline stability and sensitive fish or marine mammal habitat (i.e. coastal wetlands),		7	2, 3, 4, 5	2.5.2.1, 2.5.3.1, 2.5.4.1, 3.5.2.1, 3.5.3.1, 3.5.4.1, 4.5.2.2, 4.5.3.2, 4.5.4, 4.6.2, 4.7, 4.10, 5.5.2.2, 5.5.3.2, 5.5.4, 5.5.5, 5.6.2, 5.6.5, 5.7, 5.10	2-23, 2-27, 2-33, 3-20, 3-23, 3-27, 4-46, 4-49, 4-49, 4-50, 5-28 to 5-29, 5-30 to 5-31, 5-31 to 5-32, 5-34, 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential impacts on sedimentation patterns and subsequent impacts on subsea permafrost in the nearshore region,		7	3	3.5.4.2	3-28
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Potential impacts of sedimentation from propeller wash on water quality, fish and fish habitat and, benthic invertebrates,		7	2, 4, 5	2.5.2.1, 2.5.3.1, 2.5.4.1, 2.5.5 4.5.2.2, 4.5.3.2, 4.5.4, 4.6.2, 4.7, 4.10, 5.5.2.2, 5.5.3.2, 5.5.4, 5.5.5, 5.6.2, 5.6.5, 5.7, 5.10	2-23, 2-27 to 2-30, 2-33 to 2-36, 2-39, 4-46, 4-49, 4-49, 4-50, 4-52, 4-54, 5-28 to 5-29, 5-30 to 5-31, 5-31 to 5-32, 5-32, 5-34, 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Potential impacts of ballast water discharge on water quality, fish and fish habitat, benthic invertebrates including cumulative impacts over the life of the Project,		7	2, 5	2.5.2.1, 5.5.2.2, 5.5.3.2, 5.5.4, 5.5.5, 5.6.2, 5.6.5, 5.7, 5.10	2-23 to 2-24, 5-28 to 5-29, 5-30 to 5-31, 5-31 to 5-32, 5-32, 5-34, 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ix. Potential impact on marine environment and bio-accumulation in marine food chains, in particular on benthic organisms, from antifouling toxins (e.g. tributyltin) leaching from marine vessels, and		7	2, 3, 4, 5	2.5.2.1, 2.5.3.1, 3.5.2.1, 3.5.3.1, 4.5.2.1, 4.5.3.1, 5.3.2, 5.5.2, 5.10	2-23, 2-27 to 2-30, 3-20, 3-23, 4-44, 4-46, 5-21, 5-25 to 5-29, 5-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		x. Potential impacts of climate change and sea level change on Project elements.		9	2	2.10, 2.11, 2.12, 2.13, ,2.14, 2.15, 2.16	2-14 to 2-19
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	*8.1.14 Marine Wildlife*			-	-	-	-

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.14.1 Baseline Information	i. A description of marine wildlife populations, distributions and ecologies in the RSA, with emphasis on identified marine wildlife VECs and species with special designations (Species at Risk listed on Schedule 1 of the federal SARA and species with designations by the COSEWIC). This description should include reference to species having significant ecological functions, and/or of importance for Inuit life and culture,		7	6, 7	6.1, 6.11, 7.1, 7.11	6-1 to 6-15, 6-55 to 6-62, 7-1 to 7-9, 7-42 to 7-48
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Characterization of marine wildlife habitat in the LSA, including habitat used by VECs for feeding, calving, nursing, over-wintering, and other critical activities, and		7	6, 7	6.1, 6.11, 7.1, 7.11	6-1 to 6-15, 6-55 to 6-62, 7-1 to 7-9, 7-42 to 7-48
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Identification of marine wildlife species, historical and current habitats, distribution, seasonal migration patterns, critical areas (i.e. feeding, calving, over wintering, etc.), and potential interactions with shipping activities.		7	6, 7	6.1, 6.11, 7.1, 7.11	6-1 to 6-15, 6-55 to 6-62, 7-1 to 7-9, 7-42 to 7-48
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT	8.1.14.2 Impact Assessment	The Proponent is required to present an impact analysis that gives consideration to the potential for Project shipping activities to impact the marine wildlife. The Proponent shall, where any impact to marine wildlife is identified, indicate the cultural or practical importance of that species to northerners. In addition, the analysis shall include the following:		7	6, 7	6.5.2, 7.5.2	6-25 to 6-36, 7-18 to 7-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		i. Potential loss to or deterioration in the habitat of marine wildlife VECs due to shipping route(s). Special consideration should be given to Species at Risk listed on Schedule 1 of the federal SARA, species with designations by the COSEWIC, species having significant ecological functions, and/or of importance for Inuit life and culture,		7	6, 7	6.5.2.1, 6.5.2.2, 7.5.2.1, 7.5.2.2	6-26 to 6-33, 7-20 to 7-28
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential direct and indirect impacts to marine wildlife, marine fish and marine habitat from marine shipping activities including increased noise levels,	Yes	7 ~~10~~ 10 Addendum 10	6, 7 ~~6~~ ~~7.4~~ ~~15~~ ~~11~~ 15 6	6.5.2.2, 7.5.2.2 ~~7.4~~ ~~11~~ 11 9.4	6-27 to 6-33, 7-22 to 7-28 ~~22 to 23~~ ~~19 to 20~~ 19 to 20 9-6 to 9-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential spills, malfunctions and other accidents associated with shipping operations and any resulting impacts to marine wildlife, marine habitat and marine fish,		9	3	3.3.1, 3.3.2, 3.3.3, 3.4.5, Appendix V9-3A	3-6 to 3-8, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		iv. Risk assessment of the potential introduction of non-native aquatic species due to ballast water discharge, ship wash and hull fouling,		7 8	5 6	5.5.2, 5.5.3.2, 5.5.4, 5.5.5, 5.6, 5.7, 5.10 6.4.1.10	5-25 to 5-29, 5-30, 5-31 to 5-32, 5-32 to 5-34, 5-37 6-94 to 6-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential interactions, accidental injuries and mortality of marine wildlife directly or indirectly from proposed shipping (open water and potential ice breaking during break-up in the spring and following freeze-up in the fall) activities, in particular those marine wildlife which congregate in areas where the shipping routes would pass through,		7	6, 7	6.5.2.3, 6.5.2.6, 7.5.2.2, 7.5.2.3, 7.5.2.6	6-33 to 6-34, 7-22 to 7-28, 7-33 to 7-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vi. Potential direct and indirect effects on marine wildlife behaviour, distribution, abundance, migration patterns, species health and reproduction from marine shipping activities,		7	6, 7	6.5.2, 7.5.2	6-25 to 6-36, 7-18 to 7-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		vii. Evaluation of the potential for contaminants to be released to the environment and taken up by VECs as a result of the Project, and		8	6	6.1, 6.4.1, 6.4.2	6-2 to 6-13, 6-18 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.1 BIOPHYSICAL ENVIRONMENT AND IMPACT ASSESSMENT		viii. Assessment of potential residual and cumulative effects on marine wildlife VECs resulting from escalated marine traffic in the RSA over the mining lifecycle (and including the potentially extended mine operation period). Consideration should be given to the possible significant increase of marine vessel traffic along shipping routes.		7	6, 7	6.6, 7.6	6-39 to 6-48, 7-36
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent shall present baseline information on the functioning and stability of the socio- economic environment in the RSA (see Section 7.3), with a corresponding impact assessment covering all Project phases of development (construction, operations, temporary closure, final closure, and post-closure).		8	3, 4	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent shall describe the components of the socio- economic environment and the processes affecting them as they exist without the Project. This will serve as a baseline against which the potential changes and impacts of the Project can be measured and will also justify the Proponent's selection of VSECs and indicators.		8	3, 4	3.1, 4.1	3-1 to 3-25, 4-1 to 4-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent shall provide a clear rationale for its selection of communities, the public consultation carried out, and relevant reference studies and reports from which baseline data is collected.		3 8	1 3, 4	1.3, 1.4 3.1, 3.4, 4.1, 4.4	1-5 to 1-12, 1-12 to 1-19 3-1 to 3-22, 3-36 to 3-37, 4-1 to 4-21, 4-31 to 4-32

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		In its impact assessment, the Proponent shall describe and assess the interactions between the socio-economic and biophysical environments, including the roles of the land and wage-based economies and the nature of a mixed economy in the North. The discussion should reflect a proper understanding of the structure and functioning of the potentially affected societies in order to identify the potential of the Project to affect them, whether positively or negatively, and to ensure that any socio-economic mitigation measures put in place by the Proponent have a reasonable likelihood of attaining their objectives.		8	3, 4	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent shall also provide discussions of items (Topics for Discussion) which are essential to capturing the overall socio-economic analysis but are beyond the responsibility of the Proponent to resolve in terms of the existing socio-economic conditions found within the Kitikmeot Region, Nunavut or Yellowknife, Northwest Territories.		8	3, 4	3.5, 4.5	3-42 to 3-104, 4-33 to 4-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		Whenever relevant and appropriate, data shall be disaggregated by age, gender, ethnic affiliation, community, and territorial, provincial, and federal region.		8	3, 4	3.1, 4.1	3-1 to 3-25, 4-1 to 4-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		Socio-economic indicators are used to present baseline information and subsequently measure impacts related to the proposed project, those indicators selected must be adequate to address all types of foreseeable impacts, including cumulative and residual. The EIS shall clearly identify and justify the Proponent's selection of indicators, identify when and on which VSEC the potential impacts may manifest.		8	3, 4	-	3-1 to 3-25, 4-1 to 4-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		The Proponent is expected to clearly identify limitations and knowledge gaps encountered in its efforts to collect the information required by the following sections of these Guidelines.		8	3, 4	3.1, 4.1	3-1 to 3-25, 4-1 to 4-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.1 Economic Development and Opportunities	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.1.1 Baseline Information	i. The traditional economy, current economic structure including the interaction between the wage and traditional economy, development trends in the Project RSA and variability in potential impacted communities as well as in Nunavut as a whole,		8	4	4.1	4-1 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		ii. The economic development levels in the Project RSA comparing to other regions in Nunavut, advantages and constraints of economy development,		8	3	3.1	3-1 to 3-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iii. The roles the exploitation of renewable resources (e.g., subsistence and commercial hunting and fishing) play in economic terms and its significance for the local economy,		8	4	4.1	4-1 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iv. Community and resident self-reliance, and		8	3	Appendix V8-3A	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		v. Overview of Nunavut's Real Gross Domestic Product, rate of Gross Domestic Product (GDP) growth, Consumer Price Index, import/export and trade balance of goods, personal savings rate, and business investment.		8	3	3.1	3-1 to 3-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.1.2 Impact Assessment	i. Potential impact on the local economy from regional level and community level as well as the implications of the Project on economic diversity,		8	3	3.5	3-42 to 3-104
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		ii. Potential impact on the traditional economic activities including hunting, fishing and sport hunting/guiding, etc.,		8	4	4.5	4-33 to 4-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iii. Potential impacts related to accessibility and removal of barriers for traveling, fishing, hunting/trapping and other activities by local communities as a result of construction and operation of the all-weather road,		8	4	4.5	4-33 to 4-60
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iv. Potential impacts on local and regional economy due to temporary closure and final closure, and		8	3	3.5.3	3-48 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		v. Provide a discussion on the effects that the Project may have on Nunavut's Real Gross Domestic Product, rate of GDP growth, Consumer Price Index, import/export and trade balance of goods, personal savings rate, and business investment.		8	3	3.5	3-42 to 3-104
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.2 Employment	-		-	-	-	-

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.2.1 Baseline Information	i. The labour supply statistics in terms of relative genders, ages and other demographic categories,		8	3	3.1	3-1 to 3-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		ii. An assessment of the current local and national labour force available to satisfy the needs of the Project development at each phase, identifying gaps between this availability and project needs by education level and other categories that may help to identify barriers and needs, including a discussion of the availability of Canadian labour and the potential need for foreign employees to address any gap in meeting project labour needs,		8	3	3.1.2, 3.5	3-1 to 3-25, 3-42 to 3-104
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iii. Local household incomes, income sources, and compositions of income within the Project RSA,		8	3	3.1.2.2	3-3 to 3-6
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iv. Provision of sector specific breakdown of employment within the NSA and as pertains to Yellowknife, NT,		8	3	Appendix V8-3A	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		v. Existing local employment opportunities and labour supply status, and		8	3	3.1.2.2	3-3 to 3-6
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		vi. A discussion of the requirements for employment (e.g. education levels, criminal records, drug and alcohol policies, language abilities), and the potentials of needs to be met by local recruitment, as well as the extent to which the skills of the available workers match job requirements.		8 10	3 28	3.1, 3.8 All	3-1 to 3-25, 3-124 to 3-128 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.2.2 Impact Assessment	i. An assessment of the potential for development of the local labour force,		8	3	3.1, 3.5.3.3, 3.8	3-1 to 3-25, 3-64 to 3-80, 3-124 to 3-128
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		ii. A discussion of culturally-sensitive workforce management practices that will meet both the Project's immediate labour force needs as well as the region's longer-term economic development needs,		8 10	3 28	3.8 All	3-124 to 3-128 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iii. A discussion of potential changes in the traditional activities and household function due to wage employment associated with the Project,		8	3, 4	3.5.3.5, 4.5.2.2	3-84 to 3-95, 4-44 to 4-53
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iv. An evaluation of the effects of competition for labour between the Project and existing businesses, institutions, and traditional activities, and		8	3, 4	3.5.3.3, 3.5.6.1, 3.7.2.1, 4.5.2.1, 4.5.2.2	3-64 to 3-80, 3-101 to 3-103, 3-121, 4-38 to 4-53
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		v. Potential impacts on employment due to situations of Project temporary and final closure.		8	3	3.5.3.3	3-64 to 3-80
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.2.3 Topics of Discussion	i. Evaluation of the possible effect of changes in income earnings on patterns of savings expenditure and consumption values, especially with changes to public housing rental requirements due to changes of employment status.		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.3 Education and Training	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.3.1 Baseline Information	i. An overview of the existing education system (early childhood through post-secondary),		8	3	3.1.2.3	3-6 to 3-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		ii. Available training programs for adults and youth through the existing education system,		8	3	3.1.2.3	3-6 to 3-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iii. Local education infrastructure, capacity, funding resources, and administration system,		8	3	3.1.2.3, 3.1.2.6	3-6 to 3-7, 3-11 to 3-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iv. Education and skill levels of the residents in the Project RSA, and experience of the local labour force in different demographic categories based on available data.		8	3	3.1.2.3	3-6 to 3-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.3.2 Impact Assessment	i. An assessment of Project impacts to the education system and how it would influence training programs. Include an evaluation on how the Project might affect attendance, retaining teachers, class sizes, and other components of the education system,		8	3	3.3.2, 3.5	3-29 to 3-37, 3-42 to 3-104
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		ii. Provision of an assessment on the demands that might be placed on the educational infrastructure, capacity, funding resources and administration system,		8	3	3.3.2, 3.5	3-29 to 3-37, 3-42 to 3-104

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iii. Requirements for education levels, skills and experiences of labour force from the Project in short, medium term and foreseeable future, taking account the vision of expansion for the Project lifespan, and regional economy development,		8	3	3.3, 3.5	3-27 to 3-41, 3-42 to 3-104
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iv. A discussion of potential need of local labour force training to meet the needs of the Project. The types of training can be those specifically required by the Project, or others geared toward universally applicable skills that improve workers' opportunities in other sectors of the local economy. This assessment shall include predicted training resources and predicted resources needed to meet the designed training programs, if applicable,		8	3	3.8	3-124 to 3-128
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		v. An evaluation of training programs planned by the Proponent, the associated challenges and likelihood of success of trainees to satisfy the Project needs and regional economy development with consideration of cultural and language barrier,		8 10	3 24, 28	3.8 All	3-124 to 3-128 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		vi. A discussion of the potential for longer term community capacity building programs, if any have been planned or will be planned and are anticipated to be implemented throughout the Project's lifetime, regarding how mine training plans can enhance the transferability of skills after the mine closure (e.g. management and HR skills, computer skills, heavy equipment experience, finance skills, etc.), and		8 10	3 24, 28	3.5.3.4, 3.8 All	3-80 to 3-84, 3-124 to 3-128 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		vii. A discussion of other possible solutions to fill up the gap between requirements of project needs, and education level and qualifications of local labour force.		8	3	3.5.3.4	3-80 to 3-84
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4 Contracting and Business Opportunities	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.1 Baseline Information	i. Provision of the most up-to-date statistics and data available as it relates to contracting and business opportunities from socio-economic studies of communities in the Project RSA,		8	3	3.1	3-1 to 3-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		ii. Estimates of goods supplied to the Project, including country food supply for Inuit workers at the mine, procurement, services contracting, and other business opportunities in the Project RSA that may result from the Project, and		8	3	3.5	3-42 to 3-104
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT		iii. The economy structure and characteristics of the local and regional economies, existing business types, scales of the different sectors of economy, and potential capacities to meet the needs of the Project.		8	3	3.1	3-1 to 3-25
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	i. An assessment of economic effects, positive and negative, stemming from the Project's contracting and business opportunities through the lifespan of the Project,		8	3	3.5.3.2	3-61 to 3-64
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	ii. Opportunities for local, regional, and territorial businesses to supply goods and services both directly to the Project, and indirectly to meet the demand created by the expenditure of new income by employment in the Project,		8	3	3.5.3.2	3-61 to 3-64
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	iii. An assessment of the Project effects on other local and regional economic sectors, in particular the competition to other business' needs due to limited capacity of local business,		8	3	3.5, 3.6.2.1	3-42 to 3-104, 3-113 to 3-114
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	iv. An assessment of the contributions made to public, communities and Inuit from the Project,		8 10	3 26	3.5 All	3-42 to 3-104 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	v. An assessment of the project-related procurement, and potential capacity to meet Project needs,		8	3	3.5.3.1, 3.5.3.2, 3.5.3.3	3-48 to 3-80
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	vi. A discussion on barriers to local business capacity building,		8 10	3 24	3.1.2.5, 3.5, 3.8 All	3-10 to 3-11, 3-42 to 3-104, 3-124 to 3-128 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	vii. An assessment of existing country food supply sources from the Project region and Nunavut, and opportunities to supply country foods for Inuit workers at the Project,		8 10	4 28	3.3.2.2 3.1.2	3-34 to 3-37 3 to 4
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	viii. An assessment of opportunities for local communities to diversify their economic sources and to supply new goods and services to meet the need generated by the Project, and		8	3	3.5.3.2	3-61 to 3-64
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.4.2 Impact Assessment	ix. Potential impacts on local businesses and services due to temporary closure and final closure.		8	3	3.5.3.2	3-61 to 3-64

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.5 Population Demographics	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.5.1 Baseline Information	i. A description of regional and local community populations, demographics structure, composition, characteristics and population trends, and		8	3	3.1.2.1	3-2 to 3-3
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.5.1 Baseline Information	ii. A discussion of observed variations in education levels, dietary habits, religious characteristics and other social aspects in different demographic categories in the RSA.		8	3, 4	X.1	3-1 to 3-25, 4-1 to 4-22
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.5.2 Impact Assessment	i. Potential for project-induced demographic changes in population, migration, (including in-migration from outside of Nunavut), population re- distribution or movement of Nunavummiut between communities and the effects of those changes, and further details on potential interactions between local residents and non-residents,		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.5.2 Impact Assessment	ii. Potential effects of fly-in/fly-out employment on population demographics, and,		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.5.2 Impact Assessment	iii. Potential effects from various Project phases, including unemployment as a result of temporary suspension of operations or mine closure.		8	3	3.5.3.3	3-64 to 3-80
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6 Traditional Activity and Knowledge	For the purpose of the current Guidelines, traditional activity and traditional knowledge shall consider land use, food security, language, cultural activities and commercial harvesting.		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.1 Baseline Information	i. A description of cultural, ethnic, religious, and language characteristics and diversities in the RSA,		8	3, 4	X.1, X.2	3-1 to 3-27, 4-1 to 4-26
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.1 Baseline Information	ii. Local and regional economy characteristics in term of relation to traditional land use activities and wage incomes,		8	3, 4	3.1.2.7, 4.1.2.5	3-16 to 3-24, 4-7 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.1 Baseline Information	iii. Descriptions of the significance of, availability of, and level of dependence on, traditional foods as major nutritional sources by local residents within the Project RSA, including:		8	3, 4	3.1.2.7, 4.1.2.5	3-16 to 3-24, 4-7 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.1 Baseline Information	o What country foods are consumed, or are expected to be consumed in the Project RSA, which parts of country foods are consumed, and their consumption frequency, and		8	3, 4, 5, 6	3.1, 3.2, 4.1, 5.1.1, 6.1.8, 6.4.2.12, Appendix V8-5A	3-1 to 3-23, 4-1 to 4-21, 5-1 to 5-12, 6-11 to 6-12, 6-142, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.1 Baseline Information	o Descriptions, including maps, of traditional and current hunting ranges and patterns in the LSA,		8 3	4 3	4.1 Appendices V3-3A, V3-3B	4-1 to 4-21 All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.1 Baseline Information	iv. Description of the use of caribou as a subsistence species, including harvesting, sustainable use of caribou, and the cultural and social activities associated therein, to specifically include hunting, community feasts, and the commissioning of arts and crafts, and		8	4	4.1.2.5	4-7 to 4-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.1 Baseline Information	v. Details regarding wildlife and vegetative species that are culturally valuable to northerners.		8	4	4.1.2.5	4-7 to 4-20
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	i. Potential effects of the Project on the accessibility of caribou and other terrestrial wildlife species to harvesters where such may be affected by reductions in habitat and herd sizes and/or expected changes to migration patterns or human travel routings. The risks to present and future generations of harvesters should also be considered,		8	4	4.5.2.2	4-44 to 4-53
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	ii. Potential impacts related to accessibility to areas for hunting, fishing, marine harvesting, traveling, recreational and religious activities as a result of the Project development, including a consideration of individual components such as all-weather roads and marine shipping,		8	4	4.5.2.2	4-44 to 4-53
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	iii. Potential effects on sustainable resource use, such as country food availability and accessibility of carving stone deposits, taking into account the CEA throughout the entire lifespan of the Project,		8	4	4.3.2	4-28 to 4-33
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	iv. Potential impacts to marine wildlife of cultural or practical importance to northerners,		8	4	4.3.2.1	4-28 to 4-30

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	v. Potential impacts to Aboriginal fisheries species, including fish of cultural or practical importance to northerners,		8	4	4.3.2.1	4-28 to 4-30
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	vi. Potential impacts to the ongoing productivity of local or regional commercial, recreational or Aboriginal fisheries,		8	4	4.3.2.2	4-30 to 4-33
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	vii. Potential impacts to vegetation of cultural or practical value to northerners,		8	4	4.3.2.2	4-30 to 4-33
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	viii. Description on how the Proponent will comply with the Official Languages Act, and		8	4	4.3.2.2	4-30 to 4-33
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.6.2 Impact Assessment	ix. Potential impacts that the contamination of traditional food sources, including those trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes (i.e. berries, etc.), may have on individuals, families, communities, and the ability of Inuit to engage in traditional lifestyles.		8	5 6	5.5.2.3 6.4.2.11	5-30 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7 Non-traditional Land Use and Resource Use	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.1 Baseline Information	i. A description of known non-traditional land and resource use including protected areas, visual and aesthetic resources,		8	4	4.1.2.2, 4.1.2.3, 4.1.2.4	4-2 to 4-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.1 Baseline Information	ii. Provision an overview of local and regional land use activities in the LSA as well as areas potentially impacted by shipping activities,		8	4	4.1.2.5	4-7 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.1 Baseline Information	iii. A description of current and traditional land use areas and the importance of those areas to Inuit culture and social well-being,		8 3	4 3	4.1.2.5 Appendices V3-3A, V3-3B	4-7 to 4-21 All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.1 Baseline Information	iv. A description of known land use activities and relation to the local economy, self-reliance, food supplies and livelihood,		8	4	4.1.2.5	4-7 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.1 Baseline Information	v. A description of identified and anticipated overlapping zones and/or areas where the land use activities co-exist or interact with Project components and activities, and		8	4	4.5.2	4-38 to 4-53
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.1 Baseline Information	vi. A description of the current tourism activities and recreational use occurring in the Project region.		8	4	4.1.2.4	4-5 to 4-7
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.2 Impact Assessment	i. A description of impacts to known non-traditional land and resource use including protected areas, visual and aesthetic resources,		8	4	4.5.2.1	4-38 to 4-44
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.2 Impact Assessment	ii. A discussion of anticipated interactions between project development and land use activities by local residents in the Project RSA, in particular at the mine site, all-weather road and shipping routes, and		8	4	4.5.2.2	4-44 to 4-53
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.7.2 Impact Assessment	iii. A description the potential impact on the tourism industry from the Project's development which may impair the wilderness experience of tourism in the Project RSA.		8	4	4.5.2.1	4-38 to 4-44
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8 Heritage Resources	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8.1 Baseline Information	i. A summary description of known archaeological/paleontological, burial, cultural and historic, sacred and spiritual sites within the LSA based on TK and scientific baseline studies. Each site shall be described on a map with a corresponding scale. Large-scale maps should be sent to the Government of Nunavut, Department of Culture and Heritage (GN-CH) upon request to assist in its review,		8	1	1.1, 1.2, Appendices V8-1A, V8-1B	1-1 to 1-12, All, All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8.1 Baseline Information	ii. A description of regulatory requirements and procedures for recovery and removal of artefacts and/or fossils in areas of proposed development, and		8	1	1.1.1	1-1
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8.1 Baseline Information	iii. A description of the relationship between the cultural sites and social lives of local communities in the LSA.		8	1	1.1, 1.2, Appendices V8-1A, V8-1B	1-1 to 1-12, All, All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8.2 Impact Assessment	i. Potential impacts to archaeological and paleontological resources (e.g., burial sites, sacred sites), and other cultural sites within the LSA resulting from development of Project infrastructure including all-weather roads, mine sites, laydown areas, airstrips, etc.,		8	1	1.5	1-15 to 1-29
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8.2 Impact Assessment	ii. Potential impacts on archaeological and paleontological resources from increased activity in the area associated with the mine including ground transportation and ongoing exploration as well as non-mine related activities,		8	1	1.5	1-15 to 1-29
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8.2 Impact Assessment	iii. Potential impacts to archaeological and paleontological resources as a result of borrow pit and quarry construction and operation, as well as construction and use of access roads. Discussion of how considerations for potential impacts have been incorporated in the road routing and design should also be presented, and		8	1	1.5	1-15 to 1-29
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.8.2 Impact Assessment	iv. Potential impacts on cultural well-being, religious and spiritual activities which are related to cultural and historic, sacred and spiritual sites.		8	1	1.5	1-15 to 1-29
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9 Health and Wellbeing	For the purpose of the current Guidelines, discussions relating to individual and community wellness shall include family and community cohesion, as well as other indicators as may be selected by the Proponent.		8	3	3.3.2.2	3-34 to 3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.1 Baseline Information	i. A description of the current individual and family well-being including a discussion on households, family and community stability,		8	3	3.1.2.7	3-16 to 3-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.1 Baseline Information	ii. A description of household social structures within the RSA, and where possible, the prevalent representative household social structure, including: the prevalent composition (family/kin-relations co-existing, generations in the household), the gender roles, the prevalent division of household labour based upon existing gender roles, the dominant consumption patterns, access to credit, and how resources are shared/divided within the household as well as how decisions are made in the household,		8	3	3.1.2.1	3-2 to 3-3
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.1 Baseline Information	iii. A description of the current status of human health in the RSA, including mental, and psychological health, well-being, previous history and exposure, and identify vulnerable sub-groups where applicable, and		8	3	3.1.2.7	3-16 to 3-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.1 Baseline Information	iv. A description of nutritional requirements of residents in the RSA along with quantitative information on the diet habits of residents, including consideration of details such as the seasonal, gender and age-related consumption of country foods.		8	3, 4	3.1, 4.1.2.5	3-1 to 3-25, 4-7 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	i. A description of potential impacts to individual and family well-being from the Project,		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	ii. Potential impacts to household social structure from the Project (e.g. one or two family members working at the mine site),		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	iii. Potential effects on lifestyle, including the effects of a major employment base away from the communities,		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	iv. Potential effects on community and family stabilities, and culture integrity due to potential demographic changes,		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	v. Potential effects on individual, family and community health and wellbeing from workplace and community cross-cultural tension, conflict, and/or racism.		8	3	3.3.2.3	3-34 to 3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	vi. Potential impacts on human mental and physical health and well-being within the RSA resulting from potential indirect effects of the Project. This discussion should give consideration to gambling, substance abuse, family violence, sexually transmitted infections and other communicable diseases,		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	vii. Potential impact on community, family and individual well-being as a result of increased access to alcohol and other controlled substances resulting from increased incomes as well as the potential movement of these substances through the Project site or via Project- related activities (i.e. stopovers or layovers),		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	viii. Potential impacts on human health associated with traditional lifestyles where large amounts of country foods are consumed, considering the bioaccumulation and take-up of contaminants associated with changes to the level of contaminants loadings in country foods (i.e. terrestrial and marine wildlife, fish, birds, and vegetation consumed by humans), and		8	5, 6	5.5.2.2.3, 5.5.4.2.4, 5.5.4.2.5, 5.5.4.3, 5.8, 6.4.2.7.4, 6.4.2.8.5, 6.4.2.9.4, 6.4.2.12	5-29 to 5-30, 5-39 to 5-60, 5-60, 5-61, 6-104 to 6-124, 6-124 to 6-132, 6-132 to 6-163, 6-165

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.2 Impact Assessment	ix. Potential impacts to community well-being in the RSA.		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	i. A description of current substance abuse issues including trends relating to the importation of drugs and alcohol, crime and violence, and other relevant social factors,		8	3	3.1.2.7	3-16 to 3-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	ii. An overview of the current financial management programs available in the potentially affected communities,		8	3	3.3.2.3	3-34 to 3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	iii. A description of the current community well-being, including information about the capacity, availability, and affordability, where relevant, of local services and infrastructure (i.e. housing, training, education, day care services, health care, etc.),		8	3	3.1.2.6, 3.1.2.7	3-11 to 3-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	iv. A description of local and regional community and cultural values and initiatives that promote and support regional and family health and cohesion.		8	3	3.1.2.7	3-16 to 3-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	v. A description of increased pressure on existing social, institutional, and community services, facilities and services, and infrastructure,		8	3	3.3.2.3	3-34 to 3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	vi. Potential impacts to community safety and security, including indirect impacts on frequency and types of crime incidents, with consideration for a potential influx of Project personnel into local communities during the life of the Project,		8	3	3.3.2.3	3-34 to 3-37
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	vii. Identification and discussion of potential impacts of the Project on accident rates, alcohol/prohibited substance consumption and import/export, and		8	3	3.5.3.5	3-84 to 3-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.9.3 Topics for Discussion	viii. A description of barriers to current financial management programs and any incentives that would be provided by the Proponent for healthy financial management.		8	3	3.5	3-42 to 3-104
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10 Community Infrastructure and Public Services	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.1 Baseline Information	i. Description of community, cultural and recreation programs,		8	3	3.1.2.6	3-11 to 3-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.1 Baseline Information	ii. Description of existing transportation modes and travel routes/roads,		8	3	3.1.2.6	3-11 to 3-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.1 Baseline Information	iii. Discussion of costs to build infrastructure, transportation costs, and effect on public services,		8	3	3.1.2.6	3-11 to 3-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.1 Baseline Information	iv. Description of existing communication systems and services and utilities,		8	3	3.1.2.6	3-11 to 3-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.1 Baseline Information	v. Description of community & regional waste management systemsDescription of current conditions of local supply and demand of housing, including private, public and rental housing and their costs, other infrastructure, and related capacity within the RSA,		8	3	3.1.2.6	3-11 to 3-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.1 Baseline Information	vi. Description of existing public services and associated community facilities in the RSA, including law enforcement, health care, emergency response, dependency assistance, welfare utilities, temporary accommodation and food services, and		8	3	3.1.2.7	3-16 to 3-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.1 Baseline Information	vii. Description of existing outpost camps and other facilities outside of municipal boundaries which facilitate harvesting and recreation activities in the LSA, particularly within the proximity of the Project.		8	4	4.1.2.5	4-7 to 4-21
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.2 Impact Assessment	i. A discussion of demand for community infrastructure and public services from the Project directly and indirectly,		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.2 Impact Assessment	ii. An assessment of the effects on services and/or infrastructure (including housing) in public and private sectors, due to the potential use by the Project directly or indirectly, including those caused by Project-induced demographic changes, noting that where the assessment determines an impact, the Proponent should outline proposed mitigation measures,		8	3	3.3.2.1	3-30 to 3-34

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.2 Impact Assessment	iii. An assessment of potential increased demand on the local and regional health care systems, including the standard medical system, emergency response and emergency medical care, medevac services, and challenges raised by any increased demand,		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.2 Impact Assessment	iv. A discussion of building new and updating existing structures including weather shields and outposts beyond the boundary of communities and along hunting/traveling routes, and/or at hunting grounds which may facilitate local hunting activities/traveling in Project areas,		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.2 Impact Assessment	v. An assessment of incremental costs imposed by the needs from the Project directly or indirectly on public infrastructure, services, including those caused by Project-induced demographic changes, and		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.2 Impact Assessment	vi. A discussion of community access to Project infrastructure upon closure, including proposed road options.		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.3 Topics for Discussion	i. A discussion of the potential to bring in freight for communities by return shipping, and likelihood to share shipping costs with local communities,		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.3 Topics for Discussion	ii. A description of the extent and current capacity of the local transportation systems and associated infrastructure,		8	3	3.1.2.6	3-11 to 3-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.3 Topics for Discussion	iii. An assessment of public health and environmental health needs and implications to the Proponent's community initiatives, and		8 10	3 26	3.3.2.1 All	3-30 to 3-34 All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.10.3 Topics for Discussion	iv. Potential impact on availability and adequacy of existing health infrastructure and services including medical, dental, vision, social, mental (including addictions), environmental health officers, social workers, registered nurses, medical director, access to medical travel and interventions.		8	3	3.3.2.1	3-30 to 3-34
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11 Human Health and Safety	-		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.1 Baseline Information	i. A description of human exposure to current environmental contaminants in the RSA, and		8	5, 6	5.1, Appendix V8-5A, 6.1	5-1 to 5-15, All, 6-2 to 6-13
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.1 Baseline Information	ii. A discussion relating to the local health statistics when compared with other parts of Nunavut and Canada as appropriate.		8	3	3.1.2.7	3-16 to 3-24
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.2 Impact Assessment	i. A discussion of the standards, guidelines and regulations that the Project will incorporate during construction and operations, at various Project sites to minimize the impacts and protect workers' health,		2 8 10	2 6 25	2.1.5 6.4.1.9, 6.4.2.9, 6.4.3.9 3.7, 3.8	2-3 to 2-4 6-73 to 6-94, 6-132 to 6-163, 6-172 8 to 9
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.2 Impact Assessment	ii. An assessment of the health, safety and security of workers at the job sites taking into account different Project phases and locations (e.g., explosive manufacturing plant, drilling and blasting operation, and heavy equipment operations),		8	6	6.4.3.6, 6.4.3.7	6-167 to 6-168
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.2 Impact Assessment	iii. Potential impacts on human health from air contamination, fugitive dusts resulting from air and ground traffic, potential impacts to potable water quality, and exposure to escalated noise and extreme weather conditions,		8	6	6.4.2, 6.4.3	6-95 to 6-177
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.2 Impact Assessment	iv. Potential sources and characteristics of any conventional risks to workers or the public during all phases of the Project,		8	6	6.4.4	6-177 to 6-178
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.2 Impact Assessment	v. Potential effects on physical health such as mortality, morbidity, injuries, accidents, effects on sensitive sub-populations (i.e. asthma sufferers), physical hazards associated with construction, operation and closure phases, and		8	6	6.4.2.10	6-163 to 6-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.2 Impact Assessment	vi. Potential impacts of workplace discipline and cultural conflicts among Nunavummiut, Northwest Territories, and Southern workers, including those issues which may be related to or exacerbated by language barriers between employees.		10	28	3.1.4, 3.1.5, 7.1.5.3	4 to 6, 12
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.2 SOCIO-ECONOMIC ENVIRONMENT AND IMPACT ASSESSMENT	8.2.11.3 Topics for Discussion	i. A description of the existing infrastructure and health services available within the RSA and the potential impact on the quality of health services, including the resources and capacity to monitor and respond to increased health hazards.		8	3, 6	3.1, 3.3.2.3, 6.4.2.8	3-1 to 3-25, 3-37, 6-124 to 6-132
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		Key components of the Human Health Risk Assessment process include the identification of potential Project-human interaction pathways, and hazardous substance constituents of potential concern (COPC), human receptors and assessment criteria. As such, the Human Health Risk Assessment is to include:		8	6	6.4.2	6-95 to 6-165

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		i. Predicted sources, quantities and points of release from Project emissions and effluents containing hazardous substances,		8	6	6.4.2.7.1	6-104 to 6-121
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		ii. A selection process for COPCs,		8	6	6.4.2.9	6-132 to 6-169
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		iii. Identification of all pathways to human receptors including bioaccumulation in country foods,		8	6	6.4.2.7.2, 6.4.2.7.3, 6.4.2.7.4, 6.4.2.7.5	6-104 to 6-124
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		iv. Identification and characterization of human receptors (workers and the public). Include maps to delineate their locations and the distances of communities, residences, temporary/seasonal residences, etc. to project sites and related infrastructure,		8	6	6.4.2.7.3	6-104 to 6-124
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		v. The method used to convert hazardous substance exposure and human receptors from various pathways to calculate exposure or dose (e.g. conversion factors), and		8	6	6.4.2.10.3	6-163 to 6-175
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		vi. Criteria used to determine significance of impact, specifically, calculation of hazard quotients, which translates into the ratio between the predicted maximum exposure concentration for each contaminant of concern in each relevant media (i.e. air, water, soil, sediment) and the toxicity threshold for the most sensitive biological receptor in the respective medium for which toxicity information is available.		8	6	6.4.2.9.1, 6.4.2.9.2, 6.4.2.9.4, 6.4.2.10.1, 6.4.2.10.4	6-132to 6-163, 6-163 to 6-165
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		Key components of the Environmental Risk Assessment process include the identification of potential project and terrestrial and aquatic receptor interaction pathways, hazardous substance COPCs, terrestrial and aquatic ecological receptors and assessment criteria. As such, the Environmental Risk Assessment is to include:		8	6	6.4.1	6-18 to 6-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		i. Predicted sources, quantities and points of release from the Project emissions and effluents containing hazardous substances,		8	6	6.4.1.7.1	6-36 to 6-58
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		ii. The selection process for COPCs,		8	6	6.4.1.9	6-73 to 6-94
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		iii. Identification of disease vectors,		8	6	6.4.1.6	6-35 to 6-36
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		iv. Identification of pathways to terrestrial and aquatic ecological receptors (VECs),		8	6	6.4.1.7.2, 6.4.1.7.3, 6.4.1.7.4, 6.4.1.7.5	6-36 to 6-58
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		v. Identification and characterization of terrestrial and aquatic ecological receptors,		8	6	6.4.1.1, 6.4.1.2, 6.4.1.7.3	6-19 to 6-21, 6-36 to 6-58
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		vi. The method used to convert hazardous substance exposure and intake by the various ecological receptors from the various pathways into an exposure or dose (e.g. conversion factors),		8	6	6.4.1.9.1, 6.4.1.10, 6.4.1.11	6-172, 6-94 to 6-95
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		vii. Exposure conditions, identifying routes of exposure (air, water, soil, food), public and occupational exposure, address high risk populations,		8	6	6.4.1.7.2, 6.4.2.7.2, 6.4.2.10	6-36 to 6-58, 6-163 to 6-16
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		viii. Noise effects (i.e. potential effects on human health resulting from atmospheric noise levels and noise interactions with species that are traditional food sources), and		8	6	6.4.3	6-165 to 6-177
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.3 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT		ix. Criteria used to determine significance of impact, specifically, calculation of hazard quotients, which translates into the ratio between the predicted maximum exposure concentration for each contaminant of concern in each relevant media (i.e. air, water, soil, sediment) and the toxicity threshold for the most sensitive biological receptor in the respective medium for which toxicity information is available.		8	6	6.4.1.9, 6.4.1.10, 6.4.1.11	6-73 to 6-85
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.4 ACCIDENT AND MALFUNCTIONS ASSESSMENT		An assessment must be provided for malfunction and accident scenarios that have a reasonable probability of occurring. The assessment is to include:		-	-	-	-
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.4 ACCIDENT AND MALFUNCTIONS ASSESSMENT		i. A description of the source, quantity, mechanism, rate, form and characteristics of contaminants and other materials both physical and chemical, likely to be released to the surrounding environment during the postulated malfunctions and accidents, and		9	3	All	All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.4 ACCIDENT AND MALFUNCTIONS ASSESSMENT		ii. A description of any contingency, clean-up or restoration work in the surrounding environment that would be required during, or immediately following, the postulated malfunction and accident scenarios.		9	3	All	All
8.0 PROJECT ENVIRONMENT AND IMPACT ASSESSMENT	8.4 ACCIDENT AND MALFUNCTIONS ASSESSMENT		The assessment for conventional malfunctions and accidents should include fire and explosion incidents and demonstrate that the conventional malfunctions and accidents are unlikely to cause long-term or residual effects both to persons and the environment, taking into account the proposed mitigation measures and including preventive measures and emergency response capability.		9	3	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		An Environmental Management Plan (EMP) provides a systematic approach to consistently manage all environmental affairs for the Proponent, addressing concerns through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, with an aim to improving its environmental performance by continual improvement of the management system. The Proponent shall present its environmental policy, its EMP and associated environmental management system through which it will deliver this plan.		10	1	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		The EMP shall provide a perspective on how potentially adverse environmental effects will be managed throughout the life of the Project.		10	1	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		The Proponent shall discuss the flexibility of the proposed EMP to respond to changes in the mining development plan, the regulatory regime, the biophysical and socio-economic environments, technology, research results, and the understanding of TK.		10	1	2, 7, 8, 9, 12	1 to 3, 11 to 13, 15
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		The Proponent shall discuss how the results from the EMP will be used in applying adaptive environmental management throughout all phases of the Project, and identify threshold/criteria and indicators to trigger management actions in each sub plan.		10	1	2, 7, 13	1 to 3, 11 to 12, 15 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		The EMP shall be comprised of individual monitoring and mitigation plans, specific to various aspects, components, activities and phases of the Project. Although the information requirements of the following sections are intended to be as comprehensive as possible, it is recognized that various items may be dependent on the Proponent's development plans for the Project, which will continue to be refined throughout the NIRB's review process.		10	1	13	15 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		While some information required under these plans might not be available for the Proponent's Draft EIS submission, the Proponent shall include a scheduled timeline relating to stages of the NIRB's review process or the later licensing/regulatory processes when this information will become available (i.e. Technical Meeting, Final EIS, Final Hearing, and Water Licensing).		Noted			
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		The NIRB recognizes that flexibility in the arrangement of the information requested in the following sections may be required and the Proponent may use its judgement in consolidating or arranging the information in the most effective fashion.		Noted	-	-	-
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		In its individual monitoring and mitigation plans, the Proponent shall also assess the likely effectiveness of mitigation measures and associated follow-up mechanisms for adaptive management.		10	1	13.4	20 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.1 ENVIRONMENTAL MANAGEMENT PLAN		The Proponent shall provide a risk assessment of those economic (e.g. the global economy and international markets), or other conditions (e.g. ownership transfer) that might also impair the implementation or effectiveness of proposed mitigation measures or management.		9	1	1.2.4.3	1-20 to 1-27
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.2 ENVIRONMENTAL PROTECTION PLAN		The Proponent shall, based on its impact predictions for identified VECs and VSECs, prepare an Environmental Protection Plan (EPP) in accordance with its EMP prior to commencement of construction for all phases of the Project (site preparation, construction, operation, maintenance, any potential modifications, temporary closure, final closure (decommission & reclamation) and post-closure).		10	1 2 7	13 1 7	15 to 20 1 43 to 47
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.2 ENVIRONMENTAL PROTECTION PLAN		The EPP shall be integrated into procedure documents for all phases of the Project which target the site management staff, the Proponent's occupational health, safety and environmental compliance staff, as well as government departments and agencies tasked with environmental and regulatory compliance monitoring/surveillance.		10	1	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.2 ENVIRONMENTAL PROTECTION PLAN		A Table of Contents and an annotated outline for the EPP is to be presented in the EIS which shall address the major Project activities, permit requirements, mitigation measures and contingency planning in combination with other management plans.		10	2	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		In accordance with the EMP, the Proponent shall present individual monitoring and mitigation plans, specific to various aspects of the Project and the environment, to be incorporated into all applicable phases of the Project.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		In these plans, the Proponent is required to outline how results from monitoring will be used to refine or modify the design and implementation of mitigation measures and management plans.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		The plans are meant to ensure that the Project is conducted as proposed, predicted adverse environmental effects are promptly mitigated, and relevant laws and regulations are met, and thus ensure the proper operation of works, equipment, and facilities connected to the Project. Plans should outline procedures for the re-assessment, improvement, or reorientation of the plan should it be determined at any point in the Project's development that such plan no longer meets the initial purpose or objective.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		In its monitoring and mitigation plans, the Proponent should specify proposed criteria or thresholds to trigger the mitigation measures based on its monitoring results, including the position of the person for the implementation of these mitigation measures, the system of accountability and the phase and component of the Project to which the mitigation measure would be applied.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		Each of the monitoring and mitigation plans shall include:	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		i. Objectives of the monitoring program, applicable laws, regulations and/or Acts,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		ii. The VECs and VSECs to be monitored, with associated parameters and indicators, and selection criteria/thresholds to be compliant with,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		iii. A description of the frequency, duration, and geographic extent of monitoring with justification for each, and identification of the personnel who will conduct the monitoring, collect, analyze and interpret data,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		iv. A description of measures taken to protect the monitoring infrastructure from climate change and potential major climate events (e.g. extreme flows),		9	2	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		v. Proposed actions in the event that observed results (impacts) differ from those predicted, including a discussion of actions to be taken for observed non-compliance with the law or regulations, performance targets or with the obligations imposed on contractors by the environmental provisions of their contracts,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		vi. Proposed reporting scheme for monitoring results, including format, reporting intervals, and responsible territorial and federal authorities,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		vii. An evaluation of the efficiency of mitigation measures, and the compliance with Project authorizations,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		viii. Plans for integration of monitoring results with other aspects of the Project including, adjustments for operating procedures and refinement of mitigation measures,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		ix. Procedures/mechanism to assess the effectiveness of monitoring programs, mitigation measures, and adaptive programs for areas disturbed by the Project,	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		x. A discussion of the relationship between monitoring plans and the EMP, and	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		xi. Quality assurance and quality control measures to be applied to monitoring programs.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		As described in Section 7.3, the Proponent should consider the design of all biophysical environmental monitoring programs to ensure that the baseline data required is useful in understanding the relationship between the natural ecological conditions and the potential Project impacts on these conditions. This would improve interpretation of monitoring data in order to differentiate between natural variability and project-specific impacts.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.3 MONITORING AND MITIGATION PLANS		All monitoring plans should be designed so that results from these programs can be coordinated with ongoing regional initiatives or programs with relevant government organizations, or regional authorities.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS		The Proponent shall present environmental monitoring and management plans developed to eliminate or mitigate potential negative impacts of the Project on the biophysical environment as identified in Section 8.1.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS		The Proponent shall also identify any residual effects after appropriate mitigation measures are implemented.		1 4 5 6 7 8	6, 7, 8 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All X.5, X.6, X.7, X.8 X.5, X.6, X.7, X.8 X.5, X.6, X.7, X.8 X.5, X.6, X.7, X.8 X.5, X.6, X.7, X.8	All 1-15 to 1-33, 2-11 to 2-26 4-26 to 4-69, 5-83 to 5-152, 6-35 to 6-81, 7-19 to 7-64, 8-30 to 8-92, 9-30 to 9-60, 10-21 to 10-54 1-41 to 1-53, 4-35 to 4-62, 5-21 to 5-44, 6-53 to 6-71, 7-35 to 7-49 2-16 to 2-43, 3-12 to 3-34, 4-36 to 4-46, 5-19 to 5-30, 6-18 to 6-49, 7-15 to 7-40 1-15 to 1-30, 3-42 to 3-127, 4-33 to 4-84, 5-23 to 5-61
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS		The plans shall be developed to reflect the complete life span of the Project, and contain appropriate monitoring and evaluation techniques (e.g. indicators) that will allow regulators to intervene in a timely and constructive manner.	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS		The plans shall target identified VECs and are to include, but should not be limited to, the following list:	Yes	~~10~~ 10 Addendum 10	~~All~~ 1-3,7-18,22-29 4,5,6,19,20,21,30,31	~~All~~ All All	~~All~~ All All

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	The Proponent shall provide an assessment of the potential risks from natural hazards, in both marine and terrestrial environments. This plan shall encompass the whole life of the mine and will provide mitigative measures which address the potential ecological and human health risks. The Proponent shall also identify and describe the likelihood of possible malfunctions and accidents occurring independently of, or associated with natural hazards.		9 10	3 3	3 4.2, 5.5.5	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	The Proponent shall develop an Emergency Response Plan to be supported by appropriate manual emergency response capabilities and that can be applied to deal with the range of emergency situations considered reasonable under circumstances of the Project.		10	3	All	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	The following issues shall be included in the Risk Management and Emergency Response Plan:		-	-	-	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	i. An assessment of potential natural hazards in the LSA and shipping corridors, including frequency, magnitude and possibilities of occurrence. Natural hazards to be considered should include extreme weather events, natural seismic events, landslides, and flooding,		9 10	2, 3 3	2.2, 3.2 4.2	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	ii. An analysis of the potential for malfunctions and accidents associated with Project facilities and activities, including land or ice based, air or marine transportation, occurring independent of, or associated with natural hazards,		9 10	All 3	All 4.3	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	iii. Annual aviation audits for the aircraft types, companies and infrastructure associated with all Project related air transportation and documentation of the minimum flying height and seasonal flight restriction for the Project area,		10	3	5.4	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	iv. An assessment of fire risk to evaluate potential fire hazards, as well as the fire protection systems and features (including both physical attributes and program elements) used to mitigate the effects of fire,		10	3	5.5.2	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	v. Alerting, notification and reporting procedures, and associated responsible organizations and personnel,		10	3	2, 3, 4, 5	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	vi. Contingency responding procedures corresponding to each risk, and associated security systems and prevention measures, such as monitoring systems, hazard and leak detection systems, fire-control systems, and standby emergency systems,		10	3	4,5	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	vii. A discussion of options for the medical transport of injured staff or persons both within and beyond the Project area,		10	3	5.5.1	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	viii. A discussion of the constraints resulting from logistics and time frames for prompt reaction, with consideration for the potential distance to an accident or emergency site, and possible weather conditions which might cause considerable delays or obstacles,		10	3	5.5	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	ix. A description of how relevant government agencies, Inuit organizations and local communities will be involved in the development and application of the plans if applicable, and		10	3	1.4	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.1 Risk Management and Emergency Response Plan	x. Any other contemplated loss prevention practices, including insurance.		10	3 15	8 12, 13	~~All~~ All All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.2 Fuel Management Plan	The Proponent shall develop Fuel Management Plans based on its environmental policy, to promote environmental awareness and safety. These plans are to be linked to Spill Contingency Plans, and must include the following, at a minimum:		-	-	-	-
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.2 Fuel Management Plan	i. Requirements of federal and territorial regulations,	Yes	~~10~~ Addendum 10	4 4	4 3	~~2 to 3~~ 3-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.2 Fuel Management Plan	ii. Conceptual design drawings for fuel storage areas and procedures for bulk fuel transfer,	Yes	~~10~~ Addendum 10	4 4	~~7.3.1, Figure 6.1-2, Figure 6.1-3~~ 7.4, Figure 6.1-1, Figure 6.1-2	~~14 to 15, 7 to 8, 9 to 10~~ 7-4, 6-3, 6-5
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.2 Fuel Management Plan	iii. Substances covered by the plan (e.g. oil, fuel, hazardous materials, chemicals and other deleterious substances),	Yes	~~10~~ Addendum 10	4 4	~~1, 2~~ 1, 2	~~1 to 2~~ 1-1 to 2-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.2 Fuel Management Plan	iv. Training for emergency response staff including distributing Material Safety Data Sheet (MSDS) to designated emergency response and health centre staff,	Yes	~~10~~ Addendum 10	4 ~~6~~ 4 6	~~7.3~~ ~~7~~ 7.3 9	~~13 to 15~~ ~~17 to 23~~ 7-2 to 7-4 9-1 to 9-7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.2 Fuel Management Plan	v. Alerting, notification and reporting procedures, and	Yes	~~10~~ Addendum 10	4 ~~5~~ 4 5	~~5, 9~~ ~~5~~ 5, 9 4	~~3 to 4, 16 to 17~~ ~~7 to 14~~ 5-1, 9-1 to 9-2 4-1 to 4-7

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.2 Fuel Management Plan	vi. Duties and responsibilities of key organizations and personnel.	Yes	~~10~~ Addendum 10	~~4~~ ~~5~~ 4 5	~~5, 9~~ ~~5~~ 5, 9 4	~~3 to 4, 16 to 17~~ ~~7 to 14~~ 5-1, 9-1 to 9-2 4-1 to 4-7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3 Spill Contingency Plans	The Proponent shall develop Spill Contingency Plans based on its Environmental Policy and which promote environmental awareness and safety, and further, which facilitate efficient clean- up for potential spill incidents related to the Project. These plans shall include Land, Water and Ice Based Spill Contingency Plans, Oil Handling Facility Contingency Plans and Shipboard Oil Pollution Emergency Plans.	Yes	~~10~~ Addendum 10	~~5~~ 5	~~All~~ All	~~All~~ All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3 Spill Contingency Plans	In each plan, the Proponent shall address potential constraints to timely actions and immediate clean-up of spills which result from logistical and/or weather conditions.	Yes	~~10~~ Addendum 10	~~5~~ 5	~~8.2, All~~ 8.2, All	~~23 to 25, All~~ 8-1 to 8-4, All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3 Spill Contingency Plans	The Proponent shall include the following elements in its development of all spill contingency plans:		-	-	-	-
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.1 Land, Water and Ice Based Spill Contingency Plans	i. Requirements of federal and territorial regulations,	Yes	~~10~~ Addendum 10	~~5~~ 5	~~1.6~~ 3	~~3 to 4~~ 3-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.1 Land, Water and Ice Based Spill Contingency Plans	ii. Substances to which the plan is applicable (e.g. oil, fuel, hazardous materials, chemicals and other deleterious substances) and potential spill scenarios (on land, water and ice, if applicable),	Yes	~~10~~ Addendum 10	~~5~~ 5	~~3, 8~~ 7.3, 8	~~6, 22 to 28~~ 7-7, 8-1 to 8-9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.1 Land, Water and Ice Based Spill Contingency Plans	iii. Training for emergency response staff, including distributing Material Safety Data Sheets (MSDS) to designated emergency response and health centre staff,	Yes	~~10~~ Addendum 10	~~5~~ 5	~~6, 6.4~~ 5, 5.4	~~14 to 16~~ 5-1 to 5-2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.1 Land, Water and Ice Based Spill Contingency Plans	iv. Alerting, notification and reporting procedures,	Yes	~~10~~ Addendum 10	~~5~~ 5	~~8.15, 9~~ 8.1.5, 9	~~23, 28 to 31~~ 8-1, 9-1 to 9-2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.1 Land, Water and Ice Based Spill Contingency Plans	v. Duties and responsibilities of key spill response organizations and personnel,	Yes	~~10~~ Addendum 10	~~5~~ 5	~~5~~ 4	~~7 to 14~~ 4-1 to 4-7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.1 Land, Water and Ice Based Spill Contingency Plans	vi. Clean-up strategies, technologies and corresponding inventory of spill response equipment and kits based on different substances of spills and environment conditions where spills might occur, and	Yes	~~10~~ Addendum 10	~~5~~ 5	~~8~~ 8	~~22 to 28~~ 8-1 to 8-9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4+1059:1067 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.1 Land, Water and Ice Based Spill Contingency Plans	vii. Spill site restoration and remediation (including treatment of contaminated soils).	Yes	~~10~~ Addendum 10	~~5~~ 5	~~8.6~~ 8.6	~~28~~ 8-8
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.2 Oil Handling Facility (OHF) Contingency Plan	i. Regulatory requirements of the Canada Shipping Act,	Yes	~~10~~ Addendum 10	~~6~~ 6	~~1.1~~ 3	~~1~~ 3-1 to 3-2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.2 Oil Handling Facility (OHF) Contingency Plan	ii. Established Oil Pollution Prevention/Emergency Plan for operation of OHF,	Yes	~~10~~ Addendum 10	~~6~~ 6	~~1.2~~ 2.1	~~1 to 2~~ 2-1 to 2-2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.2 Oil Handling Facility (OHF) Contingency Plan	iii. Responsible personnel required equipment and training, and	Yes	~~10~~ Addendum 10	~~6~~ 6	~~6~~ 8	~~13 to 17~~ 8-1 to 8-4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.2 Oil Handling Facility (OHF) Contingency Plan	iv. Response scenarios and procedures.	Yes	~~10~~ Addendum 10	~~6~~ 6	~~8~~ 10	~~23 to 27~~ 10-1 to 10-5
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.3 Shipboard Oil Pollution Emergency Plans (SOPEPs)	i. Requirements of national laws and regulations, as well as international regulations and standards for proposed shipping operation of the Project,	Yes	~~10~~ Addendum 10	~~6~~ 6	~~2.1~~ 4.1	~~2~~ 4-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.3 Shipboard Oil Pollution Emergency Plans (SOPEPs)	ii. Marine transportation to be used for the Project including fuel tankers, container ships, barges, tugs, and any other marine vessels,	Yes	~~10~~ Addendum 10	~~6~~ 6	~~3.1, 3.2, 4~~ 5.1, 5.2, 6	~~4, 9 to 10~~ 5-1, 6-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.3 Shipboard Oil Pollution Emergency Plans (SOPEPs)	iii. A discussion regarding the relationship between SOPEPs and the Canadian Coast Guard's Regional Response Plan, including identification of potential for the Regional Response Plan to be adapted to the Project,	Yes	~~10~~ Addendum 10	~~6~~ 6	~~7.2~~ 9.2	~~19 to 20~~ 9-3 to 9-4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.3 Shipboard Oil Pollution Emergency Plans (SOPEPs)	iv. Procedures for accident/incident reporting and principle emergency response, and	Yes	~~10~~ Addendum 10	~~6~~ 6	~~7.3~~ 9.3	~~20 to 22~~ 9-4 to 9-6
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.3.3 Shipboard Oil Pollution Emergency Plans (SOPEPs)	v. Parties (e.g. the Proponent, marine vessel operators and possible third parties) who carry out emergency actions.	Yes	~~10~~ Addendum 10	~~6~~ 6	~~7.2, 7.3, 7.4~~ 9.2, 9.3, 9.4	~~19 to 23~~ 9-3 to 9-7

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	The Proponent shall develop a Site Water Management Plan for the Project. This plan shall provide a consolidated source of information on the strategies to be applied to intercept, collect, contain, conserve, monitor and prevent the release of potentially contaminated waters. This plan shall also include a discussion of all major sources of water from the Project including process effluent, open pit water, underground mine water, site and stockpile drainage/runoff, and sewage/grey waste water and is to be associated with the baseline data and impact assessment required by Subsection 8.1.6.1. The plan shall at a minimum, consider the following:		10	7	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	i. Surface runoff, snowmelt, and rainwater that might come in contact with contaminated areas at the mine sites and along roads,		10	7	3.4, 3.5, 3.6, 3.7	14 to 42
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	ii. Runoff from overburden stockpiles, waste rock stockpile areas including waste rock identified with potential ARD and ML, ore stockpiles and quarry sites,		10	7	3.4, 3.5, 3.6, 3.7	14 to 42
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	iii. Runoff from the lined fuel tank farms, fuel transfer stations, and landfill facilities,		10	7	3.4, 3.5, 3.6, 3.7	14 to 42
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	iv. The prediction of the artesian inflow into the tailing management facilities during operation with support from numerical modeling if permafrost beneath the tailing management facilities is predicted to thaw during the life cycle of the tailing management facilities. The potential preferential flow along the fault cut through the pits should be considered in the inflow prediction. Measures for controlling the groundwater inflow/seepage, where necessary, should be discussed and a groundwater monitoring plan should be developed,		10	7	3.4, 3.5, 3.6, 3.6.8, 3.7	14 to 42
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	v. A description of the water management strategies, including methods for any water conservation and recycling methods to maximize water reuse and minimize use of natural waters,		10	7	4, 7.1, 7.2.2, 7.4	42, 43 to 45
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	vi. A description of the water management for the open pits and underground mines, and the tailings management facilities with consideration for the capacity of the open pits and underground mines, and the tailings management facilities to cope with storms, floods and other intermittent natural events with consideration of a conservative precipitation event (i.e., the PMP: Probable Maximum Precipitation). Design of the pumping capacity of the plant and treatment facility should take the potential maximum inflow and the PMP event into consideration,		2 10	7 7	Appendix V2-7H, Appendix V2-7G 3, 7	All, All 3 to 42, 43 to 47
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	vii. Contingency plans should the mine water volumes be significantly larger or less than estimated, specifically to address plans for mine operations and safety during times of low water availability,		10	7	9	50
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	viii. Management measures to reduce potential impacts to the receiving environment, including collection and monitoring of drainage water, installation of settling ponds, sumps or silt curtains, and geochemical characterization of construction materials,		10	7	7	43 to 47
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	ix. Proposed management of contact and noncontact water, and how the design of these components incorporates the consideration of climate change, especially when water diversions are proposed (i.e. increased or decreased flows),		10	7	3.4.2, 7.9	14 to 17, 47
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	x. Waste water treatment technologies and facilities, and estimated volumes and treatment targets of the effluent, as well as the applicable discharge standards including standards under the Fisheries Act,		10	7	3.3, 3.6.10	13 to 14, 35
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	xi. Waste water management in the construction stage at construction camps, including treatment/disposal methods, associated facilities,		10	7	3.3, 3.5.10	13 to 14, 25
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	xii. Conceptual operation and maintenance plans, including options for sewage sludge, and		2 10	4 7	4.3.6 3.3	4-26 to 4-27 13 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.4 Site Water Management Plan	xiii. Contingency measures for sewage plant malfunction and/or disturbances, associated spill response measures, as well as treatment technologies and facilities.		10	7	5 3.3	8.3.2 13 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.5 Ore Storage Management Plan	The Proponent shall present an Ore Storage Management Plan which encompasses all ore generated or produced by the Project and includes at a minimum:		10	8	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.5 Ore Storage Management Plan	i. A discussion of the predicted ore stockpile volumes/tonnage, physiochemical characteristics, stockpile methods and procedures including dust control, runoff management, progressive reclamation plans, and other details as deemed relevant,		10	8, 29	3.1, 3.2, 3.3, 3.4, 6 2.1, 2.2, 2.5, 3.4, 5.11	2 to 5, 6 to 7 9 to 11, 13 to 14, 15 to 16, 25 to 26
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.5 Ore Storage Management Plan	ii. A description of analyses implemented in the development of the proposed pile design and runoff management plans, include description and analysis of the water balance of the stockpiled ore material, the physical and chemical characteristics of seepage and runoff from the stockpiled ore material, as well as the thermal condition of the pile and surrounding ground, and consideration in the design of control measures to ensure seepage and runoff do not impact the surrounding environment,		10	8	3.1, 3.2, 3.3, 3.4, 6	2 to 5, 6 to 7

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.5 Ore Storage Management Plan	iii. A discussion on the means to minimize loss of ore material to the environment by wind and other means,		10	8	6.2	7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.5 Ore Storage Management Plan	iv. A discussion of proposed plans for accommodating the projected volumes of materials at the ore stockpile facilities, with a discussion of measures for contingency measures to address the situation in which the designed facilities are not adequate to accommodate ore actually generated,		10	8	3	2 to 5
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.5 Ore Storage Management Plan	v. Details regarding the process for selecting the preferred options for management of ore stockpile, including a discussion of alternative options (methodologies as well as locations) considered, and the rationale by which the proposed scheme was selected, and		2 10	4 8	4.2.4 3.5	4-9 to 4-11 5 to 6
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.5 Ore Storage Management Plan	vi. A conceptual plan to monitor and audit ore generated.		10	8	7	7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	The Proponent shall present a Mine Waste Management Plan which addresses all waste rock generated or produced by the Project through all Project phases as well as all tailings generated by the Project over the mine life. It may assist the Proponent to consult with the Prediction Manual for Drainage Chemistry from Suphidic Geologic Materials (Price, 2009) and Cold Regions Cover System Design Technical Guidance Document (O'Kane Consultants, 2012) in the identification of the waste rock characteristics as well as resulting plan. The Plan shall include, at a minimum:		10	9	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	i. A discussion of the predicted volumes/tonnage, physicochemical characteristics, segregation criteria, stockpile methods and procedures including dust control, runoff and seepage management, progressive reclamation plans, and other details as deemed relevant for both waste rock and tailings,		10	9 22	3, 7 3.1	2 to 10, 11 to 12 2 to 4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	ii. A description of analyses implemented in the development of the proposed pile design and runoff and seepage management plans, include description and analysis of the water balance of the waste rock pile, the physical and chemical characteristics of seepage and runoff from waste rock piles, as well as the thermal condition of the pile and surrounding ground, and consideration in the design of control measures to ensure seepage and runoff do not impact the surrounding environment,		10	9	3, 7	2 to 10, 11 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	iii. A description of analyses implemented in the development of the proposed pond design and runoff and seepage management plans, include description and analysis of the water balance, the physical and chemical characteristics of seepage and runoff from surrounding area, as well as the thermal condition of the pond and surrounding ground, and consideration in the design of control measures to ensure seepage and runoff do not impact the surrounding environment,		2 10	7 9	Appendix V2-7E 3, 7	All 2 to 9, 11 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	iv. A description of the potential for rock heave phenomena and any resulting implications to ground stability,		10	9	3.5	8
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	v. A discussion of proposed plans for accommodating the projected volumes of materials at waste rock and tailings facilities, with a discussion of measures for contingency situations in which the designed facilities may not be adequate to accommodate the volumes of waste rock and tailings actually generated,		10	9 22	3 3.1	2 to 10 2 to 4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	vi. Details regarding the process for selecting the preferred options for the management of waste rock and tailings, including a discussion of alternative options (methodologies as well as locations) considered, and the rationale by which the proposed schemes were selected,		2 10	4 9	4.2.5, 4.2.6 3.7	4-11 to 4-18 8 to 10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	vii. Detailed information on the waterways impacted by the proposed deposition of tailings to determine whether or not the Navigable Waters Protection Act (or subsequent replacement legislation) applies, as well as details of any anticipated impacts to navigation on any waterways listed as "navigable", and		10	22	6.4	15
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	vii. Detailed information on the waterways impacted by the proposed deposition of tailings to determine whether or not the Navigable Waters Protection Act (or subsequent replacement legislation) applies, as well as details of any anticipated impacts to navigation on any waterways listed as "navigable", and		10	9	7.4	12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.6 Mine Waste Rock and Tailings Management Plan	viii. Conceptual plans to monitor and audit mine waste rock and tailing ponds.		10	9 22	8 7	12 to 13 16
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.7 Landfill and Waste Management Plan	The Proponent shall develop a Landfill and Waste Management Plan which discusses how non-combustible, non-hazardous industrial wastes will be handled in a safe and environmentally sound manner, and includes the sorting, possible transport, and ultimate disposal of Project wastes. The plan should emphasize how the Proponent plans to minimize the environmental footprint of the Project, and shall include:		10	10	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.7 Landfill and Waste Management Plan	i. Landfill management plans for the mining operations phase,		10	10	7.3	10 to 12

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.7 Landfill and Waste Management Plan	ii. A discussion of measures taken during periods of rainwater, snow and spring freshet,		10	10	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.7 Landfill and Waste Management Plan	iii. Landfill closure and reclamation plans,		10	10 29	7.3 5.10	10 to 12 25
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.7 Landfill and Waste Management Plan	iv. A description of plans to reduce/reuse/recycle Project wastes, and		10	10	4.3	4 to 5
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.7 Landfill and Waste Management Plan	v. A discussion of any planned use of municipal waste management facilities or services.		10	10	4, 7	2 to 6, 9 to 15
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	The Proponent shall develop a Hazardous Materials Management Plan. The hazardous materials discussed are to include hydrocarbon contaminated soils, snow and water, fuel, lubricants, process reagents, chemical reagents used for site laboratory, solvents and paints, medical wastes, batteries, and other office-generated hazardous waste. This plan shall be developed in connection with the Emergency Response and Contingency Plan, and is to include the following:		10	12	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	i. Characterization of potential environmental hazards posed by these materials, and the management of these through the environmental management system,		10	12	6	6 to 11
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	ii. Purchasing controls, shipment tracking procedures,		10	12	10	22 to 28
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	iii. Fuel storage monitoring program,		10	12	9	22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	iv. Safe handling and storage procedures,		10	12	7.3, 7.4, 7.5	12 to 22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	v. A discussion of the allocation of responsibilities for managing shipments, storage, handling and use of potentially hazardous materials,		10	12	7.3	12 to 22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	vi. Contingency and emergency response plans associated with hazardous materials,		10	12	6.2, 7.4	10 to 11, 21 to 22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	vii. Type and delivery of training for management, workers, and contractors whose responsibilities include handling potentially hazardous materials as well as those that may be required to assist and/or treat any of the above if there is an emergency/accident (i.e. local fire department, health centre, Royal Canadian Mounted Police detachment, etc.),		10	12	6.3	11
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	viii. Procedures for the maintenance and review of records of hazardous material consumption and incidents in order to anticipate and avoid impacts on human health and the environment,		10	12	11	28 to 29
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	ix. Plans for unused chemicals and/or reagents upon the completion of Project activities,		10	12	7.3.6	21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	x. Procedures to track and manage wastes generated through use of these products, including shipments of potentially hazardous waste to licensed disposal facilities, and		10	12	10, 11, 12	22 to 29
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.8 Hazardous Materials Management Plan	xi. A discussion on the waste management at the dock site including shipping waste generated on board and hazardous waste.		10	12	7.1, 7.3.5	11, 20 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.9 Incineration Management Plan	The Proponent shall develop an Incineration Management Plan which is consistent with the guidance provided in Environment Canada's (EC) Technical Document for Batch Waste Incineration (EC, 2010). The Plan shall include but not be limited to the following:		10	11	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.9 Incineration Management Plan	i. Standards/requirements for emissions from incinerator operation,		10	11	4, 6.1	2, 4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.9 Incineration Management Plan	ii. Incineration technologies to be used, facilities and equipment to be used,		10	11	6, 7, 8	4 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.9 Incineration Management Plan	iii. Personnel training programs for incinerator management and operation, and		10	11	6.4, 6.5	4 to 6
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.9 Incineration Management Plan	iv. Collection and reporting of operational data and maintenance records.		10	11	8, 9, 10, 11, 12	8 to 10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	The Proponent shall develop a Roads Management Plan for all access/service roads proposed in the Project areas. The Plan shall address construction, operations, temporary closure and final closure phases of the Project. In association with the Spill Contingency Plan and the Wildlife Mitigation and Monitoring Plan, this plan shall include:		10	14	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	i. Permitting regime and land tenure of all ground transportation as well as designations of accessibility to public,		10	14	1.2.1, 5	1, 13 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	ii. A discussion on how the selected route(s) may correspond to the needs of other developers and of Nunavummiut, paying particular mind to any public consultation undertaken with respect to the proposed routing, specifically as it may relate to traditional land or resource use,		10	14	1.2.1	1

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	iii. Construction details applicable to Transport Canada's Navigable Waters Protection Program which could include, but not be limited to, any works built or placed in, on, over, under, through or across a navigable waterway (i.e. bridges, booms, dams, and causeways).		10	14	4.1, 4.2	9 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	iv. Projected traffic volumes, including the types and numbers of vehicles to be used, fluctuations on a seasonal or annual basis, and measures to enforce speed limits,		10	14	1.2.2, 8	1, 17 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	v. Protocols for accidents, accidents causing injuries, vehicle malfunction and emergency protocols,		10	14	8	17 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	vi. Mitigation measures and protocols to be implemented during construction and operations to mitigate potential impacts to wildlife, including explicit thresholds for mitigation of potential wildlife interactions, collisions and follow-up procedures,		10	14	9, 10	21 to 22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	vii. Measures for preventing the permafrost degradation during construction and operation of ground transportation,		10	14	4.2, 7.3	11 to 12, 16
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	viii. Operational procedures for daily operation and maintenance including dust suppression methods, snow removal, de-icing, snow drift/banks management,		10	14	7.1, 7.2	14 to 16
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	ix. Measures to control surface runoff during spring freshet and flooding during construction and operation phases,		10	14	4.2. 7.1	11 to 12, 14-18
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	x. Measures to control sedimentation during construction, maintenance and operation,		10	14	4.2.3	12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	xi. Safety procedures, emergency reporting and procedures for fuel/chemical spills, and other emergency events		10	14	8	17 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	xii. Plans for site reclamation, especially temporary construction camp and quarry sites which are used for extracting construction materials, disposal of construction waste materials and options of final closure and reclamation, and		10	14	12	22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.10 Roads Management Plan	xiii. A discussion of potential future uses (e.g. potential public use).		10	14	12	22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	The Proponent shall present a Shipping Management Plan for all Project-related shipping, in connection with the SOPEPs (Subsection 9.4.2), the Wildlife Mitigation and Monitoring Plan, and other related plans as applicable. This plan should include:		10	15	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	i. Applicable environmental legislation, regulations Acts and guidelines associated with shipping, including:		10	15	5, 7, Appendix A	9 to 11, 12 to 16, All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	o International legislation, such as: MARPOL Convention, Protocols and Annexes as set out by the International Maritime Organization (IMO, 2008, MARPOL 73/78),		10	15	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	o Canadian legislation, such as: Canada Shipping Act, Arctic Waters Pollution Prevention Act (e.g. Zone/Date System, Arctic Ice Regime Shipping System, Ice Navigators if applicable),		10	15	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	o Construction details applicable to Transport Canada's Navigable Waters Protection Program which could include, but not be limited to, any works built or placed in, on, over, under, through or across a navigable waterway (i.e. bridges, booms, dams, and causeways), and		10	15	1.1, 7.2, Appendix A	1 to 2, 13 to 14, All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	o How the Proponent and its shipping contractors/partners intend to either meet or exceed these requirements for both barging and deep sea shipping operations and for all marine shipping alternatives.		10	15	1.2, 7.0	2, 12 to 16
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	ii. A description of basic contingency planning associated with the marine transportation component of the project, particularly in relation to the movement of oil, explosives and other hazardous materials,		10	15	2, 7.4	6, 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	iii. Provide a hazard identification analysis of the barge and ship routes and a preliminary risk analysis of the marine routes under consideration, along with intended methods of mitigating marine transportation risks,		10	15	7	12 to 16
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	iv. A discussion of proposed safety measures,		10	15	7	12 to 16
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	v. A discussion of the challenges related to cleaning up fuel spills in the Arctic environment due to cold temperatures, presence of ice, darkness and remoteness,	Yes	~~10~~ Adddendum	~~5, 6~~ 5, 6	~~8.2.3~~ ~~3.3.5~~ 8.2.3 5.3.5	~~24 to 25~~ ~~6 to 7~~ 8-3 to 8-4 5-3 to 5-4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	vi. Disposal plans and management for onboard waste including solid waste and sewage/grey water while docked at the dock facility and while in transit. Plans should include discussion on how the Proponent and its shipping contractors/partners intend to either meet or exceed legislation and/or other regulatory requirements,		10	15	1.3, 7.5	2 to 6, 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	vii. Ballast water management plan for all Project shipping, as applicable, with indication of the proposed ballast water exchange locations in mid-ocean, at the dock facility in Bathurst Inlet, and alternative exchange zones within waters under Canadian jurisdiction. Include associated implications for regulatory compliance (Government of Canada, 2006),		10	15	8, Appendix A	16, All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	viii. Proposed measures to eliminate or reduce the risk of invasive aquatic and non-aquatic species being introduced into Canadian waters as a result of shipping,		10	15	11	19 to 20

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	ix. A discussion of whether the shipping route or part of the proposed shipping route is a compulsory or non-compulsory pilotage area, and associated implications for regulatory compliance (Government of Canada, 2009) if applicable,		10	15	1.2	2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	x. Marine wildlife mitigation and onboard monitoring plans, including:		10	15	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	o Applicable guidelines, monitoring protocols, and reporting/action procedures,		10	15	11.1	19
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	o Measures to minimize the potential interactions between marine mammals and marine vessels, and		10	15	11.2	19
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	o A description of how interactions between marine mammals and shipping operations will be dealt with,		10	15	11.3	19 to 20
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	xi. Details regarding the proposed procedures for accident, malfunctions and incident management and reporting, including accidental spills of fuel and chemicals along the shipping routes, and from the accidental grounding/stranding of ships along the shipping routes. This should include a discussion of the preparedness of adequate resources to respond to a large fuel spill from a cargo vessel in transit, with reference to the SOPEPs,		10	15	9	16 to 18
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	xii. Measures to mitigate potential impacts to the safety of persons traveling in boats along Project shipping routes,		10	15	10	18 to 19
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	xiii. Measures to prevent the transportation of illicit substances via the marine shipment of project-related goods and supplies,		10	15	13	22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	xiv. Anticipated use of police services for offloading supplies and materials, including dangerous goods and explosives, and in the engagement of emergency/accident procedures,		10	15	7.1, 7.2, 7.3, 7.4, Appendix A	12 to 14, All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	xv. Identified third party liabilities, and		10	15	Appendix A	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.11 Shipping Management Plan	xvi. Measures intended to mitigate potential socio-economic impacts as results of shipping.		10	15	3	6 to 7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	The Proponent shall develop a Borrow Pits and Quarry Management Plan which includes:		10	16	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	i. Regulations and guidelines to be complied with,		10	16	4	9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	ii. A description of how the Proponent will minimize the overall impact on surrounding environments by maximizing the use of existing pits and quarry sites to the extent possible, to minimize the number of opened pits, and minimizing haul distances and surface disturbance,		10	16	6	9 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	iii. Sediment, dust and erosion prevention and control measures,		10	16	6.3	11
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	iv. Results of ARD/ML potential testing for quarried materials and pit walls, and associated mitigation measures,		2 10	7 16	Appendix V2-7D (7.2.3) 3.4	72 6 to 7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	v. Aggregate extraction and quarry methods, with associated mitigation measures for potential impacts on the environment, including archaeological,		10	16	3, 6	2 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	vi. Proposed methods for handling ice, with plans to manage water released by the thawing of permafrost and ground ice, and		10	16	6.4	11 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.12 Borrow Pits and Quarry Management Plan	vii. A progressive reclamation strategy and associated technologies.		10	16	3.6	7 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	The Proponent shall develop an Explosives Management Plan which provides information on explosives transport, storage and handling at the Project. This plan must discuss the following:		10	13	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	i. Applicable federal and territorial Regulations and Acts,		10	13	4	3 to 4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	ii. Methods and procedures for the manufacture, transport, storage, handling, and use of explosives,		10	13	6.1, 6.2, 6.5, 6.6	4 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	iii. Details on the manufacture and storage facilities for Ammonium Nitrate and Fuel Oil (ANFO), including applicable guidelines, monitoring protocols, and reporting/action procedures,		10	13	6.1.1, 6.1.2, 9, 10	4 to 5, 19 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	iv. Best practices to minimise usage and loss rate,		10	13	8	18 to 19
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	v. Safe handling and spill containment prevention methods,		10	13	6.7, 6.8	14 to 17
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	vi. An evaluation of worst case scenarios (e.g. accidental explosion),		10	13	10.4	20 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	vii. Security measures to be implemented,		10	13	6.9	17
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	viii. Personnel training program, and		10	13	6.4	11 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.13 Explosives Management Plan	ix. An internal audit and inspection.		10	13	9.1	19 to 20

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.14 Air Quality Monitoring and Management Plan	The Proponent shall develop an Air Quality Monitoring and Management Plan in association with the baseline data collected and the impact assessment in Subsection 8.1.1. This plan must include the following key elements:		10	17	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.14 Air Quality Monitoring and Management Plan	i. A description of proposed air quality monitoring and related adaptive management measures for emissions related to the Project as described in Subsection 8.1.1.2, including thresholds for action and mitigation strategies,		10	17	4, 6, 7	2 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.14 Air Quality Monitoring and Management Plan	ii. An emissions reduction strategy, through which the Proponent would employ appropriate technologies and operating practices, in an effort to minimize emissions of air contaminants from all Project facilities including compliance with approved criteria, and reducing the production of GHGs and other emissions,		10	17	6.1	5 to 7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.14 Air Quality Monitoring and Management Plan	iii. A dust reduction plan which addresses the use of dust suppression agents, procedures and applicable guidelines for all Project areas where fugitive dust is a concern for air quality and human health,		10	17	6.1	5 to 7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.14 Air Quality Monitoring and Management Plan	iv. An incineration management plan, as described in Subsection 9.4.9, describing how emissions will be minimized and the Canada-wide Standards for Dioxins and the Furans and the Canada-wide Standards for Mercury emissions met, and		10	17	6.1	5 to 7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.14 Air Quality Monitoring and Management Plan	v. Procedures for reporting of project emissions and monitoring results.		10	17	11	16 to 17
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.15 Noise Abatement Plan	The Proponent shall develop a Noise Abatement Plan to provide information on monitoring and mitigating of noise impacts based on its impact assessment in Subsection 8.1.2. This plan must discuss:		10	18	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.15 Noise Abatement Plan	i. Applicable standards, guidelines and regulations that will be incorporated to minimize and mitigate noise effects from the Project,		10	18	2	1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.15 Noise Abatement Plan	ii. An environmental noise follow-up monitoring program indicating location, duration, timing and type of noise monitoring to be conducted,		10	18	4	2 to 3
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.15 Noise Abatement Plan	iii. A description of noise control methods based on the climatic conditions and available technologies to be employed should mitigation be required,		10	18	3, 4	1 to 3
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.15 Noise Abatement Plan	iv. Measures and technologies to be adopted in the design and manufacturing of Project infrastructure and facilities to reduce noise,		10	18	3	1 to 2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.15 Noise Abatement Plan	v. A description of noise attenuation and minimization measures to be employed through choosing appropriate equipment, installation of noise silencing devices, scheduling of take-off and landing aircrafts, and blasting timing, and		10	18	3	1 to 2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.15 Noise Abatement Plan	vi. Occupational related noise management programs.		10	18	3	1 to 2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	The Proponent shall develop an Aquatic Effects Management Plan to provide information regarding proposed mitigation measures designed to protect and minimize the impacts on the aquatic system (freshwater and marine) from all project activities occurring in or near watercourses through all project phases, as well as those plans and programs designed to monitor potential effects to the aquatic system. This plan must include:	Yes	~~10~~ Addendum 10	~~19~~ 19	~~All~~ All	~~All~~ All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	i. Applicable standards, guidelines and regulations,	Yes	~~10~~ Addendum 10	~~19~~ 19	~~4~~ 1.3	~~2 to 3~~ 1-2 to 1-3
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	ii. Erosion and sediment control measures for works in or near waterbodies and watercourses,	Yes	~~10~~ Addendum 10	~~19~~ 19	~~6.1.2~~ 5.2.6	4 to 8 5-5 to 5-6
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	iii. Measures to be applied to protect fish, aquatic biota, and the habitat of both during blasting in or near freshwater and marine environments,	Yes	~~10~~ Addendum 10	~~19~~ 19	~~6.1.3~~ 5.4.6	~~8~~ 5-12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	iv. A description of the fish-out program proposed for the removal of fish from the lakes that are proposed to be dewatered during construction of the mine and the tailings impoundment area,	Yes	~~10~~ Addendum 10	~~19~~ 31	~~6.1.4~~ All	~~8 to 12~~ All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	v. Monitoring and reporting protocols as per the Environmental Effects Monitoring (EEM) program of the Metal Mining Effluent Regulations (EC, 2011),	Yes	~~10~~ Addendum 10	~~19~~ 19	~~7.2.4~~ 7	~~22~~ 7-1 to 7-2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	vi. A description of monitoring study design and field methods, including indicators to be measured, sampling frequency and methods, timing, spatial extent and Universal Transverse Mercator (UTM) coordinates of sampling locations for each aquatic sampling location, and	Yes	~~10~~ Addendum 10	~~19~~ 19	~~7~~ 5	~~12 to 35~~ 5-1 to 5-12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.16 Aquatic Effects Management Plan	vii. A description of how indictors, sampling design, methodology and the analysis will be appropriate and adequate to detect spatial and temporal project related impacts on the aquatic ecosystem and provide statistically rigorous tests of impact prediction presented in the EIS.	Yes	~~10~~ Addendum 10	~~19~~ 19	~~7~~ 5	~~12 to 35~~ 5-1 to 5-12

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	The Proponent shall develop a Wildlife Mitigation and Monitoring Plan in consultation with Government of Nunavut-Department of Environment (GN-DOE), Fisheries and Oceans Canada (DFO), Environment Canada (EC), and other relevant agencies or organizations. This plan must include appropriate mitigation and monitoring for selected terrestrial and marine species, with consideration for potential impacts identified in the relevant subsections of the EIS. This plan is required to include the following:	Yes	~~10~~ Addendum 10	~~20~~ 20	~~All~~ All, Addendum Appendices V5-5I, V5-5J, V5-5K	~~All~~ All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	i. A description of the LSA and the RSA for wildlife mitigation and monitoring programs,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.1.4~~ 6	~~49 to 50~~ 6-1 to 7-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	ii. Selection criteria and rationales for wildlife species selected for monitoring and mitigation programs,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~2, 3, 4, 6, 7.1~~ 2, 3, 4, 6, 7.1	~~2 to 51~~ 2-1 to 7-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	iii. A description of how TK collected by the Proponent has been integrated into baseline data collection, impact predictions and significance determinations, and the development of mitigation and monitoring programs,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~1.1~~ 1.1	~~1-1~~ 1-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	iv. Details regarding plans for involvement of local hunters in wildlife baseline studies and monitoring program if applicable, including the mechanisms and resources allocated for local participation,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.1.2~~ 7.2.1.3	~~48~~ 7-33 to 7-35
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	v. Plans for coordinating wildlife studies/monitoring activities with other organizations, institutions, government departments and/or individual researchers conducting wildlife studies in the RSA, to minimize the impacts on wildlife from studies/survey activities,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.1~~ 7.2.1.2, 7.2.2.2 to 7.2.2.4, 7.2.2.7, 8.2.2.4, 9.2.2.3	47 to 51 7-31 to 7-33, 7-40 to 7-45, 7-47, 8-12, 9-15
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	vi. A discussion of how terrestrial wildlife surveys, particularly low elevation caribou surveys, and monitoring protocols (including data confidentiality) will be designed to mitigate potential impacts on terrestrial mammals, in particular caribou,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.3~~ 7.2.2.4	~~77 to 112~~ 7-43 to 7-45
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	vii. A description of monitoring study design and field methods, including indicators to be measured, sampling frequency and methods, timing, spatial extent, and Universal Transverse Mercator (UTM) coordinates of transect lines if applicable, for each wildlife species to be monitored,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.2, 7.3~~ 7.2.1.1 to 7.2.1.3, 7.2.2.2 to 7.2.2.7, 8.2.2.3	~~51 to 112~~ 7-28 to 7-35, 7-40 to 7-47, 8-12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	viii. A description of how indicators, sampling design, methodology and analysis will be appropriate and adequate to detect spatial and temporal project-related impacts on wildlife and provide statistically rigorous tests of impact predictions presented in the EIS,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.2, 7.3~~ 7.2.1.1 to 7.2.1.3, 7.2.2.2 to 7.2.2.7, 8.2.2.3	~~51 to 112~~ 7-28 to 7-35, 7-40 to 7-47, 8-12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	ix. Measures to be applied to avoid or reduce the disturbance, harassment, injury or mortality of marine mammals due to shipping activities,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~11~~ 19	~~19 to 20~~ 19-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	x. Measures to be applied to avoid or reduce the disturbance, harassment, injury or mortality of terrestrial wildlife due to Project activities, including measures to prevent wildlife from entering pit areas and birds from landing on tailings impoundment area,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~6~~ 7.1.3, 7.1.5.1 to 7.1.5.3, 7.1.5.6 to 7.1.5.8, 7.1.5.11	~~7 to 47~~ 7-8 to 7-12, 7-12 to 7-20, 7-20 to 7-21, 7-23
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xi. Measures to minimize noise disturbance to wildlife and hunters/travellers when conducting aerial wildlife surveys,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.3~~ 7.2.2.2 to 7.2.2.7, 8.2.2.3	~~77 to 112~~ 7-40 to 7-47, 8-12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xii. Procedures and structures designed to mitigate/manage potential impacts to wildlife and wildlife movement (e.g. caribou crossings and migration routes) during construction and operations,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~6.2, 6.4~~ 7.1.5.10, 9.1.3.7	~~8 to 14, 17 to 21~~ 7-23, 9-4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xiii. Plans to facilitate the safe passage of wildlife across the all-weather access road and associated mitigation measures to prevent collisions with wildlife,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~6.2, 6.4~~ 7.1.5.10, 9.1.3.7	~~8 to 14, 17 to 21~~ 7-23, 9-4
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xiv. Plans and measures to avoid or reduce the potential for Project activities to act as an attractant to wildlife species and to avoid and reduce injury, illness or mortality of wildlife (including intentional killing of wildlife by mine personnel to defend human life or property),	Yes	~~10~~ Addendum 10	~~20~~ 20	~~6.3~~ 7.1.9, 8.1.7, 9.1.7, 10.1.7, 11.1.7, 12.1.7	~~14 to 17~~ 7-26, 8-5, 9-5, 10-4, 11-4, 12-2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xv. A description of data analysis methods, triggers/thresholds for adaptive management plans, and proposed mitigation measures,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~7.3~~ 7.2.2.2 to 7.2.2.7, 8.2.2.3	~~77 to 112~~ 7-40 to 7-47, 8-12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xvi. A mechanism for the evaluation of effectiveness of mitigation measures,	Yes	~~10~~ Addendum 10	~~20~~ 20	~~9~~ 17	~~113~~ 17-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xvii. Quality assurance and quality control measures, and	Yes	~~10~~ Addendum 10	~~20~~ 20	~~13~~ 21	~~114~~ 21-1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.17 Wildlife Mitigation and Monitoring Plan	xviii. Reporting and plan updating procedures.	Yes	~~10~~ Addendum 10	~~20~~ 20	~~11~~ 19	~~113 to 114~~ 19-1

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	The Proponent shall present a No Net Loss Plan (NNLP) to discuss measures to be implemented for off set of the loss of aquatic habitat due to Project activities and components. This plan should include the principle of No Net Loss for fish habitat as outlined in the Policy for the Management of Fish Habitat (DFO, 1986), and shall include, where appropriate, habitat replacement options and monitoring programs and off set plans as developed in consultation with DFO and KIA. The No Net Loss Plan shall discuss the following:	Yes	~~10~~ Addendum 10	~~21~~ 21	~~All~~ All	~~All~~ All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	i. Requirements of related DFO policies,	Yes	~~10~~ Addendum 10	~~21~~ 21	~~1.1.1~~ 1.1.1	~~6 to 7~~ 6 to 7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	ii. The estimate of total fish habitat loss and methods used for estimations,	Yes	~~10~~ Addendum 10	~~21~~ 21	~~2~~ 2	~~7 to 14~~ 8 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	iii. Plans to off-set losses to fish habitat in order to achieve "No Net Loss" of fish habitat productive capacity,	Yes	~~10~~ Addendum 10	~~21~~ 21	~~3~~ 3	~~14 to 20~~ 15 to 19
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	iv. Procedures and structures designed to mitigate/manage potential impacts to fish and fish habitat during construction and operation including fishout programs of any drained lakes,	Yes	6 7 ~~10~~ Addendum 10	6, 7 4, 5 ~~21~~ 21 31	6.5.3, 6.8, 7.5.3, 7.8 4.5.3, 4.8, 5.5.3, 5.8 ~~3, 5, 9~~ 3, 5 All	6-61 to 6-70, 6-71 to 6-74, 7-46 to 7-56, 7-57 to 7-60 4-46 to 4-49, 4-52, 5-29 to 5-31, 5-34 to 5-37 ~~14 to 20, 22 to 27, 69 to 70~~ 15 to 19, 23 to 27 All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	v. Details regarding the proposed offsetting options, including locations and conceptual designs for implementation (e.g. rearing habitat, migration channels, etc.),	Yes	~~10~~ Addendum 10	~~21~~ 21	~~3~~ 3	~~14 to 20~~ 15 to 19
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	vi. A discussion on how TK was incorporated into the development of the No Net Loss Plan,	Yes	~~10~~ Addendum 10	~~21~~ 21	~~2.1.3~~ 2.1.3	~~12 to 13~~ 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	vii. A description of the location(s) of the tailings impoundment area and the fish habitat affected by the deposit,	Yes	~~10~~ Addendum 10	~~21~~ 21	4 4	~~20 to 22~~ 20 to 22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	viii. A description of the measures to be taken to mitigate any potential adverse effect on the fish habitat that could result from plan implementation,	Yes	~~10~~ Addendum 10	~~21~~ 21	~~3, 4~~ 3, 4	~~14 to 22~~ 15 to 22
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	ix. A description of measures to be taken to monitor plan implementation,	Yes	~~10~~ Addendum 10	~~21~~ 21	~~5, 7.2.2, 7.5~~ 5, 7.3.1.2, 7.4.4	~~22 to 27, 45 to 46, 65 to 66~~ 23 to 27, 48 to 49, 72 to 73
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	x. A description of the measures to be taken to verify the extent to which the plan's purpose has been achieved,	Yes	~~10~~ Addendum 10	~~21~~ 21	~~7.5~~ 7.4.4	~~65 to 66~~ 72 to 73
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	xi. A description of the time schedule for plan implementation, which shall provide for achievement of the purpose of the plan within a reasonable time, and	Yes	~~10~~ Addendum 10	~~21~~ 21	~~7.4.3, Table 7.4-1, 7.5~~ 7.4.3, Table 7.4-2, 7.4.4	~~64-66~~ 71 to 73
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.4 BIOPHYSICAL MANAGEMENT PLANS	9.4.18 No Net Loss Plan	xii. A description of the consultation efforts for the No Net Loss Plan for the tailings impoundment area, including KIA, DFO and other affected parties, including overall effort and opportunities for parties to provide options for offsetting predicted impacts to fish and fish habitat.	Yes	~~10~~ Addendum 10	~~21~~ 21	~~2~~ 2	~~7 to 14~~ 8 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS		The Proponent shall present plans, policies and programs to minimize potential negative socio- economic effects and to optimize the potential positive effects of the Project. Socio-economic management plans shall be developed and organized to correspond with the socio-economic impact assessment described in Section 8.2. Plans should reflect the complete life span of the Project, and contain appropriate monitoring and evaluation techniques (e.g. indicators) that will allow regulators to intervene in a timely and constructive manner.		10	23, 24, 26, 28	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS		The Proponent shall describe its socio-economic mitigation and monitoring plans and mitigation programs, including how they will identify, react and mitigate potentially adverse socio-economic impacts and augment positive socio-economic impacts.		8 10	3 23, 24, 26, 28	3.8, 3.9 All	3-124 to 3-139 All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS		In consultation with the Kitikmeot Socio-Economic Monitoring Committee (SEMC), the Proponent should clearly identify the role it will take in regional monitoring initiatives, including how its monitoring plans will align with those of the regional SEMC. The Proponent may also use experience from other projects or jurisdictions regarding the success of such mitigation measures as part of the Proponent's assessment of impacts and development of these plans.		10	23	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS		The Proponent shall outline how the predominant regional language/dialect in the RSA will be incorporated into each respective plan. The management plans shall include, but are not limited the following individual plans:		8	3	3.8	3-124 to 3-128
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.1 Business Development Plan	The Proponent shall provide a Business Development Plan that includes, but is not limited to:		10	24	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.1 Business Development Plan	i. Commitments (e.g., workforce percentage) and strategies for local/regional preferential hiring and contracting,		10	24	7.1	5 to 8
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.1 Business Development Plan	ii. Strategies for building capacity for local businesses and entrepreneurs,		10	24	7.2	8 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.1 Business Development Plan	iii. Communication methods to share information on opportunities with local or regional businesses,		10	24 26	7.1 7.4	5 to 8 9 to 10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.1 Business Development Plan	iv. Community-based investment or initiatives that may lead to economic diversity, and		10	24	7.3	9 to 10

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.1 Business Development Plan	v. A discussion on what efforts the Proponent will undertake to ensure project-specific benefits can remain in the Kitikmeot region and/or in Nunavut.		10	24	7.1	5 to 8
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	The Proponent shall present an Occupational Health and Safety Plan focusing on the following elements in conjunction with its Spill Contingency Plan, Risk Management Plan, Noise Abatement Plan, and any other relevant plans:		10	25	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	i. An overview of the occupational health and safety program for the activities and works being proposed,		10	25	1	1 to 3
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	ii. Policies and guidelines regarding interaction with Nunavut's medical health system including the provision of relevant health and safety information regarding hazardous materials, including Material Safety Data Sheets to the appropriate health centers and any emergency response staff,		10	25	3.12	11
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	iii. Safety and management procedures related to hazardous chemical, physical, and biological agents and materials, including their manufacture, storage, use and disposal,		10	25	3.1	4 to 5
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	iv. Best safety practices and safety awareness programs,		10	25	3.7	8
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	v. An overview of the workplace conditions, such as accommodation, food/nutrition, health and safety, alcohol/drug/smoking policies, and recreation,		10	25	3.13	11 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	vi. Employee involvement and related training programs for ensuring awareness of employee responsibilities in environmental and health and safety management, including roles pertaining to safety orientation, hazard analysis, first-aid training, human-wildlife encounters and protocols to follow, etc.,		10	25	3.8	8 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	vii. Risk management and safety management details regarding the preparedness of mine safety equipment and devices,		10	25	3	4 to 14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	viii. Procedures for emergency incidence reporting and actions including procedures for medical transport of injured staff or persons, including transport from the location of the incident to help, ambulance or medical transportation onsite, and medevac to local health center, hospital, or referral south,		10	25	3.9, 3.11	9 to 11
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	ix. Details regarding workplace monitoring and control, and		10	25	3.1, 3.13	4 to 5, 11 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.2 Occupational Health and Safety Plan	x. First aid training and occupational medical surveillance.		10	25	3.12	11
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	The Proponent shall present a Community Involvement Plan which discusses the following:		10	26	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	i. Provision of a clear definition of public and community for the purposes of the Community Involvement Plan,		10	26	7	5 to 10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	ii. Mechanisms for providing information to the public and potentially affected communities regarding regular updates of Project's progress, initiatives and future work plans (e.g. training opportunities, hiring information, etc.),		10	26	7.1, 7.2	5 to 8
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	iii. Plans and procedures for communicating with the public and Project employees during any temporary closure or slowdown periods,		10	26	7.1	5 to 7
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	iv. Methods and procedures for establishing effective two-way communications for collecting and addressing public concerns,		10	26	7.3	8 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	v. Methods to evaluate public engagement efforts in order to identify the effectiveness of the plan,		10	26	7.3	8 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	vi. Measures to assist communities with addressing potential social needs and problems related to the Project, including proposed counselling services for employees and their families regarding matters such as substance abuse, work-related stress management, family support, etc.,		10	26	7.4	9 to 10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	vii. An approach to promoting the participation of Nunavummiut in project employment, including any preferential recruitment policies or practices,		10	26	7.4	9 to 10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	viii. Plans for promoting local contracting opportunities and purchasing of local products (e.g. country foods),		10	26	7.4	9 to 10

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	ix. A discussion of how input from communities has influenced the design and implementation of monitoring plans and initiatives,		10	26	7.2	7 to 8
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	x. A discussion of communications procedures for the Proponent and members of affected communities to disseminate Project monitoring results and Project information on social, cultural, and ecological conditions, and		10	26	7.5	10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.3 Community Involvement Plan	xi. A discussion of procedures for community-based monitoring of social, cultural, and ecological conditions to determine if, when, and how the Project contributes to community sustainable development.		10	26	7.5	10
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.4 Cultural and Heritage Resources Protection Plan	The Proponent shall, in consultation with the Government of Nunavut-Department of Culture and Heritage, present a Cultural and Heritage Resources Protection Plan which includes the following:		10	27	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.4 Cultural and Heritage Resources Protection Plan	i. Applicable regulations and guidelines for management of potential impacts to identified cultural and heritage resources,		10	27	2	1
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.4 Cultural and Heritage Resources Protection Plan	ii. Results of archaeological investigations and studies,		10	27	1, 3, 8	1 to 2, 6 to 12
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.4 Cultural and Heritage Resources Protection Plan	iii. Inventory of known archaeological resources in Project areas,		8 10	1 27	1.5 3	1-15 to 1-29 1 to 2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.4 Cultural and Heritage Resources Protection Plan	iv. A discussion of how the results from the Proponent's impact assessment have been considered and incorporated into the plan, and		10	27	3	1 to 2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.4 Cultural and Heritage Resources Protection Plan	v. General and site-specific measures for the protection of archaeological sites and mitigation of potential adverse impacts.		10	27	3, 4	1 to 2
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	The Proponent shall develop a Human Resource Plan, consulting with relevant GN departments where applicable, which includes the following:		10	28	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	i. Applicable human resources legislation, the Proponent's understanding of labour standards practices and how the Proponent will meet the requirements developing employment policies and the Proponent's policies on compensation and benefit programs (e.g. health care plan, insurance, vacation/maternity leave, etc.),		10	28	3, 7.1	2 to 7, 9 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	ii. Recruitment strategies with communities that includes regular information updates regarding employment/training opportunities, hiring plans and time schedules, etc.,		10	28	7.2	13 to 15
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	iii. A strategy discussing steps to reduce labour force entry barriers and improvement to employee retention,		10	28	3.1, 7.1	2 to 6, 9 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	iv. Any plans for training programs designed to assist the local labour force with potential employment at the mine (e.g. partnerships with local schools and other educational institutions, on-the-job learning, and apprenticeships),		10	28	7.3	15 to 18
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	v. Education and Orientation Plan to assist employees to understand their responsibilities in environmental protection and health and safety management, and to provide cultural and financial management training,		10	28	7.1	9 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	vi. Worker rotation and pay schedules, health and safety programs, preferential recruitment policy, gender equality, skills and entry requirements, training, career development, and counselling programs available for employees,		10	28	7	9 to 18
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	vii. A discussion of how the planned work schedules that are adapted to traditional activities, whether the Proponent will provide no-cost commuting to allow workers to continue to live in their own communities and to participate in their traditional economic and cultural activities,		10	28	7.1	9 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	viii. Policies regarding onsite public safety and wellbeing, cross-cultural orientation, firearms control, sexual and gender harassment, alcohol and drug control measures, reporting of incidents involving drugs/alcohol, smoking policies, gambling activities, and supply of country food to Inuit workers at the mine site.,		10	28	3.1, 7.1	2 to 6, 9 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	ix. Details on any priorities for Inuit, northerners, etc. or other staffing measures targeting categories of individuals,		10	28	3.1, 7.2	2 to 6, 13 to 15
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	x. Recognition and management plans regarding the rights and needs of hunting activities and traveling through Project areas by the residents from adjacent communities,		10	28	3.1	2 to 6

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	xi. Strategies for communicating relevant information of IIBA terms and conditions to employees,		10	28	7.1	9 to 13
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	xii. Policies and regulations regarding hunting and fishing by non-Inuit employees, while respecting the rights and needs of Inuit employees to harvest and pursue traditional activities, with a discussion of how such policies or regulations were designed to manage potential impacts to fisheries or wildlife resources,		10	28	3.1	2 to 6
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	xiii. A discussion of any proposed policies or regulations regarding the prohibition of recreational hunting, fishing and other related activities by employees at specific locations and timing in Project area, and		10	28	3.1	2 to 6
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.5 SOCIO-ECONOMIC MANAGEMENT PLANS	9.5.5 Human Resources Plan	xiv. Skill transferability training and employment counselling upon mine closure and during temporary mine closures.		10	28	7.3	15 to 18
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		The Proponent shall develop a preliminary Mine Closure and Reclamation Plan for the Project which outlines how the various components set out in Section 6.0 will be decommissioned, reclaimed and closed following mine closure. The plan can be preliminary with key issues addressed for the environmental assessment in the NIRB's review, with the following requirements:		10	29	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		i. To ensure that issues associated with the effective closure and reclamation of all Project components are considered at the earliest possible stage in the mine development process, thereby influencing mine design to take into account environmental issues related to mine closure and reclamation.		10	29	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		ii. To establish goals and final land use objectives for reclamation of lands potentially affected by the Project,		10	29	1.7	7 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		iii. A description of reclamation methods, time frames and schedules, including proposed progressive reclamation, research programs, and notice periods to employees and public,		10	29	4, 5	17 to 27
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		iv. A description of temporary closure measures and a discussion of at what point a temporary closure should be considered permanent for the purposes of requiring implementation of the Mine Closure and Reclamation Plan,		10	29	3, 3.1	14
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		v. A discussion of research programs to address challenges to reclamation, given the local conditions,		10	29	4.2	17 to 19
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		vi. Considerations for the protection of public health and safety,		10	29	1.7, 3, 4, 5	7 to 9, 14 to 27
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		vii. A description of the estimated contaminant and other material (physical and chemical) levels in the environment after mine closure and remediation,		10	29	5	20 to 27
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		viii. A description of closure and post-closure monitoring of environmental components including, but not limited to, wildlife, vegetation, air quality, landform stability and water quality,		10	29	6	27 to 29
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		ix. A discussion on the long-term monitoring and maintenance that may be required once physical and chemical stability of reclaimed areas have been established,		10	29	5, 6	20 to 29
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		x. A discussion on reduction or elimination of environmental effects once the mine ceases operation,		10	29	5	20 to 27
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		xi. A discussion regarding re-establishing conditions that permit the land to return to a similar pre-mining land use,		10	29	5	20 to 27
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		xii. Considerations for ARD and/or ML potential of rocks and tailings, in association with related waste rock and tailings management strategies,		2 10	7 3 29	Appendix V2-7D 4.2 2.2	All 17 to 27 10 to 11
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		xiii. Any considerations for the restoration of the natural aesthetics of the Project, and		10	29	1.7, 5	7 to 9, 20 to 27
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN		xiv. The Plan is to be considered a "living" document, the level of detail should undergo further revision to reflect the progress of the Project as well as changes in technology and/or standards or legislation. This plan should include the establishment of thresholds and identified adaptive management responses should such thresholds be reached. Future revisions should also consider input from consultations with communities and other stakeholders on methods to be used, and potential uses for project infrastructure, etc.		10	29	1.7, 1.8	7 to 9
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.6 MINE CLOSURE AND RECLAMATION PLAN	9.6.1 Care and Maintenance Plan	A preliminary Care and Maintenance Plan shall be developed for the Project in conjunction with the Mine Closure and Reclamation Plan which outlines how the various components set out in Section 6.0 will be treated in the event of a temporary closure or un-timely closure of the project. The plan can be preliminary with key issues addressed for the environmental assessment in the NIRB's review and should include a discussion on the items listed in Section 9.6.		10	29	3	14 to 17

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		A follow-up plan is a formal, ongoing process to verify the accuracy of the environmental impact predicted in the environmental assessment and permitting stage of the Project, and to determine the effectiveness of proposed mitigation measures. If either of these two steps identifies unusual and unforeseen adverse environmental effects, then the existing mitigation measures must be adjusted, or if necessary, an adaptive management plan with new mitigation or compensation measures must be developed. Adaptive management planning is particularly important for the areas where scientific uncertainty exists in the prediction of adverse effects. In order to offset the likelihood of mitigation failure and the potential severity of the consequences, the Proponent shall formulate a process through which the information related to effectiveness of mitigation measures is analyzed and associated adaptive measures would be employed in the environmental management system:		-	-	-	-
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		i. The need for such a follow-up and adaptive management plan and its objectives,		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		ii. How this plan will be structured including responses to any enforcement action or penalties for non- compliance,		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		iii. Which elements of the monitoring program described in Section 9.3, would be incorporated,		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		iv. The mechanisms, through which monitoring results will be analysed, and if necessary, adjusted mitigation measures or adaptive management plan will be employed. In addition, how the effectiveness of the new mitigation measure will be assessed and verified,		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		v. The roles to be played by the Proponent, regulatory agencies, and others in such a plan, and possible involvement of independent researchers,		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		vi. The sources of funding for the plan and reporting,		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		vii. How an increased and perhaps unforeseen cost associated in a plan would be managed in implementing such measures, and		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		viii. The quantitative triggers or thresholds that will indicate the need to alter or vary the management plan or mitigation measures.		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.7 FOLLOW-UP AND ADAPTIVE MANAGEMENT PLANS		viii. The quantitative triggers or thresholds that will indicate the need to alter or vary the management plan or mitigation measures.		10	1	13	13 to 21
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.8 SIGNIFICANCE OF RESIDUAL IMPACTS		After having established the mitigation measures, the EIS shall present the residual effects assessment of the Project on the components of the biophysical and human environments, so that the reader can clearly understand the real consequences of the Project, the degree of mitigation of the effects and which effects cannot be mitigated or compensated for.		1 4 5 6 7 8	6, 8 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	All	All
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.8 SIGNIFICANCE OF RESIDUAL IMPACTS		The Proponent should include a summary table in this section of its EIS, which presents the effects before and after mitigation on the various components of the environment, the mitigation measures applied and the residual effects have been assessed.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5, X.6, X.7, X.8, X.9, X.10	1-15 to 1-33, 2-11 to 2-27 4-26 to 4-65, 5-131 to 5-249, 6-37 to 6-90, 7-18 to 7-69, 8-32 to 8-100, 9-30 to 9-63, 10-22 to 10-58 1-41 to 1-57, 4-26 to 4-64, 5-14 to 5-42, 6-44 to 6-74, 7-34 to 7-61 2-16 to 2-45, 3-12 to 3-36, 4-40 to 4-54, 5-22 to 5-37, 6-20 to 6-55, 7-15 to 7-42 1-15 to 1-31, 3-42 to 3-130, 4-33 to 4-85, 5-23 to 5-62
9.0 ENVIRONMENTAL MANAGEMENT SYSTEM	9.8 SIGNIFICANCE OF RESIDUAL IMPACTS		The determination of significance of residual impact shall take into account the attributes of each impact in accordance with the criteria established in Section 7.14.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5, X.6, X.7, X.10	1-15 to 1-31, 1-33, 2-11 to 2-25, 2-27 4-26 to 4-62, 4-65, 5-131 to 5-242, 5-249, 6-37 to 6-82, 6-90, 7-18 to 7-63, 7-69, 8-32 to 8-94, 8-100, 9-30 to 9-58, 9-63, 10-22 to 10-54, 10-58 1-41 to 1-56, 1-57, 4-26 to 4-59, 4-63, 6-44 to 6-71, 6-74, 7-34 to 7-57, 7-61 2-16 to 2-41, 2-45, 3-12 to 3-33, 3-36, 4-40 to 4-52, 4-54, 5-22 to 5-34, 5-37, 6-20 to 6-50, 6-55, 7-15 to 7-37, 7-42 1-15 to 1-29, 1-31, 3-42 to 3-124, 3-130, 4-33 to 4-82, 4-85, 5-23 to 5-61, 5-62
10.0 CONCLUSION			The EIS should end with a conclusion presenting a summary analysis of the overall projected biophysical and socio-economic impacts, anticipated transboundary and cumulative effects, proposed mitigation measures, and residual impacts. While highlighting the impacts in the Kitikmeot Region, this conclusion should clearly present the importance of the EIS findings to the NSA and Canada.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5, X.6, X.7, X.8, X.9, X.10	1-15 to 1-33, 2-11 to 2-27 4-26 to 4-65, 5-131 to 5-249, 6-37 to 6-90, 7-18 to 7-69, 8-32 to 8-100, 9-30 to 9-63, 10-22 to 10-58 1-41 to 1-57, 4-26 to 4-64, 5-14 to 5-42, 6-44 to 6-74, 7-34 to 7-61 2-16 to 2-45, 3-12 to 3-36, 4-40 to 4-54, 5-22 to 5-37, 6-20 to 6-55, 7-15 to 7-42 1-15 to 1-31, 3-42 to 3-130, 4-33 to 4-85, 5-23 to 5-62
11.0 LIST OF CONSULTANTS AND ORGANIZATIONS			The Proponent shall prepare a list of all the consultants who contributed to the preparation of the EIS, including the role of each and contact information in an appendix to the EIS. In addition, the Proponent shall prepare a list of organizations consulted in preparing this EIS where such consultations provided materials as included as supporting documentation or evidence within the EIS, including the time, place, and purpose of the consultation, reference materials provided, and contact information for the organization.	Yes	1 3 Addendum 3	Appendix V1-4 1, 2 1, 2	All Appendices ~~V3-1A, V3-1B, V3-1C,~~ V3-1E~~, V3-2A~~ Addendum Appendices V3-1A, V3-1B, V3-1C, V3-2A	All All
APPENDIX A: NUNAVUT IMPACT REVIEW BOARD'S 10 MINIMUM EIS REQUIREMENTS			The following are the minimum required elements for an Environmental Impact Statement required under a Part 5 Review:		3 Addendum 3	1 1	All, Appendices ~~V3-1A, V3-1B, V3-1C,~~ V3-1D, V3-1E, ~~V3-1F,~~ V3-1G Addendum Appendices V3-1A, V3-1B, V3-1C, V3-1F	All All
			1. Statement of Consultation Principles and Practices		-	-	-	-

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
			The Proponent must conduct pre-Project consultations with locally affected persons. Where at all possible, information about the Project must be distributed, and comments collected with a view to resolving any differences. Discussions should include, but not be limited to, land uses, policies, resource uses, Archaeological areas, infrastructure, and terrain sensitivities. Aboriginal cultural concerns must be highlighted throughout. The Proponent shall explain where, how, why, and with whom it conducted public consultation, and shall demonstrate an understanding of the rights, interests, values, aspirations, and concerns of the potentially affected communities. All comments from the public must be summarized, documented, and presented in the EIS.	Yes	3 Addendum 3	1 1	All, Appendices ~~V3-1A, V3-1B, V3-1C,~~ V3-1D, V3-1E, ~~V3-1F,~~ V3-1G Addendum Appendices V3-1A, V3-1B, V3-1C, V3-1F	All, All, All, All, All, All, All, All
			2. Definition of Project		-	-	-	-
			A definition of the Project must include a discussion of any connected or subsequently related projects in order to reveal the primary purpose and better understand complex or multi-staged related proposals.		2	1, 2, 3	All	All
			3. Statement of Project's Purpose		-	-	-	-
			Based on the concepts of the Precautionary Principle and Sustainable Development, an EIS must contain a statement explaining the need for, and the purpose of the Project. Where further economic development is needed for a given area, the Board expects the deficiencies in the economic status quo to be stated.		2	1	2.4.1	2-2
			4. Anticipated Impacts Analysis		-	-	-	-
			A comprehensive impact assessment must be carried out which includes, but is not limited to, environmental effects that are likely to result from the Project in combination with other projects or activities that have been, or will be, carried out. Anticipated impacts include short and long- term, direct and indirect, positive and negative, cumulative, socio-economic, archaeological and cultural impacts. This element of the EIS must include a mitigation analysis that explains how the impacts could be avoided, minimized, cured, eliminated, or compensated.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.5, X.6, X.7, X.8, X.9, X.10	1-15 to 1-33, 2-11 to 2-27 4-26 to 4-65, 5-131 to 5-249, 6-37 to 6-90, 7-18 to 7-69, 8-32 to 8-100, 9-30 to 9-63, 10-22 to 10-58 1-41 to 1-57, 4-26 to 4-64, 5-14 to 5-42, 6-44 to 6-74, 7-34 to 7-61 2-16 to 2-45, 3-12 to 3-36, 4-40 to 4-54, 5-22 to 5-37, 6-20 to 6-55, 7-15 to 7-42 1-15 to 1-31, 3-42 to 3-130, 4-33 to 4-85, 5-23 to 5-62
			5. Cumulative Effects Analysis (CEA)		-	-	-	-
			Cumulative Effects must be analyzed for all Part 5 Reviews. A project proposal causes a Cumulative Effect if, when added to other projects in the region, or projects reasonably foreseeable in the region, will cause an additive effect. A comprehensive examination of all Cumulative Effects must be included in an EIS.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.6	1-29 to 1-31, 2-23 to 2-25 4-55 to 4-62, 5-197 to 5-242, 6-69 to 6-82, 7-50 to 7-63, 8-70 to 8-94, 9-55 to 9-58, 10-51 to 10-54 1-55 to 1-56, 4-57 to 4-59, 5-37 to 5-38, 6-70, 7-56 to 7-57 2-39 to 2-41, 3-30 to 3-32, 4-50 to 4-52, 5-232 to 5-34, 6-35 to 6-39 to 6-48, 7-36 1-29, 3-104 to 3-120, 4-60 to 4-78, 5-61
			6. Significant Effects Analysis		-	-	-	-
			The Board must be advised of the significant impacts of the Project. This should be based upon:		-	-	-	-
			a. the Project setting, taking into account the location's unique exosystemic characteristics, and		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.1	1-1 to 1-10, 2-1 to 2-6 4-1 to 4-18, 5-1 to 5-122, 6-1 to 6-22, 7-1 to 7-14, 8-1 to 8-25, 9-1 to 9-25, 10-1 to 10-15 1-1 to 1-29, 4-1 to 4-23, 5-1 to 5-12, 6-1 to 6-35, 7-1 to 7-25 1-1 to 1-31, 2-1 to 2-14, 3-1 to 3-10, 4-1 to 4-30, 5-1 to 5-11, 6-1 to 6-15, 7-1 to 7-9 1-1 to 1-11, 3-1 to 3-25, 4-1 to 4-21, 5-1 to 5-15
			b the severity of the impacts, taking into account, but not limited to public health, land use plans, protected areas, habitat, or species, public concern, etc.		3 4 5 6 7 8	1, 3 1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	1.6.2, 3.3 X.5.4, X.5.5 X.5.4, X.5.5 X.5.4, X.5.5 X.5.4, X.5.5 X.5.4, X.5.5	1-37 to 1-38, 3-50 to 3-53 1-28 to 1-29, 2-22 to 2-23 4-32 to 4-55, 5-191 to 5-197, 6-64 to 6-69, 7-46 to 7-50, 8-65 to 8-70, 9-54 to 9-55, 10-48 to 10-51 1-46 to 1-55, 4-45 to 4-57, 5-31 to 5-37, 6-70 2-33 to 2-39, 3-27 to 3-30, 4-49 to 4-50, 5-31 to 5-32, 6-38 to 6-39, 7-36 1-26 to 1-29, 3-95 to 3-101, 4-55 to 4-60, 5-20 to 5-61
			Ultimately, the Board will decide which effects are significant and report to the Minister accordingly.		Noted	-	-	-
			7. Project Alternatives		-	-	-	-
			This requirement includes, but goes well beyond, alternative means of carrying out the Project that might be economically and technically feasible and the environmental effects of those alternative means. This assessment must include the "no-go" or "no-build" alternative, as well as the "preferred" alternative. The "no-go" alternative is not only a potentially stand-alone option, it also serves as a baseline for comparison with other development alternatives that might reasonably be proposed in the circumstances. Environment Canada's Guidelines for the Assessment of Alternatives for Mine Waste Disposal (EC, 2011) may also be used by the Proponent in their assessment.		2	4	4	4-1 to 4-30
			8. Sustainability Analysis		-	-	-	-
			The EIS must contain an analysis of the ability of renewable resources affected by the Project to sustain current and future generations in Nunavut and Canada.		9 10	1 1	1.2.4 3	1-18 to 1-35 3-25
			9. Monitoring or Post-Project Analysis (PPA)		-	-	-	-
			The purposes of a PPA are to:		-	-	-	-
			a. measure the relevant effects of projects on the ecosystemic and socio-economic environments of the Nunavut Settlement Area,		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.9	1-33, 2-26 to 2-27 4-63 to 4-65, 5-246 to 5-249, 6-86 to 6-90, 7-68 to 7-69, 8-98 to 8-100, 9-62 to 9-63, 10-56 to 10-58 1-57, 4-62 to 4-63, 5-41 to 5-42, 6-74, 7-60 to 7-61 2-45, 3-36, 4-54, 5-37, 6-53 to 6-55, 7-40 to 7-42 1-30 to 1-31, 3-128, 4-84 to 4-85, 5-61

Addendum Appendix V1-1A. Table of Concordance

Guidelines Section			Guidelines Text	New or Updated Information Provided	FEIS Volume	FEIS Chapter	FEIS Section	Page Numbers
Part	Section	Subsection						
			b. determine whether and to what extent the land or resource use in question is carried out within the predetermined terms and conditions,		10	23	3.2	3
			c. provide the information base necessary for agencies to enforce terms and conditions of land or resource use approvals, and		10	23	3.2	3
			d. assess the accuracy of the predictions contained in the project impact statements.		4 5 6 7 8 10	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5 1	X.9 X.9 X.9 X.9 X.9 13	1-33, 2-26 to 2-27 4-63 to 4-65, 5-246 to 5-249, 6-86 to 6-90, 7-68 to 7-69, 8-98 to 8-100, 9-62 to 9-63, 10-56 to 10-58 1-57, 4-62 to 4-63, 5-41 to 5-42, 6-74, 7-60 to 7-61 2-45, 3-36, 4-54, 5-37, 6-53 to 6-55, 7-40 to 7-42 1-30 to 1-31, 3-128, 4-84 to 4-85, 5-61 15 to 20
			10. Transboundary Effects Analysis		-	-	-	-
			Where relevant, an EIS must include an assessment of all significant adverse ecosystemic or socio-economic transboundary effects.		4 5 6 7 8	1, 2 4, 5, 6, 7, 8, 9, 10 1, 4, 5, 6, 7 2, 3, 4, 5, 6, 7 1, 3, 4, 5	X.7	1-31, 2-25 4-62, 5-242, 6-82, 7-63, 8-94, 9-58, 10-54 1-56, 4-59, 5-38, 6-70 to 6-71, 7-57 2-41, 3-32, 4-52, 5-34, 6-48, 7-37 1-29, 3-120 to 3-124, 4-78 to 4-82, 5-61

ADDENDUM APPENDIX V1-9: PARTY-RECOMMENDED TERMS & CONDITIONS AND COMMITMENTS (NEW)

Party-Recommended Project Certificate Terms & Conditions and Commitments

(as at close of hearing April 30, 2016)

What follows provides a list of project certificate terms and conditions recommended to NIRB by federal and territorial agencies and the KIA during the April 2016 NIRB public hearings.

Type	Party	Identifier	Relevant IR/TC	Suggested Term & Condition and Commitment as revised and updated during public hearings
Term and Condition	DFO	DFO-T-1	DFO-TC-1 DFO-TC-2	The Proponent shall engage with Fisheries and Oceans Canada in exploring possible Project specific thresholds, mitigation and monitoring for blasting that would exceed the requirements of Fisheries and Oceans Canada's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (D.G. Wright and G.E. Hopky, 1998).
Term and Condition	DFO	DFO-T-2	DFO-TC-9	The Proponent commits to engage DFO and other interested parties during the regulatory phase on the design, construction, and operation of adequate fish passage to permit migration of Arctic Grayling from Goose Lake to natural spawning and rearing habitat located in upper Rascal Stream East, south of the planned airstrip. Any additional information required to ensure the design of the fish passage will be completed prior to significant construction activities at the Goose Property.
Term and Condition	DFO	DFO-T-3	DFO-TC-6	The Proponent will provide Fisheries and Oceans Canada (DFO) with the bathymetry, depth and location of proposed water withdrawal sites, volumes to be extracted, anticipated water level decreases, and fish habitat features within each waterbody proposed to be used for winter water withdrawal in support of the construction of the winter ice roads. This will be provided primarily during the regulatory phase however in certain cases waterbodies may be added in the future. If additional waterbodies are required the Proponent commits to provide all required information on the additional proposed lakes, to DFO for review prior to use of these waterbodies.
Term and Condition	DFO	DFO-T-4	DFO-TC-7	The Proponent will implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of the construction, operation, and decommissioning of winter ice roads, and from under ice water withdrawals. This includes adequately screening the water intakes pipes to prevent impingement and entrainment of fish.
Term and Condition	DFO	DFO-T-5	DFO-TC-14	The Proponent commits to developing and implementing a pre-construction monitoring plan for seal lairs to ensure potential lair locations are not impacted by the ice road or airstrip construction. If construction is scheduled during the seal pupping period, then the identified potential lair locations – such as ice ridges or large snow drifts, will be avoided and monitoring for ringed seal presence will be triggered prior to construction. The Proponent will update the text in the WMMP Plan (Section 7.2.8.3) to include working with Fisheries and Oceans Canada and interested parties to determine the most appropriate methodology should construction be proposed during the seal pupping period and structures that may support lairs (ice ridges and snow banks) be unavoidable. Prior to construction of the project, a detailed Standard Operating Procedure (SOP) will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.
Term and Condition	DFO	DFO-T-6	DFO-TC-15	The Proponent commits to produce a simplified SOP and ensure that Marine mammal surveys are conducted following the basic methods provided in the protocol outlined in Recommended Seabird and Marine Mammal Observational Protocols for Atlantic Canada (Moulton & Mactavish 2004). The Proponent has also committed to avoiding any groups of marine mammals observed on the ocean surface except where the safety of the ship is in concern (FEIS Volume 10, Chapter 20, Section 6.11.3). The Proponent also commits to continue to work with Fisheries and Oceans Canada and interested parties in the development of the ship based marine mammal monitoring program that utilizes bridge crew. The Proponent will update the text in the WMMP Plan (FEIS Volume 10, Chapter 20, Section 7.2.8.5) to this effect.
Term and Condition	DFO	DFO-T-7	DFO-TC-16	The Proponent will implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of water crossing construction, operation, and decommissioning for all fish-bearing water crossings. The Proponent acknowledges these measures include, but are not limited to, appropriate design of water crossings to facilitate fish passage at both high and low flows, timing windows that incorporate spawning, incubation and hatch times for all species using water courses, sediment and erosion control, protection of riparian vegetation, and other forms of bank stabilization.
Term and Condition	DFO	DFO-T-8	DFO-TC-17	The Proponent's proposed monitoring program for culverts on fish bearing watercourses during the Operations and Closure phases will include measures to ensure that barriers to fish passage do not form over time as a result of crossing damage due to ice blockage, flooding, or movement of debris all of which may occur at freshet. Detailed design drawings and an updated monitoring program will be produced prior to construction during the regulatory phase.
Term and Condition	ECCC	ECCC-T-1		The Proponent shall design and implement a marine monitoring program at the Marine Laydown Area to identify potential impacts of the project on the marine environment and inform adaptive management actions. *Commentary: The monitoring program shall be in line with the proposed monitoring in the Aquatic Effects Monitoring Plan presented in the FEIS Vol. 10 Chapter 19.*
Term and Condition	INAC	INAC-T-1	INAC-TC-8 & INAC-TC-9	The Proponent shall revise the Closure and Reclamation Plan to include an adaptive management component that documents proposed monitoring and mitigation measures to ensure long-term containment of the Tailings Storage Facility and Waste Rock Storage Areas. The revised plan shall include detail on the triggers for implementing alternative mitigation options, and shall be submitted to the Nunavut Water Board during the water license application process.
Term and Condition	TC	TC-T-1	F-TC-TC-4	The Proponent will adhere to requirements for loading and handling explosives within the prescribed regulatory requirements.
Term and Condition	TC	TC-T-2	F-TC-TC-8	The Proponent must refer to the latest version of Transport Canada's Emergency Response Guide and update its Risk Management & Emergency Response Plan as appropriate.
Term and Condition	KIA	KIA-T-1	KIA-TC-19	The Proponent will derive a site-specific water quality objective for arsenic in a way that is satisfactory to both the Kitkmeot Inuit Association and Environment and Climate Change Canada prior to the first techncial meeting as part of the Nunavut Water Board water licencing process.
Term and Condition	KIA	KIA-T-2		The Wildlife Mitigation and Monitoring Plan will be updated as needed during the life of the project in conjunction with the KIA and submitted to the NIRB for review. Updates may be triggered by significant changes in the project plan, results reported in the annual Wildlife Effects Monitoring Plan report that indicate changes in conditions that are likely to be biologically meaningful, significant updates to the scientific understanding or methods relevant to wildlife at the project site, or as necessary.
Term and Condition	GN	GN-T-1	GN-1(1)	The Proponent is strongly encouraged to participate in the work of the Kitikmeot Socio- Economic Monitoring Committee along with other agencies and the communities of the Kitikmeot region, and to identify areas of mutual interest and priority for incorporation into a collaborative monitoring framework that includes socio-economic priorities related to the Project, communities, and the Kitikmeot Region as a whole.

Party-Recommended Project Certificate Terms & Conditions and Commitments

(as at close of hearing April 30, 2016)

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Type	Party	Identifier	Relevant IR/TC	Suggested Term & Condition and Commitment as revised and updated during public hearings
Term and Condition	GN	GN-T-2	GN-1(2)	The Proponent is encouraged to work in collaboration with other socio-economic stakeholders including for example, the Government of Nunavut, Indigenous and Northern Affairs Canada, the Kitikmeot Inuit Association, and communities of the Kitikmeot Region, to establish a socio-economic working group for the Project to develop and oversee the Back River Socio-Economic Monitoring Program. The working group should develop a Terms of Reference which outlines each member's roles and responsibilities with regards to, where applicable, project-specific socio-economic monitoring throughout the life of the Project. The Terms of Reference are to be provided to the Nunavut Impact Review Board upon completion, and within one year of issuance of the Project Certificate.
Term and Condition	GN	GN-T-3	GN-1(3)	The Proponent is very strongly encouraged to develop the Back River socio-economic monitoring program to monitor impacts predicted in the FEIS through indicators presented in the Back River socio-economic monitoring plan. Regional concerns identified by the Kitikmeot SEMC will also be considered for inclusion. Where possible, the Proponent is encouraged to work in collaboration with all other socio-economic stakeholders such as the GN, Indigenous and Northern Affairs Canada, the Kitikmeot Inuit Association, and the communities of the Kitikmeot Region in developing this program, which should include a process for adaptive management and mitigation in the event unanticipated impacts are identified. The Proponent shall produce annual Back River socio-economic monitoring reports throughout the life of the Project that are submitted to the Nunavut Impact Review Board and shared with the wider Kitikmeot SEMC. Details of the Back River socio-economic monitoring program are to be provided to the Nunavut Impact Review Board upon finalization, and within one year of issuance of the Project Certificate.
Term and Condition	GN	GN-T-4	GN-4	The Proponent is encouraged to identify and register all trades occupations, journeypersons, and apprentices working with the Project, as well as to provide the Government of Nunavut with information regarding the number of registered apprentices and journeypersons from other jurisdictions employed at the Project. Related Legislation - The Apprenticeship, Trade, and Occupation Act and Regulations
Term and Condition	GN	GN-T-5	GN-5	To the extent the sharing of such information is not inconsistent with any Inuit Impact Benefit Agreement with Kitikmeot Inuit Association, the Proponent is strongly encouraged to submit staff schedule estimates to the Nunavut Impact Review Board (NIRB) and to the Government of Nunavut (GN) 6 months prior to each phase of the project (construction, operations, closure). The schedule should, at a minimum, provide a description of: o Title of positions required by department and division; o Quantity of positions available by Project phase; The Proponent is also strongly encouraged to submit additional staff schedule information to the Nunavut Impact Review Board (NIRB) and to the Government of Nunavut (GN) for each phase of the project (construction, operations, closure), as it becomes available. This information includes: o Transferable skills, both certified and uncertified which may be required for, or gained during, employment within each position; and, o The National Occupational Classification (NOC) code for each individual position. The Proponent is encouraged to consult the GN during development of the schedule. A new schedule should be submitted following any significant deviation from original predictions. However, any staff schedule information provided by the Proponent will be consistent with obligations established under the Inuit Impact and Benefit Agreement (IIBA) negotiated with the Kitikmeot Inuit Association (KIA).
Term and Condition	GN	GN-T-6	GN-7(1) and 7(2)	Provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association the Proponent is strongly encouraged to communicate and collaborate with the GN and Nunavut Housing Corporation (NHC) on potential housing initiatives with a view to enhancing employee access to a range of housing options, including homeownership. Initiatives may include, but are not limited to, the provision of financial literacy, financial planning, and personal budgeting training.
Term and Condition	GN	GN-T-7	GN-8	The Proponent is strongly encouraged to work with the Kitikmeot Socio-Economic Monitoring Committee (K-SEMC) to design and implement a voluntary housing survey to be offered to its Nunavummiut employees. The survey should be designed in collaboration with the Government of Nunavut, the Nunavut Housing Corporation and other relevant stakeholders. Non-confidential results of the survey are to be reported to the Government of Nunavut and other members of the K-SEMC. The frequency and content of the survey should be determined by the collaborating parties. Content may include changes of address, housing status (i.e. public/social, privately owned/rented, government, etc.), and migration intentions.
Commitment	DFO	DFO-C-1	DFO-TC-10	The Proponent will continue to work with Environment and Climate Change Canada and Fisheries and Oceans Canada at the regulatory approval stage to reconcile the regulatory requirements related to the use of Umwelt Lake as a Saline Water Management Pond.
Commitment	DFO	DFO-C-2	DFO-TC-11	The Proponent will continue to work with Fisheries and Oceans Canada (DFO) and the impacted communities at the regulatory approval stage to develop a detailed fish-out and offsetting plan.
Commitment	INAC	INAC-C-1	INAC-TC-1	The Proponent commits to modeling of total metal concentrations, as may be required, to establish appropriate discharge criteria and predict downstream compliance. For parameters not requiring total metals modeling, appropriate justification should be provided. This information is expected for review as part of the Type A Water Licence Application process.
Commitment	INAC	INAC-C-2	INAC-TC-2	The Proponent commits to monitor water quality of the pit sump to validate water quality predictions and implement mitigation should monitoring show that pit walls are a more appreciable source of loading than indicated by current modeling. The Proponent commits to providing details of options for mitigation for review as part of the Type A Water Licence Application process.
Commitment	INAC	INAC-C-3	INAC-TC-3	The Proponent commits to providing additional information on the proposed waste water treatment plant to show that adequate treatment capacity is in place, and that there is sufficient capacity available to address spills, accidents and malfunctions. This should be presented for review during the Type A Water License Application process.

Party-Recommended Project Certificate Terms & Conditions and Commitments

(as at close of hearing April 30, 2016)

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Type	Party	Identifier	Relevant IR/TC	Suggested Term & Condition and Commitment as revised and updated during public hearings
Commitment	INAC	INAC-C-4	INAC-TC-6 & INAC-TC-10	The Proponent has committed to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program should include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. The Proponent will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process. Further, where the results of this program show the potential for seepage, the Proponent commits to the establishment of a monitoring program with the capability of determining that contaminants are being contained within the facility. The Proponent shall provide sufficient justification where it is determined that monitoring is not required. The options for monitoring shall be provided for review as part of the Type A Water Licence Application process.
Commitment	INAC	INAC-C-5	INAC-TC-7	The Proponent commits to further thermal modeling to support dam design along critical cross-sections of the Main Dam. This should be presented for review during the Type A Water Licence Application process.
Commitment	INAC	INAC-C-6	INAC-TC-11	The Proponent shall revise their Ore and Waste Rock Management Plan to include monitoring that demonstrates contact water (runoff and shallow groundwater) from the Waste Rock Storage Areas is adequately captured and managed. This shall be submitted to the Nunavut Water Board during the water licence application process.
Commitment	KIA	KIA-C-1	KIA-IR-65, KIA-TC-18, KIA-TC-20, KIA-TC-21,and KIA-TC-22	The Proponent commits to developing the Aquatic Effects Monitoring Program and adaptive management thresholds in conjunction with the Kitikmeot Inuit Association prior to the first technical meeting as part of the Nunavut Water Board water licensing process.
Commitment	KIA	KIA-C-2	KIA-TC-07	The Proponent commits to provide the Kitikmeot Inuit Association with information regarding the construction of the winter ice road including, but not limited to, fill, quarry and borrow sites required for the construction of the winter road for review and approval prior to construction.
Commitment	KIA	KIA-C-3	KIA-TC-09	The Proponent commits to providing the results of the blast hole cutting sampling and testing program along with other geochemical monitoring results in an annual monitoring report. For at least the first annual report, the Proponent will engage a geochemical specialist to review the results and evaluate whether further changes in the monitoring or management activities is required. If such a recommendation is made, the Proponent will update WRMP accordingly. Regardless of whether such a recommendation is made, the WRMP will be updated at the time of water licence renewal.
Commitment	KIA	KIA-C-4	KIA-TC-10	The Proponent commits to test a mixture of tailings and treatment sludges to evaluate the potential for remobilization of arsenic from this material. Tests will be conducted as sludges are produced. The Proponent commits to provide their proposed testing method to the Kitikmeot Inuit Association for review and approval prior to initiating these tests, and will provide the results of the testing in the annual monitoring report that will be submitted as part of the water license requirements.
Commitment	KIA	KIA-C-5	KIA-TC-12, KIA-IR-41/KIA-TC-13	The Proponent commits to working in conjunction with Kitikmeot Inuit Association in the permitting phase as it relates to fisheries impacts and compensation, to review the offsetting plan as required under the Fisheries Act.
Commitment	KIA	KIA-C-6	KIA-TC-15	The Proponent commits to actively involve the Kitikmeot Inuit Association in the adaptive management of the fish offsetting plan.
Commitment	KIA	KIA-C-7	KIA-TC-16	The Proponent commits to actively involve the Kitikmeot Inuit Association in evaluating early outcomes from monitoring and updating fish offsetting plans.
Commitment	KIA	KIA-C-8	KIA-TC-23	The Proponent commits to collect additional baseline water quality data from the lakes in the project area during freshet and fall as confirmed by measurements of higher flow prior to construction. The Proponent commits to use this data to update the water and load balance model.
Commitment	KIA	KIA-C-9		The Proponent commits to providing a more detailed description of activities, with reference to what equipment will be operating and how often, during the different stages of a staged reduction in project activities in the next Wildlife Mitigation and Monitoring Plan update. This will include a quantitative description of the noise produced by these activities and the area over which continuous noise thresholds for caribou will be exceeded.
Commitment	KIA	KIA-C-10		Sabina will work in conjunction with the KIA to develop a plan for winter road use cessation and/or management in April to protect the spring migration of the Beverly caribou herd to be a component in their land tenure agreement.
Commitment	KIA	KIA-C-11		Sabina commits to developing an adaptive management plan, in conjunction with the KIA, to manage caribou access to the TSF if caribou are observed to be drinking from the tailings water.
Commitment	KIA	KIA-C-12		Sabina commits to increase the visual observation distance trigger for enhanced mitigation for caribou around roads (in Table 6.10-2 of Version H.1 of the Wildlife Mitigation and Monitoring Plan, for fall and winter seasons) from 250 to 500 m.
Commitment	KIA	KIA-C-13		The Proponent will update the Wildlife Mitigation and Monitoring Plan to include a plan that will be implemented immediately in the event of calving caribou shifting their range to overlap with the Project Development Area. The Proponent will update the Wildlife Mitigation and Monitoring Plan to reflect the following measures in order to identify the presence of an aggregation (group) of caribou calving near the Project site during the calving period, post calving and summer. If a group of greater than 250 caribou are observed by active monitoring within 4 km of the Project site, then staged reduction of helicopter use and heavy vehicle use would be triggered. The threshold for cessation of blasting will be the greater of 4 km, or according to Commitment KIA-C14 of this table. The aggregation group size definition may be updated based on best available science in subsequent Wildlife Mitigation and Monitoring Plan updates.
Commitment	KIA	KIA-C-14		The Proponent commits to decreasing the sound levels as indicated in the Wildlife Mitigation and Monitoring Plan used to calculate the distance that caribou must be from blasting prior to explosion detonation from 108 dB to a level more protective of caribou. These levels will be reduced to 96 dB.

Party-Recommended Project Certificate Terms & Conditions and Commitments

(as at close of hearing April 30, 2016)

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Type	Party	Identifier	Relevant IR/TC	Suggested Term & Condition and Commitment as revised and updated during public hearings
Commitment	GN	GN-C-1	1 (DEIS)	Provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association, The Proponent commits to include project-specific data concerning employee community or residence and number of employees that relocated from the year prior (where available, to and from, for Cambridge Bay, Kugluktuk, Taloyoak, Gjoa Haven, and Kugaaruk) in their Socio-Economic Monitoring Program and subsequent annual reports. The details of this process will be captured in the terms of reference for the project specific Back River Socio-Economic Monitoring Committee.
Commitment	GN	GN-C-2	2(DEIS)	Through the Back River Project Socio-economic Monitoring Program (SEMP) and annual reporting to NIRB, Sabina commits to socio-economic monitoring throughout all phases of the Project as long as there is a reasonable expectation of Project-related impacts to the socio-economic environment, to the extent the sharing of such information is not inconsistent with the terms and conditions of any Inuit Impact Benefit Agreement with Kitikmeot Inuit Association. This will include temporary closure and care and maintenance phases of the Project. This commitment will be finalized in the Terms of Reference.
Commitment	GN	GN-C-3	3.2 (DEIS)	Sabina commits to actions to promote youth being able to make informed choices regarding their career direction, including encouraging youth to stay in school to take advantage of the employment opportunities made available by the Project.
Commitment	GN	GN-C-4	4 (DEIS)	The Proponent commits to provide NOC coding information in their workforce schedule. To the extent the sharing of such information is not inconsistent with the terms and conditions of any Inuit Impact Benefit Agreement with Kitikmeot Inuit Association the Proponent commits to identify and register, with the appropriate GN department, all trades persons and apprentices working within the Project operations. The Proponent will consult with the GN's Department of Family Services Career Development Division to identify current apprentice students for potential training and employment
Commitment	GN	GN-C-5	7 (DEIS)	Unless such matters are otherwise addressed in any Inuit Impact Benefit Agreement with Kitikmeot Inuit Association, Sabina will continue to support childcare in the communities through our donations policy and informal visits to assess potential areas of need. Also, Sabina employees will be encouraged to support childcare through volunteering and participation on the associated non-profit boards responsible in each community for the delivery of childcare programming. Sabina is committed to working with the GN and community stakeholders to explore improved or alternative means of addressing potential childcare issues, but does not intend to become directly involved in the provision of childcare services.
Commitment	GN	GN-C-6	12 (DEIS)	Sabina will be offering annual influenza vaccinations to all employees and providing education on proper personal hygiene to limit the spread of influenza. All medical incidents or occurrences, including those tied to a rabid animal, will be addressed through the company HS&E policy, where a qualified on-site Nurse/Medic will assess the situation and where necessary consult with our Medical Doctor. All regulatory reporting will be adhered to for compliance.
Commitment	GN	GN-C-7	13 (DEIS)	In the event the pre-employment medicals are required, Sabina will commit to a service fee payable to the Community Health services based on a negotiated fee schedule. Sabina will develop any pre-employment medical screening program in discussion with Nunavut Health Services.
Commitment	GN	GN-C-8	14 (DEIS)	The Proponent commits to integrate information and data relating to employee support programs and training through the Back River Socio-Economic Monitoring Program Annual Report, provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association.
Commitment	GN	GN-C-9	GN-TC-2	The Proponent will communicate to the Government of Nunavut (GN) available information on major changes to Project-related tax estimates on an as-needed basis. This communication will not preclude either party from contacting the other as necessary for other relevant information.
Commitment	GN	GN-C-10	GN-TC-3	Sabina commits to keep regional education staff (e.g. the Regional Director of Education) informed of any activities the Proponent has planned, or is requested to participate in, involving community schools.
Commitment	GN	GN-C-11	GN-TC-6	Provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association, the Proponent commits to integrate information and data relating to employee support programs and training through the Back River Socio-Economic Monitoring Program Annual Report.
Commitment	GN	GN-C-12	GN-TC-9	By February 28th of each year that footprint changes are occurring or that an archaeological permit is requested, the Proponent will provide the GN-DCH a series of maps and tables indicating the current status of all archaeological sites within the Project Development Area. For clarity, the maps are to include the following specifications: a) All archaeological sites inventoried in the project development area b) Archaeological sites planned for mitigation – colour coded by year c) Archaeological sites designated for avoidance/protection – shape and colour coded d) The information in points a, b, and c overlaid onto an updated map of the final location of Project infrastructure as it is known. e) The scale of the maps has to be such that the limits of individual infrastructure components are well defined and the location of the archaeological sites within those limits is precise. The table is requested to include textual descriptions of the map contents and should evolve over time within this annual status report.
Commitment	GN	GN-C-13	GN-TC-11	The Proponent will revise the WMMP to remove remaining areas that refer only to the Bathurst herd and apply all monitoring and mitigation measures (including mitigation for shifts in calving and post-calving range) to both the Bathurst and Beverly caribou herds, except where another commitment refers to a specific herd.

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(as at close of hearing April 30, 2016)

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Commitment	GN	GN-C-14	GN-TC-12a	In consultation with the GN, the Proponent shall revise the WMMP to more clearly define the technical specifications and requirements of the proposed collar-based regional monitoring programs designed to monitor Project effects on caribou (i.e., the ZOI monitoring), and to monitor caribou range use for the purpose of mitigation (i.e seasonal ranges use monitoring), including details on required statistical power, sample size, sampling schedule and frequency of data acquisition. Prior to construction Sabina will also update the WMMP to (1) Confirm that data suitable to meet these technical specifications and monitoring needs are available and 2) demonstrate that relevant data sharing agreement are in place with government data suppliers. The revised WMMP shall be submitted to NIRB for review.
Commitment	GN	GN-C-15	GN-TC-12b	Sabina will update the WMMP Plan to include a commitment to contribute to cumulative effects/regional monitoring for caribou, grizzly bear, wolverine and/or muskox following proposals from the GN/GNWT to a maximum total combined value, to be determined. Commentary: In Section 7.3.1.5 of the WMMP (April 11, 2016), the reference to limiting the annual contribution for caribou cumulative effects monitoring to either the Bathurst or the Beverly herd will be removed. Contributions may be made to monitoring efforts on both herds in the same year, subject to a maximum total combined value to be determined.
Commitment	GN	GN-C-16	GN-TC-13a	Prior to construction, in consultation with the GN and other relevant parties, the Proponent shall revise the WMMP to address concerns regarding caribou monitoring and mitigation methods as submitted by the GN in its final submission and as further revised and clarified by the commitments made during the NIRB public hearings. The revised WMMP shall be submitted to the NIRB for review and approval.
Commitment	GN	GN-C-17	GN-TC-13b	The Proponent will update the WMMP Plan to include reductions of project activities (e.g., planned cessation in above-ground blasting, heavy truck hauling and use of helicopters (except where such activities are required in order to address regulatory compliance or health and safety)) should the core calving or post-calving ranges of the Bathurst or Beverly caribou herds overlap the Project site. The cessation of these activities will be planned for the period of time when the core calving and post-calving distribution of caribou overlaps the project, based on recent years of caribou collar and monitoring data. This planned period will be of sufficient duration to take into account annual variation in the timing and distribution of calving and postcalving caribou interactions with the Project. This plan will be updated with the WMMP Plan in consultation with the KIA, GN and other interested parties. Note to the NIRB: Note that Sabina has already committed to the KIA to provide a full description of any remaining project activities proposed during a planned cessation of above-ground blasting and heavy truck hauling, and to provide a noise model for these activities and to compare this predicted noise to the noise produced by indoor activities only. Sabina has also already committed to updating the proposed mitigation actions in the WMMP Plan in consultation with the KIA, GN and other interested parties.
Commitment	GN	GN-C-18	GN-TC-14a	During construction of the ice road, if a bear den is identified by preconstruction monitoring, the Proponent will avoid the den by 1 km. Under special circumstances an exception to the 1 km buffer may be implemented for logistical reasons following consultation with the GN.
Commitment	GN	GN-C-19	GN-TC-16	The Proponent will update the WMMP Plan to include the following commitment: Prior to removal or deterrence of raptors, the Proponent will contact GNDOE to discuss proposed mitigation options, as listed in the WMMP Plan, and will obtain the required permit prior to undertaking any activity that can lead to the destruction of raptor nests or the deterring of raptors from nesting sites.
Commitment	GN	GN-C-20	GN-TC-17a	To be more protective of muskox, the Proponent commits to updating the WMMP Plan to: (1) Increase the trigger distances for blasting mitigation measures for muskox (table 6.3-1 in the current April 2016 version of the WMMP); and (2) Specify mitigation measures, trigger distances and group size thresholds for the operation of heavy equipment on site roads and aircraft (vertical and horizontal distance buffers).
Commitment	GN	GN-C-21	GN-TC-20c	To the extent possible, and with appropriate mitigation and monitoring in place, the Proponent shall take into consideration the higher potential of caribou presence in the area when planning outdoor construction activities (including site clearing, blasting, and operation of heavy equipment) during the period July 26 to August 31.
Commitment	GN	GN-C-22	GN-TC-21	In consultation with the GN and other relevant authorities, the Proponent shall develop criteria and procedures governing the deterring of wildlife from blast zones and relaxation of mitigation measures for animals deemed Project-Tolerant. These criteria and procedures shall, amongst other things, address the list of questions related to deterrence and project tolerant animals presented by the GN in its final written submission (GN comment #13) on the Final Environmental Impact Statement. These criteria and procedures shall be submitted to the NIRB for review and approval prior to construction. For clarity, caribou will only be deterred if their safety is at direct risk. Reference to deterring wildlife from blasting zones will be removed from the blasting management plan (FEIS Volume 7, Chapter 13, Section 7)" Commentary: Draft information was included in the April 11, 2016 WMMP Plan update but further details will be added.
Commitment	GN	GN-C-23	GN-TC-22b	The Proponent shall include in the WMMP specific details on additional monitoring and mitigation that will be triggered when large groups of caribou occur near the ice roads.
Commitment	GN	GN-C-24	GN-TC-23a	The Proponent commits to updating the WMMP to include the trigger that should the existing incidental observation program record >5 persons per year using the road for harvesting purposes then the Proponent will implement a more direct monitoring program for persons using the ice road and reported as part of the Socio-Economic Monitoring Report to NIRB.
Commitment	GN	GN-C-25	GN-TC-24	In consultation with the KIA, GN, and other relevant parties the Proponent shall develop and implement a vegetation monitoring plan for the winter road that is designed to quantify the potential impacts on vegetation. The plan shall be submitted to the NIRB prior to winter road construction. Findings from these studies will be used to inform reclamation planning as appropriate.
Commitment	NSMA	NSMA-C-1		The Proponent commits to one or two site visits for the NSMA, with the details to be worked out at a later date. [NOTE: SEE HEARING TRANSCRIPT FOR SPECIFIC WORDING]
Commitment	YDFN	YDFN-C-1		The Proponent will update section 6.10.5.5 of the WMMP, Triggers and Mitigation point 2, to remove the term "predominantly female" and replace it with language that clarifies what mixed groups of caribou will trigger the cessation of heavy trucks. [NOTE: SEE HEARING TRANSCRIPT FOR SPECIFIC WORDING]

2. Volume 2 Addenda: Project Description and Alternatives

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of Project Description and Alternatives, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

The Back River Project (the Project) is a proposed gold project owned by Sabina Gold & Silver Corp. (Sabina) within the West Kitikmeot region of southwestern Nunavut. It is situated approximately 400 km southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories. The Project is comprised of two main areas: the Goose Property and the Marine Laydown Area (MLA) situated along the western shore of southern Bathurst Inlet. The majority of annual resupply will be completed using the MLA, located in Bathurst Inlet, and an approximately 160 km in long winter ice road will interconnect these sites.

The Feasibility Study for the Project, completed in June 2015, positively identified the economic viability and potential of the Back River Project. The mine plan reflects an estimated 10 year operating mine life based on currently identified ore reserves, with a total ore feed of 19.8 million tonnes to a single process plant at the Goose Property. The life of the Back River Project, from mobilization and construction to operations and closure, reclamation, and post closure, is 27 years.

The Project includes several mineral deposits: Umwelt, Llama, Echo, and Goose Main at the Goose Property. Ore will be mined using conventional open pit and underground methods and trucked to the process plant. Waste rock will be stored in several designated waste rock storage areas (WRSAs) on the surface or backfilled in mined out workings. Tailings from the process plant will first be stored in a Tailings Storage Facility (TSF) located near the process plant and then backfilled in mined out open pits.

Alternatives within the Project have been evaluated according to the following criteria: technical feasibility; economic validity; potential impacts to the environment; and amenability to reclamation. Input received during community and government engagement and consultation has been considered in the alternatives assessments. As the Project planning advances, alternatives assessment criteria will also include community acceptability or preference as well as the potential for enhancing socio-economic effects.

The Project will create significant socioeconomic benefits. The total GDP impact is estimated to be over $500 million during the Construction phase and $2.5 billion over the 10 years of production. The Project will substantially benefit Nunavut and will contribute as much as $44 million in GDP to Nunavut during

the two years of construction and as much as $380 million in GDP during the Operation phase. Construction is estimated to result in a total of about 4,300 person-years of direct, indirect, and induced employment across Canada and approximately 21,000 person-years over the 10-year operations.

Both Project locations will have self-sufficient operating infrastructure including: accommodations, administration, laydown areas, diesel-fired power generation, emergency and medical facilities, maintenance shops, warehousing, and water and waste management facilities.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 6.0) in respect of the new information provided on the topic of Project Component and Activities, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

INTRODUCTION (FEIS VOLUME 2, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

PROJECT COMPONENTS AND ACTIVITIES (FEIS VOLUME 2, CHAPTER 2)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

FUTURE DEVELOPMENT (FEIS VOLUME 2, CHAPTER 3)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

ALTERNATIVES (FEIS VOLUME 2, CHAPTER 4)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

ECONOMIC AND OPERATING ENVIRONMENT (FEIS VOLUME 2, CHAPTER 5)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. Hence, no changes have been made to this chapter of the FEIS. The following is provided in this Addenda Summary only to update on the Inuit Impact and Benefit Agreement (IIBA).

In 2016, Sabina formally commenced its negotiations with the KIA on land tenure and IIBA terms for the Back River project. The parties continue to advance a detailed non-binding term sheet which will form the basis to finalize definitive agreements once completed. Sabina is committed to working with the KIA to complete the term sheet and the definitive agreements with an objective of formally outlining Sabina's social, economic and environmental commitments to the people of the Kitikmeot Region. Sabina believes that it is reasonable to expect, assuming that progress on the negotiations continues at the current pace, that these agreements will be successfully completed before the end of 2017. Further detail on this subject is available in FEIS Addendum Volume 3 Addenda Summary.

DETAILED PROJECT DESCRIPTION – CONSTRUCTION (FEIS VOLUME 2, CHAPTER 6)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

DETAILED PROJECT DESCRIPTION – OPERATIONS (FEIS VOLUME 2, CHAPTER 7)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

DETAILED PROJECT DESCRIPTION – RECLAMATION AND CLOSURE (FEIS VOLUME 2, CHAPTER 8)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

DETAILED PROJECT DESCRIPTION – ENVIRONMENTAL MANAGEMENT (FEIS VOLUME 2, CHAPTER 9)

No areas of concern noted within the NIRB Hearing Report or the Ministers' Referral Letter. However, Sabina has prepared new or updated information for management plans to address concerns directed at other sections of the FEIS. Four management plans were revised, two were revised significantly, and two are new as reflected in this updated table.

FEIS Addendum Volume 2, Table 9.2-1. Monitoring and/or Mitigation Plans for the Back River Project (Revised)

Chapter	Document	Construction	Operations and Ongoing Maintenance	Temporary Closure / Care and Maintenance	Final Closure	Post Closure
1	Environmental Management Plan	x	x	x	x	x
2	Environmental Protection Plan	x	x	x	x	x
Biophysical Monitoring and Mitigation Plans						
3	Risk Management and Emergency Response Plan	x	x	x	x	
4	Fuel Management Plan **(Revised)**	x	x	x	x	
5	Spill Contingency Plan **(Revised)**	x	x	x	x	
6	Oil Pollution Emergency Plan **(Revised)**	x	x	x	x	
7	Site Water Monitoring and Management Plan	x	x	x	x	
8	Ore Storage Management Plan		x	x		
9	Mine Waste Rock Management Plan	x	x	x	x	
10	Waste Management Plan	x	x	x	x	
11	Incineration Management Plan	x	x	x	x	
12	Hazardous Materials Management Plan	x	x	x	x	
13	Explosives Management Plan	x	x	x	x	
14	Road Management Plan	x	x	x	x	
15	Shipping Management Plan	x	x	x	x	
16	Borrow Pits and Quarry Management Plan	x	x	x	x	
17	Air Quality Monitoring and Management Plan	x	x	x	x	
18	Noise Abatement Plan	x	x	x	x	

(continued)

FEIS Addendum Volume 2, Table 9.2-1. Monitoring and/or Mitigation Plans for the Back River Project (Revised) (completed)

Chapter	Document	Construction	Operations and Ongoing Maintenance	Temporary Closure / Care and Maintenance	Final Closure	Post Closure
19	Aquatic Effects Management Plan **(Significantly Revised)**	x	x	x	x	
20	Wildlife Mitigation and Monitoring Plan **(Significantly Revised)**	x	x	x	x	
21	Conceptual Fish Offsetting Plan **(Revised)**	x	x		x	
22	Tailings Management Plan	x	x	x	x	x
Socio-economic Management Plans						
23	Socio-economic Monitoring Plan	x	x	x	x	
24	Business Development Plan	x	x	x	x	
25	Occupational Health and Safety Plan	x	x	x	x	
26	Community Involvement Plan	x	x	x	x	
27	Cultural and Heritage Resources Protection Plan	x	x	x	x	
28	Human Resources Plan	x	x	x	x	
Mine Closure						
29	Mine Closure and Reclamation Plan		x	x	x	x
30	**Vegetation Monitoring Plan (New)**	x	x			
31	**Conceptual Fish-out Plan (New)**	x				

APPENDICES (FEIS VOLUME 2)

FEIS Appendix	Title	Summary of Change
Appendix V2-4A	Waste Management Multiple Accounts Analysis Report	No changes
Appendix V2-4B	MLA Location	No changes
Appendix V2-4C	Summary Results from Select Alternative Assessments	No changes
Appendix V2-6A	Logistics and Transportation Memo	No changes
Appendix V2-7A	Hydrogeology Characterization and Modeling Report	No changes
Appendix V2-7B	Hydrology Report	No changes
Appendix V2-7C	Site-Wide Geotechnical Properties Report	No changes
Appendix V2-7D	Geochemical Characterization Report	No changes
Appendix V2-7E	WRSA Design Report	No changes
Appendix V2-7F	Mineral Processing Memo	No changes
Appendix V2-7G	Tailings Management System Design Report	No changes
Appendix V2-7H	Water and Load Balance Report	No changes
Appendix V2-7I	Site-Wide Water Management Report	No changes
Appendix V2-7J	FEIS Design Drawings	No changes

3. Volume 3 Addenda: Public Consultation, Government Engagement, and Traditional Knowledge

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of the Public Consultation, Government Engagement, and Traditional Knowledge, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

Public consultation, government engagement, and traditional knowledge was incorporated during the development of the FEIS. Public consultation and engagement is a legal requirement in Nunavut, an industry best practice, and an important corporate commitment. Effective public consultation and engagement helps ensure that community members are informed and knowledgeable about proposed projects, that community support for those projects is more readily obtained, and sustainable development goals are achieved. A number of goals have been followed: 1) identification and prioritization of communities and community stakeholder groups; 2) developing an understanding of key community and stakeholder views regarding the Project; 3) addressing community and stakeholder issues and expectations; and 4) continuous improvement. Communities engaged include Cambridge Bay (Ekaluktutiak), Kugluktuk (Coppermine), Kingaok (Bathurst Inlet), Omingmaktok (Bay Chimo), Gjoa Haven (Ursuqtuq), Taloyoak (Spence Bay), and Kugaaruk (Pelly Bay), as well as number of Northwest Territories Aboriginal organizations have also been engaged for the Project.

The government engagement program provides government officials with clear and comprehensive information regarding the proposed Project and the various management and mitigation plans that support its development. Sabina has engaged a number of federal agencies about the Project, including the Canadian Northern Economic Development Agency, Fisheries and Oceans and Canadian Coast Guard Canada, Indigenous and Northern Affairs Canada, Environment and Climate Change Canada, Natural Resources Canada, and Transport Canada. The Government of Nunavut participates in, and provides expertise during, the environmental assessment and review process for proposed mines in Nunavut. The Government of the Northwest Territories has been involved primarily in the assessment of transboundary and cumulative effects for the Project.

Traditional Knowledge studies provide a valuable way of documenting spatial and temporal patterns of hunting, harvesting, fishing, habitation and travel in a given area. They can also provide detailed information on local ecological processes, socio-cultural patterns and institutions, spirituality, ethical, and other matters. The FEIS has made significant efforts to engage local communities through incorporation of their TK into the Project's planning and design.

Sabina has utilized six primary sources of TK: a Naonaiyaotit Traditional Knowledge Project (NTKP) database report for the Project; theme-based TK workshops; a report on existing and publically available Northwest Territories TK; the results of public consultation and engagement activities; a TK study on the Bernard Harbour Arctic char fishery; and other sources. Likewise, Inuit Qaujimajatuqangit values have helped guide Sabina's decision making for the Project and have been incorporated into the design of Sabina's overall Project management approach. It's also important to highlight that Sabina partnered with the KIA in two key elements of its TK study – preparation of the NTKP database report and execution of the theme-based TK workshops. Sabina has considered TK on an equal basis with all scientific forms of information collected for the Project.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Sections 7.1 and 7.2) in respect of the new information provided on the topic of the Public Consultation, Government Engagement, and Traditional Knowledge, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

PUBLIC CONSULTATION AND ENGAGEMENT (FEIS VOLUME 3, CHAPTER 1)

The Public Consultation and Engagement section of FEIS Volume 3 provided a comprehensive overview of Sabina's public consultation and engagement activities for the Project. More specifically, it described:

- The purpose and goals of Sabina's public consultation and engagement program;
- Regulations and requirements pertaining to public consultation and engagement for the Project;
- Consultation and engagement with key Inuit and Aboriginal organizations in Nunavut and the Northwest Territories;
- Consultation and engagement with potentially affected communities in Nunavut and the Northwest Territories;
- Methods used in Sabina's public consultation and engagement program;
- Results of Sabina's public consultation and engagement program, including key issues that were identified and Sabina's commitments to addressing these issues; and
- Sabina's long-term commitments to public consultation and engagement (as described further in FEIS Volume 10, Chapter 26 Community Involvement Plan).

Sabina utilized industry and northern best practices to develop its public consultation and engagement program, and has received very positive feedback on its approach from community and government representatives, regulators, and other Project stakeholders to date. Approximately 185 community and stakeholder meetings on the Project were held prior to the November 2015 FEIS submission, during which a substantial amount of feedback was received by Sabina. This feedback was later input into a community engagement database and analyzed to address key issues and concerns local stakeholders had about the Project. The various plans and designs presented in the FEIS incorporated this feedback and resulted in a number of Project improvements.

Since the November 2015 FEIS submission, nearly 50 additional meetings with community and stakeholder representatives have been held on the Project (for a total of over 230 Project-related meetings to date). Sabina has worked hard to ensure communities are given regular updates on the Project and are provided with opportunities to share feedback. For example, Sabina conducted a tour of all the Kitikmeot communities in July 2016 to explain the Final Hearing Report and describe the next steps that would be taken by Sabina. Sabina has also continued to advance the Bernard Harbour Restoration Project with the Kugluktuk HTO, hosted a Project site visit with community members in April 2016, and has participated in various other meetings and events (e.g., the annual Kitikmeot Socio-economic Monitoring Committee meeting, Kitikmeot Career Fair, Kitikmeot Mayors Conference, Kitikmeot Trade Show). As before, a significant amount of support for the Project continues be received from community stakeholders.

Sabina also visited the communities of Cambridge Bay and Kugluktuk in November and December 2016 (meeting with the public, HTOs, Community Advisory Groups, and residents of Bathurst Inlet and Bay Chimo) to describe recent improvements made by Sabina to its Wildlife Mitigation and Management Program Plan (WMMP Plan). Feedback obtained from community members was generally very positive and recommendation were fed into the WMMP Plan. Many individuals Sabina met with openly supported the revised caribou mitigation and management measures presented in the WMMP Plan, agreed with Sabina's interpretation of caribou-related TK and scientific (e.g., collar) data, and found the new WMMP Plan 'infographics' easy to understand.

While there have been a number of new engagement activities conducted since the FEIS submission, the overall approach, methods, and findings of Sabina's public consultation and engagement program have not changed. Sabina continues to build upon the positive relationships it has developed with local residents and regularly provides opportunities for meaningful engagement. Sabina will also maintain a public consultation and engagement program throughout the life of the Project, as described in its Community Involvement Plan. Likewise, Sabina's donations program has remained active since the FEIS submission, with over $155,000 donated (in addition to various in-kind supports) to Kitikmeot Region causes and initiatives since 2012.

As required under Article 26 of the NLCA, Sabina must have an Inuit Impact and Benefits Agreement (IIBA) with the KIA prior to the commencement of the Project. In 2016, Sabina formally commenced its negotiations with the KIA on land tenure and IIBA terms for the Project. The parties continue to advance a detailed non-binding term sheet which will form the basis to finalize definitive agreements once completed. Sabina is committed to working with the KIA to complete the term sheet and the definitive agreements with an objective of formally outlining Sabina's social, economic, and environmental commitments to the people of the Kitikmeot Region. Sabina believes that it is reasonable to expect, assuming that progress on the negotiations continues at the current pace, that these agreements will be successfully completed before the end of 2017.

Key terms of the non-binding term sheet include:

- Surface land rights tenure and obligations, including commercial lease parameters;
- Reclamation obligations and security;
- Payments terms for surface land rights and IIBA;
- Payment terms for water and wildlife compensation;
- IIBA implementation process and ongoing communication and monitoring;
- Inuit employment objectives;
- Inuit labour relations, including employment rotation, health and safety and language objectives;
- Inuit training and education objectives, including scholarship funding objectives;
- Inuit community and cultural objectives;
- Inuit business and contracting objectives, including subcontractors; and
- Inuit environmental monitoring objectives, including identification, protection and conservation of archaeological sites and specimens.

Considering the above points, no need has been identified to update the main text of this Public Consultation and Engagement section of Volume 3 at this time. However, the following appendices have been updated to reflect Sabina's ongoing community engagement activities:

- FEIS Addendum Appendix V3-1A - Record of Meetings with Community and Stakeholder Groups (Revised)
    - This record has been updated with all meetings and major correspondence with community and stakeholder groups as of February 2017. These records date back to 2012.

- FEIS Addendum Appendix V3-1B - Record of Attempted Meetings with Community and Stakeholder Groups (Revised)
    - This record has been updated with all attempted meetings with community and stakeholder groups as of February 2017. These records date back to 2012.
- FEIS Addendum Appendix V3-1C - Community and Stakeholder Group Meeting Minutes and Public Comment Forms (Addenda)
    - This record has been updated with meeting minutes and public comment forms as of February 2017. These records date back to 2012.
- FEIS Addendum Appendix V3-1F – Record of Donations (Revised)
    - This record has been updated with all community donations made by Sabina as of February 2017. These records date back to late 2011.

GOVERNMENT ENGAGEMENT (FEIS VOLUME 3, CHAPTER 2)

The Government Engagement section of FEIS Volume 3 provided a summary of Sabina's government engagement program. Throughout the process, Sabina consistently sought to provide government officials with clear and comprehensive information regarding the proposed Project and the various management and mitigation plans that support its development. Sabina also regularly communicated important Project timelines and milestones to government officials, so that they can more effectively plan their workloads and be sufficiently prepared to participate in the environmental assessment process.

To date, the goals of Sabina's government engagement program have been to:

- develop two-way communication and dialogue that builds trust and results in action;
- provide information to government officials about the Project in a timely, transparent, and accessible fashion to support government agencies in their review processes; and
- obtain information and knowledge from government agencies to help Sabina address issues and develop appropriate management and mitigation strategies.

Sabina has engaged a number of federal agencies on various occasions about the Project, including the Canadian Northern Economic Development Agency (in particular, the Northern Projects Management Office), Fisheries and Oceans Canada (including Canadian Coast Guard and Canadian Hydrographic Service), Indigenous and Northern Affairs Canada, Environment and Climate Change Canada, Natural Resources Canada, and Transport Canada.

Sabina also actively engaged both territorial governments. The Government of Nunavut participated actively on a broad range of issues primarily related to wildlife and socio-economic issues. The Government of the Northwest Territories was engaged primarily on caribou issues but also more broadly.

While there have been a number of new engagement activities conducted since the FEIS submission, the overall approach, methods, and findings of Sabina's government consultation and engagement program have not changed in any significant manner. Sabina continues to build upon the positive relationships it has developed. Engagement with government officials will continue to be important not only in these review stages but also on-going as these departments and agencies provide an important regulatory and oversight function for project activities. Sabina recognizes there will be an on-going need for both formal and informal government engagement activities.

Considering the above, no need has been identified to update the main text of the Government Consultation and Engagement section of FEIS Volume 3 at this time. However, the Appendix V3-2A has been updated to document Sabina's ongoing government engagement activities.

Between the November 2015 FEIS submission and April 2016 FEIS Final Hearing, Sabina held 16 separate meetings with various officials to ensure that all issues were well understood and agreement was reached on the way forward for key issue areas. These discussions were reflected and then refined in the

discussions during the FEIS Final Hearing. Following the FEIS Final Hearing, Sabina continued to reach out where appropriate to government agencies. Twenty-two separate meetings were held to review actions taken by Sabina since the FEIS Final Hearing and to outline our next steps. In particular, Sabina was able to significantly advance the work on the WMMP Plan through an in-depth multi day session with Government of Nunavut and the KIA, as well as engagement with the Government of the Northwest Territories.

- FEIS Addendum Appendix V3-2A - Record of Meetings with Government Officials (Revised)
    - This record has been updated with all meetings with government officials as of February 2017. These records date back to 2012.

TRADITIONAL KNOWLEDGE (FEIS VOLUME 3, CHAPTER 3)

The TK section of FEIS Volume 3 provided a comprehensive overview of the TK collected and used by Sabina from Nunavut and the Northwest Territories. More specifically, it described:

- How TK was defined and incorporated into the FEIS (including a summary table of all instances where TK was used in the FEIS);
- How Inuit Qaujimajatuqangit values were incorporated into the Project;
- TK sources utilized in the FEIS, including:
    - Naonaiyaotit Traditional Knowledge Project (NTKP) database report;
    - Theme-based TK workshops;
    - Report on existing and publically available TK from selected Aboriginal groups in the Northwest Territories;
    - Public consultation and engagement results;
    - TK study on the Bernard Harbour Arctic char fishery; and
    - Other relevant sources;
- The role of TK in Project planning and design, including:
    - Baseline data collection;
    - Impact prediction;
    - Significance assessment; and
    - Development of mitigation and monitoring programs.

Sabina actively worked to collect and incorporate Project-specific TK throughout the FEIS. Perhaps most importantly, Sabina signed a TK Agreement with the KIA in 2012 and later partnered with them on two major TK initiatives relevant to the Project area. While Sabina and the KIA jointly developed work plans for these two studies, the KIA led all data collection and reporting activities. The first report prepared by the KIA was regional in nature and presented TK from 68 individuals from the western Kitikmeot Region, while the second report was specific to the Project and presented TK from 17 elders and land users intimately familiar with the Project and/or surrounding areas. These two reports provided a substantial amount of TK on topics such as wildlife (e.g., caribou, muskox, bears, fish, birds), other environmental components, and Inuit harvesting, culture, and land use, while following established best practice TK research methodologies.

In addition to these two studies, land user TK was collected through a number of other methods. For example, TK was collected during Sabina's community engagement program (e.g., through feedback received during public and stakeholder meetings held throughout the Kitikmeot Region, beginning in 2012) and documented in a community engagement database containing some 165 topic directories. In addition, a series of land use focus groups were held with residents of Cambridge Bay, Kugluktuk, Bathurst Inlet, and Bay Chimo as a component of the Project's socio-economic studies to better understand potential Project interactions with contemporary land user activities. Beyond these, a report on existing and publically available Northwest Territories TK was also prepared (with a focus on caribou) and incorporated into the FEIS, to help ensure relevant TK from Aboriginal organizations in the Northwest

Territories was considered by Sabina. A TK study on the Bernard Harbour Arctic char fishery was additionally conducted in partnership with the Kugluktuk HTO. This study involved 11 individuals from Kugluktuk and Cambridge Bay and collected information to support stream restoration efforts at Bernard Harbour, which Sabina anticipates will help satisfy a Fisheries and Oceans requirement to offset fisheries habitat effects at the Project.

One area where TK was most actively considered by Sabina in the FEIS was caribou and other terrestrial wildlife. For example, TK and community feedback were used for scoping and refining the initial VEC/VSEC list for the Project, and in the baseline against which potential effects were assessed. This baseline included TK on matters such as caribou ecology, migration, and harvesting patterns, and revealed that caribou migration routes and the location of calving areas around the Project have changed substantially over time. The use of motion-sensor wildlife cameras also provided valuable baseline information, whose placement on the land was directly informed by the advice of local Inuit land users. Sabina's final significance determinations were likewise informed by TK and every effort was made to ensure equal consideration of TK and scientific data in the conclusions that were drawn.

Finally, TK helped inform the development of mitigation and monitoring programs for the Project. These were developed primarily to minimize potential Project effects on wildlife valued by local communities or to address areas where community concerns had been raised. For example, the Project's WMMP Plan has been directly informed by community input and TK. The WMMP Plan includes a series of staged Project shutdown procedures that aim to reduce Project interactions with caribou during sensitive periods. These procedures focus primarily on the calving and post calving periods, as these were noted to be particularly sensitive periods for caribou by the public and through TK. The WMMP Plan also addresses the possibility of large numbers of caribou returning to the Project area at some point in the future, which was another concern raised by the public and through TK. Furthermore, the Project's design utilizes winter access roads (rather than all-season roads) that preferentially cross large lakes, which helps further address public concerns related to caribou. This design choice reduces the potential for disruption to the movement of caribou and other wildlife during summer movements; minimizes loss and degradation of vegetation due to physical clearing; reduces deposition of airborne dustfall; and reduces surface compaction.

Considering the comprehensive amount of TK that has already been collected and integrated by Sabina, no need has been identified to conduct additional TK studies or analyses for the FEIS Addendum. The overall findings of Sabina's TK program have not changed, nor has any new information been identified that would affect the impact assessment conclusions presented in the FEIS. In fact, comments received during post-FEIS public consultation and engagement activities have acted to further confirm and supplement the TK that has already been collected.

For example, Sabina visited the communities of Cambridge Bay and Kugluktuk in November and December 2016 (meeting with the public, HTOs, Community Advisory Groups, and residents of Bathurst Inlet and Bay Chimo) to describe recent improvements made by Sabina to its WMMP Plan. Feedback obtained from community members was generally very positive. In particular, support was expressed for the improved caribou mitigation and management measures presented in the revised WMMP Plan and many individuals found the new WMMP Plan 'infographics' easy to understand. There was also general agreement with Sabina's presentation of caribou-related TK and scientific information, and Sabina's interpretation of that information. Sabina will continue to build upon the positive relationships it has developed with local residents and will provide regular opportunities for meaningful engagement and the sharing of TK. Sabina will also maintain a public consultation and engagement program throughout the life of the Project, as described in its Community Involvement Plan (FEIS Volume 10, Chapter 26).

In the Final Hearing Report, the NIRB concluded that there is uncertainty in relation to the potential effects of the Project on traditional activity and land use. Sabina has prepared new or updated information as well as providing additional clarity to address Section 5.6 of the Final Hearing Report. This information can be found in response FHR-NIRB-5.6 under FHR-NIRB-5.6(A) - Potential Effects of the Project on Traditional Activity and Land Use. More specifically, Sabina has provided additional clarity on

how TK was collected and considered as well as the potential use of the WIR for harvesting. New or updated information on the proposed Inuit Environmental Advisory Committee through a Draft Terms of Reference (FEIS Addendum Appendix V3-1H).

None of the additional information presented in the FEIS Addendum affects the conclusions presented in the Traditional Knowledge section of the FEIS (FEIS Volume 3, Chapter 3).

APPENDICES (FEIS VOLUME 3)

FEIS Appendix	Title	Summary of Change
Appendix V3-1A	Record of Meetings with Community and Stakeholder Groups	Revised – Addendum Appendix V3-1A Record of Meetings with Community and Stakeholder Groups
Appendix V3-1B	Record of Attempted Meetings with Community and Stakeholder Groups	Revised – Addendum Appendix V3-1B Record of Attempted Meetings with Community and Stakeholder Groups
Appendix V3-1C	Community and Stakeholder Group Meeting Minutes and Public Comment Forms	Revised – Addendum Appendix V3-1C Community and Stakeholder Group Meeting Minutes and Public Comment Forms
Appendix V3-1D	Terms of Reference for the Cambridge Bay and Kugluktuk Community Advisory Groups	No changes
Appendix V3-1E	Community Stakeholder Interviews for the Back River and Hackett River Projects: Participant Responses to Questions related to the Potential Development of the Projects	No changes
Appendix V3-1F	Record of Donations	Revised – Addendum Appendix V3-1F Record of Donations
Appendix V3-1G	Summary of Topics Raised During Public Consultation and Engagement	No Changes
Addendum Appendix V3-1H	Draft Terms of Reference Inuit Environmental Advisory Committee	New
Appendix V3-2A	Record of Meetings with Government Officials	Revised – Addendum Appendix V3-2A Record of Meetings with Government Officials
Appendix V3-3A	Inuit Traditional Knowledge of Sabina Gold & Silver Corp.'s Back River (Hannigayok) Project	No changes
Appendix V3-3B	Naonaiyaotit Traditional Knowledge (Sabina Gold & Silver Corp. Proposed Back River Project), Results from Data Gaps Workshops, Final Report (June 2014)	No changes
Appendix V3-3C	Existing and Publically Available Traditional Knowledge from Aboriginal Groups in the Northwest Territories	No changes
Appendix V3-3D	Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut	No changes

3.3 TRADITIONAL ACTIVITY AND KNOWLEDGE (TK) (ADDENDA)

NIRB Section:	Section 5.6 – Traditional Activity and Knowledge	Ref No.:	FHR-NIRB-5.6

Reference to NIRB Report:
Section 5.6 – Traditional Activity and Knowledge

Conclusions and Recommendations of the Board (Section 5.6.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that there is considerable uncertaintly in relation to the potential effects of the Project on traditional activity and land use **[FHR-NIRB-5.6(A)]**.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

FHR-NIRB-5.6(A) – Potential Effects of the Project on Traditional Activity and Land Use

The Board has concluded that there is uncertainty in relation to the potential effects of the Project on traditional activity and land use. Sabina would like to take this opportunity to describe how it has actively worked to address uncertainty and concerns related to traditional activity and land use throughout the review process.

Sabina has collected and incorporated a significant amount of regional and Project-specific Traditional Knowledge (TK) within the FEIS. Sabina recognizes the inherent value of TK and the importance of its use in the environmental assessment of proposed developments. Sabina has made notable efforts to engage local communities through incorporation of their TK and land use information into the Project's planning, design, operation, and closure. FEIS Volume 3 describes Sabina's approach to TK and the methods used to collect and interpret it, and FEIS Volume 8 further describes considerations for current land use.

Sabina's ongoing commitment to the importance and inclusion of TK throughout the environmental assessment was also highlighted during the FEIS Final Hearing:

> *"Traditional knowledge plays a very important role in environmental assessments within Nunavut. Although we collect scientific baseline and we do scientific models, we always consider available traditional knowledge in the assessment and consider it when planning our activities. Sabina has negotiated and is working with the Kitikmeot Inuit Association on all traditional knowledge matters. In our case, the Kitikmeot Inuit Association on behalf of Sabina collected information relevant to the project, and then we were able to use this information to ensure that we had all of these traditional considerations within our design."*[1]

Sabina partnered with the KIA in two key elements of its TK study – preparation of a Naonaiyaotit Traditional Knowledge Project (NTKP) database report and execution of theme-based TK workshops. The basis of this partnership was a TK Agreement signed between Sabina and the KIA in May 2012. The basic premise of this agreement was that regional TK should be collected, owned, and managed by the Inuit directly and not by a specific Proponent. Signing of this agreement provided Sabina with access to TK held by the KIA in the NTKP database. The agreement also outlines the terms and conditions pertaining

[1] M. Pickard, Sabina, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 804, Lines 18 to 26; Pg. 805, Lines 1 to 5

to Sabina's use of the TK. Sabina and the KIA additionally cooperated in the collection and reporting of new (or otherwise unrecorded) TK in the Project area. Two TK reports were subsequently prepared by the KIA for Sabina, which were utilized within the FEIS and provided the majority of TK considered.

Sabina worked closely with the KIA on TK throughout the FEIS and broader review process:

> *"The KIA submitted approximately 140 information requests for the Draft Environmental Impact Statement review phase and 67 information requests to the Nunavut Impact Review Board for the Final Environmental Impact Statement phase. The Final Environmental Impact Statement review generated issues related to wildlife, fish and fish habitat, geotechnics, and water quality.* ***25 traditional knowledge issues, mostly editorial in nature, were identified in the Final Environmental Impact Statement and resolved with outcomes included in the KIA's final written submission****."* [2]

Sabina also commissioned a review of publically available TK from Northwest Territories Aboriginal groups, as well as a current land use study for the Project area utilizing a series of Kitikmeot Inuit focus groups. In addition, Sabina and the Kugluktuk Hunters and Trappers Organization (HTO) collected TK information related to the Bernard Harbour Fisheries Offset. This information was subsequently provided to the KIA for their future use and entry into the NTKP database.

As a result of these efforts five reports were produced and provided within the FEIS (four focused on TK and one on land use and socio-economics), and the information was considered in all relevant sections of the FEIS. The referenced reports are:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project, Naonaiyaotit Traditional Knowledge Project (NTKP)* (KIA 2012) (FEIS Appendix V3-3A);
- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report* (June 2014) (KIA 2014) (FEIS Appendix V3-3B);
- *Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories* (FEIS Appendix V3-3C);
- *Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut* (FEIS Appendix V3-3D); and
- Back River Project: 2012 Socio-economic and Land Use Baseline Report (FEIS Appendix V8-3A).

The *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project, Naonaiyaotit Traditional Knowledge Project* report was regional in nature and presented TK from 68 individuals from the western Kitikmeot Region. The *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project) Final Report* was specific to the Project and presented TK from 17 elders and land users familiar with the Project area. These studies provided a comprehensive amount of Inuit TK on diverse topics such as wildlife (e.g., caribou, muskox, bears, fish, birds), and Inuit harvesting, culture, and land use. These studies all followed well-established TK research methodologies.

The number and types of people interviewed, informed consent practices employed, research methods (e.g., expert-led interviews and focus groups; results verification with land users; stringent interview, mapping and reporting protocols), and data analysis methods used (e.g., use of interview/workshop transcript analysis, GIS databases) all meet the test of 'best practice' qualitative and TK research. Similar methods have been successfully used in TK studies for previously approved mining projects in

[2] J. Ottenhof, KIA, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1070, Lines 24 to 26; Pg. 1071, Lines 1 to 8

Nunavut (e.g., Baffinland Iron Mines Corporation's Mary River Project Inuit Qaujimajatuqangit study) and elsewhere in Canada (see for example: Tobias 2009; Armitage and Kilburn 2015).

Good qualitative research (of which TK research is a sub-genre) does not require every single person to be interviewed, or every single piece of information on a particular topic to be captured. Rather, this kind of research is often meant to focus on those individuals most familiar with the subject area and/or geographic area of interest (e.g., land users with detailed knowledge of the Project area) to produce comprehensive and reliable findings. These findings should also be easy to replicate, if necessary, by other researchers using similar methods. When qualitative research is conducted properly, increasing the number of people interviewed will not necessarily lead to improved results (or if they do, the improvements may be marginal).

In addition, Sabina initiated a comprehensive community engagement program in the Kitikmeot region in order to ensure all regional residents (including those not directly involved in the TK studies) were provided with opportunities to learn about the Project and provide feedback including relevant TK. A considerable amount of TK pertinent to the Project was provided by residents of the Kitikmeot region during this process. This information was collected (e.g., in meeting notes and reports) and later integrated into Sabina's community engagement database (containing some 165 topic directories) and FEIS submission. At the time of the Public Hearing, over 250 engagements or major correspondences had been held with communities in Nunavut and the NWT on the Project. Since the November 2015 FEIS submission, nearly 50 additional meetings with community and stakeholder representatives were held on the Project (FEIS Addendum Appendix V3-1A and FEIS Addendum Appendix V3-1C). Sabina remains committed to meaningful community engagement throughout the Project's lifespan, as described in the Community Involvement Plan (FEIS Volume 10, Chapter 26).

A TK study was also carried out by Sabina in partnership with the Kugluktuk HTO in an effort to develop a better understanding of the Arctic Char fishery in the Nulahugyuk Creek - Hingittok Lake (Bernard Harbour, Nunavut) area. The study has revealed that Bernard Harbour was, and continues to be, an important land use area for a number of Inuit families. A copy of the TK study report can be found in FEIS Appendix V3-3D, while more information on Sabina's Conceptual Fish Offsetting Plan can be found in FEIS Addendum Volume 10, Chapter 21.

Land user TK was also collected through a number of additional methods. For example, land use focus groups were held with residents of Cambridge Bay, Kugluktuk, Bathurst Inlet, and Bay Chimo as a component of the Project's socio-economic studies. These workshops were conducted to better understand potential Project interactions with land user activities in the Project area. Beyond these, a report on existing and publically available Northwest Territories TK (which focused primarily on caribou) was also prepared and incorporated into the FEIS, to ensure relevant TK from Aboriginal organizations in the Northwest Territories was considered by Sabina. Put together, these various methods and studies have provided Sabina with a comprehensive amount of TK on the Project area from residents of the Kitikmeot Region and Northwest Territories. It is in our opinion that this information was more than sufficient for the Project's effects assessment and arguably represents a 'best practice' approach to TK collection and community engagement in Canada's Arctic.

Sabina also recognizes that TK has a valuable role to play throughout the life of the Project. For this reason, Sabina will continue to maintain its TK agreement with the KIA in good standing and has committed to implementing a Project-specific Inuit Environmental Advisory Committee in proposed term and condition GN-T-1. The Inuit Environmental Advisory Committee will be established jointly with the KIA, be composed of nominated community members knowledgeable of the Project area, and will serve in an advisory capacity to the Project on TK, wildlife, and on other related matters. The Inuit Environmental Advisory Committee may also be used to help plan any future TK studies and initiatives that are required. Additional information on the Inuit Environmental Advisory Committee can be found in FEIS Addendum Appendix V3-1H.

Sabina will continue to support relevant TK and traditional initiatives in the Kitikmeot region through its donations program, as described in the Community Involvement Plan in the FEIS (FEIS Volume 10, Chapter 26). Likewise, community organizations will continue to be encouraged to submit donation requests for TK-related programming in the Project area. To-date, Sabina has provided over $155,000 and various in-kind supports to Kitikmeot region causes and initiatives through its donations program. The Inuit Impact and Benefit Agreement (IIBA) that will be negotiated with the KIA for the Project may include additional provisions related to TK programing in the Kitikmeot region.

Sabina acknowledges the NIRB has concerns over the lack of clarity presented during the FEIS Final Hearing with regards to the establishment of a Project-specific Inuit Environmental Advisory Committee with the KIA. For this reason, Sabina has included a draft Terms of Reference (TOR) for the Inuit Environmental Advisory Committee (FEIS Addendum Appendix V3-1H) which outlines the proposed structure and operation of the Inuit Environmental Advisory Committee. However, this TOR will require further discussion with the KIA before it is finalized, as it is expected to become a component of the IIBA that is currently being negotiated with KIA.

Sabina appreciates the Board's concerns about potential increased public use of the winter ice road (WIR), however, would like to further clarify why increased public use is not anticipated to result in any significant manner. First, the WIR will be operated as a private road by Sabina and access to it will be controlled. Only Project-related traffic will be permitted to use the WIR and any unauthorized public use will be monitored and reported on by Sabina staff. Additional WIR mitigation and management actions that will be conducted during all Project phases can be found in the updated Wildlife Mitigation and Monitoring Program Plan (FEIS Addendum Volume 10, Chapter 20). The WIR will only be operated seasonally, from mid-January to the end of April. This short operating season will likely serve as a disincentive to land users primarily because no major caribou migrations are known to occur in the area during this time.

Furthermore, the WIR will not be connected to any community in Nunavut or any southern location in the Northwest Territories. The remoteness of the WIR is thus expected to make high levels of public access increasingly unlikely. The northern terminus of the WIR (at the Marine Laydown Area) is approximately 300 km and 375 km from the two closest permanent communities to the Project, Cambridge Bay and Kugluktuk, respectively, while the southern terminus (at Goose Property) is approximately 530 km from Yellowknife. These represent considerable distances land users in these communities would be required to travel in order to access the Project area to hunt.

Studies conducted for the FEIS also indicate that while land use activities do occur throughout the western Kitikmeot Region, they most often occur in proximity to existing communities (e.g., due to convenience, shorter travel distances, and cost of fuel). Likewise, land use workshops conducted for the Project's socio-economic studies indicate that some land use in the Project area occurs around the Marine Laydown Area, primarily by residents of Bathurst Inlet and Bay Chimo. A very limited amount of Inuit land use currently occurs in the vicinity of other Project areas. Observations made by on-site Sabina staff provide further confirmation of this, as there have been no recorded instances of land users accessing the Goose or George camps during operational periods since Sabina acquired the Project in 2009. Significant changes to current land use patterns and activities, and/or increases in hunting around the Project area are thus not expected.

As noted previously, regular monitoring of unauthorized public use of the winter ice road will be conducted by Sabina. Results of this monitoring will be reported on annually through Sabina's socio-economic monitoring program (to be submitted as part of Sabina's annual report to the NIRB) and annually to the Kitikmeot Socio-economic Monitoring Committee and Back River Socio-economic Monitoring Working Group. Sabina's socio-economic monitoring plan currently proposes to monitor the indicators 'number of times unauthorized use of Project roads reported' and 'number of times land users utilized Project camp facilities' to help satisfy Project monitoring requirements. In addition, and as

proposed in GN-C-24, should more than five groups of Inuit utilize the WIR in any one season for harvesting purposes Sabina will report and will implement a more direct monitoring program.

Sabina acknowledges the outstanding concerns of the Board on the adequacy of and use of TK, the ongoing role of a Project-specific Inuit Environmental Advisory Committee, and the potential use of the WIR and its effect on land use. Additional clarity has been provided on the collection and use of TK as well as the potential use of the WIR for traditional pursuits. Sabina has also provided a Draft TOR for the Inuit Environmental Advisory Committee for further consideration. Sabina wishes to reiterate our commitment to continuing to gather and utilize TK and land use information throughout the life of the Project.

References:

Armitage, P. and S. Kilburn. 2015. *Conduct of Traditional Knowledge Research — A Reference Guide*. Whitehorse, YT: Wildlife Management Advisory Council (North Slope).

Tobias, T. 2009. *Living Proof – The Essential Data-Collection Guide for Indigenous Use-and-Occupancy Map Surveys*. Vancouver, BC: Ecotrust Canada/UBCIC.

Attachment:

FEIS Addendum Appendix V3-1H. Draft Terms of Reference Inuit Environmental Advisory Committee

ADDENDUM APPENDIX V3-1A: RECORD OF MEETINGS WITH COMMUNITY AND STAKEHOLDER GROUPS (REVISED)

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
Cambridge Bay		
February 14, 2012	Brenda Sitatak HTO Manager	Introductions and information sharing.
February 14, 2012	Renee Krucas Executive Director, Kitikmeot Heritage Society	Introductions and information sharing.
February 14, 2012	Connie Kapolak High School Principal	Introductions and information sharing.
March 27, 2012	Brenda Sitatak HTO Manager	Introductions and update.
March 27, 2012	Stephen King, Senior Administrative Officer Jim McEchrean, Economic Development Officer Hamlet of Cambridge Bay	Project introduction.
April 5, 2012	Renee Krucas Executive Director, Kitikmeot Heritage Society	Letter / invitation to nominate representatives to the Cambridge Bay Community Advisory Group.
April 5, 2012	Stephen King, Senior Administrative Officer Hamlet of Cambridge Bay	Letter / invitation to nominate representative to the Cambridge Bay Community Advisory Group.
April 5, 2012	Brenda Sitatak HTO Manager	Letter / invitation to nominate representative to the Cambridge Bay Community Advisory Group.
June 14, 2012	General public	Call-in radio show.
June 14, 2012	Jessie Lyall, HTO Board Member Brenda Sitatak, HTO Manager	Project introduction.
June 14, 2012	General public	Public meeting - Project overview.
June 14, 2012	Hamlet Council and administration	Project introduction.
June 15, 2012	Cambridge Bay Community Advisory Group	Project introduction.
September 11-12, 2012	Cambridge Bay Community Advisory Group	Sabina hosted a dinner and meeting for the Cambridge Bay and Kugluktuk Community Advisory Groups (CAGs) in Cambridge Bay on September 11, 2012. The CAGs also visited the Back River Project site on September 12, 2012.
September 27-29, 2012	Interviews conducted with a number of individuals representing a variety of interests in the community including: government administration; health, wellness and social services; safety and protection services; business and economic development; and education and training	Socio-economic baseline data collection; documentation of expected Project benefits, Project concerns, and suggested mitigation measures.
November 19, 2012	General public	Call-in radio show.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
November 19, 2012	High school students and staff	Mining and geology presentation.
November 19, 2012	General public	Public open house.
November 19, 2012	Cambridge Bay Community Advisory Group	Project update.
November 30 - December 1, 2012	Local hunters from Cambridge Bay	Land use focus group.
February 5-6, 2013	General public	Sabina representatives participated in NIRB's scoping meetings for the Project and were available to the public for questions and information sharing.
February 5, 2013	Cambridge Bay Community Advisory Group	Project update.
April 23, 2013	General public	Public meeting - Project overview/update.
April 23, 2013	Cambridge Bay HTO	Project overview/update.
August 20, 2013	General public	Sabina provided an overview of the Back River Project and its traditional knowledge study.
August 20, 2013	General public	The Kitikmeot Inuit Association provided an overview of the Naonaiyaotit Traditional Knowledge Project (NTKP) report completed for the Back River Project and additional traditional knowledge workshops being conducted.
August 21, 2013	Cambridge Bay Community Advisory Group	Project update and review of Inuinnaqtun terminology for traditional seasons.
August 21-23, 2013	Selected elders and knowledge holders	A series of traditional knowledge workshops were held with selected elders and local knowledge holders for Sabina's traditional knowledge study. These workshops focused on the topics of 'heritage and land use', 'terrestrial environment' and 'marine environment'.
November 19, 2013	General public	Public meeting - Project overview/update & DEIS submission overview.
November 19, 2013	Cambridge Bay Community Advisory Group	Project update.
November 19, 2013	Cambridge Bay high school students	Project overview and discussion of future employment opportunities.
November 19, 2013	General public	Radio update.
January 23, 2014	General public	Career fair participation.
February 2014	Kitikmeot Heritage Society	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
February 2014	Cambridge Bay Community Advisory Group	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
February 2014	Hamlet of Cambridge Bay	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
February 2014	Cambridge Bay HTO	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
March 25, 2014	General public	NIRB held community information sessions for the Project's DEIS and were available to the public for questions and information sharing. Note – Sabina representatives were unable to attend due to flight cancellations.
March 28, 2014	Cambridge Bay Community Advisory Group	Project update.
April 27, 2014	General public	Radio update / call-in radio show.
April 28, 2014	Jim McEchrean, Economic Development Officer, Hamlet of Cambridge Bay	Project update.
April 28, 2014	Brendan Griebel, Executive Director, Kitikmeot Heritage Society	Introductions and Project update/overview.
April 28, 2014	General public	Radio update / call-in radio show.
June 7-10, 2014	Selected elders and knowledge holders	A series of traditional knowledge interviews were held with selected elders and local knowledge holders as a component of proposed fish offsetting activities in the Bernard Harbour, Nunavut area.
July 14-15, 2014	Cambridge Bay Community Advisory Group	Sabina hosted the Cambridge Bay and Kugluktuk Community Advisory Groups at the Back River Project site on July 14-15. Site tours were provided and Project information was shared.
October 28,2014	Hamlet of Cambridge Bay	Project update.
November 20, 2014	Cambridge Bay Community Readiness Initiative Committee	Sabina met with Cambridge Bay's Community Readiness Initiative Committee.
December 18, 2014	Cambridge Bay Community Readiness Initiative Committee	Sabina met with Cambridge Bay's Community Readiness Initiative Committee.
February 5, 2015	Cambridge Bay high school students	Project overview and discussion of future employment opportunities.
February 9, 2015	Kitikmeot Heritage Society representatives	Project update and discussion of potential future donations.
February 9, 2015	Gordon Bligh, Arctic College	Project update and discussion of mine-related training/education.
March 10, 2015	Cambridge Bay Community Readiness Initiative Committee	Sabina met with Cambridge Bay's Community Readiness Initiative Committee.
April 7, 2015	Cambridge Bay Community Readiness Initiative Committee	Sabina met with Cambridge Bay's Community Readiness Initiative Committee.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
May 10, 2015	Cambridge Bay Community Readiness Initiative Committee	Sabina met with Cambridge Bay's Community Readiness Initiative Committee.
June 15, 2015	Cambridge Bay Community Advisory Group	Project update and FEIS submission overview.
June 16, 2015	Hamlet of Cambridge Bay Representatives	Project update and FEIS submission overview.
June 16, 2015	General public	Public meeting – Project update and FEIS submission overview.
October 7, 2015	Cambridge Bay HTO	Project update and FEIS submission overview.
February 10, 2016	Cambridge Bay Community Advisory Group	Project update and FEIS submission/NIRB final hearings overview.
March 5, 2016	Hamlet of Cambridge Bay Cambridge Bay HTO	Emailed letter re: Sabina's FEIS submission.
April 11-12, 2016	Cambridge Bay HTO Representative Cambridge Bay Community Wellness Centre Representative	Representatives from the Cambridge Bay HTO and Community Wellness Centre participated in meetings and a Back River Project site visit hosted by Sabina.
July 6, 2016	Cambridge Bay Community Advisory Group	Project update re: NIRB final hearing report.
July 6, 2016	General Public	Public Meeting – Project update re: NIRB final hearing report.
July 7, 2016	Cambridge Bay HTO	Project update re: NIRB final hearing report.
September 15, 2016	General Public	Sabina participated in the Cambridge Bay portion of the 2016 Kitikmeot Career Fair.
September 19, 2016	Hamlet of Cambridge Bay	Project update re: NIRB final hearing report (Sabina representatives participated in-person and via teleconference).
November 30, 2016	General Public	Project update and update on revised Wildlife Mitigation and Monitoring Program.
December 1, 2016	Cambridge Bay HTO	Project update and update on revised Wildlife Mitigation and Monitoring Program.
December 1, 2016	General Public	Sabina representatives set up an informational table at the Co-op regarding the revised Wildlife Mitigation and Monitoring Program.
December 1, 2016	Cambridge Bay Community Advisory Group	Project update and update on revised Wildlife Mitigation and Monitoring Program.
January 23, 2017	Cambridge Bay Community Advisory Group members (various) Past Project employee	Letter – Update on January 12, 2017 INAC Minister's decision and thank you for providing letter of support.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
Kugluktuk		
April 11, 2012	Barbara Adjun HTO Manager	Letter / invitation to nominate representative to the Kugluktuk Community Advisory Group.
April 26, 2013	Donald LeBlanc, Senior Administrative Officer Hamlet of Kugluktuk	Letter / invitation to nominate representative to the Kugluktuk Community Advisory Group.
June 12, 2012	Kugluktuk HTO	Project introduction.
June 12, 2012	General public	Public meeting - Project overview.
June 13, 2012	Donald LeBlanc, Senior Administrative Officer Hamlet of Kugluktuk	Project introduction.
June 13, 2012	Kugluktuk Community Advisory Group	Project introduction.
September 11-12, 2012	Kugluktuk Community Advisory Group	Sabina hosted a dinner and meeting for the Kugluktuk and Cambridge Bay Community Advisory Groups (CAGs) in Cambridge Bay on September 11, 2012. The CAGs also visited the Back River Project site on September 12, 2012.
October 1-3, 2012	Interviews conducted with a number of individuals representing a variety of interests in the community including: government administration; health, wellness and social services; safety and protection services; business and economic development; and education and training	Socio-economic baseline data collection; documentation of expected Project benefits, Project concerns, and suggested mitigation measures.
November 21, 2012	High school students and staff	Mining and geology presentation.
November 21, 2012	General public	Public meeting - Project overview/update.
November 21, 2012	Kugluktuk Community Advisory Group	Project update.
November 27, 2012	Local hunters from Kugluktuk	Land use focus group.
February 7-8, 2013	General public	Sabina representatives participated in NIRB's scoping meetings for the Project and were available to the public for questions and information sharing.
February 8, 2013	Kugluktuk Community Advisory Group	Project update.
April 22, 2013	General public	Public meeting - Project overview/update.
April 22, 2013	Kugluktuk Community Advisory Group	Project update.
August 12, 2013	General public	Sabina provided an overview of the Back River Project and its traditional knowledge study.
August 13, 2013	General public	The Kitikmeot Inuit Association provided an overview of the Naonaiyaotit Traditional Knowledge Project (NTKP) report completed for the Back River Project and additional

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
		traditional knowledge workshops being conducted.
August 14-16, 2013	Selected elders and knowledge holders	A series of traditional knowledge workshops were held with selected elders and local knowledge holders for Sabina's traditional knowledge study. These workshops focused on the topics of 'heritage and land use', 'terrestrial environment' and 'marine environment'.
November 18, 2013	General public	Public meeting - Project overview/update & DEIS submission overview.
November 18, 2013	Kugluktuk Hamlet Council	Project update.
November 18, 2013	Kugluktuk Community Advisory Group	Project update.
November 18, 2013	Kugluktuk high school students	Project overview and discussion of future employment opportunities.
January 24, 2014	General public	Career fair participation.
February 12, 2014	Donald LeBlanc, Senior Administrative Officer Hamlet of Kugluktuk	Letter / invitation to nominate representative to the Kugluktuk Community Advisory Group.
February 2014	Kugluktuk Community Advisory Group	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
February 2014	Hamlet of Kugluktuk	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
February 2014	Kugluktuk HTO	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
March 19, 2014	David Nivingalok (Chairperson) and Kevin Klengenberg (Secretary-Treasurer), Kugluktuk HTO	Teleconference to discuss proposed fish offsetting work to be conducted at Bernard Harbour.
March 24, 2014	General public	Sabina representatives participated in NIRB's community information sessions for the Project's DEIS and were available to the public for questions and information sharing.
March 24, 2014	Kugluktuk Community Advisory Group	Project update.
March 25, 2014	Kugluktuk HTO	Meeting to discuss proposed fish offsetting work to be conducted at Bernard Harbour and the associated TK study.
April 29, 2014	Kugluktuk HTO	Meeting to discuss Kugluktuk HTO-Sabina Bernard Harbour Restoration Project Agreement.
April 30, 2014	Kugluktuk Community Readiness Initiative Committee	Sabina met with Kugluktuk's Community Readiness Initiative Committee in Kugluktuk to discuss the plans and goals of the committee and how Sabina might contribute.
April 30, 2014	Donald LeBlanc, SAO, Hamlet of Kugluktuk	Project update.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
May 2, 2014	Kugluktuk Community Readiness Initiative Committee	Sabina met with Kugluktuk's Community Readiness Initiative Committee in Yellowknife to discuss the plans and goals of the committee and how Sabina might contribute.
June 1-6, 2014	Selected elders and knowledge holders	A series of traditional knowledge interviews were held with selected elders and local knowledge holders as a component of proposed fish offsetting activities in the Bernard Harbour, Nunavut area. A project overview meeting/presentation was also held with local study participants prior to the interviews commencing.
July 13, 2014	Bernard Harbour TK study participants, HTO chairperson, and acting HTO manager	A TK study results verification meeting was held with participants in the Bernard Harbour TK study and with the Kugluktuk HTO chairperson and acting manager. Various clarifications were made by the participants, which were later incorporated into the final TK study report.
July 14-15, 2014	Kugluktuk Community Advisory Group	Sabina hosted the Cambridge Bay and Kugluktuk Community Advisory Groups at the Back River Project site on July 14-15. Site tours were provided and Project information was shared.
July 17, 2014	Kugluktuk HTO chairperson	The chairperson of the Kugluktuk HTO accompanied Sabina representatives and various other attendees during a day-long site visit to the Bernard Harbour stream restoration project.
February 12, 2015	Kugluktuk Community Advisory Group	Sabina provided a Project update and administered a country food consumption questionnaire.
February 12, 2015	Kugluktuk HTO representatives	Sabina met with the Kugluktuk HTO chairperson, treasurer, and manager to provide an update on the Bernard Harbour restoration project and Bernard Harbour TK study.
February 17, 2015	Kugluktuk HTO	Letter and copy of the draft 'Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut' provided to the HTO.
April 21, 2015	Kugluktuk HTO	Final copy of the 'Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut' provided to the HTO.
May 8, 2015	Barbara Adjun, Kugluktuk HTO Manager	Phone update on the Bernard Harbour restoration project.
May 21, 2015	David Nivingalok, Kugluktuk HTO Chairperson	Phone update on the Bernard Harbour restoration project.
May 27, 2015	Hamlet of Kugluktuk	Sabina participated (via teleconference) in a multi-stakeholder information session hosted on Kugluktuk's Community Readiness Initiative where feedback was sought on the draft Kugluktuk Community Readiness Report.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
June 17, 2015	General public	Public meeting – Project update and FEIS submission overview. The results of the Bernard Harbour TK study and plans for the Bernard Harbour restoration project were also reviewed.
June 18, 2015	Kugluktuk Community Advisory Group	Project update and FEIS submission overview.
June 18, 2015	Kugluktuk HTO	Project update and FEIS submission overview. The results of the Bernard Harbour TK study and plans for the Bernard Harbour restoration project were also reviewed.
June 19, 2015	Hamlet of Kugluktuk	Project update and FEIS submission overview.
July 8, 2015	David Nivingalok, Kugluktuk HTO Chairperson	Letter providing information on the 2015 Bernard Harbour work proposal.
February 11, 2016	Kugluktuk HTO	Project update and FEIS submission/NIRB final hearings overview. Bernard Harbour project update.
February 12, 2016	Kugluktuk Community Advisory Group	Project update and FEIS submission/NIRB final hearings overview.
March 5, 2016	Hamlet of Kugluktuk Kugluktuk HTO	Emailed letter re: Sabina's FEIS submission.
March 16-17, 2016	Kugluktuk Job Fair and Graduation Ceremony	Sabina participated in a job fair and graduation ceremonies in Kugluktuk.
April 11-12, 2016	Kugluktuk HTO Representatives	Representatives from the Kugluktuk HTO participated in meetings and a Back River Project site visit hosted by Sabina.
June 7, 2016	General Public	Public Meeting on the Bernard Harbour Restoration Project
June 8-9, 2016	Kugluktuk HTO and Invited Participants	Bernard Harbour Restoration Project Workshop
June 17, 2016	Kugluktuk HTO	Teleconference Project update re: NIRB final hearing report.
July 5, 2016	Hamlet of Kugluktuk	Project update re: NIRB final hearing report.
July 5, 2016	General Public	Public meeting – Project update re: NIRB final hearing report.
July 6, 2016	Kugluktuk Community Advisory Group	Project update re: NIRB final hearing report.
September 16, 2016	General Public	Sabina participated in the Kugluktuk portion of the 2016 Kitikmeot Career Fair.
November 9, 2016	Kugluktuk HTO	Sabina provided a Bernard Harbour Restoration Project update by teleconference.
December 2, 2016	Kugluktuk HTO	Project update, Bernard Harbour project update, and update on revised Wildlife Mitigation and Monitoring Program
December 3, 2016	General Public	Call-in radio show - Project update and update on revised Wildlife Mitigation and Monitoring Program

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
December 3, 2016	General Public	Project update and update on revised Wildlife Mitigation and Monitoring Program
December 4, 2016	Kugluktuk Community Advisory Group	Project update and update on revised Wildlife Mitigation and Monitoring Program
January 23, 2017	Hamlet of Kugluktuk Kugluktuk HTO Three elders Community member	Letter – Update on January 12, 2017 INAC Minister's decision and thank you for providing letter of support.
Kingaok and Omingmaktok		
April 5, 2012	Sam Kapolak, Chairperson Bathurst Inlet HTO	Letter / invitation to nominate representative to the Cambridge Bay Community Advisory Group.
April 5, 2012	Peter Kapolak, Chairperson Omingmaktok HTO	Letter / invitation to nominate representative to the Cambridge Bay Community Advisory Group.
November 18, 2012	Various residents of Kingaok and Omingmaktok	Sabina hosted a Project information meeting in Cambridge Bay specifically for residents of Kingaok and Omingmaktok.
November 30 - December 1, 2012	Local hunters from the Bathurst Inlet area	Land use focus group.
Fall 2012	Interviews conducted with selected individuals from the Bathurst Inlet area for Sabina's socio-economic study	Socio-economic baseline data collection; documentation of expected Project benefits, Project concerns, and suggested mitigation measures.
January 1, 2013	Boyd Warner President, Bathurst Inlet Lodge	Project discussion (via phone).
August 14-16, 2013 (in Kugluktuk) August 21-23 (in Cambridge Bay)	Selected elders and knowledge holders from or familiar with the Bathurst Inlet area	A series of traditional knowledge workshops were held with selected elders and local knowledge holders for Sabina's traditional knowledge study. These workshops focused on the topics of 'heritage and land use', 'terrestrial environment' and 'marine environment'.
November 19, 2013	Various residents of Kingaok and Omingmaktok	Project update in Cambridge Bay specifically for residents of Kingaok and Omingmaktok and the Cambridge Bay community advisory group.
February 2014	Omingmaktok HTO	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
September 24, 2014	Residents of Kingaok and Omingmaktok	Letter / invitation to attend October 28, 2014 dinner and meeting on the Back River Project in Cambridge Bay, specifically for residents of Kingaok and Omingmaktok.
October 28, 2014	Residents of Kingaok and Omingmaktok	Dinner and meeting on the Back River Project in Cambridge Bay, specifically for residents of Kingaok and Omingmaktok.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
January 21, 2015	Residents of Kingaok and Omingmaktok	Letter / invitation to attend February 8, 2015 dinner and meeting on the Back River Project in Cambridge Bay, specifically for residents of Kingaok and Omingmaktok.
May 21, 2015	Residents of Kingaok and Omingmaktok	Letter / invitation to attend June 15, 2015 dinner and meeting on the Back River Project in Cambridge Bay, specifically for residents of Kingaok and Omingmaktok.
June 15, 2015	Residents of Kingaok and Omingmaktok	Dinner and meeting on the Back River Project (re: Project update and FEIS submission overview) in Cambridge Bay, specifically for residents of Kingaok and Omingmaktok.
February 9, 2016	Residents of Kingaok and Omingmaktok	Dinner and meeting on the Back River Project (re: Project update, FEIS submission, and NIRB final hearings overview) in Cambridge Bay, specifically for residents of Kingaok and Omingmaktok.
March 5, 2016	Bathurst Inlet HTO Bay Chimo HTO	Emailed letter re: Sabina's FEIS submission.
April 11-12, 2016	Bathurst Inlet HTO Representative Bay Chimo HTO Representative	Representatives from the Bathurst Inlet HTO and Bay Chimo HTO participated in meetings and a Back River Project site visit hosted by Sabina.
December 1, 2016	Residents of Kingaok and Omingmaktok	Project update and update on revised Wildlife Mitigation and Monitoring Program
Gjoa Haven		
June 20, 2012	Hamlet Council members and staff	Project introduction.
June 20, 2012	General public	Public meeting - Project overview.
September 17-19, 2012	Interviews conducted with a number of individuals representing a variety of interests in the community including: government administration; health, wellness and social services; business and economic development; and education and training	Socio-economic baseline data collection; documentation of expected Project benefits, Project concerns, and suggested mitigation measures.
February 12, 2013	General public	Sabina representatives participated in NIRB's scoping meeting for the Project and were available to the public for questions and information sharing.
February 13, 2013	General public	Radio Show - Project update and notice of upcoming Actua educational program for Kitikmeot youth.
April 24, 2013	General public	Public meeting - Project overview/update.
April 24, 2013	Gjoa Haven HTO	Project overview/update.
April 24, 2013	General public	Radio Show - Project update.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
November 20, 2013	General public	Public meeting - Project overview/update & DEIS submission overview.
November 20, 2013	Gjoa Haven HTO	Project update.
November 20, 2013	Hamlet of Gjoa Haven representatives	Project update.
November 20, 2013	Gjoa Haven high school students	Project overview and discussion of future employment opportunities.
November 20, 2013	General public	Radio update.
January 21, 2014	General public	Career fair participation.
February 2014	Hamlet of Gjoa Haven	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
February 2014	Gjoa Haven HTO	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
March 26, 2014	General public	NIRB held community information sessions for the Project's DEIS and were available to the public for questions and information sharing. Note – Sabina representatives were unable to attend due to flight cancellations.
March 5, 2016	Hamlet of Gjoa Haven Gjoa Haven HTO	Emailed letter re: Sabina's FEIS submission.
March 7, 2016	Hamlet of Gjoa Haven Gjoa Haven HTO Residents of Gjoa Haven	Emailed letter re: recent attempts by Sabina to host a public meeting in Gjoa Haven.
April 11-12, 2016	Hamlet of Gjoa Haven Representative Kitikmeot Inuit Association (Gjoa Haven) Representative	Representatives from the Hamlet of Gjoa Haven and Kitikmeot Inuit Association (Gjoa Haven) participated in meetings and a Back River Project site visit hosted by Sabina.
July 8, 2016	Hamlet of Gjoa Haven representatives	Project update re: NIRB final hearing report.
July 8, 2016	General Public	Public meeting - Project update re: NIRB final hearing report.
January 23, 2017	Hamlet of Gjoa Haven Past Project employees (various)	Letter – Update on January 12, 2017 INAC Minister's decision and thank you for providing letter of support.
Taloyoak		
June 19, 2012	General public	Public meeting - Project overview.
June 19, 2012	Taloyoak HTO	Project overview.
June 19, 2012	Tommy Aiyout, Mayor of Taloyoak David Irqquit, Assistant SAO Hamlet of Taloyoak	Project overview.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
September 25-26, 2012	Interviews conducted with a number of individuals representing a variety of interests in the community including: government administration; health, wellness and social services; safety and protection services; business and economic development; and education and training	Socio-economic baseline data collection; documentation of expected Project benefits, Project concerns, and suggested mitigation measures.
February 13, 2013	General public	Sabina representatives participated in NIRB's scoping meeting for the Project and were available to the public for questions and information sharing.
February 14, 2013	General public	Radio Show - Project update and notice of upcoming Actua educational program for Kitikmeot youth.
April 25, 2013	General public	Public meeting - Project overview/update.
April 25, 2013	General public	Radio Show - Project update.
November 21, 2013	General public	Public meeting - Project overview/update & DEIS submission overview.
November 21, 2013	Taloyoak HTO	Project update.
November 21, 2013	Taloyoak Hamlet Council	Project update.
November 21, 2013	Taloyoak high school students	Project overview and discussion of future employment opportunities.
November 21, 2013	General public	Radio update.
January 20, 2014	General public	Career fair participation.
February 2014	Hamlet of Taloyoak	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
February 2014	Taloyoak HTO	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
March 28, 2014	General public	NIRB held community information sessions for the Project's DEIS and were available to the public for questions and information sharing. Note – Sabina representatives were unable to attend due to flight cancellations.
June 17, 2015	General public	Public meeting – Project update and FEIS submission overview.
June 17, 2015	Hamlet of Taloyoak	Project update and FEIS submission overview.
March 5, 2016	Hamlet of Taloyoak Taloyoak HTO	Emailed letter re: Sabina's FEIS submission.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
April 11-12, 2016	Hamlet of Taloyoak Representative Taloyoak HTO Representative	Representatives from the Hamlet of Taloyoak and Taloyoak HTO participated in meetings and a Back River Project site visit hosted by Sabina.
July 7, 2016	Taloyoak HTO	Project update re: NIRB final hearing report.
July 7, 2016	Hamlet of Taloyoak representatives	Project update re: NIRB final hearing report.
July 7, 2016	General Public	Public meeting - Project update re: NIRB final hearing report.
January 23, 2017	Hamlet of Taloyoak	Letter – Update on January 12, 2017 INAC Minister's decision and thank you for providing letter of support.
Kugaaruk		
June 18, 2012	General public	Public meeting - Project overview.
September 20-21, 2012	Interviews conducted with a number of individuals representing a variety of interests in the community including: government administration; health, wellness and social services; safety and protection services; business and economic development; and education and training	Socio-economic baseline data collection; documentation of expected Project benefits, Project concerns, and suggested mitigation measures.
February 11, 2013	General public	Sabina representatives participated in NIRB's scoping meeting for the Project and were available to the public for questions and information sharing.
February 11, 2013	General public	Radio Show - Project update and notice of upcoming Actua educational program for Kitikmeot youth.
April 26, 2013	General public	Public meeting - Project overview/update.
April 26, 2013	General public	Radio Show - Project update.
April 26, 2013	Kugaaruk Hamlet Council	Project overview/update.
November 22, 2013	General public	Public meeting - Project overview/update & DEIS submission overview.
November 22, 2013	Kugaaruk Hamlet Council	Project update.
November 22, 2013	Kugaaruk high school students	Project overview and discussion of future employment opportunities.
November 22, 2013	General public	Radio update.
January 22, 2014	General public	Career fair participation.
February 2014	Hamlet of Kugaaruk	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.
February 2014	Kugaaruk HTO	Letter – Update on January 2014 DEIS submission to NIRB and NWB. DEIS Plain Language Summary included.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
March 27, 2014	General public	NIRB held community information sessions for the Project's DEIS and were available to the public for questions and information sharing. Note – Sabina representatives were unable to attend due to flight cancellations.
June 16, 2015	General public	Public meeting – Project update and FEIS submission overview.
March 5, 2016	Hamlet of Kugaaruk Kugaaruk HTO	Emailed letter re: Sabina's FEIS submission.
April 11-12, 2016	Hamlet of Kugaaruk Representative Kugaaruk HTO Representative	Representatives from the Hamlet of Kugaaruk and Kugaaruk HTO participated in meetings and a Back River Project site visit hosted by Sabina.
July 6, 2016	Kugaaruk HTO	Project update re: NIRB final hearing report.
July 6, 2016	Hamlet of Kugaaruk	Project update re: NIRB final hearing report.
July 6, 2016	General Public	Public meeting - Project update re: NIRB final hearing report.
January 23, 2017	Hamlet of Kugaaruk	Letter – Update on January 12, 2017 INAC Minister's decision and thank you for providing letter of support.
Yellowknife / Other Locations in the Northwest Territories		
November 15, 2012	Yellowknives Dene First Nation representatives	Project overview.
November 16, 2012	General public	Public meeting – Project overview.
February 20, 2013	General public	Sabina representatives participated in NIRB's scoping meeting for the Project and were available to the public for questions and information sharing.
November 12, 2013	Tlicho Government / Kwe Beh Working Group representatives	Project overview.
November 13, 2013	Deninu K'ue First Nation representatives	Project overview.
November 13, 2013	General public	Public meeting - Project overview/update.
November 14, 2013	Yellowknives Dene First Nation representative (T. Slack)	Project update.
November 15, 2013	North Slave Métis Alliance representatives	Project overview.
January 24, 2013	Yellowknives Dene First Nation (Attn: Todd Slack)	Delivery of two USB memory sticks with full digital versions of Sabina's DEIS submission included on each.
January 24, 2013	Tlicho Government / Kwe Beh Working Group (Attn: Henry Zoe and Sonny Zoe)	Delivery of two USB memory sticks with full digital versions of Sabina's DEIS submission included on each.
January 24, 2013	North Slave Métis Alliance (Attn: Eric Binion)	Delivery of two USB memory sticks with full digital versions of Sabina's DEIS submission included on each.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
January 24, 2013	Deninu K'ue First Nation (Attn: Chief Louis Balsillie and Stephen Cuthbert)	Delivery of two USB memory sticks with full digital versions of Sabina's DEIS submission included on each.
April 1, 2014	General public	Sabina representatives participated in NIRB's community information sessions for the Project's DEIS and were available to the public for questions and information sharing.
May 8, 2014	Yellowknives Dene First Nation	Email update re: DEIS / NIRB regulatory process.
May 8, 2014	Tlicho Government / Kwe Beh Working Group	Email update re: DEIS / NIRB regulatory process.
May 8, 2014	North Slave Métis Alliance	Email update re: DEIS / NIRB regulatory process.
May 8, 2014	Lutsel K'e Dene First Nation	Email update re: DEIS / NIRB regulatory process.
May 8, 2014	Deninu K'ue First Nation	Email update re: DEIS / NIRB regulatory process.
May 8, 2014	Dene Nation	Email update re: DEIS / NIRB regulatory process.
July 24, 2014	Yellowknives Dene First Nation	Email update re: Sabina's DEIS IR responses.
July 24, 2014	Tlicho Government / Kwe Beh Working Group	Email update re: Sabina's DEIS IR responses.
July 24, 2014	North Slave Métis Alliance	Email update re: Sabina's DEIS IR responses.
July 24, 2014	Lutsel K'e Dene First Nation	Email update re: Sabina's DEIS IR responses.
July 24, 2014	Deninu K'ue First Nation	Email update re: Sabina's DEIS IR responses.
July 24, 2014	Dene Nation	Email update re: Sabina's DEIS IR responses.
July 25, 2014	North Slave Métis Alliance representative (Matt Hoover)	Phone call to discuss Sabina's DEIS Information Request responses and future regulatory timelines/requirements.
May 28, 2015	Yellowknives Dene First Nation	Emailed letter and notice of June 15, 2015 public meeting in Yellowknife.
May 28, 2015	Tlicho Government	Emailed letter and notice of June 15, 2015 public meeting in Yellowknife.
May 28, 2015	Deninu Kue First Nation	Emailed letter and notice of June 15, 2015 public meeting in Yellowknife.
May 28, 2015	North Slave Métis Alliance	Emailed letter and notice of June 15, 2015 public meeting in Yellowknife.
May 28, 2015	Lutsel K'e Dene First Nation	Emailed letter and notice of June 15, 2015 public meeting in Yellowknife.
June 15, 2015	General public	Public meeting - Project update and FEIS submission overview.
February 8, 2016	North Slave Métis Alliance	Project / FEIS update meeting.
March 5, 2016	Yellowknives Dene First Nation	Emailed letter re: Sabina's FEIS submission.
March 5, 2016	Tlicho Government / Kwe Beh Working Group	Emailed letter re: Sabina's FEIS submission.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
March 5, 2016	North Slave Métis Alliance	Emailed letter re: Sabina's FEIS submission.
March 5, 2016	Lutsel K'e Dene First Nation	Emailed letter re: Sabina's FEIS submission.
July 8, 2016	North Slave Métis Alliance	Project update re: NIRB final hearing report.
July 8, 2016	General Public	Public meeting - Project update re: NIRB final hearing report.
Other		
February 13-15, 2012	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Trade Show in Cambridge Bay.
March 28, 2012	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Socio-Economic Monitoring Committee meeting in Cambridge Bay.
April 16-19, 2012	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Mining Symposium in Iqaluit.
September 25-27, 2012	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Trade Show in Iqaluit.
October 30-31, 2012	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Stakeholders Meeting in Cambridge Bay to discuss training and labour market needs in the Kitikmeot Region.
November 13-15, 2012	Various community, government, and industry stakeholders participated	Sabina participated in the Yellowknife Geoscience Forum.
March 30, 2013	Various community, government, industry, and other stakeholders	Sabina issued the winter 2013 edition of its Project newsletter 'Back River News' via email and at various locations in the Kitikmeot communities.
February 11-13, 2013	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Trade Show in Cambridge Bay.
April 8-11, 2013	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Mining Symposium in Iqaluit.
June 28, 2013	Various community, government, industry, and other stakeholders	Sabina issued the summer 2013 edition of its Project newsletter 'Back River News' via email and at various locations in the Kitikmeot communities.
September 12, 2013	Various community, government, and industry stakeholders participated	Sabina participated in a meeting on Community Readiness in the Kitikmeot Region, hosted by the Kitikmeot Inuit Association and Canadian Northern Economic Development Agency, in Cambridge Bay.
September 24-26, 2013	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Trade Show in Iqaluit.
October 9, 2013	Various community, government, industry, and other stakeholders	Sabina provided an email update on the results of its pre-feasibility study for the Back River Project.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
October 18, 2013	Various community, government, and industry stakeholders participated	Sabina participated (via teleconference) in the Kitikmeot Stakeholders Working Group meeting in Cambridge Bay to discuss training and employment activities and opportunities in the Kitikmeot Region.
November 15, 2013	Various community, government, industry, and other stakeholders	Sabina issued the fall 2013 edition of its Project newsletter 'Back River News' via email and at various locations in the Kitikmeot communities.
November 19-21, 2013	Various community, government, and industry stakeholders participated	Sabina participated in the Yellowknife Geoscience Forum.
November 20-21, 2013	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Socio-Economic Monitoring Committee meeting in Cambridge Bay.
December 3, 2013	Various community, government, and industry stakeholders participated	Sabina participated (via teleconference) in the Kitikmeot Stakeholders Working Group meeting in Cambridge Bay to discuss training and employment activities and opportunities in the Kitikmeot Region.
January 22, 2014	Various community, government, industry, and other stakeholders	Sabina issued the spring 2014 edition of its Project newsletter 'Back River News' via email and at various locations in the Kitikmeot communities.
February 10-12, 2014	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Trade Show in Cambridge Bay.
February 12, 2014	Various community, government, industry, and other stakeholders	Sabina provided an email update on the DEIS conformity decision it received for the Back River Project.
February 18, 2014	Various community, government, and industry stakeholders participated	Sabina participated (via teleconference) in the Kitikmeot Stakeholders Working Group meeting in Cambridge Bay to discuss training and employment activities and opportunities in the Kitikmeot Region.
March 4, 2014	Various community, government, industry, and other stakeholders	Sabina provided an email update on the updated mineral resource estimate it produced for the Back River Project.
April 7-10, 2014	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Mining Symposium in Iqaluit.
April 28, 2014	Various community, government, industry, and other stakeholders	Sabina provided an email update on recent agreements signed between Sabina and the KIA for the Back River Project.
June 5, 2014	Various community, government, and industry stakeholders participated	Sabina participated (via teleconference) in the Kitikmeot Stakeholders Working Group meeting in Cambridge Bay to discuss training and employment activities and opportunities in the Kitikmeot Region.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
October 7-9, 2014	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Trade Show in Iqaluit.
October 22, 2014	Various community, government, and industry stakeholders participated	Sabina participated (via teleconference) in the Kitikmeot Stakeholders Working Group meeting in Cambridge Bay to discuss training and employment activities and opportunities in the Kitikmeot Region.
November 13-19, 2014	Various community and government stakeholders participated	Sabina participated in the Nunavut Impact Review Board's Technical Meeting and Pre-Hearing Conference for the Back River Project in Cambridge Bay.
November 25-27, 2014	Various community, government, and industry stakeholders participated	Sabina participated in the Yellowknife Geoscience Forum.
January 13, 2015	Various community, government, industry, and other stakeholders	Email update to Sabina email distribution list re: environmental assessment progress and anticipated FEIS submission.
January 27, 2015	Various community, government, industry, and other stakeholders	Sabina issued the winter 2015 edition of its Project newsletter 'Back River News' via email and at various locations in the Kitikmeot communities.
February 4, 2015	Various government and KIA representatives participated	Sabina participated in a meeting in Cambridge Bay to establish a Terms of Reference for the Back River Socio-Economic Monitoring Committee Working Group.
February 9-11, 2015	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Trade Show in Cambridge Bay.
April 13-16, 2015	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Mining Symposium in Iqaluit.
April 21-23, 2015	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Mayors' Conference in Cambridge Bay.
September 14, 2015	Various community, government, industry, and other stakeholders	Email update to Sabina email distribution list re: Initial Project Feasibility Study.
November 3-4, 2015	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Socio-Economic Monitoring Committee meeting in Cambridge Bay.
December 9, 2015	Various community, government, industry, and other stakeholders	Email update to Sabina email distribution list re: FEIS submission.
February 9, 2016	Selected youth from the Kitikmeot Region	Sabina met with selected youth from the Kitikmeot Region who were participating in the Kitikmeot Trade Show, to discuss education and career opportunities.
February 9-10, 2016	Various community, government, and industry stakeholders participated	Sabina participated in and presented a Project update at the Kitikmeot Trade Show in Cambridge Bay.

Appendix V3-1A. Record of Meetings and Major Correspondence with Community and Stakeholder Groups

Date	Individual(s) / Organization	Type of Activity
February 17, 2016	Various community, government, industry, and other stakeholders	Sabina issued the winter 2016 edition of its Project newsletter 'Back River News' via email and at various locations in the Kitikmeot communities.
April 4-6, 2016	Various community, government, and industry stakeholders participated	Sabina participated in the Nunavut Mining Symposium in Iqaluit.
April 19-21, 2016	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Mayors' Conference in Cambridge Bay.
April 25-30, 2016	Various community and government stakeholders participated	Sabina participated in the Nunavut Impact Review Board's Final Hearing for the Back River Project in Cambridge Bay.
November 15-17, 2016	Various community, government, and industry stakeholders participated	Sabina participated in the Yellowknife Geoscience Forum in Yellowknife.
November 30-December 1, 2016	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Socio-Economic Monitoring Committee meeting in Cambridge Bay.
December 2, 2016	Back River Socio-Economic Monitoring Working Group Members	Sabina participated in a Back River Socio-Economic Monitoring Working Group meeting in Cambridge Bay.
February 6-8, 2017	Various community, government, and industry stakeholders participated	Sabina participated in the Kitikmeot Trade Show in Cambridge Bay.

ADDENDUM APPENDIX V3-1B: RECORD OF ATTEMPTED MEETINGS WITH COMMUNITY AND STAKEHOLDER GROUPS (REVISED)

Appendix V3-1B. Record of Attempted Meetings with Community and Stakeholder Groups

Attempted Meetings			
Date	**Community**	**Individual(s) / Organization**	**Details**
June 2012	Kugaaruk	Kugaaruk Hamlet Council	Invitations for in-person meeting on June 18 made in May and June 2012; Hamlet Council informed Sabina they were unavailable.
June 2012	Kugaaruk	Kugaaruk HTO	Invitations for in-person meeting on June 18 made in May and June 2012; HTO informed Sabina they were unavailable.
June 2012	Gjoa Haven	Gjoa Haven HTO	Invitations for in-person meeting on June 20 made in May and June 2012; HTO informed Sabina they were unavailable.
June 2012	Taloyoak	Taloyoak Hamlet Council	Invitations for in-person meeting on June 19 made in May and June 2012; Hamlet Council informed Sabina they were unavailable.
August 2012	Kingaok	General public	Sabina attempted to organize an August 2012 public meeting in Kingaok in June/July 2012. Sabina was informed by local residents that the proposed time period was unworkable as community members would not be present.
August 2012	Omingmaktok	General public	Sabina attempted to organize an August 2012 public meeting in Omingmaktok in June/July 2012. Sabina was informed by local residents that the proposed time period was unworkable as community members would not be present.
April 23, 2013	Cambridge Bay	Cambridge Bay CAG	Only one CAG representative was available so the meeting was cancelled. Other CAG members were out of town or otherwise did not show up for the meeting.
April 26, 2013	Kugaaruk	Kugaaruk HTO	A meeting with the Kugaaruk HTO was arranged prior to Sabina's arrival in the community, but Sabina was informed the day of the meeting that HTO members were no longer available to meet.
August 2013	Omingmaktok	General public	Sabina attempted to organize a visit to Omingmaktok in August 2013 and host a public meeting to discuss the Project, but was informed that no community members would be present during the proposed time period.
August 2013	Kingaok	General public	Sabina attempted to organize a visit to Kingaok in August 2013 and host a public meeting to discuss the Project, but was informed that no community members would be present during the proposed time period.
November 2013	Lutsel K'e	Lutsel K'e Dene First Nation	Sabina attempted to organize a visit to Lutsel K'e to meet with the Lutsel K'e Dene First Nation leadership, but was informed a meeting could not occur. However, Sabina shared Project information and a copy of its community presentation with LKDFN representatives.
November 2013	N/A	Dene Nation	Sabina attempted to organize a meeting with Dene Nation representatives in Yellowknife, but a mutually appropriate time was not able to be identified during the week Sabina was in Yellowknife.

Appendix V3-1B. Record of Attempted Meetings with Community and Stakeholder Groups

Attempted Meetings			
Date	**Community**	**Individual(s) / Organization**	**Details**
November 2013	Kugluktuk	Kugluktuk HTO	A meeting with the Kugluktuk HTO was arranged prior to Sabina's arrival in the community, but Sabina was informed the day of the meeting that HTO members were no longer available to meet.
November 2013	Cambridge Bay	Cambridge Bay HTO	A meeting with the Cambridge Bay HTO was arranged prior to Sabina's arrival in the community, but Sabina was informed the day before the meeting that HTO members were no longer available to meet.
November 2013	Cambridge Bay	Cambridge Bay Hamlet Council	A meeting with the Cambridge Bay Hamlet Council was arranged prior to Sabina's arrival in the community, but Sabina was informed the day before the meeting that Hamlet council members were no longer available to meet.
November 2013	Kugaaruk	Kugaaruk HTO	A meeting with the Kugaaruk HTO was arranged prior to Sabina's arrival in the community, but Sabina was informed the day of the meeting that HTO members were no longer available to meet.
March 25, 2014	Cambridge Bay	General public	Sabina representatives attempted to participate in NIRB's community information sessions for the Project's DEIS, but were prevented from doing so due to flight cancellations.
March 26, 2014	Gjoa Haven	General public	Sabina representatives attempted to participate in NIRB's community information sessions for the Project's DEIS, but were prevented from doing so due to flight cancellations.
March 27, 2014	Kugaaruk	General public	Sabina representatives attempted to participate in NIRB's community information sessions for the Project's DEIS, but were prevented from doing so due to flight cancellations.
March 28, 2014	Taloyoak	General public	Sabina representatives attempted to participate in NIRB's community information sessions for the Project's DEIS, but were prevented from doing so due to flight cancellations.
July 2014	Kingaok	General public	Sabina attempted to organize a visit to Kingaok in July 2014 and host a public meeting to discuss the Project, but was informed that no community members would be present during the proposed time period.
October 7-9, 2014	Cambridge Bay	Kitikmeot Mayors' Conference - Various community, government, and industry stakeholders	Sabina was scheduled to attend and present at the 2014 Kitikmeot Mayors' Conference in Cambridge Bay but the conference was cancelled due to weather.
February 8, 2015	Cambridge Bay	Residents of Kingaok and Omingmaktok	A meeting with residents of Kingaok and Omingmaktok was cancelled due to the death of an elder in the community.
February 9, 2015	Cambridge Bay	Cambridge Bay Community Advisory Group	A meeting with the Cambridge Bay Community Advisory Group was cancelled due to the death of an elder in the community.

Appendix V3-1B. Record of Attempted Meetings with Community and Stakeholder Groups

Attempted Meetings			
Date	**Community**	**Individual(s) / Organization**	**Details**
June 16, 2015	Kugaaruk	Kugaaruk HTO	A meeting with the Kugaaruk HTO was arranged prior to Sabina's arrival in the community, but Sabina was informed the day of the meeting that the HTO was no longer available to meet.
June 17, 2015	Cambridge Bay	Cambridge Bay HTO	Sabina attempted to organize a meeting with the Cambridge Bay HTO, but a mutually appropriate time was not able to be identified during the period of time Sabina was in Cambridge Bay.
June 18, 2015	Gjoa Haven	Hamlet of Gjoa Haven	Sabina attempted to organize a meeting with the Hamlet of Gjoa Haven, but was informed the Hamlet was too busy with the Franklin ship explorations to meet during the proposed time.
June 18, 2015	Gjoa Haven	Gjoa Haven HTO	Sabina offered to meet with the Gjoa Haven HTO but was informed that a meeting was unable to occur.
June 18, 2015	Gjoa Haven	General public	Sabina and the Hamlet of Gjoa Haven had previously arranged for a public meeting to be held on the Back River Project on June 18, 2015, but was informed the day of the meeting that a meeting space was no longer available as it was being used for Parks Canada-Hamlet of Gjoa Haven meetings on the Franklin ship explorations.
October 6, 2015	Gjoa Haven	General public	Sabina was scheduled to host a public meeting on the Project in Gjoa Haven but the meeting had to be postponed due to flight cancellations.
February 8, 2016	Gjoa Haven	General public	Sabina was scheduled to host a public meeting on the Project in Gjoa Haven but the meeting had to be cancelled due to flight cancellations.
July 8, 2016	Gjoa Haven	Gjoa Haven HTO	A meeting with the Gjoa Haven HTO was arranged prior to Sabina's arrival in the community, but no HTO board members or staff arrived at the scheduled meeting time.
October 26, 2016	Kugluktuk	Kugluktuk HTO	A teleconference meeting (on the Bernard Harbour Restoration Project) with the Kugluktuk HTO was arranged by Sabina but the meeting had to be postponed due to a lack of quorum.
December 2, 2016	Cambridge Bay	General Public	Sabina was scheduled to set-up an informational table at the local Co-op on December 2 regarding the revised Wildlife Mitigation and Monitoring Program, but was told by the Co-op this was no longer possible.

ADDENDUM APPENDIX V3-1C: COMMUNITY AND STAKEHOLDER GROUP MEETING MINUTES AND PUBLIC COMMENT FORMS (ADDENDA)

MEETING INFORMATION	
DATE	February 8, 2016 (9:30am)
TYPE OF MEETING	North Slave Métis Alliance – Project update
LOCATION	North Slave Métis Alliance offices Yellowknife, Northwest Territories
ATTENDEES	Matthew Pickard (Sabina) Jason Prno (Sabina) Allan Harman Jr. (NSMA) Shin Shiga (NSMA) Ed Jones (NSMA) Wayne [last name unrecorded] (NSMA)
COMMENTS	Matthew Pickard provided a Project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – What price are your shares trading at on the TSX?

Q – You are one of the only companies advancing a project right now?

Q – Who does your drilling?

Q – Will you be doing open pit or shaft mining?

Q – Have you seen caribou around the MLA in recent years?

Q – Is that ice in the picture of the MLA you showed?

Q – Is your processing going to be similar to that used at Giant Mine?

Q – Is some of your gold found in magnetite? Can you see visible gold?

Q – How toxic are your tailings ponds?

Q – Your water treatment is a filter process? How do you get rid of the toxic chemicals? Are you proposing a road from Coronation Gulf? How are you transporting your goods to and from the site?

Q – When you reach production will you require additional tailings disposal areas?

Q – Does your closure plan require the use of dams?

Q – The PAG rock will be frozen?

Q – How deep will you be mining?

Q – Your open pits will eventually be filled with water?

Q – How long is the Meadowbank Mine's mine life?

Q – Will it be a two-in/two-out rotation? Will Yellowknife be a point-of-hire?

Q – Does Nunavut have a mine training society like the NWT?

Q – Do you use a facilitator for your TK studies?

Q – Do you work with any consultants on TK?

Q – Will TK be used in any future monitoring?

Q – It's nice when the TK studies are run by the community, because the individuals being interviewed will be more comfortable.

Q – Is there any NWT membership in your Community Advisory Groups?

Q – There's a hearing just for a DEIS in Nunavut? Is there a timeline or time limits for EA in Nunavut?

Q – What is your employee rotation schedule?

Q – There were a lot of comments made on caribou by the NSMA in our last meeting with you. What commitments have you made regarding caribou in the FEIS?

Q – What are the project shutdown procedures for caribou?

Q – Have any concerns about dust been raised?

Q – Do you use the 14 km zone of influence used by the diamond mines for caribou?

Q – What are the prevailing wind directions in the different seasons? Particularly the calving seasons? Can you get back to me with this information?

Q – Are you extracting any silver at this project?

Q – What is your cost per tonne to process the ore?

Q – Gold will have to hit $2,800.00/oz. for you to make money?

Q – Do you anticipate the price of gold going up?

Q – If the gold price goes below $850.00/oz., you'll shut the mine down?

Q – We're in constant legal battles with the government to get our rights recognized. It's looking promising though.

Q – Are all of Sabina's holdings in Nunavut?

Q – When will the caribou technical presentation occur at the final hearings?

Q – What date will you have all your paperwork completed and be able to build the mine?

Q – Nunavut is more open to the mining industry than the NWT. There is less red tape. We need to shorten our process.

Q – Is there a Sabina representative involved in the Bathurst caribou herd range plan meetings? Is Sabina committed to that process?

Q – When will Sabina's procurement opportunities start?

Q – The NSMA owns Metcor, and has cement, shotcrete, and trucking companies. We would be interested in any business opportunities Sabina can provide.

Q – Will Yellowknife companies be included in the procurement opportunities offered by Sabina?

Q – Will there be direct flights from Yellowknife to site?

Q – Is there an opportunity for NSMA members to see the Back River property in the future?

Q – The caribou calving and post-calving season would be a good time for us to visit.

MEETING INFORMATION	
DATE	February 9, 2016 (5:30pm)
TYPE OF MEETING	Project update and dinner with residents of Bathurst Inlet and Bay Chimo
LOCATION	Arctic Islands Lodge, Northwest Passage Room Cambridge Bay, Nunavut
ATTENDEES	Matthew Pickard (Sabina) John Kaiyogana (Sabina) Jason Prno (Sabina) Various residents of Bathurst Inlet and Bay Chimo (see sign-in sheet)
COMMENTS	Matthew Pickard provided a Project update presentation. Jason Prno took meeting notes. Josie Tucktoo-Lacasse provided interpretation services.

MEETING NOTES:

Q – Marine areas and ocean areas are receding these days. We elders are observing this. Once the ice goes it seems like the oceans are starting to recede. I wanted to make a comment on the marine environment and not sit back and not say anything. The shipping companies need to be aware of this. I went out boating one day and was quite taken aback. We were out across from Bay Chimo and I noticed that an island had newly appeared because the ocean receded.

Q – The shipping companies need to be aware that the sand moves. It moves into estuaries and rivers. They can become shallower. We've sometimes heard that ships run aground because of the shifting sand.

Q – From what we heard from one of the elders, the water will probably continue to recede in the ocean. The water runs down into the ocean. It happens all over the world, high and low tides. There are people who are able to predict the weather. It happens regularly, especially during the fall. It is a common occurrence at certain times of the year, the water receding. I always look to the sky, to the horizon. I can always tell what the weather will be just from observation.

Q – At the MLA where there are archaeology sites – What are you going to do with the items there? Our elders taught us if you are going to take something old off the land you need to replace it with something. At a burial site, we would just leave everything alone. What are you going to do with the items there?

Q – Here at our meeting tonight, this isn't even a quarter of the people from Bathurst Inlet and Bay Chimo. One of our old MLAs supported us with what we needed at Bathurst Inlet and Bay Chimo, like new houses. Schools, health stations, stores, HTOs, and the yearly barge are what kept us in the communities. Fishing provided food. Once the government was changed over we began to lose all these things. Older people began to get sick and had to leave Bathurst Inlet and Bay Chimo. A number of us from Bathurst Inlet and Bay Chimo have never been trained and we don't work. For Back River Project training, how can we make sure the people of Bathurst Inlet and Bay Chimo will get training? Will we be the priority?

Q – Do you have an IIBA with the KIA? Is there anyone on the IIBA committees representing Bathurst Inlet and Bay Chimo? I wasn't aware that Sabina had started negotiating an IIBA. It would be really useful to have Bathurst Inlet and Bay Chimo representatives on that committee. We're so close and are the ones so affected by the project. We are so limited by what we can take to Bathurst Inlet and Bay Chimo. It also takes us two days to travel there.

Q – Regarding your job openings at site this year for heavy equipment operators – What kind of equipment is on site?

Sign-in Sheet

Meeting: BC | BATHURST INLET

Date: FEB 09/16

Sabina GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	EMMA Klengenberg	
2	CLARENCE Klengenberg	
3	Martin Kapolak	
4	Kayle Kamingoak	
5	Lance AKOLAK	
6	Tony Akolak	
7	Robert AKOLAK	
8	Peter Kapolak	
9	Joanne Kamingoak	
10	ELLA PANEGYUK	
11	Lena Kamoayok	
12	Karen Kamoayok	
13	JESSIE HAGIALOK	
14	Connie Kapolak	
15	Mary Kaniak	
16	Cassie Kapolak	
17	Bernice Kapolak	
18		
19		
20		

Sabina Gold & Silver Corp.
Back River Project
Meeting Notes

MEETING INFORMATION	
DATE	February 10, 2016 (1:30pm)
TYPE OF MEETING	Cambridge Bay Community Advisory Group – Project update
LOCATION	Sabina Office Cambridge Bay, Nunavut
ATTENDEES	Matthew Pickard (Sabina) John Kaiyogana (Sabina) Jason Prno (Sabina) Martina Kapolak (CAG member) Connie Kapolak (CAG member) Keith Lear Sr. (CAG member) Howard Greenly (CAG member) Mary Avalak (CAG member)
COMMENTS	Matthew Pickard provided a Project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – Are you trying to build an ice road right now?

Q – Where did you have an ice road six years ago?

Q – We were told that you guys were building an ice road this year.

Q – Are you still planning on developing George?

Q – Is TMAC pushing you out of the picture?

Q – So nothing with this project will affect the wildlife, right? The Bathurst herd is a big deal right now. We have a big meeting coming up with the wildlife board in Iqaluit in two weeks about all the Nunavut caribou herds.

Q – Has Raytheon tried to get a hold of Sabina? It sounds like they are trying to take over all companies around here.

Q – Do you have a design for the mill you can show us? This is the kind of thing we need to see from you guys.

Q – What are we getting out of this project? What is John [Kaiyogana] getting out of this project?

Q – Was the Water Board trying to give you a hard time? Or, that was TMAC?

Q – You should be at the NWMB meetings on caribou in Iqaluit in 2 weeks. Industry needs to be there.

Q – How much money will we get out of the IIBA?

Q – Bathurst Inlet and Bay Chimo are the most impacted. They should get the most benefits.

Q – Do you have native hiring targets?

Q – During aerial surveys I was involved in this past summer, the animals weren't even phased when we flew over them at 250 feet.

Q – It's still my big concern – How do you keep animals out of the tailings?

Q – How are the animals moved away from tailings if needed?

Q – Will the tailings be transferred off site after you close?

Q – Lupin said the tailings wouldn't leak, but they did.

Q – How do you get the cyanide up there?

Q – As the economy has slowed, will this delay the project at all?

Q – Do you cap your tailings with ocean water or lake water?

Q – How deep are you guys going with your tailings?

MEETING INFORMATION	
DATE	February 11, 2016 (7:00pm)
TYPE OF MEETING	Kugluktuk HTO – Project update / Bernard Harbour project update
LOCATION	Kugluktuk HTO Office Kugluktuk, Nunavut
ATTENDEES	John Kaiyogana (Sabina) Jason Prno (Sabina) Cam Stevens (Golder Associates – By phone) Larry Adjun (Kugluktuk HTO) Kevin Klengenberg (Kugluktuk HTO) Jorgen Bolt (Kugluktuk HTO) Jayko Palongayak (Kugluktuk HTO) Peter Taktogon (Kugluktuk HTO) Gustin Adjun (Kugluktuk HTO) Johnny Nivingalok Jr. (Kugluktuk HTO)
COMMENTS	Jason Prno provided a Back River Project update presentation. Jason Prno and Cam Stevens provided a Bernard Harbour project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Back River Project Update

Q – Is the mine going to be profitable? Even with the change in gold price?

Q – Shipping in the winter would cause concerns related to caribou that use the ice.

Q – You say there will be no winter shipping, but could this decision get superseded? In the Baffin Region, there was a shipping decision that was overruled and the company has gone ahead with its plans.

Q – You have a 10 year mine life for one area?

Q – Open pit mining has more impact than underground mining.

Q – I'm concerned about impacts on caribou calving.

Q – Your ships will have 30 feet of draft. Have you studied that area? There are shallow areas there. Spills are a concern. What plans do you have in place?

Q – What depth data are you using?

Q – There was bad fishing this year. Maybe it was due to the use of sonar?

Q – Janet Kadlun is our new local employment liaison at the Hamlet. It would be good for you to speak with her.

Q – Moose isn't included on your VEC list? Moose may become an alternate species we hunt instead of caribou.

Q – Will you have a community liaison officer in Kugluktuk?

Q – It's good to deal with a face that you know, locally. A lot of people don't have a phone or internet either. A local liaison officer would be good to have.

Q – In the past we had a regular government employment officer stationed here. We don't have that any more.

Q – You will have 800 employees. So, that's 400 people on site every two weeks? Will that be a two-and-two rotation? What percentage of Inuit will be employed?

Q – A two-and-two is a good rotation.

Q – It's frustrating to see a lot of southerners at mine sites. They should be northerners.

Bernard Harbour Project Update

Q – Water is lower everywhere. How do you make this project longer-term and last?

Q – I've seen low water at Bernard Harbour and seen the fish struggling. There was no water for them to move in. Over the last 10-20 years our weather has really been changing. There has been less precipitation. Lots of other creeks and lakes in the area are getting shallower.

Q – Are the juvenile fish that are moving downstream coming in schools? It seems like there are spikes in the 2014 graph you showed? Do you have weather data that goes along with this? This may be a cause.

Q – What percentage of adults moving downstream are males versus females? You can easily tell the difference by looking at them.

Q – Have any of these fish been tagged?

Q – Are you going to be studying the lake too? And creeks feeding into the lake?

Q – Has anyone been up to the camp to witness ice breakup on the creek? The ice is moving rocks around in the Coppermine River. Maybe it's also doing that at Bernard Harbour?

Q – How quickly do you need us to sign the new Bernard Harbour project agreement?

MEETING INFORMATION	
DATE	February 12, 2016 (9:30am)
TYPE OF MEETING	Kugluktuk Community Advisory Group – Project update
LOCATION	Hamlet of Kugluktuk Boardroom Kugluktuk, Nunavut
ATTENDEES	John Kaiyogana (Sabina) Jason Prno (Sabina) Ryan Nivingalok (CAG member) David Nivingalok (CAG member) Tommy Norberg (CAG member) Alice Ayalik (CAG member) Larry Adjun (interim CAG member)
COMMENTS	Jason Prno provided a Project update presentation and took meeting notes. Doris Elatiak provided interpretation services.

MEETING NOTES:

Q – Will you have an ice road this year from Cambridge Bay?

Q – The open pits will be filled with tailings? Where are you going to put the open pit tailings?

Q – Will you have fencing around the tailings?

Q – At Lupin, people were fired if they spoke out about caribou drinking from the tailings there.

Q – So there will be no major effects from the project. What about caribou? There are lots of talks going on. Do you expect any concerns to be raised?

Q – The HTO wants to protect the green area [shown in the Sabina presentation/animation for the Bathurst caribou herd], the calving area. We will bring this forward at the next meetings with NPC.

Q – [Unrecorded comment]

Q – How's the water at Bernard Harbour right now?

Q – Regarding the calving grounds – People don't hunt when caribou are calving. They leave the cows and calves so there are more caribou. We only shoot the bulls.

Q – Keep the water clean so that animals won't be affected. Look after the water. Humans are the same as the animals.

Back River Project Site Visit
April 12, 2016
-Final Summary Report-

Participants:

Bruce McLeod – Sabina
Matthew Pickard – Sabina
Wes Carson – Sabina
Angus Campbell – Sabina
Walter Segsworth – Sabina
David Fennel – Sabina
Anna Stylianides – Sabina
John Kaiyogana – Sabina
Jason Prno – Sabina
Jared Ottenhof – Kitikmeot Inuit Association
Allen Kapolak – Bathurst Inlet HTO
Nancy Haniliak – Bay Chimo HTO
Annie Neglak – Cambridge Bay Community Wellness Centre
John Lyall Sr. – Cambridge Bay HTO
Jayko Palongayak – Kugluktuk HTO
Larry Adjun – Kugluktuk HTO
Ben Putuguq – Kitikmeot Inuit Association (Gjoa Haven)
Patrick Arendse – Hamlet of Gjoa Haven
Joe Ashevak – Hamlet of Taloyoak
Sam Tulurialik – Taloyoak HTO
Barnaby Immingark – Kugaaruk HTO
Guido Tigvareark – Hamlet of Kugaaruk

Overview:

Sabina Gold & Silver Corp. (Sabina) organized a Back River Project (the Project) site visit on April 12, 2016. This site visit was arranged to better familiarize Kitikmeot Region community members with the Project and the environmental assessment being conducted for it. The site visit was undertaken by Sabina outside of the Nunavut Impact Review Board (NIRB) review process and did not constitute a site visit associated with the NIRB's Final Hearing for the Project.

Representatives from all Kitikmeot communities attended. A total of two (2) individuals from each Kitikmeot community were invited to participate, in addition to one (1) individual from each of Bathurst Inlet and Bay Chimo. Invitation letters were sent to the same community organizations that NIRB invited to be represented at the Final Hearing for the Project. Sabina asked these organizations to mutually nominate who from their communities should attend the site visit, and that all site visit

participants be attending the Final Hearing. Because nominations were not received from all communities by the deadline of March 29, 2016, Sabina identified remaining participants on a 'first come, first serve' basis. Community organizations were contacted directly by Sabina at this time to provide nominations. In these cases, the first names that were provided to Sabina were accepted.

Sabina covered all costs associated with site visit participant travel, food, and accommodations and arranged all bookings. Site visit participants attended a number of meetings and events including an April 11 evening meeting/dinner in Yellowknife, an April 12 morning/afternoon site visit, and an April 12 evening meeting/dinner in Yellowknife. Participants did not receive monetary compensation for attending the site visit.

Productive discussions were held during these meetings and during the site visit itself. Sabina representatives also responded to numerous questions during this time and provided various Project-related information. Discussions focused on a number of areas including current Project operations (e.g. camp and exploration activities), future plans for the Project (e.g. development plans and siting/operation of infrastructure), site-based environmental management measures (e.g. pertaining to waste and water management, wildlife, spill response), and Project-related benefits (e.g. local employment and training).

Site facilities that were visited included the administration building, mess hall/kitchen, accommodations complex, incinerator, warehouse, maintenance shop, core shack, and various laydown and outdoor storage areas. Notes were taken during the April 11 and 12 evening meetings, but not during the site visit itself as these discussions were often informal in nature.

Attachments:

April 2016 Site Visit – Selected Photos
April 2016 Site Visit – Agenda
April 2016 Site Visit Overview Presentation
Meeting Notes – April 11, 2016 (Evening)
Meeting Notes – April 12, 2016 (Evening)

April 2016 Back River Project Site Visit
- Selected Photos-

Sabina
Sabina
Sabina

EXIT

April 2016 Back River Project Site Visit
- Agenda-

Date	Events
Sunday April 10, 2016	• Kugaaruk community representatives fly to Yellowknife on scheduled flights (evening) • Airport pick-ups (evening) • Check-in at the Explorer Hotel in Yellowknife (evening) • Dinner on your own (Explorer Hotel restaurant is open until 9:00pm) • Overnight at the Explorer Hotel
Monday April 11, 2016	• Breakfast on your own (Explorer Hotel restaurant opens at 7:00am) • Lunch on your own (Explorer Hotel restaurant opens at 11:00am) • Remaining community representatives fly to Yellowknife on scheduled flights (afternoon) • Pre-site visit meeting and buffet dinner at the Explorer Hotel (7:00pm – Katimavik 'C' Room) • Overnight at the Explorer Hotel
Tuesday April 12, 2016	• Breakfast on your own (Explorer Hotel restaurant opens at 7:00am) • Depart hotel for Yellowknife airport (8:00am) • Depart Yellowknife for the Back River Project's Goose Camp on charter flight (9:00 am) • Goose Camp tour and lunch (10:30am – 3:00pm) • Depart Goose Camp for Marine Laydown Area/George Camp overflight and return to Yellowknife (3:00pm) • Return to Yellowknife (5:30pm) • Follow-up meeting and buffet dinner at the Explorer Hotel in Yellowknife (7:00pm – Katimavik 'C' Room) • Overnight at the Explorer Hotel
Wednesday April 13, 2016	• Breakfast on your own (Explorer Hotel restaurant opens at 7:00am) • Hotel check-out (morning) • Airport drop-offs (morning) • Community representatives fly home on scheduled flights (morning)

Sabina
GOLD & SILVER CORP.

Back River (Hannigayok) Gold Project

Community Site Visit

Overview

Forward Looking Information

Statements relating to our belief as to the timing of completion of the feasibility study, the EIS and the environmental assessment, the timing of receipt of a project certificate and permits and the timing of the start of construction and the first gold pour, and the results of the feasibility study, the potential tonnage and grades and contents of deposits and the potential production from and viability of Sabina's properties are forward looking information within the meaning of securities legislation of certain Provinces in Canada. Forward looking information are statements that are not historical facts and are generally, but not always identified by the words "expects," "plans," "anticipates," "believes," "intends," "estimates," "projects," "potential," "opportunities," and similar expressions, or that events or conditions "will," "would." "may," "could," or should occur. The forward looking information is made of the date of this presentation. This forward looking information is subject to a variety of risks and uncertainties which could cause actual events or results to differ materially from those reflected in the forward looking information, including, without limitation: the effects of general economic conditions; changing foreign exchange rates; risks associated with exploration and project development; the calculation of mineral resources and reserves; risks related to fluctuations in metal prices; uncertainties related to raising sufficient financing to fund the planned work in a timely manner and on acceptable terms; changes in planned work arising from weather, logistical, technical or other factors; the possibility that results of work will not fulfill expectations and realize the perceived potential of the Company's properties; risk of accidents, equipment breakdowns and labour disputes; access to project funding or other unanticipated difficulties or interruptions; the possibility of cost overruns or unanticipated expenses in the work program; title matters; government regulation; obtaining and receiving necessary licences and permits; the risk of environmental contamination or damage resulting from Sabina's operations and other risks and uncertainties including those described in Sabina's annual information form for the year ended December 31, 2015 available at www.sedar.com

Forward looking information is based on the beliefs, estimates and opinions of Sabina's management on the date the statements are made. Sabina undertakes no obligation to update the forward looking information should management's beliefs, estimates or opinions, or other factors, change, except as required by applicable law.

Sabina GOLD & SILVER CORP.

Sabina Gold and Silver Corp.

The Company is represented here by:

Sabina Representative	Position/Role
Bruce McLeod	President & CEO
Matthew Pickard	Vice President, Environment & Sustainability
Wes Carson	Vice President, Project Development
Jason Prno	Government Engagement Advisor
John Kaiyogana	Community Liaison Office
David Fennell	Director, Board of Directors
Walter Segsworth	Director, Board of Directors
Anna Stylianides	Director, Board of Directors

Sabina GOLD & SILVER CORP.

Sabina Gold and Silver Corp.

The Communities are represented by:

Participant	Community Organization
Allen Kapolak	Bathurst Inlet HTO
Nancy Haniliak	Bay Chimo HTO
Annie Neglak	Cambridge Bay Community Wellness Centre
John Lyall Sr.	Cambridge Bay HTO
Jayko Palongayak	Kugluktuk HTO
Larry Adjun	Kugluktuk HTO
Ben Putuguq	Kitikmeot Inuit Association (Gjoa Haven)
Patrick Arendse	Hamlet of Gjoa Haven
Joe Ashevak	Hamlet of Taloyoak
Sam Tulurialik	Taloyoak HTO
Barnaby Immingark	Kugaaruk HTO
Guido Tigvareark	Hamlet of Kugaaruk

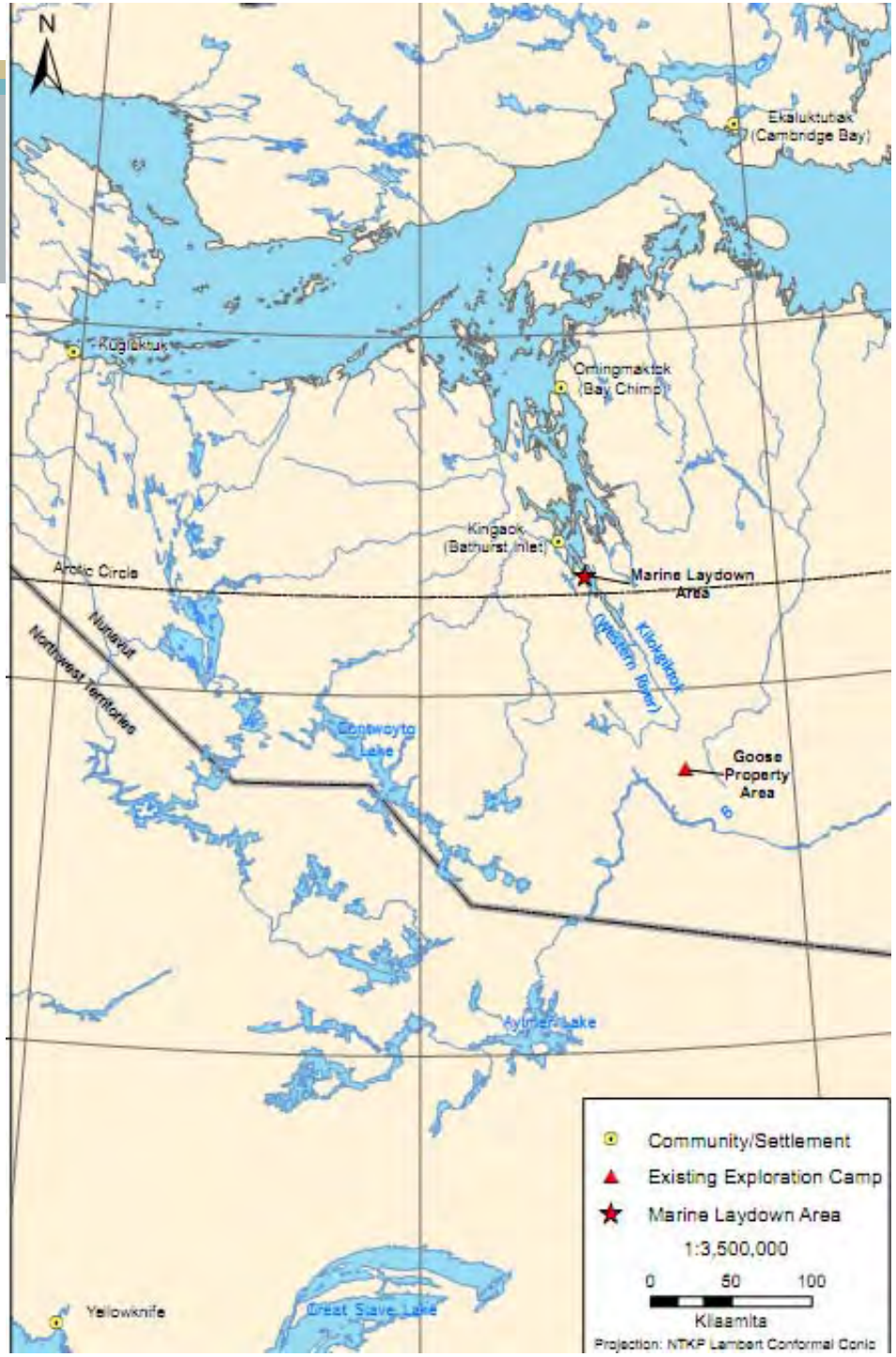
Sabina GOLD & SILVER CORP.

Sabina Gold and Silver Corp.

- Vancouver based emerging developer
- Aim to become a significant gold producer
- Publicly listed on Toronto Stock Exchange (TSX: SBB)
- Projects in Nunavut
  - Back River Gold Project
  - Wishbone Greenstone Belt
  - Royalty on the Hackett River Project
- Skilled staff with extensive northern experience
- Committed to sustainable responsible northern development
- Acknowledge the need for effective community engagement

Sabina GOLD & SILVER CORP.

Project Location



Back River Project

- Proposed gold mine
- 100% operated by Sabina Gold & Silver Corp.
- Exploration commenced in 1982.
- Sabina acquired the Project in 2009.
- Mineral resources of 5.3 M oz. gold (measured and indicated) and 1.9 M oz. gold (inferred)
- Feasibility Study press releases issued in May and September 2015
- Continuation of the environmental assessment and permitting processes
- Small 2016 field program:
  - Baseline, engineering, mineral resource drilling

Goose Property (Summer 2015)

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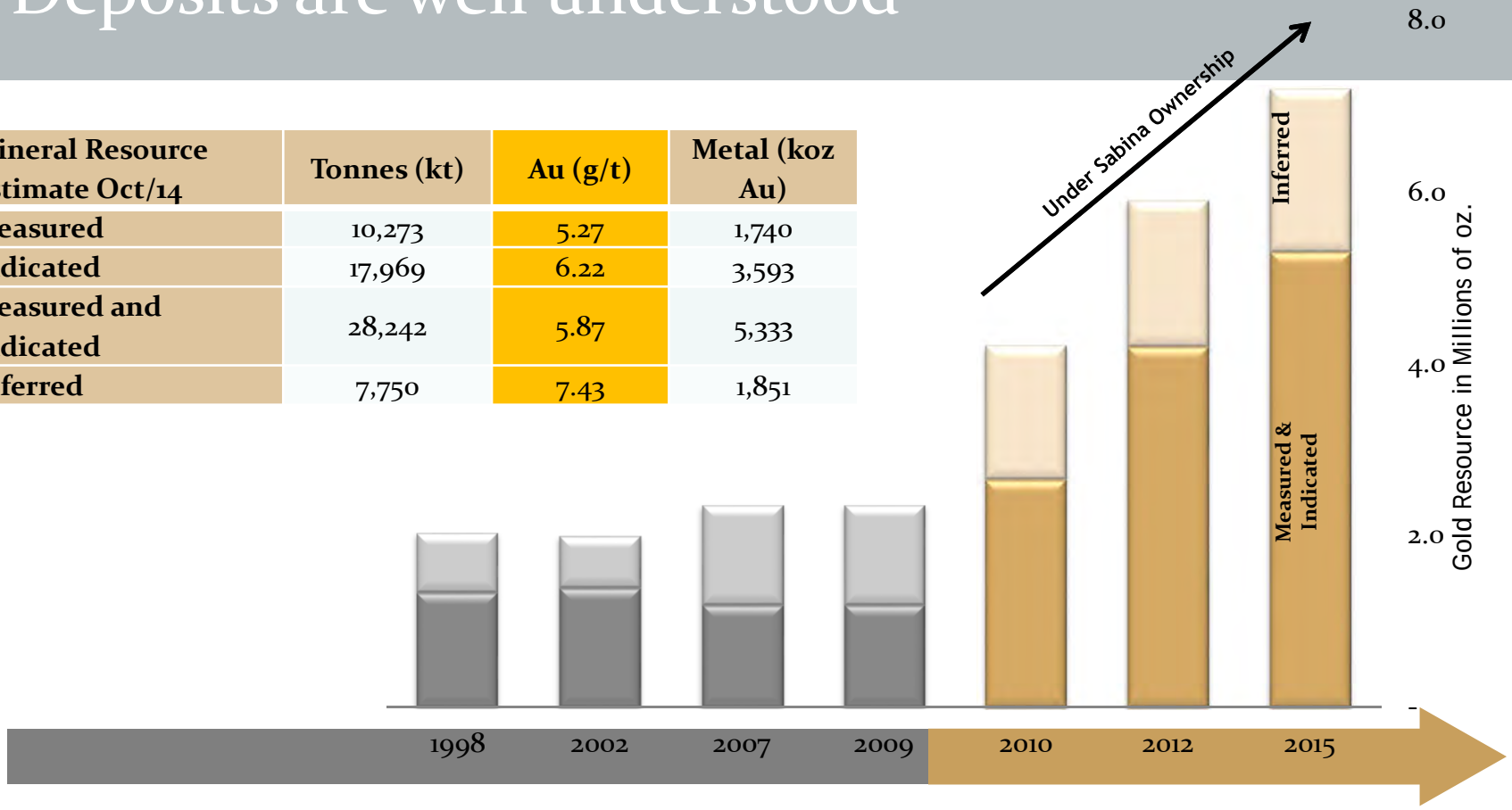
Deposits are well understood

Mineral Resource Estimate Oct/14	Tonnes (kt)	Au (g/t)	Metal (koz Au)
Measured	10,273	5.27	1,740
Indicated	17,969	6.22	3,593
Measured and Indicated	28,242	5.87	5,333
Inferred	7,750	7.43	1,851



1980's & 90s

George & Goose deposit discoveries

1997-2009

Project owned by Arauco, Kinross, Miramar & DPM

June 2009

Project acquired by Sabina

2010-2014

+325% resource growth under Sabina

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Current Back River Project Infrastructure

Goose Property (Summer 2015)

What are we proposing to build?

Mine Site at Goose Property

- Open pit and underground mining
  - 4 mining deposits/areas: Umwelt, Llama, Goose Main, Echo
  - 10+ years of production
- Process Plant
  - Up to 6,000 tonnes/day
  - Crushing and grinding, gravity separation, cyanide leaching, carbon recovery
  - ~350,000 ounces gold annually; doré bars shipped out by air
- Tailings Storage
  - Starter above-ground impoundment (tailings storage facility; TSF)
  - Subsequent tailings disposal in mined out open pits (tailings facilities; TFs)
- Waste Rock Storage
  - Multiple facilities; potentially acid-generating (PAG) waste rock capped with not potentially acid-generating (NPAG) waste rock (permafrost encapsulation)

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What are we proposing to build?

Supporting Facilities

- Water and waste management facilities
- Explosives storage
- Power generation facilities
- Fuel and bulk storage areas
- Water treatment plant
- Sewage treatment plant
- Landfill (Goose Property) and Landfarms
- Buildings (e.g. administrative complex, maintenance facilities, warehousing)

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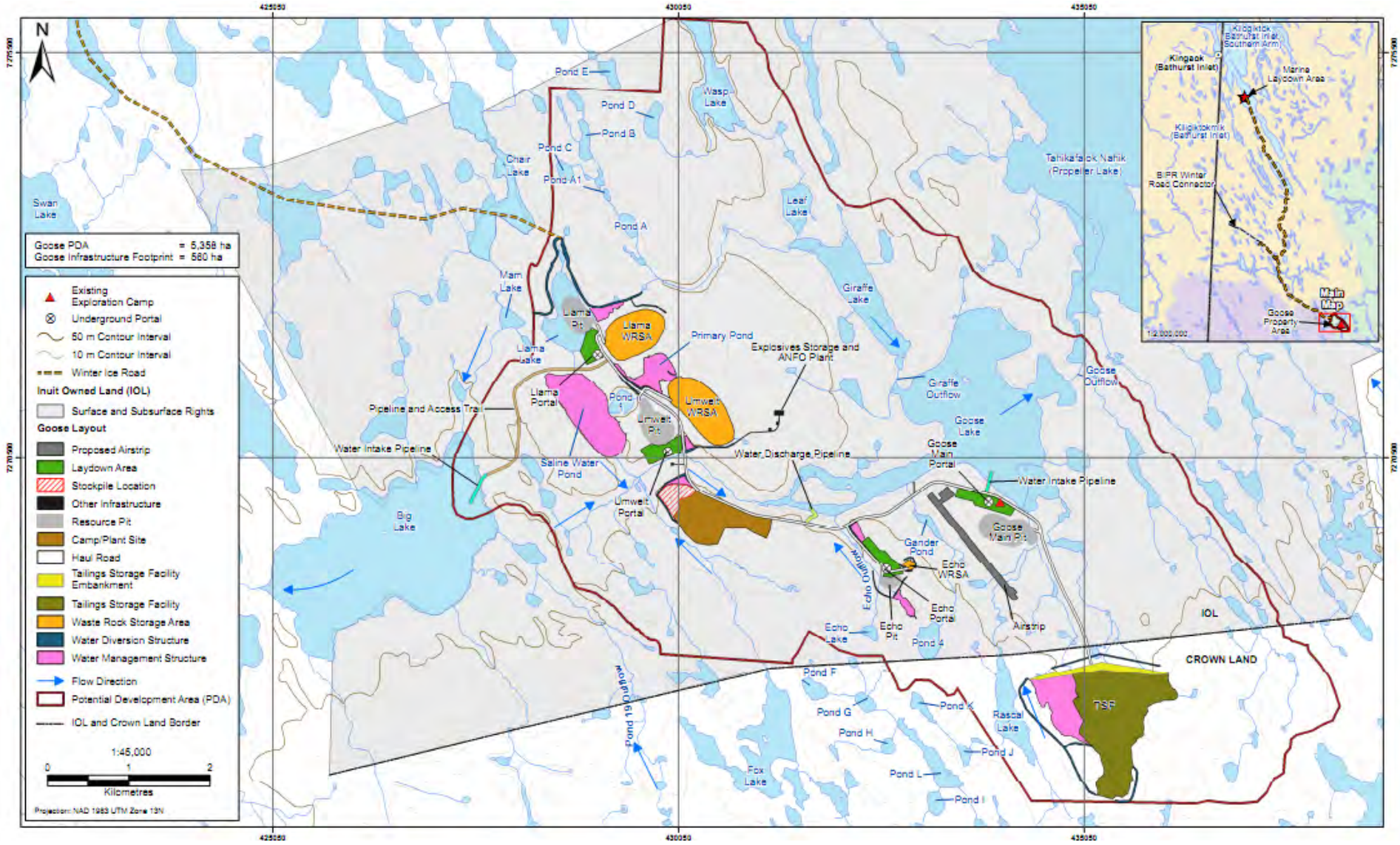
Goose Property (Mine Site)
Potential Development Area and Layout



What are we proposing to build?

Waste and Water Management Facilities

- Water Intakes: Goose Lake and Big Lake
- Water Treatment Plant: TSS, As, Cu
- Tailings Storage Facility & In-Pit Tailings Facilities
- Saline Water Pond
- Contact Water Ponds (approx. 10)
  - Primary Pond, Ore Stockpile Pond, WRSA ponds, etc.
- Non-Contact Water Diversions and Ponds
  - Diverting water away/around Llama Pit and Echo Pit

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What are we proposing to build?

Key Waste and Water Management Activities

- Construction:
  - Lake dewatering: Llama Lake and Umwelt Lake
  - Dewatering discharged initially to Goose Lake, then TSF
  - Treated sewage effluent discharged to approved land disposal area
- Operation:
  - Process water from tailings reclaim, with make-up water from Goose Lake
  - Contact water collected and discharged to TSF
  - Non-contact water management
  - Treated sewage effluent discharge to TSF or approved land disposal area
- Closure
  - Pit flooding

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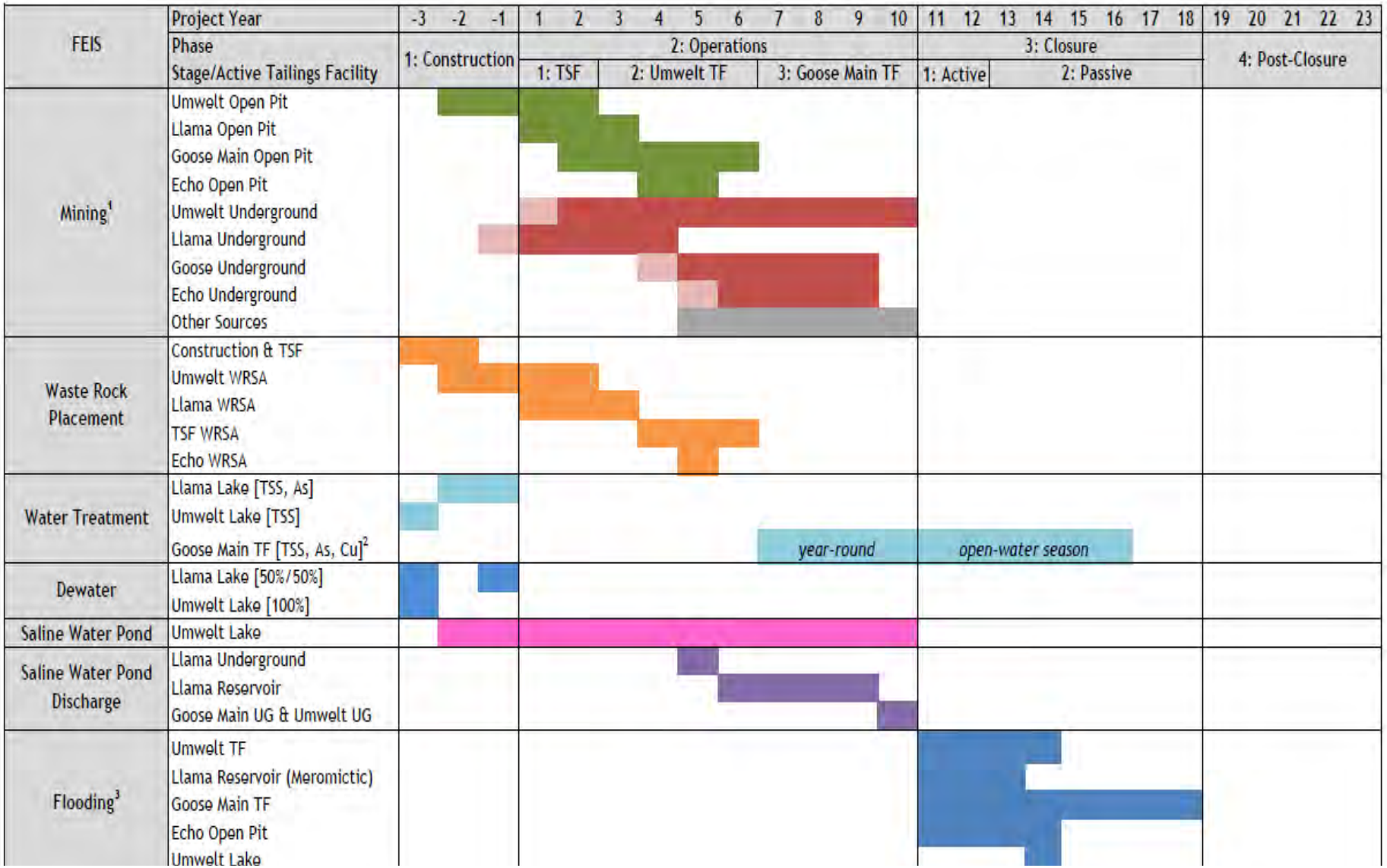
Mining, Waste and Water Timelines



What are we proposing to build?

Transportation and Logistics

- Sealift Delivery of Supplies to Marine Laydown Area (Bathurst Inlet)
  - Open water shipping only
- Winter Road Access MLA to Goose Property
  - 157 km winter road
- Accommodations
  - Goose Property: up to 465 person camp; Marine Laydown Area: up to 75 person camp
- Worker Transportation
  - Remote fly-in/fly-out operation
  - Year-round aircraft access to Goose Property
  - Seasonal aircraft access to Marine Laydown Area

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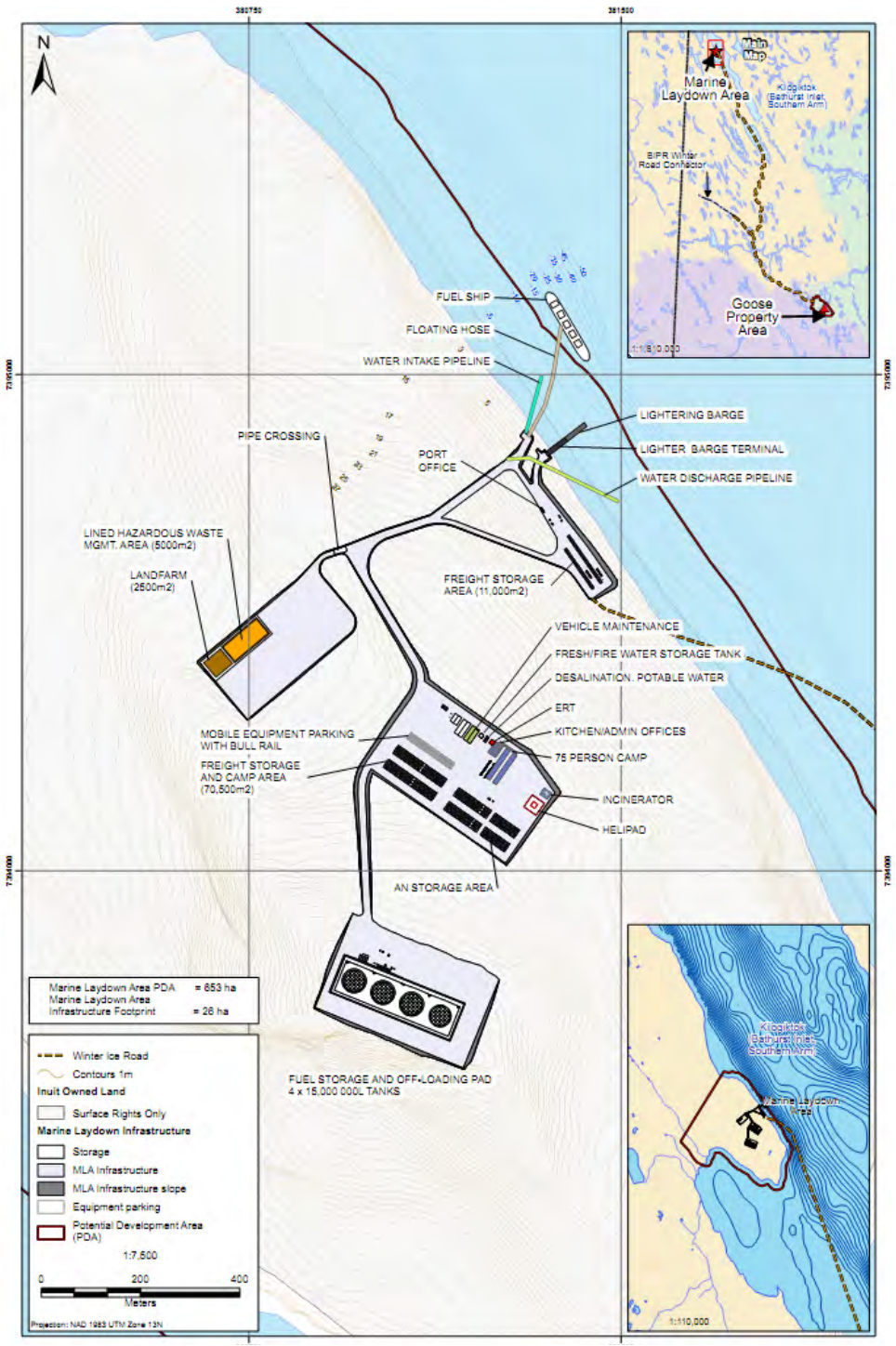
Current Back River Project Infrastructure

Marine Laydown Area (Summer 2014)

Marine Laydown Area

Key Activities

- Ocean-going barges (16,000 DWT; draft 5.9 m)
- Ships (17,000 DWT; draft 9.7 m)
- Construction: approx. 3-5 ships/yr
- Operation: approx. 4-5 ships/yr
- Seasonal 75 person camp
- Fuel off-loading and storage
- Sealift off-loading
- Laydown area
- Support to winter haulage of supplies over winter road



Marine Laydown Area

Infrastructure

- Water Intake: Bathurst Inlet
- Water Discharge: Bathurst Inlet
- Desalination Plant
- Sewage Management: Pacto Incinerating Toilets
- Greywater Discharge: Terrestrial (1.5 km from Inlet)
- Landfarm
- Oil/Water Separator

Key Water Activities

- Desalination of saline water for potable and industrial use
- Runoff Management – management of total suspended solids (TSS)
- Greywater Discharge

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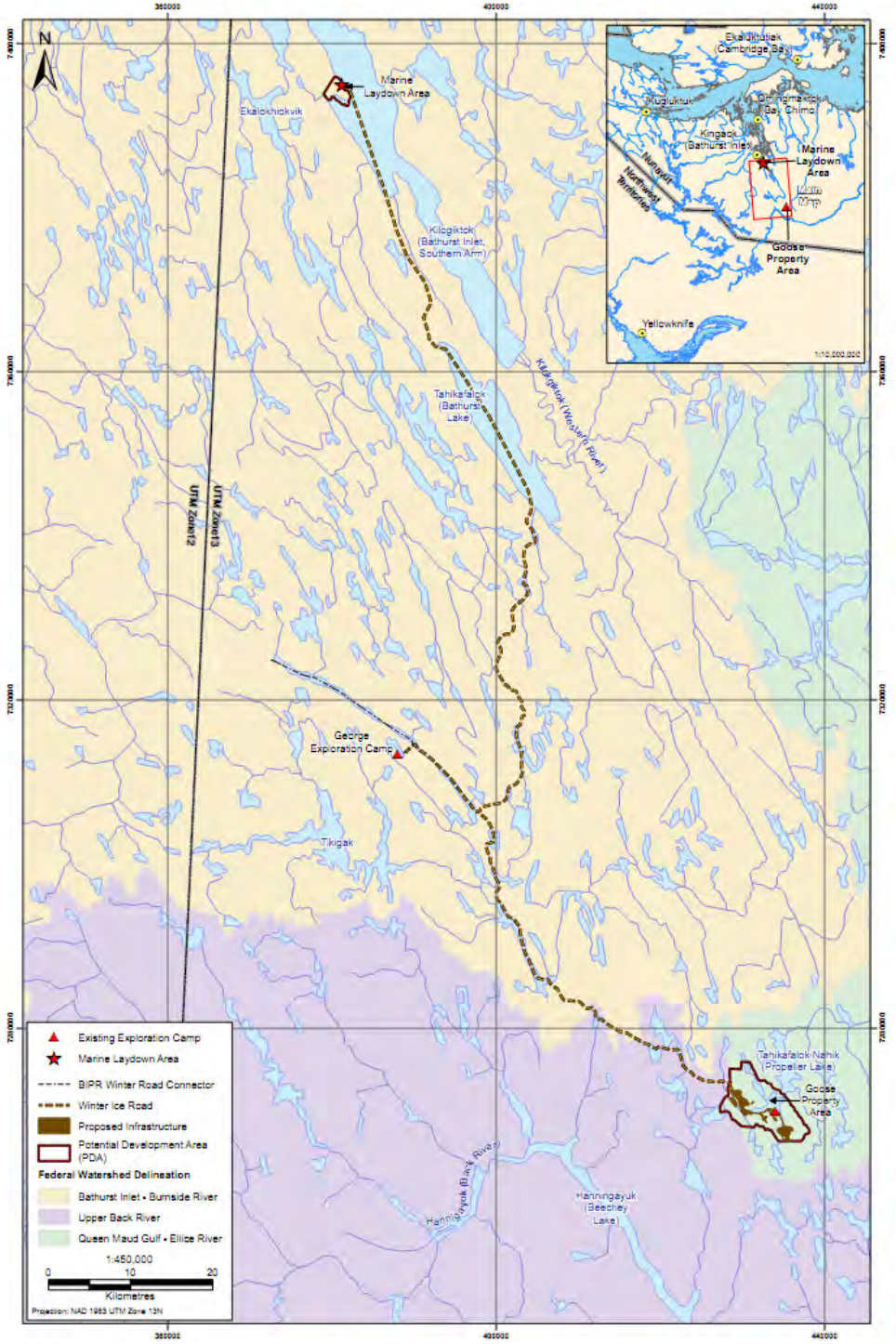
Winter Ice Road

Key Facts

- Total distance: 157 km
  - On land: 66 km
  - Over water: 91 km
- No. of waterbodies: 51
- Annual construction from both fronts (Mine and MLA)
- Road Operation:
  - Construction: approx. 800-1,200 truck loads/yr
  - Operation: approx. 1,600-2,100 truck loads/yr



Schedule

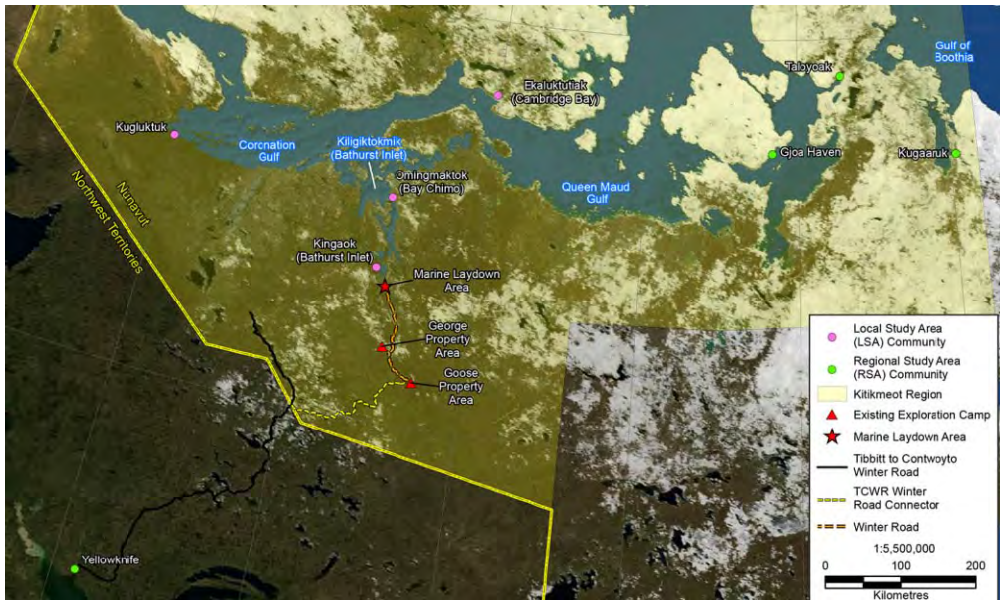
- Construction - will take 4 years; 2017
- Operation –for 10 years; 2020
- Closure – will take approximately 8 years
- Schedule dependent on Project approvals, final design, financing, etc.

Year	Key Construction Activities
2017 (Year -4)	Type A water licence issued MLA initial sea lift
2018 (Year -3)	Sealift, mobilization, and long lead item procurement Expand airstrip and construct first fuel tank at Goose; construct port facilities at MLA Initial winter ice road from MLA to Goose
2019 (Year -2)	Finish construction of port facilities at MLA Winter ice road from MLA to Goose Install construction camp & mine infrastructure at Goose Commence open pit mining and TSF construction
2020 (Year -1)	Construct mine site infrastructure Continue open pit mining Commission process plant

Our Stakeholders

Sabina's Primary Affected Communities

- Cambridge Bay
- Kugluktuk
- Bathurst Inlet
- Bay Chimo
- Gjoa Haven
- Taloyoak
- Kugaaruk



Regional Stakeholders

- Kitikmeot Inuit Association
- Nunavut Tunngavik Inc. (NTI)
- Government of the Northwest Territories
- Akaitcho Dene First Nations, Tlicho Government, North Slave Métis Alliance

>247 engagements, including 186 meetings held to date

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Our Approach

Community Meetings and Major Correspondences

	Meetings	Major Correspondences	TOTAL
Cambridge Bay	51	7	58
Kugluktuk	43	9	52
Bathurst Inlet & Bay Chimo	8	6	14
Gjoa Haven	15	2	17
Taloyoak	17	2	19
Kugaaruk	14	2	16
Other (e.g. northern trade shows & conferences, SEMCs, newsletters)	27	12	39
Yellowknife / Other Locations in the NWT	11	21	32
TOTAL	186	61	247

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Our Approach - Inuit Employment

2013 Employment

- 58 Inuit employees (30% of approx. 200 total employees)
- $1,654,590 gross payroll value

2014 Employment

- 15 Inuit employees (50% of approx. 30 total employees)
- $339,201 gross payroll value

Mine Development

- Aim to repeat successes during exploration

	Employment Estimates
Construction	• Average approx. 650 • Peak employment (during busy periods) approx. 1,000
Operations	• Average approx. 800 • Peak employment (during busy periods) approx. 1,150

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Our Stakeholders

Government of Nunavut (GN)

- Environment
- Culture and Heritage
- Health and Social Services
- Economic Development and Transportation

Government of Canada

- Environment Canada (EC)
- Indigenous and Northern Affairs Canada (INAC)
- Department of Fisheries and Oceans Canada (DFO)
- Natural Resources Canada (NRCan)
- Transport Canada (TC)
- Northern Development Agency (CanNor)
- Health Canada (HC)

Government of Northwest Territories

>156 meetings held to date

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Our Approach

- **Consistent company representation**
  - John Kaiyogana, Jason Prno, Matthew Pickard
- **Community Liaison Officer**
  - Cambridge Bay office since 2012, staffed by John Kaiyogana
- **Engagement at different levels**
  - Public, advisory groups, traditional knowledge
- **Careful documentation**
  - Consultation database, organized by keyword
  - 150 topics
- **Integration**
  - Into decision-making, impact assessment, mitigation measures and monitoring programs

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Our Approach

Working with Communities

- Newsletters and other materials (e.g. fact sheets, posters, maps)
- Social media (e.g. website, Twitter)
- Donations
- Public meetings
- Community Liaison Officer and office in Cambridge Bay
- Community advisory groups
- Meetings with key stakeholder groups (e.g. HTOs, Hamlets, youth, elders)
- Radio shows and information booths
- TK studies
- Bernard Harbour Restoration Project

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Our Approach

Community Advisory Group Site Visits

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Our Approach

Traditional Knowledge Studies

1. Support to KIA's Naonaiyaotit Traditional Knowledge Project (NTKP)
2. Project-specific and theme-based traditional knowledge workshops
   - Led by KIA; Cambridge Bay and Kugluktuk
   - Topics included: heritage and land use, terrestrial environment, marine environment
   - Results not available in DEIS, now presented in FEIS
3. Publicly Available TK Study Reports by Others
   - Akaitcho Dene First Nations, Tłı̨chǫ, North Slave Metis
4. Public consultation database
5. Bernard Harbour Arctic Char Fishery
   - With Kugluktuk HTO; Sabina industry partner on HTO-led studies
6. Other sources
   - Nunavut Wildlife Harvest Study, Elder site visits, etc.

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Our Approach

Bernard Harbour Traditional Knowledge Study

Reference: '*Copper Inuits spearing salmon at Nulahugyuk Creek, Northwest Territories (Nunavut), Canadian Museum of History, 37080*'

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Assessed Valued Components

Valued Ecosystem Components (VECs)

- Atmospheric (Vol 4)
  - Air Quality, Noise & Vibration
- Terrestrial (Vol 5)
  - Vegetation & Special Landscape Features, Caribou, Grizzly bear, Muskox, Wolverine & Furbearers, Migratory Birds, Raptors
- Freshwater (Vol 6)
  - Hydrology, Water Quality, Sediment Quality, Fish/Aquatic Habitat, Fish Community
- Marine (Vol 7)
  - Water Quality, Sediment Quality, Fish/Aquatic Habitat, Fish Community, Seabirds/Seaducks, Ringed Seals

Valued Socio-economic Components (VSECs)

- Human (Vol 8)
  - Archeology
  - Non-Traditional Land & Resource Use
  - Socio-Economics
  - Health, Safety, & Community Well-Being
  - Subsistence Economy & Land Use
  - Country Foods/Human Health

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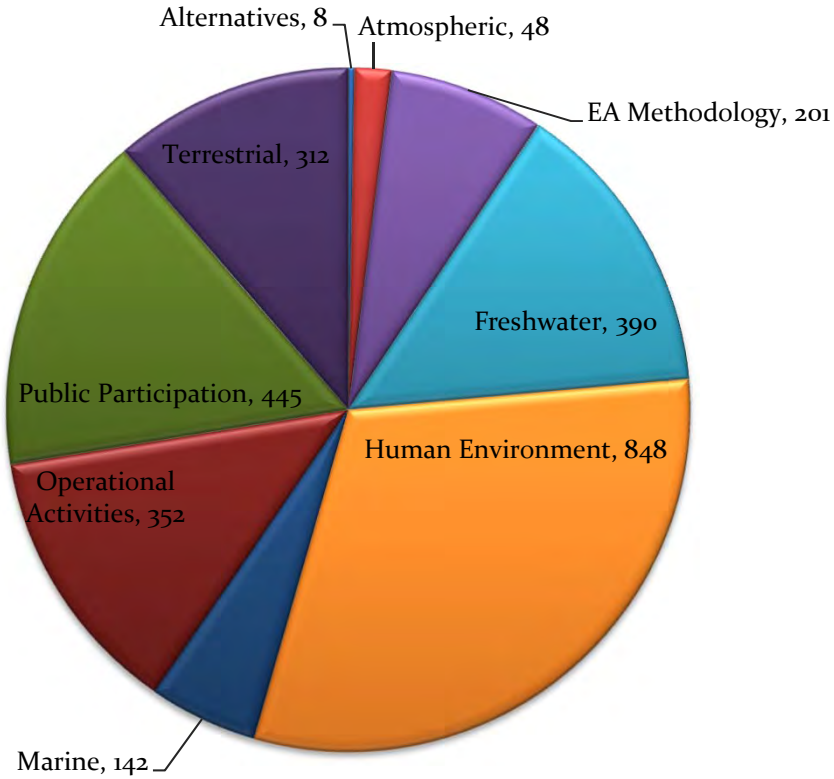
Community Engagement

Comments from Communities, by Topic



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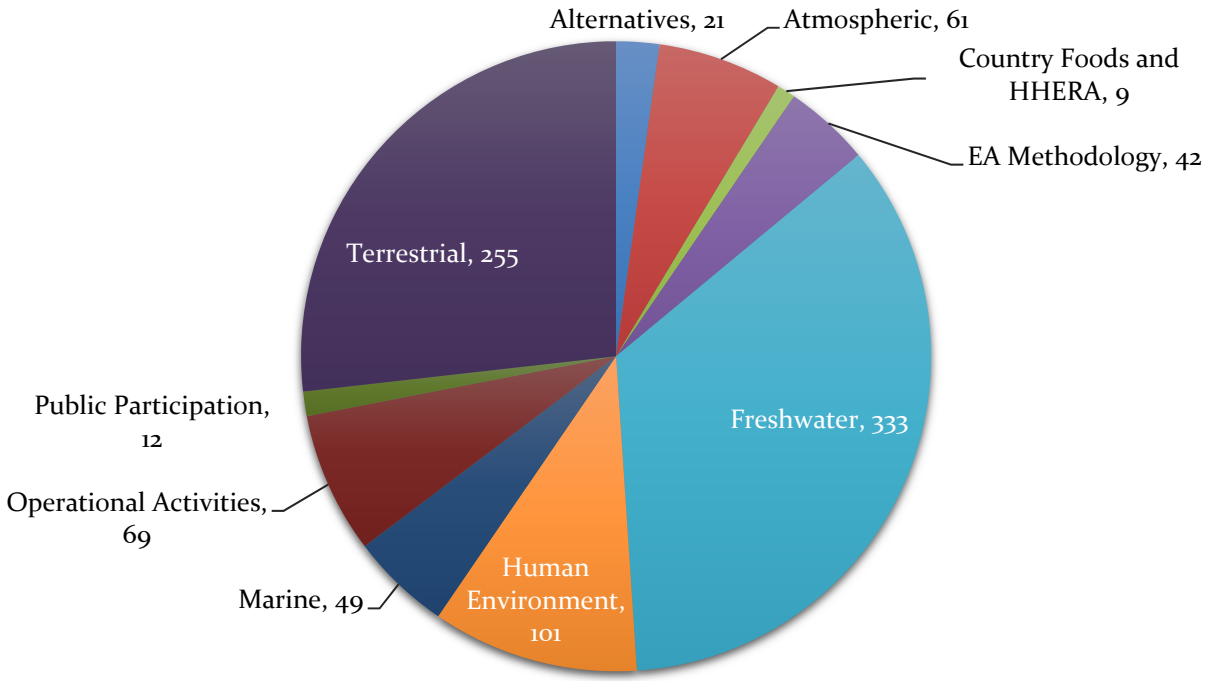
Environmental Review Process

Draft and Final Environmental Impact Statements (DEIS and FEIS)
Information Requests (IRs) and Technical Comments (TCs), by Topic



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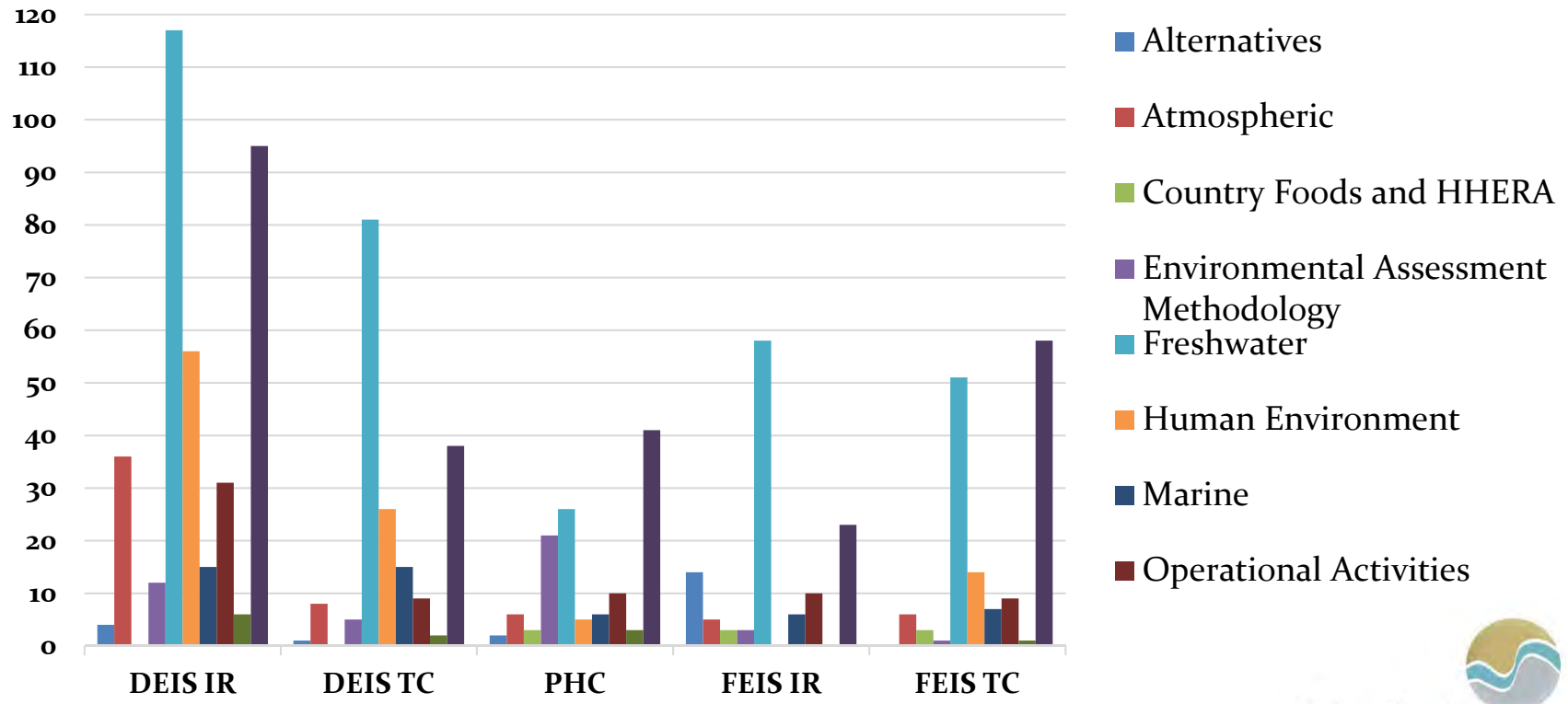
Environmental Review Process

Information Requests and Technical Comments Through Review Process, by Topic



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Environmental Review Process

In Summary:

- Focus in review of the DEIS and FEIS has been the Terrestrial and Freshwater Environments
- Terrestrial Environment
  - Primary focus has been caribou
  - Permafrost and other terrestrial mammals also a focus
- Freshwater Environment
  - Focus mainly water and sediment quality (incl. geochemistry)
  - Fish and fish habitat next main focus
  - Groundwater was a larger focus in the DEIS; less of a focus on FEIS

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Schedule for Tomorrow's Site Tour

- Breakfast on your own (Explorer Hotel restaurant opens at 7:00am)
- Depart hotel for Yellowknife airport (8:00am)
- Depart Yellowknife for the Back River Project's Goose Camp on charter flight (9:00 am)
- Goose Camp tour and lunch (10:30am – 3:00pm)
- Depart Goose Camp for Marine Laydown Area/George Camp overflight and return to Yellowknife (3:00pm)
- Return to Yellowknife (5:30pm)
- Follow-up meeting and buffet dinner at the Explorer Hotel in Yellowknife (7:00pm – Katimavik 'C' Room)
- Overnight at the Explorer Hotel

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Back River (Hannigayok) Gold Project

www.backriverproject.com

Sabina Gold & Silver Corp.
www.sabinagoldsilver.com

Sabina
GOLD & SILVER CORP.

MEETING INFORMATION	
DATE	April 11, 2016 (7:00pm)
TYPE OF MEETING	Pre Back River Project Site Visit Meeting
LOCATION	Explorer Hotel Yellowknife, Northwest Territories
ATTENDEES	Bruce McLeod (Sabina) Matthew Pickard (Sabina) Wes Carson (Sabina) Walter Segsworth (Sabina) David Fennel (Sabina) Anna Stylianides (Sabina) John Kaiyogana (Sabina) Jason Prno (Sabina) Jared Ottenhof (Kitikmeot Inuit Association) Allen Kapolak (Bathurst Inlet HTO) Nancy Haniliak (Bay Chimo HTO) Annie Neglak (Cambridge Bay Community Wellness Centre) John Lyall Sr. (Cambridge Bay HTO) Jayko Palongayak (Kugluktuk HTO) Larry Adjun (Kugluktuk HTO) Ben Putuguq (Kitikmeot Inuit Association – Gjoa Haven) Patrick Arendse (Hamlet of Gjoa Haven) Joe Ashevak (Hamlet of Taloyoak) Sam Tulurialik (Taloyoak HTO) Barnaby Immingark (Kugaaruk HTO) Guido Tigvareark (Hamlet of Kugaaruk)
COMMENTS	Following an organized dinner, Bruce McLeod and Matthew Pickard provided a Project overview presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – How far out from the MLA will the ships be anchored?

Q – I think you mentioned that each fuel ship will have to have their own trained personnel on board to respond to their own spills?

Q – Can we take photos during the site visit?

Q – Can we take video during the site visit?

Q – How much fuel will you be bringing in and storing on site?

Q – How many fuel ships per year will there be?

Q – You will have 15 million litre fuel tanks? Those are big tanks.

Q – I would like to see where your tailings deposition will occur. Where will your tailings pipelines be? What types of pipelines will you use? What materials will they be made of?

Q – What do you do with the greywater? Where is it discharged?

Q – The HTOs will want to see the site in the summer. Can that be arranged?

Q – What will you use for an airstrip at the MLA?

MEETING INFORMATION	
DATE	April 12, 2016 (7:00pm)
TYPE OF MEETING	Post Back River Project Site Visit Meeting
LOCATION	Explorer Hotel Yellowknife, Northwest Territories
ATTENDEES	Bruce McLeod (Sabina) Matthew Pickard (Sabina) Wes Carson (Sabina) Angus Campbell (Sabina) Walter Segsworth (Sabina) David Fennel (Sabina) Anna Stylianides (Sabina) John Kaiyogana (Sabina) Jason Prno (Sabina) Jared Ottenhof (Kitikmeot Inuit Association) Allen Kapolak (Bathurst Inlet HTO) Nancy Haniliak (Bay Chimo HTO) Annie Neglak (Cambridge Bay Community Wellness Centre) John Lyall Sr. (Cambridge Bay HTO) Jayko Palongayak (Kugluktuk HTO) Larry Adjun (Kugluktuk HTO) Ben Putuguq (Kitikmeot Inuit Association – Gjoa Haven) Patrick Arendse (Hamlet of Gjoa Haven) Joe Ashevak (Hamlet of Taloyoak) Sam Tulurialik (Taloyoak HTO) Barnaby Immingark (Kugaaruk HTO) Guido Tigvareark (Hamlet of Kugaaruk)
COMMENTS	Following an organized dinner, Bruce McLeod and Matthew Pickard provided opening remarks and led a subsequent group discussion. Jason Prno took meeting notes.

MEETING NOTES:

Q – The site looked good. It looked good for an exploration site. It would have been nice to see it without snow on the ground. You have nice facilities. How do you keep wildlife out of the camp? In order to protect the workers? You have no fencing.

Q – The oil drums on site – Were they all empty? Or full?

Q – What do you do with your greywater? Do you have a tank for the grease trap? Where does the greywater drain to?

Q – I was first notified I was going to Cambridge Bay for the NIRB hearings, then days later I was asked to come on this site tour. It was too short of notice for me. I've never been to a mine site before. I would like to thank the organizers for this tour. I really enjoyed it. I saw things I've never seen before, like an incinerator.

Q – I enjoyed the visit very much. Thank you.

Q – I don't know a lot about mining. Spills into a water source – I need to be educated about these things. I want to be educated about mining so I can speak on behalf of our elders. I am an elder in training. We need to protect the land. Our ancestors lived on the land and endured the conditions. I was touched while we were flying [over the Bathurst Inlet area], thinking of my ancestors.

Q – Yellowknife is having a big problem with arsenic pollution right now. How will Sabina deal with arsenic to prevent this from happening again? I thought all the gold in the Precambrian belt was the same? But you're saying the Giant Mine gold was different?

Q – Flying over Bathurst Inlet reminded me of my hometown [Kugaaruk] because of the landscape. Thanks for the visit. Will you be hiring workers from each community? What will you do to encourage community members to work? Will there be training?

Q – From past visits I've made to Goose and George, there have been big infrastructure improvements there. It's much nicer now. Nice to see the improvements. I wanted to commend you guys on what you've done. I wanted to let you know that Kugluktuk and the HTO have always been actively involved in mining. I wish you all the best. The onus is now on us to go back to our communities and tell them that things at Back River are being developed appropriately.

Q – Next time it would be nice to visit the site after all the snow is gone.

Q – You were saying George Lake has a higher grade of gold? Why aren't you mining it?

MEETING INFORMATION	
DATE	June 7, 2016 (7:00pm)
TYPE OF MEETING	Public Meeting on the Bernard Harbour Restoration Project
LOCATION	Recreation Complex Kugluktuk, Nunavut
ATTENDEES	John Kaiyogana (Sabina) Jason Prno (Sabina) Cam Stevens (Golder) Georgina Williston (Fisheries and Oceans Canada) Mark D'Aguiar (Fisheries and Oceans Canada)
COMMENTS	Jason Prno, Georgina Williston, and Cam Stevens provided consecutive presentations. Jason Prno presented an overview of the Back River Project, Georgina Williston presented on the Fisheries Act and offsetting for the Back River Project, and Cam Stevens presented on the Bernard Harbour offsetting project. Jason Prno took meeting notes. Mona Tiktalek provided interpretation services.

MEETING NOTES:

Q – How far is Hingittok Lake from the ocean? In miles?

Q – Regarding climate change, are you keeping track of changes to water temperatures in Nulahugyuk Creek?

Q – Since you've done your studies, is the fish population declining? Or increasing?

Q – Thank you to the HTO for identifying this project. My question is regarding tagging. How many fish are going back and forth now? Since you began the tagging?

Q – How deep is the lake [Hingittok Lake]? How deep is the river [Nulahugyuk Creek]?

Q – Are you going to make the river any deeper?

Q – Will the lake get smaller? How can we change climate change?

Q – How long have you been doing this study? How much longer will you be doing this project?

Q – You mentioned there were three types of fish [char] that go up and down river at Bernard Harbour. How do you tell which fish is which?

Q – In regards to hydrology, how much water are you losing in the river during your studies? We're losing a lot of lakes and streams all over the area. Permafrost is melting very fast in the area. Lakes are disappearing due to the permafrost melting away. Even lakes with fish in them. Sinkholes are seen by hunters along trails. How long will this river [Nulahugyuk Creek] last? Why was this river chosen over others in the region? The Coppermine River is becoming very narrow now due to less water coming down. The river break-up is not as dramatic as it was in the past. Oceans are coming into contact with a lot of contamination, with things like fire retardants. These fire retardants may be coming from the fighting of forest fires further south. What chemicals are being accumulated in fish? In the whales and seals that we eat? We're seeing more illness in our community. More young people are having strokes. Mining activity is to blame as well. We want the land kept clean. Traditional Knowledge should be integrated into the scientific work you are conducting.

Q – How long will the mitigation project take to offset the impacts [at Back River]?

Q – Will you be hiring Inuit from the communities right away at Back River?

Q – Will you be conducting security checks for drugs and alcohol at Back River?

Q – Will criminal records checks be conducted on people who apply for work at Back River? Some people are good workers even though they have a criminal record and you need to look at hiring them.

Q – Could Sabina partner with the Hamlet to offer mine training to community members here in the community? For something like airbrakes training? And other training?

Q – I used to work at Tahera. For security, they had x-ray machines and dogs to search for drugs. Would you use the same at Back River?

Q – I have a suggestion for Sabina. You should look into creating at Traditional Knowledge advisory group for the project. The members would come from communities in the Kitikmeot and the Northwest Territories, to make sure that Traditional Knowledge is being used properly. Inuit and Aboriginal organizations in Yellowknife and the Northwest Territories have concerns. You should have a Traditional Knowledge watchdog from each community.

Q – How often do you look at resumes at Sabina? There are a lot of people that are looking for jobs in the community.

[End of meeting]

Sign-in Sheet

Meeting: Kugluktuk Public Meeting

Date: June 7, 2016

	NAME	ORGANIZATION
1	Koput Algona	
2	Evelyn Kaviyoyana	
3	Komek Niviyaluk	
4	Laia Enoogaidak	
5	Eric Kaiyogana	
6	Harry Abjun	KHTO
7	Jonathan Akcok	
8	Carla Algona	
9	Arnold Angivaqs	
10	Gordon Hikumak	
11	Mark D'Aguiar	DFO
12	Fred G. Taptuna	
13	Kain Klengenberg	KHTO
14	Laura Jcohokiak	
15	Phil Evaglok	
16	Joe Novoligak	
17	Robert Harvoyak	
18	Roy Kokak	
19	Jayko Kalongayak	HTO
20	Betty Allen	Home Wife

Sign-in Sheet

Meeting: Kugluktuk Public Meeting

Date: June 7, 2016

	NAME	ORGANIZATION
1	Colin Haviqyak	
2	Marjorie Kaunyak	
3	Clifton Tiktalek	
4	Mona Tuktalik	
5	DAVID ENGMOAK	
6	Cassidy Kukkilnkak	
7	Daniel A-	
8	Deanna N.	
9	Richard K	
10	Jean Kaiyogana	
11	[illegible]	
12	[illegible]	
13	[illegible]	
14	MA. Ingmahiak	
15	Mary Angulalik	
16	A. EGINA	
17	[illegible]	
18	[illegible]	
19	[illegible]	
20	Agnes Adelaide	

Sign-in Sheet

Meeting: Kugluktuk Public Meeting

Date: June 7, 2016

	NAME	ORGANIZATION
1	John Ifimaluk	
2	JOE ALGIAK	
3	Torlee Ehogaloak	
4	JAKOB OTTENHOF	
5	Marcel (Miyet	
6	BRENDA KOKAK	
7	JACKIE K. NOVOLIGAK	
8	Gustin	
9	LISA TUKTALETK	
10		
11	Steven Anaktak	
12	Glen Okheena	
13	Ida Okheena	
14	Florianne Okheena	
15	M. J. Katiak	
16	Kallak	
17	Timothy Milyuhak	
18		
19		
20		

Sign-in Sheet

Meeting: Kugluktuk Public Meeting

Date: June 7, 2016

Sabina GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	DONALD HAVIOYAK	
2	MARGARET HAVIOYAK	
3	Lucy Manigoggo	
4	Chelsea Haviovak	
5	Nellie Kaayogana	
6	Bessie Kuklukat	
7	[illegible] Kuklukat	
8	Ellen Ekpuk	
9	RANDY NIGOKTOLIK	
10	Sidney Ongalak	
11	[illegible]	
12	[illegible]	
13	[illegible] Evaglok	
14	Andrea Kuodluak	
15	Adrian Kudlak	
16	Anissa Ayalucak	
17	Charlie Evaglok	
18	M. Allen	
19	TONY EVAGLOK	
20	AIE	

Sign-in Sheet

Meeting: Kugluktuk Public Meeting

Date: June 7, 2016

	NAME	ORGANIZATION
1	Ken Mulgrew	GN —
2	Nigel Allurak	
3	[illegible]	
4	Agnes Kokak	
5	Mona Himiak	
6	Susie Himiak	
7	GEORGE MANDEVILLE	
8	Andrew J Atatahak	
9	Megan Allurak	
10	Red Pedersen	
11	Shirley Kataginon	
12	Shin Shigu	
13	Stevie Tiktalek	
14	Valerie Kolaohok	
15	Hughie Kenny	
16	JAMES LAFLURTY	
17	[illegible]	
18	Rose Emaglok	
19	M. Kellogok	
20	[illegible]	

Sign-in Sheet

Meeting: Kugluktuk Public Meeting

Date: June 7, 2016

	NAME	ORGANIZATION
1	Rosemarie Kuptok	
2	Susie Tigitkok	
3	BOBBY ALGONA	
4	Mary Algona	
5		
6	Millie Hatgimo	
7	Falisha Kleinsenberg	
8	Candace Angohiak	
9	FOITATAK	
10	CharlesSitatak	
11	Michael Kamingoak	
12	JARED Kaiyogana	
13	Anna Ragalak	
14	Brenda Angahak	
15	Annie Angahak	
16	Tyrone Anablak	
17	Dora Kunana	
18	Breale Hokanak	
19	Paige Haviyak	
20	Christa Kayo	

Sign-in Sheet

Meeting: Kugluktuk Public Meeting

Date: June 7, 2016

	NAME	ORGANIZATION
1	Martha Milukshuk	
2	Bonnie Kadlun	
3	Dennis Allen	
4	ERNIE KUKILUKAK	
5	Donny Evaglok	
6	Johnny Katogyn	
7	Gordon Kokak	
8	Liam Mulgrew	
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MEETING INFORMATION	
DATE	June 8, 2016 (9:00am)
TYPE OF MEETING	Bernard Harbour Restoration Project Workshop
LOCATION	HTO Office Kugluktuk, Nunavut
ATTENDEES	John Kaiyogana (Sabina) Jason Prno (Sabina) Cam Stevens (Golder) Georgina Williston (Fisheries and Oceans Canada) Mark D'Aguiar (Fisheries and Oceans Canada) Larry Adjun (Kugluktuk HTO) Colin Adjun (Kugluktuk HTO) Kevin Klengenberg (Kugluktuk HTO) Peter Taktogon (Kugluktuk HTO) Johnny Nivingalok (Kugluktuk HTO) Gustin Adjun (Kugluktuk HTO) Adrian Kudlak (Youth Invitee) John Ivarluk (Elder Invitee) Jared Ottenhof (KIA) Monica Angohiatok (Government of Nunavut)
COMMENTS	Cam Stevens provided a presentation and led a workshop on the Bernard Harbour offsetting project. Jason Prno took meeting notes.

MEETING NOTES:

Q – I think it is better to train the youth for the project, so they will know what to do.

Q – At Read Island, where I regularly travel, there are some years when the water is low, when the char can't make it up the river. In other years, they can. Sometimes char will die because they can't make it up. We've spent many hours moving rocks there and opening up the channels. As soon as you open up the channels the char start to go up. Otherwise, they would die.

Q – They were tagging fish here in Kugluktuk one time and they caught one of the fish in Alaska. We also caught a chum salmon from Alaska here in Kugluktuk one time.

Q – A fish from Kugluktuk was caught all the way in Lac de Gras.

Q – At Read Island it can be different every year. There can be low water or high water. Snow and rain amounts will affect the water levels and the char. We see char trying to go up the river sideways when there isn't a lot of water.

Q – I believe the creeks and lakes are getting shallow because there is less snow. We used to be able to make an igloo anywhere. Now I have to bring a tent everywhere. The lower you dig in Bernard Harbour, the lower the lake level will be [on Hingittok Lake].

Q – At Read Island, the timing of the char migration doesn't seem to have changed. The upstream migration can happen in a matter of days.

Q – The Coppermine River is getting lower. Before, I used to go up the river with a 70 [horsepower motor], now I go with a 60 and can't make it up. There are lots of rocks sticking up. You can't fight nature.

Q – One year at Read Island we saw low water and saw at least 15 dead char. We stopped counting after 15. We created some channels and fish started going upstream.

Q – At Read Island, the ice chunks coming downstream during breakup can plow some of the rocks out of the way.

Q – You can see this above the falls on the Coppermine River as well; big boulders can be moved by ice.

Q – Permafrost melts faster when you remove the rocks. This will make the creek drain out faster. You should compare two creeks; one creek could be left alone and one creek could be restored.

Q – Are the problem spots on the creek the same every year?

Q – Last fall the rivers were pretty high because of the rain we had.

Q – When you don't see a dead fish on the rivers you are happy.

Q – Male fish will collect rocks up in the lake for a nest for the females to lay their eggs in; a bed. There are beautiful shiny gold rocks. They protect the eggs from predators.

Q – They change the colour of the bed, to camouflage the eggs.

Q – Fish will lay eggs in gravel.

Q – If you start fixing the problem areas upstream you may not need to fix the downstream problem areas, as the improved flow will open the downstream areas up.

Q – I think it will take 2-3 weeks to fix the lower, downstream problem areas.

Q – It would be helpful if you had a camp cook for the restoration crew. The work will get done a lot quicker this way.

Q – You could rotate the cooks, to prevent the work from being too monotonous.

Q – The selection of youth helpers for the restoration project is pretty important. You don't want someone who doesn't want to be there. It would be a good idea for competent youth to have their own firearm. They may not always have the bear monitor around.

Q – We have to think about the safety of the group; not everyone should necessarily have a firearm.

Q – Radios would be useful to have. If the groups have radios, not everyone will need a firearm.

Q – After the students work for the day, it would be good to have a planned activity each night, to prevent them from sitting idle.

Q – The fish biologists could work with and talk with the kids to get them interested in a biology career. They could teach the kids how to collect data and how to do field observations. Near the end of the fieldwork, the group should also meet and share their experiences with one another. They could reflect on their experiences and what was learned.

Q – You should bring traditional food one night while you're in camp.

Q – You could break the Bernard Harbour team into groups. Every day each group would switch tasks and duties. There could be a schedule. For example, one group could cook and one group could be in charge of camp maintenance.

Q – The HTO board is aware of the need to renew the Bernard Harbour restoration project partnership agreement with Sabina. We'll work on the agreement.

Q – When do you have to have your permit applications submitted?

Q – Bring lots of work gloves for the kids.

Q – There are lots of predators out there that would eat the dead and struggling fish. Bears, wolves, and eagles.

Q – It's a good idea to watch and observe the creek before you start working, to see what the best channels might be and where the fish are going.

Q – At Read Island we built a weir to trap and tag fish.

Q – Is there funding available for the HTO to purchase the equipment recommended to complete the Bernard Harbour project?

Q – Will you have a phone number or some way to make arrangements for emergency evacuations by plane at the DEW line station?

Q – We should keep a SPOT unit in the boats we use.

Q – The HTO is currently getting new safety equipment to make sure the HTO boat is commercially viable.

Q – The group at Bernard Harbour should have a bush radio, so the kids can call home.

Q – It's good to know that you guys are going back to Bernard Harbour.

Q – If you're going to be there 8-10 years, you might want to look at building tent frames at Bernard Harbour?

Q – Or a new cabin?

Q – Tent frames rot out and then the HTO will be responsible for cleaning up the mess. A new cabin is the best choice.

Q – We need some torch-on roofing for the Bernard Harbour HTO cabin. Maybe also a new window and door.

Q – A bathroom or outhouse would be useful to have at Bernard Harbour. Especially for the women who will be there.

[The construction of an outhouse at Bernard Harbour, to support the Bernard Harbour restoration project, was noted by the group to be a high priority]

Q – A permanent bathroom structure would be preferred [over a removable tent].

Q – Lumber to build bunk beds in the cabin would be useful.

Q – Bring bear spray.

Q – Bring more bear bangers and rubber bullets.

Q – We'll need slugs for bears in emergencies. 12 gauge, 2 ¾ inch shells.

[End of meeting]

Sabina Gold and Silver Corp.
Back River Gold Project
Meeting Notes

MEETING INFORMATION	
DATE	July 5, 2016 (12:15 pm – 10:45am)
TYPE OF MEETING	Hamlet of Kugluktuk
LOCATION	Hamlet of Kugluktuk Council Chambers Kugluktuk, Nunavut
ATTENDEES	Matthew Pickard (Sabina) John Kaiyogana (Sabina) Andrew Crook (Sabina) Peter Taktogon (Councillor, Hamlet of Kugluktuk) Lucy Taipana (Councillor, Hamlet of Kugluktuk) Grant Newman (Deputy Mayor, Hamlet of Kugluktuk) Bill Williams (Hamlet of Kugluktuk) Janet Kadlun (Hamlet of Kugluktuk)
COMMENTS	Matthew Pickard and John Kaiyogana provided a Project update presentation. Andrew Crook took meeting notes.

MEETING NOTES:

C – Council will put it on the next agenda to draft a proper motion to prepare a statement from the council. Individuals can write support letters. Some members of the council will attend the public meeting tonight.

C – It was very surprising. All community representatives supported the Project. Information at the hearings was very clear. We heard it twice. We had opportunity to ask questions.

[Meeting finished at 10:45am]

MEETING INFORMATION	
DATE	July 5, 2016 (7:00pm – 9:00pm)
TYPE OF MEETING	Kugluktuk Public Meeting
LOCATION	Kugluktuk Recreational Complex Kugluktuk, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Andrew Crook (Sabina) John Kaiyogana (Sabina) Various members of the public (see sign-in sheet)
COMMENTS	Matthew Pickard provided a Project update presentation. Andrew Crook took meeting notes. Mona Tiktalek provided interpretation services.

MEETING NOTES:

Q – Will the mining be contracted out?

Q – The biggest concern I have is the chemicals part of it. You say post closure programs – Every mine I hear is going to leave the area as clean as possible, as close to before as when the mine opened. I hear this from every mining company. I don't think it has ever been accomplished before. How well does the company make each and every one of those chemicals used as inert as possible? Is every chemical part that you work with be made inert during closure? I would really like the chemicals part resolved. Most mining companies leave the tailings ponds. Also dust problems, we have dust going many miles especially in the diamond mines. The fine dust powder goes way up in the air and goes many miles. I would like the company to have a dust management program be more stringent and more careful. Rocks naturally have chemicals in them. The rock and soil is a little different in your area. Post-closure program – Maybe my younger generation would go to the mine area hunting after the mine is closed. I have a concern about unsafe holes or contaminated areas when hunting. Also, rain and water, and break of the tailings dam. We don't want that to ever happen in our area, in our hunting grounds. People have been in this area for thousands of years. We still find tools made of rock in this area. How much archaeology have you done in the area? Is it just laydown areas or all the way down to the areas near the mines as well? These are some of the concerns we the young people and the elders have. A lot of elders have talked a lot of burial grounds they can't remember now. When I think of these areas, I think of your cemeteries, they are very sacred and protected areas. All of these areas should be protected by law.

C – We and our parents live on the land and know it well. We have to protect our land, because of our caribou, animals, fish, and drinking water. It's a hunting place. People used to hunt caribou and wolves, everything – So we want the lands to be clean for all the animals and the people. If mining impacts animals, it impacts the people too. It's good to hear they are trying to take care of our land and lakes.

C – I would like to see Sabina have elders on site at all times to help with archaeology and support. At least 2-3 per shift working around these areas. We always have concerns the archaeology done may not be thorough enough. I think elders that know the area would be very helpful.

C – Graves are marked by an item that belonged to that person. If you want that item, you have to exchange something else for it.

C – Thank you for coming to Kugluktuk to let us hear about the Project. I was born in that area.

[Meeting finished at 9:00pm]

FREDD G. TAPTUNA

FREDD G. TAPTUNA
P.O. Box [illegible]

Sabina Gold & Silver Corp.
Back River Gold Project

JUNE, 07/2016
19:10 PM

PUBLIC COMMENT FORM

(867) 983 - 3033) M.
1- (867) 983 - 3133) FAX.

Please share any comments, concerns, or suggestions you have regarding the Back River Gold Project:

2) A) FOR ENVIRONMENT LAND - WATER - RE GOOSE LAKE / GEORGE LAKE & AIR - THE BACK RIVER PROJECT, WHEN YOU ARE IN OPERATION, ARE YOU KEEPING THE ENVIRONMENT, LAND & WATER CLEAN? B) HOW OFTEN DOES A MINE INSPECTOR "BIG SHOT" GO TO EACH CAMP SITE?

Is there anything you would like to learn more about?

2) A) FOR YOUR HIRING PROCESS, DOES THE KITIKMEOT REGION LIKE CAMBRIDGE BAY & KUGLUKTUK HAVE THE NO. 1 HIRING PRIORITY?

B) CAN YOUR COMPANY PROVIDE ON THE JOB TRAINING FOR LIKE HEAVY EQUIPMENT - DUMP TRUCK, RACK HOE EXCAVATOR, FUEL TRUCK, SKIDSTEER & MOBILE CRUSHER PLANT?

Is there anything we could be doing better?

* WHEN YOU GO TO A COMMUNITY FOR MEETINGS, YOU SHOULD HOLD A COMMUNITY FEAST & HAVE LOTS OF DOOR PRIZES, THAT WAY YOU'LL FEED SOME UNEMPLOYED PEOPLE, & PEOPLE THAT ARE ON CHEAP SOCIAL ASSISTANCE, NO FOOD TO EAT AT THEIR HOMES & YOU'LL HAVE MORE PEOPLE ATTENDING YOUR MEETINGS. NO FOOD BANKS HERE IN THE NORTH! & EVERYTHING IS COSTLY, HIGH PRICE.

Contact information (optional):

Name: FREDD G. TAPTUNA - 207 HAIKUNA ST. / P.O. BOX 214
Address: KUGLUKTUK NUNAVUT X0B-0A2
Phone number: (867) 982-5084) HOME, (867) 982-3121) MESSAGES EMPLOYMENT OFFICER.
Email: FREDD TAPTUNA @ HOTMAIL.COM

EXTRA NOTES: A) SOME PEOPLE MAY HAVE HAD BAD EXPERIENCES IN THE PAST AT A MINING CAMP, CAN YOU FORGIVE & FORGET THE PAST? REHIRE? I WOULDN'T REPEAT THE SAME MISTAKE TWICE. & I'D LIKE TO LEARN MORE? WE ARE THE ONES LIVING IN THE COSTLY NORTH SO WE NEED →

FOR EXAMPLE LIKE - GETTING YOUR DRIVER'S LICENSE FOR CLASS 5 OR HEAVIER. FIRST AID CERTIFICATE AND SAFETY CERTIFICATE, ETC.

(B)

> TO WORK HARD TO SURVIVE. WE NEED TO WORK HARD TO BUY FOOD, CLOTHING & PAY BILLS. BUY LOTS OF FOOD FOR YOUR FAMILIES. GAINING SOMETHING GOOD WHILE AT WORK REALLY MAKES IT WORTH WHILE & MEANINGFUL. YOU LOVE & LIKE IT WHEN

Sign-in Sheet

Meeting: Kugluktuk

Date: Jul 05/16

Sabina
GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	Willie Pugulak	
2	Mona Tiktalik	Interpreter
3	Gordon Hikoralak	
4	Josie Allakpik	
5	DAVID TIKTALIK JR	
6	Tina Kaiyogana	
7	Lucy Maniyogana	
8	Bessie Kukiluk	
9	George Kukiluk	
10	Laura. K	
11	Doris Ekakiak	
12	Mona Angulalik	
13	Ray Allen	
14	Wanda Akkaq	
15	Eric Kaiyogana	
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17	Jr Kik Kinavoligak	
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19		
20	M Algona	

Sign-in Sheet

Meeting: Kugluktuk

Date: June 05/16

Sabina GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	Bobby ALGOOK	L
2	Dennis Kokoak	
3	Jimmy Hala	
4	Jonathon Kaiyogana	
5	Marcus KOKAK	
6	ALICE. AYALIK	
7	WACIEK AGLOK	
8	TIMOTHY MILUKSHUK	
9	Elmer Lutich	
10	Jayko Pelowgyak	
11	LEVIE KAKOLAK	
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MEETING INFORMATION	
DATE	July 6, 2016 (10:00 AM to 11:07 AM)
TYPE OF MEETING	Meeting with Kugluktuk Community Advisory Group
LOCATION	Hamlet of Kugluktuk Boardroom Kugluktuk, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Andrew Crook (Sabina) John Kaiyogana (Sabina) Tommy Norberg (CAG member) Alice Ayalik (CAG member)
COMMENTS	Matthew Pickard provided a Project update presentation. Andrew Crook took meeting notes. Mona Tiktalek provided interpretation services.

MEETING NOTES:

Q – What time will the decision happen?

Q – How come the NIRB did not agree? Maybe if the community writes a letter the Minister will let the Project proceed.

C – I go to mines meetings. Recently I toured Ekati. The environment and work areas were clean. We want them to stay clean. Maybe the Minister can agree we can keep it clean for the people, water, and animals.

C – When we went to Ekati, we talked about how thankful we were that Ekati was keeping it clean because we Inuit eat the animals.

C – We could do a support letter and tell the Minister to keep the mine clean to protect the environment.

C – You talked about cleanliness and animals. The people will be happy if they know you can keep it clean.

C – Thanks for keeping it clean for the birds and animals. We eat animals and eat and drink from the ground. I was worried about mines at first, now I know they can keep it clean.

C – The people here need jobs. We want to hear it is going ahead.

C – We agree that you write the letter and we can sign it.

C – There are lots of young people looking for jobs and they don't have jobs. We are getting old. We should be looking out for our young men and women. There are lots of students who have training for mines.

Q – How far from the mine would hunters have to go to shoot animals?

C – Thanks for coming in and letting us know what's happening. People are happy to hear about the Project.

[Meeting ended at 11:07 AM]

MEETING INFORMATION	
DATE	July 6, 2016 (7:00 pm – 8:20 pm)
TYPE OF MEETING	Cambridge Bay Public Meeting
LOCATION	Community Hall Cambridge Bay, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Andrew Crook (Sabina) John Kaiyogana (Sabina) Various members of the public (see sign-in sheet)
COMMENTS	Matthew Pickard provided a Project update presentation. Andrew Crook took meeting notes.

MEETING NOTES:

C – I was at that hearing and I did not say yes.

Q – I understand the Bathurst herd cannot be hunted in the Northwest Territories at all and that is a hardship for them. Is that the case in Nunavut as well?

C – I worked underground at the Lupin Mine for 10 years then got laid off. I then went to work at the airport here in Cambridge Bay. When any situation had a potential seriousness to it, the guys that were on duty at the airport were able to send notifications to pilots that there was something wrong with the runway. Along that same train of thought, I think there was a lot of leg work and studies done for the Project, it has been mentioned that the Project is in a pristine area. The people that will have felt the impacts much more than us here would be those with the Project in their backyard. Although, Nunavut's economic situation is such that you want to look carefully at every aspect of that Project because there are not a lot of other industries. Though there is frustration in a delay, the folks at NIRB did a lot of work to think about alternatives, like your people did a lot of work. By having this hiccup and this delay, I think everyone should look about information and how it was presented to see if the Project is being presented in the best interest of the company and those that will be impacted. Expect the unexpected, and ensure proper mitigation is in place.

[Meeting finished at 8:20 pm]

Sign-in Sheet

Meeting: Cambridge Bay Public Meeting

Date: July 6, 2016

Sabina GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	DAVID WYNGAARDT	NHC
2		
3	Jocelyn Porter	
4	Mark Porter	
5	PATRICK MAKSAGAK	M & PR
6	Ivan Maksagak	
7	Wayne Weeze	HAMLET of CAM-BAY
8	Solomon Amuno	~ ~
9	Dianne Bussiere	~ ~
10	ALLEN KAIYOGANA	
11	Betty Kaiyogana	
12	Michelle Buchan	KIA
13	Junior Gordon Pungun	
14	Stacey Kuliktana	
15	Betty Ann Kaniyogena	
16	DAVID KLENGENBERG	
17	Charlene Kaiyogana	
18	Bella Ahkak	
19	Katie Kudlak	
20	John Hanilak	

Sign-in Sheet

Meeting: Cambridge Bay Public Meeting

Date: July 6, 2016

Sabina
GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	GEORGE OKHINA	
2	Mary-Ann OKHINA	
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MEETING INFORMATION	
DATE	July 6, 2016 (3:10 PM to 3:50 PM)
TYPE OF MEETING	Meeting with Cambridge Bay Community Advisory Group
LOCATION	Sabina Office Cambridge Bay, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Andrew Crook (Sabina) John Kaiyogana (Sabina) John Lyall (CAG member) Keith Lear Sr. (CAG member) Martina Kapolak (CAG member)
COMMENTS	Matthew Pickard provided a Project update presentation. Andrew Crook took meeting notes.

MEETING NOTES:

Q – When do you need this letter [of support] by?

C – The guys sounded happy at Bernard Harbour last night.

Q – Could you guys draft a letter that we as a board could then review and sign?

[Meeting finished at 3:50 PM]

MEETING INFORMATION	
DATE	July 7, 2016 (10:04 AM to 10:50 AM)
TYPE OF MEETING	Meeting with Cambridge Bay HTO
LOCATION	HTO Office Cambridge Bay, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Andrew Crook (Sabina) Mark Haongak (Cambridge Bay HTO) Peter Evalik (Cambridge Bay HTO) Mercy Panegyuk (Cambridge Bay HTO) Jimmy Haniliak (Cambridge Bay HTO) John Lyall (Cambridge Bay HTO) George Angohiatok (Cambridge Bay HTO) Howard Greenley (Cambridge Bay HTO) Beverly Maksagak (Cambridge Bay HTO)
COMMENTS	Matthew Pickard provided a Project update presentation. Andrew Crook took meeting notes.

MEETING NOTES:

Q – Has the IIBA been finalized as of yet?

Q – Did you say the GNWT was not in support of the Project in the beginning?

C – When you speak about caribou going through this area – We have proven that mining has affected the caribou migration patterns. Echo Bay's winter road. I don't like to hear that mining does not have an impact. We have seen it with our own eyes.

C – The roads for tracked equipment like dozers and challengers do not seem to disturb caribou migration.

C – When we deal with issues like this, we work with a biologist to inform us about what is going on. You need to get a whole board together to decide was is best for our community. We are very concerned about the health of the Bathurst herd. We have to look further to the community and reach a decision as a whole board on what is best for the community. We focused on conserving.

C – I was really surprised with the decision, with NIRB. My phone was constantly ringing because I was at the hearing. With the NIRB decision I was surprised. I thought at the meeting, from the elders, the NIRB was hearing what the migrations do. When I talk about caribou, that was my only source of food, we always talk about wildlife in our area. It's a known fact, we get a migration in the fall, it used to come right through Cambridge Bay. Now with human activity anywhere, the caribou migration changes. It seems like every herd in Nunavut is on the decline. The migration routes change. Elders talk about the mine, what happens and what may happen, and will happen. My observations over the years about why the migration routes change is because of human activity anywhere. I was very surprised with the NIRB decision. I thought they would base the decision on the hearing because there were a lot of elders at the decision. I still have a lot of questions on the closure of Jericho and of Lupin; I am not getting answers. We are not going to be here forever, we have to look at the future for our kids and grandkids. I am still in favour of Sabina with all of the information that has been put out. With the elders in Nunavut there are still a lot of questions with other mines. If you are looking for support, I am still in favour of supporting Sabina.

C – Talking about caribou is something we can understand. Baffin Island did not have caribou 100-200 years ago. In the 1970-80s there were caribou all over town. Now they are gone. Same with Cambridge Bay, Kitikmeot, Victoria Island – We do not understand what's going on. There is lots of noise, but there must be something else going on. They are now in the east Kitikmeot. I don't think we can understand entirely what is going on. Wolves, human activities, lots of things must have impact. I don't think we can fully understand. I can support you.

Q – Speaking from the younger generation, can this board be assured that Sabina will look at mitigating factors for wildlife and land issues, ensuring that the land and wildlife will be of first concern?

C – I grew up in the Ellice River area, and have seen a lot of caribou and musk ox, used to see caribou every day. In 2007, the big game hunt closed down, migration slowed down, because of mines or change in their migration.

C – There's a lot of mixed feelings about this stuff on the impacts of mining. There are choices to be made. The benefits can be short-term and only go to a few community members while the negative effects can be long lasting and effect everyone.

[Meeting finished at 10:50 AM]

MEETING INFORMATION	
DATE	July 8, 2016 (3:30 pm)
TYPE OF MEETING	Hamlet of Gjoa Haven
LOCATION	Community Hall Gjoa Haven, Nunavut
ATTENDEES	Dave Stockley (SAO, Hamlet of Gjoa Haven) Meghan Porter (Deputy Mayor, Hamlet of Gjoa Haven) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – So the biggest issue [NIRB has] seems to be with caribou?

Q – What are the reasons for the decline in the Bathurst caribou herd?

Q – Have there been studies on caribou predation?

Q – I think it's a great project and I'll ask the council about supporting your project.

[End of meeting]

Sabina Gold & Silver Corp.
Back River Gold Project
Meeting Notes

MEETING INFORMATION	
DATE	July 8, 2016 (7:00 pm)
TYPE OF MEETING	Gjoa Haven Public Meeting
LOCATION	Gideon Qitsualik Memorial Centre Gjoa Haven, Nunavut
ATTENDEES	Various members of the public (see sign-in sheet) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes. Lena Arqvik provided interpretation services.

MEETING NOTES:

Q – Can you apply online for jobs?

Q – The hair and dropping samples you take from the animals – What do you learn from that?

Q – During the migration of the birds and when the birds start laying eggs – If the birds lay eggs around the site and then hatch, what will you do about that?

Q – Have you ever noticed if any birds are nesting in abandoned buildings? As the site is seasonal, have birds ever been found nesting directly in the site?

Q – I went to Goose and George Lake for a visit. People who are participating in a site visit should go after the snow is gone, in the late spring or summer, so they can see things that would otherwise be covered by the snow.

Q – Recently there seems to be a problem with regulators. They seem to be putting their red flag up. When will you hear from them again?

Q – When and if the site opens, will they hire educated people? I'm not educated and don't have a diploma; there are a lot of people like this is the north, but they can still be good workers.

[End of meeting]

Sign-in Sheet

Meeting: Gjoa Haven Public Meeting

Date: July 8

Sabina GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	MARK Ullikataq	Devon Pauloosie
2	SILAS OOSUAQ	Anthony Pauloosie
3	Chris K.	
4	Kenny I.	
5	Celine P	
6	UCLIKATAQ	
7	Lona Aog.vig	
8	BEN. PUTUGUQ	
9	SAUL Q	
10	PETER Akkikuruq	
11	Gail PJTUJUQ	
12	Joni Tookatak	
13	Rhola Porter	
14	P P d	
15	Sammy Kogvik	
16	Simona Akhuk	
17	JANE PUTUGUQ	
18	Esther Magahnak	
19	Donna Pauloosie	
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MEETING INFORMATION	
DATE	July 7, 2016 (3:30 pm)
TYPE OF MEETING	Hamlet of Taloyoak
LOCATION	Hamlet of Taloyoak office Taloyoak, Nunavut
ATTENDEES	David Irquit (Hamlet of Taloyoak) Murtaza Gurmani (SAO, Hamlet of Taloyoak) L.K. Banks (Hamlet of Taloyoak) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – Does the [Wishbone] greenstone belt hold gold as well?

Q – This is hardrock mining? Do you do all of the processing, up to the production of gold bars? It's more cost effective for you to do all the processing yourselves?

Q – So, you still have to build some infrastructure to get the mine up and running?

Q – 6 grams per tonne is a good grade?

Q – What is the line [Project Development Area] on the map? Are you planning to do more exploration in the area? What is the grey area [Inuit Owned Land] on the map?

Q – Is community engagement a big hurdle for you to overcome? The reason I ask has to do with the recent Supreme Court decision on the Northern Gateway project and the Duty to Consult.

Q – Do you have a quota for the number of Inuit you will hire?

[Unrecorded comments]

Q – Has the NIRB now halted this Project?

Q – Is the NIRB a territorial agency?

Q – It can be frustrating to present all your facts and figures to the NIRB board and then they go and make their own decision.

Q – Is your Project all in Nunavut?

Q – Did you have scientists involved in tracking the caribou herd movements?

Q – What are the concerns that were raised about the caribou?

Q – Did you investigate muskox? You didn't have to go and study all the lemmings and siksiks, did you?

Q – Are there harvesting limits in place for the Bathurst caribou herd?

Q – Is the perception that your Project will interrupt the migration of the caribou?

Q – Could you use fencing to keep caribou out?

Q – So the Minister has final say on the NIRB report?

Q – Have you been given a timeframe for when the Minister will make a decision?

Q – So the decision is now in the Supreme Court?

Q – The review board – It's for Nunavut?

Q – As hamlet administrators, our only concern with your Project is that we could lose workers to your mine.

Q – How long would it take for you to move into production after you received Ministerial approval?

Q – There's a lot of risk you take on as a company to develop this Project and a lot of investment.

[End of meeting]

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MEETING INFORMATION	
DATE	July 7, 2016 (1:30 pm)
TYPE OF MEETING	Taloyoak HTO
LOCATION	Taloyoak HTO office Taloyoak, Nunavut
ATTENDEES	Sam Tulurialik (Taloyoak HTO) Abel Aqqaq (Taloyoak HTO) Bruce Takolik (Taloyoak HTO) George Aklah (Taloyoak HTO) James Aiyout (Taloyoak HTO) Anaoyok Alookee (Taloyoak HTO) Elizabeth Aleekee (Taloyoak HTO) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – What direction will your ships be coming from? The east or west?

Q – What if you have to close down because the caribou get too close, will you have issues? Will it cost you money?

Q – If you start hiring Inuit people, how long at a time will they be working? If they wanted to work longer than two weeks, could they bring their family with them?

Q – Will the employees get benefits?

Q – NIRB is saying you can't continue with what you're doing right now? Would you need a letter of support to the Minister from the HTO here? Or from the Hamlet? I think the [HTO] board knows quite a bit about mining. I think we can get together as the board to discuss this and go from there.

Q – How many collars are you going to put on the caribou?

Q – When is the next hearing with NIRB for the Project?

[End of meeting]

MEETING INFORMATION	
DATE	July 7, 2016 (7:00 pm)
TYPE OF MEETING	Taloyoak Public Meeting
LOCATION	E.W. Lyall Recreation Complex Taloyoak, Nunavut
ATTENDEES	Various members of the public (see sign-in sheet) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes. Peter Maniliaq provided interpretation services.

MEETING NOTES:

Q – Are you operating underground at the mine? Where is Back River?

Q – What would happen if the water became contaminated?

Q – Do you see any muskox in your area?

Q – How much arsenic do you have in your gold minerals?

Q – The last meeting we were at in Cambridge Bay, they were really concerned about the caribou. I wonder if that's why NIRB said no. We saw all the communities agree [to the Project] at that meeting, but I'm wondering if the NIRB wants to see the caribou population increase first.

Q – You said there would be ships 3 or 5 times a year? Where would those ships come from?

Q – The fuel for the mine, would it come in by ship through the Northwest Passage? We go hunting up there.

Q – Is this your first rejection from NIRB?

Q – If the Minister rejects the NIRB recommendation, what's the plan then?

Q – At the NIRB public hearing in April, you had support from Kitikmeot communities. Your Project was rejected by the NIRB, mainly because of wildlife concerns. The caribou. The main concerns came from Kugluktuk, Bathurst Inlet, and Cambridge Bay. In the Northwest Territories the winter road impacts the caribou; the caribou go around the winter road. Now the caribou are declining. Don't tell me your winter road won't affect the caribou. The NWT and the Kitikmeot Regional Wildlife Board want the traditional knowledge hunting areas protected. We want the government to protect those areas too. You're asking for support from the communities, but at the NIRB hearing they already supported you. And now NIRB has rejected your Project because of wildlife issues. I want the community to understand that. Thank you for coming to our community and supporting us with employment, but wildlife is an important issue.

Q – Are you looking at other ways to show community members how your mine works? Like taking elders out?

Q – I have a concern. In order to respect the elders. Elders can't read that well and it can be hard to read [the presentation]. We also need to see both languages.

[End of meeting]

Sabina Gold & Silver Corp.
Back River Gold Project

Sabina
GOLD & SILVER CORP.

PUBLIC COMMENT FORM

Please share any comments, concerns, or suggestions you have regarding the Back River Gold Project:

For next visit to Taloyoak, please contact the Women's Auxiliary Group for catering services. We are an non profit group from the Anglican Church. Can we get items for penny sales for the group?

Is there anything you would like to learn more about?

Once fully open, can we please get capital dollars for a new community Hall? Work with GN. maybe 60/40 capital dollars?

Is there anything we could be doing better?

Would be nice to see an beneficiary do some of the presentation or parts of it. It would show working together.

Contact information (optional):

Name: Jeannie Ugyuk

Address: Box 26 Taloyoak, NU X0B 1B0

Phone number: 867 561 5901

Email: sammortok@yahoo.ca

Sign-in Sheet

Meeting: Taloyoak Public Meeting

Date: July 7

Sabina
GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	Irene Totalik	
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3	ᐅᑎᓪ ᐊᓪᓗ	
4	ᓕᓐᓂᑭᐊᑐ	
5	Bernie N	
6	ᓴᐅ ᔅᔅ	
7	David Qavavauk	
8	Simon Qingnaqtaq	Kitikmeot Regional Wildlife Board
9	Eva Nanning	Eva Nanning
10	JENNIFER KARCO	
11	MYRNA KARCO	
12	Peggy Ittungat	
13	Ellen Ittungat	
14	Eric Saittuq	
15	Mary Neeveacheak	
16	Jacqueline Tucktoo	
17	Betty Kootook	
18	Elizabeth Aleekee	
19	Robert Aleekee	
20	Delilah Aleekee	

Sign-in Sheet

Meeting: Taloyoak Public Meeting

Date: July 7

Sabina
GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	Allan Tamoak	
2	Jeannie Ugyuk	
3	Johnny Karoo	
4	Flora Neevecheak	
5	William. INUKSUK	
6	Sarah Jakalik	
7	A Jakalik	
8	Kenda Tetdlik	
9	Abby Totalik	
10	Theresa Amirallik	
11	Helen Qayuttuk	
12	David Igattsaq	
13	Jessica Karoo	
14	Jayko Neevecheak	KIA
15	Simon Tuckloo	
16	Martha Totalik	
17	Bill Ekelik	
18	Susie Nappaluktuktuk	
19	Allen Totalik	
20	Deborah Qingnaqtuq	

Sign-in Sheet

Meeting: Taloyoak Public Meeting

Date: July 7

	NAME	ORGANIZATION
1	Patsy Klengenberg	
2	Susie Qirnaqtuq	
3	Rebecca Karas	
4	Peter Qayutinnak Junior	
5	Alice Aleekee	
6	Kubik Tucktoo 250	
7	nan.	
8	D. Manning	
9	Janet Kingaitty	
10	Darren Gorrah	
11	Christine Neevecheak	
12	Amber Tohlik	
13	Darren Jayko	
14	Josie Lacasse	
15	Clara Tucktoo	
16	Lena Ukuqtunnuaq	
17	Stella Tweboo	
18	PETER HIQINIQ TRANS.	
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MEETING INFORMATION	
DATE	July 6, 2016 (3:00 pm)
TYPE OF MEETING	Hamlet of Kugaaruk
LOCATION	Hamlet of Kugaaruk Council Chambers Kugaaruk, Nunavut
ATTENDEES	Barthelemy Nirlungayuk (Hamlet of Kugaaruk) Jeannie Illuitok (Hamlet of Kugaaruk) Leona Apsaktaren (Hamlet of Kugaaruk) Canute Krejunark (Hamlet of Kugaaruk) Guido Tiguareark (Hamlet of Kugaaruk) Stephan Inaksajak (Hamlet of Kugaaruk) John R. Ivey (Hamlet of Kugaaruk) Sheila Anaittuq (Hamlet of Kugaaruk) Jesse Apsaktaun (Hamlet of Kugaaruk) Ovide Alakannuark (Hamlet of Kugaaruk) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes. A Hamlet interpreter provided interpretation services.

MEETING NOTES:

Q – Have you investigated impacts to the fish in the lakes?

Q – Have you spoke with elders from the Project area to learn from them?

Q – What benefits will this Project provide to the region? Will you offer training to local residents?

Q – Does Sabina have another property near Bathurst Inlet?

Q – Have you seen impacts to caribou on your site?

Q – Why are you in the communities now? You haven't been here before.

Q – How will you find the right people to work at the mine site?

Q – You should have the presentations translated. I support this Project going forward.

Q – The caribou populations will decline, it is natural. I support the Project. I want my kids to get jobs.

Q – We should discuss issuing a letter of support for Sabina at our council meeting tomorrow. I would like to adjourn the meeting now.

Q – We are having a council meeting tomorrow and will put it on the agenda to discuss issuing a letter of support.

[End of meeting]

MEETING INFORMATION	
DATE	July 6, 2016 (1:30 pm)
TYPE OF MEETING	Kugaaruk HTO
LOCATION	Kugaaruk HTO office Kugaaruk, Nunavut
ATTENDEES	Columban Pujuarjok (Kugaaruk HTO) Mariano Uqqarqluk (Kugaaruk HTO) Len Anaittuq (Kugaaruk HTO) JJ Nasalik (Kugaaruk HTO) Barnaby Immingark (Kugaaruk HTO) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – When you say Sabina 'employees', is that referring to Nunavut employees or the whole company?

Q – Are you still an exploration camp? Or are you operating?

Q – The dock [at the MLA] will be pulled out when it is no longer being used?

Q – You had a really good presentation, especially with regards to the protection of animals. I support your presentation.

Q – I was surprised. When I was at the Final Hearing I was pretty sure it was going to be a yes. I was surprised when I heard on the radio last week. Everyone was agreeing at the meeting.

Q – We have a board meeting on the 15th. We can discuss the issuance of a letter of support then. Me, I support the Project, but we need to see what the whole board says. Who do we send the letter to?

Q – On page 27 of your presentation, about the caribou – Before 2008, did the caribou ever travel east of Bathurst Inlet? I used to work underground at the Polaris mine in the early 80s, so I understand what you are trying to do. I support you guys too.

Q – Where you guys are working at the Sabina mine, are there any char around there?

Q – Do you send your assays to one place? Or different places?

Q – Keep up the good work.

[End of meeting]

MEETING INFORMATION	
DATE	July 6, 2016 (7:00 pm)
TYPE OF MEETING	Kugaaruk Public Meeting
LOCATION	Community Hall Kugaaruk, Nunavut
ATTENDEES	Various members of the public (see sign-in sheet) Wes Carson (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina)
COMMENTS	Wes Carson provided a Project update presentation. Jason Prno took meeting notes.

MEETING NOTES:

[No questions asked by the audience]

[End of meeting]

Sign-in Sheet

Meeting: Kugaaruk Public Meeting

Date: July 6

	NAME	ORGANIZATION
1	Matthew Kayasark	
2	Mary Kayasark	
3	Sam INaksajk	
4	Raymond Kayasark	
5	Kathy Anaittuq	
6	Julie Anaittuq	
7	Ashley Totalik	
8	Maria Kayasark	
9	Joseph Porter	
10	Lizzy Kayasark	
11	Dwayne aaggutaa	
12	Lena Kootook	
13	Guy KRINGORN	
14	Bernice Anaksajk	
15	Ronald Inuttinaq	
16	Lorraine Qavvik	
17	Kristine Ducklow	
18	Bernadette Iqqusaqtuq	
19	Samuel Kuksintikuun	
20	Lucien Siasuk	

Sign-in Sheet

Meeting: Kugaaruk Public Meeting

Date: July 6

Sabina
GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	Christine Inuksaq	
2	Lena Totaliq	
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MEETING INFORMATION	
DATE	July 8, 2016 (2:30 PM to 3:30 PM)
TYPE OF MEETING	Meeting with the North Slave Métis Alliance
LOCATION	North Slave Métis Alliance Office Yellowknife, Northwest Territories
ATTENDEES	Matthew Pickard (Sabina) Andrew Crook (Sabina) Bill Enge (NSMA) Arnold Enge (NSMA) Edward Jones (NSMA) Shin Shiga (NSMA) Mark Whitford (NSMA)
COMMENTS	Matthew Pickard provided a Project update presentation. Andrew Crook took meeting notes.

MEETING NOTES:

C – The primary concerns are caribou and water.

Q – The Bathurst herd is in serious decline. Could you tell us more about how the mine will not affect the herd?

Q – I don't see the water affected by this Project coming into our area at all. Is that correct?

Q – I understand that you are not doing any IBAs with Northwest Territories groups. We would like to have something there as a compensation for putting our herds in danger, even though, from your maps, it is a very low risk. What are you prepared to do for us?

Q – You would relegate our businesses to the same level as any other northern contractor. How could you extend to us business opportunities?

C – I think you can see why we have issue with the mine because we are not getting anything out of it.

C – The issue you are having is that you are blockaded by the NLCA. Would that agreement exclude you from making other agreements?

C – We can't give you support today because we can't see anything in it for us. If you can come up with some solution then we will support you.

Q – The majority of the work at Sabina will be for open pits? When does underground start? We sell shotcrete and are very interested.

[Meeting finished at 3:30 PM]

Sabina Gold and Silver Corp.
Back River Gold Project
Meeting Notes

MEETING INFORMATION	
DATE	July 8, 2016 (7:00 pm – 8:00 pm)
TYPE OF MEETING	Yellowknife Public Meeting
LOCATION	Explorer Hotel, Janvier Room Yellowknife, Northwest Territories
ATTENDEES	Matthew Pickard (Sabina) Andrew Crook (Sabina) Cheryl Wray (Sabina) Various members of the public (see sign-in sheet)
COMMENTS	Matthew Pickard provided a Project update presentation. Andrew Crook took meeting notes.

MEETING NOTES:

C – If you are able to spend $200 million in recent years to proceed this far, not hear any major issues raised, and now to hear no, is tantamount to [the NIRB] saying no to other potential projects. How are other companies going to react to this decision?

Q – Who is the NIRB board, who makes it up, what is their background?

Q – How will you deal with the arsenic contamination in the future like we have here [in Yellowknife]?

Q – Could you provide more detail on the waste water and saline water discharge at the MLA?

Q - How many trucks will be on the winter road?

[End of meeting]

Sign-in Sheet

Meeting: Yellowknife

Date: July 8, 2016.

Sabina GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	Catherine Braun Rodrigues	GNWT-ITI
2	Atousa Pourfarod	—
3	BRIAN SANDERSON	LUTSEL KE Dene
4	Rick FADER	RETIRED RIO TINTO
5	Tom Hoefer	Chamber of Mines
6	Kate Witherly	GNWT - ENR
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MEETING INFORMATION	
DATE	September 19, 2016 (7:00pm)
TYPE OF MEETING	Cambridge Bay Hamlet Council
LOCATION	Hamlet Council Chambers Cambridge Bay, Nunavut
ATTENDEES	Matthew Pickard (Sabina – By teleconference) John Kaiyogana (Sabina) Jeannie Ehaloak (Mayor, Hamlet of Cambridge Bay) Joe Ohokannoak (Deputy Mayor, Hamlet of Cambridge Bay) David Kasoni (Councillor, Hamlet of Cambridge Bay) Wilf Wilcox (Councillor, Hamlet of Cambridge Bay) Wiz Mohammed (Councillor, Hamlet of Cambridge Bay) Pam Gross (Councillor, Hamlet of Cambridge Bay) Christina [unrecorded last name] (Councillor, Hamlet of Cambridge Bay) Janet Stafford (Hamlet of Cambridge Bay) [Unrecorded name] (Hamlet of Cambridge Bay) Jim McEachern (Hamlet of Cambridge Bay) Gailene Pigalak (Hamlet of Cambridge Bay) Jane George (Nunatsiaq News)
COMMENTS	Matthew Pickard provided a Project update presentation and took meeting notes.

MEETING NOTES:

Q – Can people live full time at your site instead of coming back to the communities?

Q – What are the next steps in the process?

Q – What would you like this council to do? Do you want a letter of support or something else?

Q – When you are next in town could we arrange for an in-person meeting?

[End of meeting]

Sabina Gold & Silver Corp.
Back River Gold Project
Meeting Notes

MEETING INFORMATION	
DATE	November 9, 2016 (7:00 pm – 8:30 pm)
TYPE OF MEETING	Kugluktuk HTO - Back River Project and Bernard Harbour project update
LOCATION	By teleconference
ATTENDEES	Jason Prno (Sabina) John Kaiyogana (Sabina) Cam Stevens (Golder) Kevin Klengenberg (Kugluktuk HTO) Jorgen Bolt (Kugluktuk HTO) Colin Adjun (Kugluktuk HTO) Bessie Sitatak (Kugluktuk HTO) Jayko Palongayak (Kugluktuk HTO) Peter Taktogon (Kugluktuk HTO) Johnny Nivingalok (Kugluktuk HTO)
COMMENTS	John Kaiyogana and Jason Prno provided a Back River Project update. Cam Stevens provided a Bernard Harbour project update. Jason Prno took meeting notes.

MEETING NOTES:

Back River Project update:

- Are those letters of support you received going to be submitted by Sabina as part of your application to the Minister?
- Are you still committed to local hiring?
- Is there anyone at your camp right now?
- Is the price of gold stable? How confident is Sabina that the gold price will remain stable and you will still be able to build the mine? The price seems to change all the time.
- Has the Bernard Harbour project cost overrun this past summer been approved by Sabina? Will Sabina still be paying it?

Bernard Harbour project update:

- What were the water temperatures like this summer while you were at Bernard Harbour?
- Usually in August or the middle of August the fish will start migrating, at least in other areas. Is it the same at Bernard Harbour? The reason I ask is because certain rivers have certain times when the fish will go up to the lakes. Like Reid Island. There can be a lot of fish move in a short period of time. Like in a week and a half.

- During the migration did you see any increase in other sea animals or sea birds at that time?
- How many fish did you tag with floy tags vs. pit tags?
- Each year is a different story; if you have a rainy season you will have higher water. Char can only go up when the water is higher; the water levels can change day by day. So, do you have an idea when these migrations normally happen at Bernard Harbour? Month and date?
- Are there any salmon being caught down there?
- We've caught some chum salmon in the Coppermine River. We have some in our freezer here.
- When I was with the Department of Environment, we did some fish tagging and a fish was caught over in Alaska. A fish from Alaska was also caught in Kugluktuk.

[End of meeting]

MEETING INFORMATION	
DATE	November 30, 2016 (7:00 PM to 8:45 PM)
TYPE OF MEETING	Community Meeting
LOCATION	Elder's Palace Cambridge Bay, Nunavut
ATTENDEES	Various members of the public (see sign in sheet) Matthew Pickard (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina) Greg Sharam (ERM)
COMMENTS	Matthew Pickard provided an update on the Project and the Wildlife Mitigation and Management Plan. Merle Keefe took meeting notes. Emily Angulalik provided interpretation services.

MEETING NOTES:

Q – What is the basis of the NWT opposition to the Project?

Q – Is the Minister of INAC's decision expected to come out before the end of 2016?

Q – Some elders would like confirmation that the Back River you are discussing here is in the west? There are two Back Rivers – One in the east and one in the west.

Q – How did you guys study all the caribou migration routes?

Q – What do the residents of Bathurst Inlet and Bay Chimo think about the mine?

Q – Do you have any representatives from Cambridge Bay on your Community Advisory Group?

Q – When does your mine start?

Q – Are all your permits and regulations approved? If not, when will you have everything in place?

Q – Once this is approved, how long will your mine operate?

Q – If this goes into production, how would you deal with people entering your mine and with the security issues?

Q – With the operations of Goose and George are you primarily open pit or underground?

Q – Do you have very stringent environmental management for your open pits?

Q – When it comes to the closure of your open pits, what are you doing?

Q – How would you deal with your waste? I am a waste technician at TMAC, that is why I am asking these waste questions.

C – Caribou are the lifeline. I am very hopeful that when there are a couple of caribou spotted near the mine site then you will do what you said and operations will slow down to a certain point. I mean, you cannot stop your mill. Caribou are very sensitive animals. When my father and I were walking near caribou they were skittish – Now we are talking heavy equipment, dozers, and loaders.

C – Even traditional knowledge shows us that caribou do not stay in the same spot the whole time. They can move 5 km or 18 km. Any plan is a good plan – It shows the communities that you are thinking about the caribou. It is very encouraging to hear not only the plan but the enthusiasm behind the plan. It makes relationships much more cohesive and friendly.

[Meeting ended at 8:45 PM]

Sabina Gold & Silver Corp.
Back River Gold Project

Sabina
GOLD & SILVER CORP.

PUBLIC COMMENT FORM

Please share any comments, concerns, or suggestions you have regarding the Back River Gold Project:

I would like to see more Jobs for the Kitikmeot Community's and also good pay and a pass to Edmonton or YK for our days off.

Is there anything you would like to learn more about?

Yes more training on a job. And I was also on the Health and Safety committee with Tmac

Is there anything we could be doing better?

Yes good pay because it's Very high cost of living up here in the north. And I also want to work for you guys if it opens

Contact information (optional):

Name: Johnny Avalak

Address: PO Box 1118 Cambridge Bay NU

Phone number: 867-983-2034

Email:

Thank you

Sign-in Sheet

Meeting: Cambridge Bay Public Meeting

Date: Nov 30/16

	NAME	ORGANIZATION
1	EMILY ANGULACIK	
2	Stacey Kuliktana	
3	Gordon Jr Pangun	
4	Johnny Avalak	
5	Ida Kuliktana	
6	Heather Kigjuar	
7	Kate Kuliktana	
8	Mary AVALAK	
9	AARON SMITH	
10	Ernest Maria	
11	Donny Anyulalek	
12	Darian Avalak	
13	David Avalak	
14	BetteAnn Maniyogena	
15	HARRY MAKSAGAK	
16	Lee Kanaroyak	
17	Kent Gustus	
18	Allen Hikoalak	
19	NOAH KUDLAK	
20		

MEETING INFORMATION	
DATE	December 1, 2016 (930am)
TYPE OF MEETING	Cambridge Bay Community Advisory Group
LOCATION	Sabina office, Cambridge Bay
ATTENDEES	Mary Avalak (CAG member) Keith Lear Sr. (CAG member) Merle Keefe (Sabina) Jason Prno (Sabina) Greg Sharam (ERM)
COMMENTS	Jason Prno and Merle Keefe provided a Project update and WMMP overview presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – Did the letter of support we submitted get taken into consideration by the NIRB?

Q – Will the regulators let you continue to advance your project while they're sorting out this recent NIRB recommendation?

Q – Will climate change affect caribou migration in May and June?

Q – Regarding global warming - Caribou are sticking around town longer because the ice hasn't frozen over on the ocean yet for them to cross over. With global warming do the caribou take a different path? Will there be an effect?

Q – Wildlife have a good instinct to adapt. Why implement these protection measures, if they are going to adapt and stay away from the mine anyways? Why would it even be a concern if the caribou moved away from the mine?

C – Really, 100-150km is not a very far distance (for the Bathurst herd to be located from Project infrastructure).

Q – Do we know why the Bathurst herd's calving range has moved?

C – I used to see lots of caribou pass by from the mainland by my camp, but I didn't see them this year. It was kind of strange not to see many caribou these past two springs. Maybe there are too many wolves? I heard there were lots of wolves in this area. I don't know why though. I've heard there are more caribou closer to Gjoa Haven.

Q – So, the noise of the mine is not a major factor in keeping the caribou away? They're going to come in anyways?

C – It's not always noise. Caribou used to come to the gravel pit here. But they've stopped going there recently. It's because they've really built up the number of cabins around there.

C – And the vegetation in that area is all torn up. A caribou will know if a hunters is there if he's making all sorts of noise.

Q – What are your studies showing? Are the caribou avoiding the site?

C – The cracks in the ocean ice have also changed, which has changed the direction the caribou travel.

C – These are good protection measures. I don't see how you could do much more. I think your plan is clear. I also like that you're using cameras and sound monitoring. You'll provide proof. You've come a long ways since the last presentation you gave us. In any case, this time off due to the NIRB recommendation has allowed you guys to put a lot more work in.

[End of meeting]

MEETING INFORMATION	
DATE	December 1, 2016 (11:45 AM to 3:00 PM)
TYPE OF MEETING	CO-OP Table/Open House
LOCATION	CO-OP Cambridge Bay, Nunavut
ATTENDEES	Various members of the public stopped by Merle Keefe (Sabina) Greg Sharam (ERM)
COMMENTS	Merle Keefe and Greg Sharam provided an update on the Project and the Wildlife Mitigation and Management Plan.

MEETING NOTES:

Q – When are jobs going to be available? (x2)

Q – When is the Project going to start?

Q – Is this a job fair? (x4)

Q –What do you do if a caribou does not want to move off the road?

Q - Is the KIA going to write a letter to the Minister to get the decision turned around?

C – I support the Project. (x2)

C – The Minister should turn the decision around.

Q – Details of infographics/posters? (x10)

Q – What are you going to do if the caribou come to the site?

Q – I missed your public meeting last night, can you please update me on what's going on? (x2)

Q – I missed the community advisory group meeting this morning, can you please update me?

Q – Are you going to provide training?

Q – Why did the NIRB recommend the Project not proceed?

[Table/open house ended at 3:00 PM]

MEETING INFORMATION	
DATE	December 1, 2016 (6:00 PM to 7:25 PM)
TYPE OF MEETING	Meeting with Residents of Bathurst Inlet and Bay Chimo
LOCATION	Community Hall Cambridge Bay, Nunavut
ATTENDEES	Various members of the public (see sign-in sheet) Matthew Pickard (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina) Greg Sharam (ERM)
COMMENTS	Matthew Pickard provided an update on the Project and the Wildlife Mitigation and Management Plan. Merle Keefe took meeting notes. Connie Kapolak provided interpretation services.

MEETING NOTES:

Q – How did you come up with the group size of 30 caribou?

Q – Where will the wildlife monitor come from?

Q – If the caribou come around and you need to shut down blasting and trucks isn't Sabina going to lose a lot of money?

Q – Sometimes caribou can make their own camp. If caribou hang around for 2 weeks, then you have to shut down right?

Q – Are you going to order the helicopters to stay 2000 ft in the air at all times?

C – The caribou used to calve to the east of Bathurst Inlet. The elders tell us that the caribou calving ranges can move. It is probably likely that they will go back to the east.

Q – Sorry I misunderstood. So the decision goes back to the Minister now?

[Meeting ended at 7:25 PM]

Sign-in Sheet

Meeting: Bathurst Inlet / Bay Chimo Residents

Date: Dec 1/16

Sabina GOLD & SILVER CORP.

	NAME	ORGANIZATION
1	Martina Kaplak	OHTO
2	Peter Kapolak	OHTO
3	Nancy Wanilak	Bay Chimo HTO
4	John Haniliak	Bay Chimo HTO
5	Connie Kapolak	Kingaut OHTO
6	Cassel "	" HTO
7	allen "	" HTO
8	Tony Akoluk	Bathurst Inlet
9	Myste Kamingoak	" "
10	Joanne Kamingoak	" "
11		
12	MARY-ANN AK	
13		
14	AMY-KAMOAYOK	
15		
16		
17		
18		
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20		

MEETING INFORMATION	
DATE	December 1, 2016 (800pm)
TYPE OF MEETING	Cambridge Bay HTO
LOCATION	Cambridge Bay HTO offices Cambridge Bay, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Jason Prno (Sabina) Merle Keefe (Sabina) Greg Sharam (ERM) Bobby Greenley (Cambridge Bay HTO) Peter Evalik (Cambridge Bay HTO) Jimmy Haniliak (Cambridge Bay HTO) Johnny Lyall Sr. (Cambridge Bay HTO) George Angohiatok (Cambridge Bay HTO) Beverly Maksagak (Cambridge Bay HTO)
COMMENTS	Matthew Pickard provided a Project update and WMMP update presentation. Jason Prno took meeting notes.

MEETING NOTES:

Q – What's the water intake for [on your site layout map]?

Q – Do you have air traffic in the summer? Will there be a lot of heavy air traffic going into Goose in the summer? What kind of aircraft? Any helicopters? Would they be staying away from the calving area? The fixed wing aircraft are probably not so bad, it's the helicopters. You can hear those for miles.

Q – I agree with what you're doing with Project shutdowns, but you still have to run a business. How is that going to go over with the higher ups in your company? If you're paying a guy $30/hr and he's just sitting around, how is that going to go over?

Q – At each of the caribou protection levels, how do you determine who will be doing the monitoring?

Q – On your roads, the snowbanks are feathered back? They won't be too tall? I don't think the caribou will be able to climb them otherwise.

C – I think the plan looks really good right now, the way it's set up. I can't think of any suggestions.

Q – I really like this too, the caribou protection measures. But what about the other wildlife, like fish and other species? Are there studies being done on how the fish are now, versus how they will be 20 years after the mine? At the Marine Laydown Area?

C – I've been at so many hearings now, with TMAC and Sabina. With NIRB and most recently with NPC. I was hearing nothing about caribou protection at the NPC meeting. I was going to suggest it as an agenda item for the next hearing in Iqaluit. It is really important. I like your caribou protection plan. There is more here than what we heard from you before.

C – There's a big difference in your plan even from our last meeting with you. Your information you presented is good. People can get confused when they are presented with a large document.

Q – What are your next steps then? Will you be presenting this plan to the NIRB or Minister?

C – Caribou is a big issue everywhere.

Q – Who will run your winter road? Winter road routes can change every year. I used to work on building a winter road.

[End of meeting]

MEETING INFORMATION	
DATE	December 2, 2016 (8:00 PM to 9:40 PM)
TYPE OF MEETING	HTO Meeting
LOCATION	HTO Office Kugluktuk, Nunavut
ATTENDEES	Larry Adjun (Kugluktuk HTO) Jayko Palongoyak (Kugluktuk HTO) Bessie Sitatak (Kugluktuk HTO) Peter Taktogon (Kugluktuk HTO) Colin Adjun (Kugluktuk HTO) Bobby Anablak (Kugluktuk HTO) Johnny Nivingalok (Kugluktuk HTO) Matthew Pickard (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina) Greg Sharam (ERM)
COMMENTS	Matthew Pickard provided an update on the Project and the Wildlife Mitigation and Management Plan. Merle Keefe took meeting notes.

MEETING NOTES:

C – I just want to fill some board members in on the project we have right now with Sabina at Bernard Harbour. Their process is to work with a HTO on this project; a project which Peter Taptuna started in 2004. Sabina is conducting this project to offset the dewatering of a lake at their site.

Q – How weatherproof are the wildlife cameras?

C – I think some of the caribou adapt to the hot sun and hide away in the shade. Everyone says the mines are scaring the caribou away and then the caribou will be standing right there beside the mine. One time there was a caribou and there happened to be a generator blowing cold air between the tents and the houses and there was a big bull sitting there all day just watching people. I thought that was very funny. It was the time of year where it was charging people and getting dangerous.

Q – Regarding stopped aircraft during a shutdown - What would happen if there was an emergency?

C – I think you guys have gone way above and beyond what you have presented at the final hearings. That is good to see. Your program is a lot more in-depth than it was at the original hearings. I think you guys have gone way above and beyond what is being called of you. When we got the Grays Bay update, they said the First Nations groups in NWT are onboard for the Grays Bay road. I think this is different than what we heard at the hearings. Just to note, we have been given the tags for the Bluenose East herd. So we are going to be in the spotlight. This is coming from the GN side, which means it's serious enough. We still support Sabina, and we still will. We know your mitigation measures out there are way above and beyond what is being called of you guys.

C – In the past I grew up with the Bathurst herd when the gold rush was going on – There were a lot of activities. The planes, blasting, it never bothers the caribou. I always tell the biologists you need to live on the land to understand the caribou. Three times we had to chase the caribou away from town and the airstrip. They don't get bothered; they stick around. I always tell the biologists to go out on the land to understand the caribou. I saw a big herd at the Ekati mine with big trucks going around

C – They did an aerial study and they found a higher number of grizzlies and wolves on the land. They have gone up.

Q – The predators are really growing and this is what is causing the caribou to go down.

C – For your information, the GN is promising to do more studies on predation. More studies on grizzly bear, wolverine, and wolf populations. They are finally listening to us and will do hair snagging studies.

C – I just have one comment on saving you five hundred thousand dollars. In Ekati we had a summer project for summer students and here in our community. We had a lot of problems with caribou around the airstrip. All the students went there and built inuksuks and that solved the problem.

C – Down south you keep them in, here you keep them out. The caribou are smart and will follow the trails. If they turn once they will follow that trail. They are pretty smart animals. You can train them too, but inuksuks are a good way to go.

C – It is very important for caribou herds, you know sometimes hunters get excited when they see a herd of caribou, to leave the leaders alone. If they shoot caribou leaders, even one, they won't know where to go. Those are females. For the young generations, we are starting to tell them to leave the first ones and the rest will follow by their steps.

C – One of the delegations from the NWT said that too. Let the leaders go first before they start shooting caribou.

C – The elders, even my grandfather, used to say let the leaders pass. You can hunt them from behind. The important thing is not to bother the leaders coming through. One caribou leads the whole group.

C – Election year is coming up for the HTO. We don't know if our HTO manager is going to be with us as he may go to TMAC to work. We may have to change things up so just so you are aware. 5 positions are opening up on our board. 5 out of 9. The elections are in January.

Q – Have you received any word from the Minister in regards to when you are going to get a definite decision on the Project?

Q – Going back to your satellite colour analysis slide - Who put those collars on?

C – These plans are clearer and a lot better than what Ekati has and what you had in the past. I'm happy with it. We need jobs for our younger population. I know the mines don't bother the caribou.

C – The mines have personnel working with the Aboriginal people on the mine site. It helped. The native people that are working in the mines have a lot of knowledge.

Q – I have one more question about the port site. As you know, there is another port site that is being proposed – Grays Bay. Will that have any impact on your port site?

Q – I may have missed this, but are you going to be hiring wildlife monitors at your site?

Q – If you hire 1-2 wildlife monitors from here is it possible they can sit down with us here at the HTO before and after their working year?

[Meeting ended at 9:40 PM]

MEETING INFORMATION	
DATE	December 3, 2016 (12:30 PM to 1:10 PM)
TYPE OF MEETING	Radio Broadcast and Call-In Show
LOCATION	Radio Station – Recreation Complex Kugluktuk, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina) Greg Sharam (ERM)
COMMENTS	Jason Prno, Merle Keefe, and Matthew Pickard provided an update on the Project and the Wildlife Mitigation and Management Plan. Merle Keefe took meeting notes.

MEETING NOTES:

[There were no individuals who called in to the radio show]

[Radio show ended at 1:10 PM]

MEETING INFORMATION	
DATE	December 3, 2016 (7:00 PM to 8:55 PM)
TYPE OF MEETING	Community Meeting
LOCATION	Community Hall Kugluktuk, Nunavut
ATTENDEES	Various members of the public (see sign in sheet) Matthew Pickard (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina) Greg Sharam (ERM)
COMMENTS	Matthew Pickard and Merle Keefe provided an update on the Project and the Wildlife Mitigation and Management Plan. Merle Keefe took meeting notes.

MEETING NOTES:

Q – When do you anticipate the NIRB will reconsider the Project?

Q – Regarding the migration of the herd - I think the mines are opening up and affecting the migration routes of the herd. When BHP started up in 1987 there was lots of caribou there – 10 to 20 thousand. If the mine sites close down, there is money put down for closure. There should be money for lost traditional knowledge too, and money should be paid as compensated for the decline of caribou.

Q – When you guys do your monitoring on caribou migration do you do predator monitoring too? For example, wolf and wolverine. The reason I am asking is that when some of our young hunters go out they see wolf and wolverine in bunches. The predators try to seal our young hunters in - They can sense it and get out of there. The predators are out there in big, big numbers.

Q – So are you guys encouraging our HTO to expand predator hunting?

Q – If Goose Lake goes ahead, how many communities will have hiring priority?

C – I think you did a very good job.

Q – When do you think Goose Lake will start full operations?

Q –Going back to migration - You touched on the herd stretching into the Northwest Territories and northern Saskatchewan. Do you work with groups from these other areas?

Q – If the mine goes ahead, how long will its life be?

C – I want an update on training. The last time I was here I asked about training for our young people. I would like an update.

Q – Can Sabina Gold & Silver provide on-the-job training?

Q – Even though gold prices are low are you still going to start operations?

Q – When you start operating will you guys work harder to get Inuit into trades positions?

[Meeting ended at 8:55 PM]

Sign-in Sheet

Meeting: Kuglukhak Public Meeting

Date: Dec 3/16

	NAME	ORGANIZATION
1	Dale Klengenberg	Radio Station
2	Abraham Carpenter	" "
3	Leo KUDLUAK	
4	FRED TAPTUNA	
5	Reed Egelack	
6	MARK TALETOK	
7	Donald Horning Sr.	
8	Margaret Awiok	
9	Willie P	
10	Joseph Koketk	
11	Yvonne Miyok	
12	RICHARD KALUGAK	
13	Jason Taptuna	
14	Valentina Kalugaak	
15	Jean Kalugaak	
16	Alyssa Ayaligak	
17	Jo Nocolar	
18	Martha Taletok	
19	John Roesch	KIA
20	Ron Hoglund	

Sign-in Sheet

Meeting: Kugluktuk Public Meeting.

Date: Dec 3/16

	NAME	ORGANIZATION
1		
2	R Evaglok	
3	Ben HiKHAiTOK	
4	Bobby Hikhaitok.	Lb Search.
5		KTO
6	Glen Okheena	
7	Rita Myon	
8	Bradley Meyok	
9	Glen TiKtalek	
10	Anne Ihumatak	
11		
12	Tony EVAGLOK	
13	Evelyn Brett	
14	George Kukikakak	
15	Bessie KUKICUKAK	
16	Kayla Pungun	
17	Mary Aleeva.	
18	Eileen Ekatil	
19		
20	Darlene Kukikakak	

MEETING INFORMATION	
DATE	December 4, 2016 (100pm)
TYPE OF MEETING	Kugluktuk Community Advisory Group
LOCATION	Ulu Building Boardroom Kugluktuk, Nunavut
ATTENDEES	Matthew Pickard (Sabina) Merle Keefe (Sabina) Jason Prno (Sabina) Greg Sharam (ERM) Ryan Nivingalok (Kugluktuk CAG)
COMMENTS	Matthew Pickard provided a Project and WMMP update presentation. Jason Prno took meeting notes.

MEETING NOTES:

C – It's nice to be brought up to speed with where you're at with the Project. Hopefully everything goes well for you, with the NIRB decision.

C – There's a lot of people looking for work. There's a balance to be had between employment and monitoring. We can't have people sitting around without work.

C – There was a lot of negativity from the NWT side.

[End of meeting]

ADDENDUM APPENDIX V3-1F: RECORD OF DONATIONS (REVISED)

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
December 2011	Illaliuvik Daycare Society	Kugaaruk	$1,500.00	Daycare support
January 2012	Kitikmeot Cup Planning Committee	Kugluktuk	In-kind	Sabina provided various prizes (e.g. Sabina promotional items) for the Kitikmeot Cup Hockey Tournament.
February 2012	Nattiq Frolics / Hamlet of Kugluktuk Recreation Department	Kugluktuk	In-kind	Sabina provided various prizes (e.g. Sabina promotional items) for the 2012 Nattiq Frolics.
June 2012	Omingmak Frolics	Cambridge Bay	$1,300.00 and in-kind	Sabina sponsored two barbeques for the Omingmak Frolics by providing food and personnel (i.e. John Kaiyogana).
August 2012	Inuit Summer Games	Kugluktuk	$650.00 and in-kind	Sabina sponsored a barbeque for the Inuit Summer Games by providing food and personnel (i.e. John Kaiyogana).
September 2012	David and Genieve Nivingalok	Kugluktuk	$250.00	The house of community advisory group member David Nivingalok was destroyed by fire. A donation was made through the Kugluktuk Co-op.
August 2012	Women Building Futures	Cambridge Bay	$5,800.00	Financial and in-kind (i.e. Sabina sponsored a dinner for the participants, trainers and organizers of the workshop) support for the Women Building Futures workshop.
November 2012	Cambridge Bay Food Bank	Cambridge Bay	$500.00	Food bank support
November 2012	Kugluktuk Food Bank	Kugluktuk	$500.00	Food bank support
November 2012	Gjoa Haven Food Bank	Gjoa Haven	$500.00	Food bank support
November 2012	Kugaaruk Food Bank	Kugaaruk	$500.00	Food bank support
November 2012	Taloyoak Food Bank	Taloyoak	$500.00	Food bank support
November 2012	Cambridge Bay Daycare Center	Cambridge Bay	$500.00	Daycare support
November 2012	Kakayak Daycare Society	Kugluktuk	$500.00	Daycare support
November 2012	Nutarqanut Pairivik Society	Gjoa Haven	$500.00	Daycare support
November 2012	Illaliuvik Daycare Society	Kugaaruk	$500.00	Daycare support
December 2012	Kugluktuk Christmas Committee	Kugluktuk	$500.00	Sabina helped sponsor Kugluktuk's 2012 Christmas celebrations.
February 2013	Kugluktuk Hockey Association	Kugluktuk	$500.00	Sabina provided jersey sponsorship for the Kugluktuk Recreation Complex Friday night hockey league.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
March 2013	Nattiq Frolics / Hamlet of Kugluktuk Recreation Department	Kugluktuk	$500.00	Sabina helped sponsor Kugluktuk's 2013 Nattiq Frolics.
March 2013	Kitikmeot Cup 2013	Taloyoak	$500.00	Sabina provided financial support for the 2013 Kitikmeot Cup in Taloyoak.
2013	Nunavut Sivuniksavut	Ottawa	$2,000.00	Sabina provided financial support for Nunavut Sivuniksavut student travel initiatives in 2013.
April 2013	Nattiq Frolics	Kugluktuk	$650.00 and in-kind	Sabina sponsored a barbeque for the Nattiq Frolics by providing food and personnel (i.e. John Kaiyogana).
May 2013	Hamlet of Taloyoak Fishing Derby	Taloyoak	$500.00	Sabina helped sponsor Taloyoak's 2013 fishing derby.
May 2013	Gjoa Haven Dog Sled Race Committee	Gjoa Haven	$350.00	Sabina donated 45 gallons of gasoline and two $50.00 Co-op gift certificates as prizes for the 2013 Gjoa Haven dog sled race.
May 2013	Hamlet of Kugaaruk Fishing Derby	Kugaaruk	$300.00	Sabina donated 45 gallons of gasoline and one $50.00 Co-op gift certificate as prizes for the 2013 Kugaaruk Fishing Derby.
May 2013	Omingmak Frolics	Cambridge Bay	$650.00 and in-kind	Sabina sponsored a barbeque for the Cambridge Bay Frolics by providing food and personnel (i.e. John Kaiyogana).
Summer 2013	Actua	Cambridge Bay Kugluktuk Gjoa Haven Taloyoak Kugaaruk	$55,000.00	Sabina (in addition to MMG Limited and Xstrata Zinc) helped fund a series of week-long science, technology, engineering and mathematics camps for youth in each Kitikmeot community during the summer of 2013. The camps were delivered by Actua, a registered Canadian charity.
Summer 2013	Kugluktuk Daycare	Kugluktuk	$1,200.00	Sabina donated a fridge and dishwasher to the Kugluktuk daycare
July 2013	Kugluktuk Fishing Derby	Kugluktuk	$250.00	Sabina donated 45 gallons of gasoline as a prize for the 2013 Kugluktuk Fishing Derby.
July 2013	Hamlet of Kugluktuk Canoe Clinic	Kugluktuk	$500.00	Sabina provided financial support for a canoe clinic offered in the Hamlet of Kugluktuk.
July 2013	Hamlet of Kugluktuk Soccer Clinic	Kugluktuk	$500.00	Sabina provided financial support for a soccer clinic offered in the Hamlet of Kugluktuk.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
October 2013	Cambridge Bay Childcare Society	Cambridge Bay	$500.00	Sabina provided $250.00 and 45 gallons of gasoline towards the Cambridge Bay Childcare Society's dinner and auction fundraiser.
November 2013	Hamlet of Kugluktuk Christmas Games	Kugluktuk	$500.00	Sabina helped sponsor Kugluktuk's 2013 Christmas celebrations.
November 2013	Kugluktuk Daycare	Kugluktuk	$150.00	Sabina visited the daycare and provided a gift of various daycare supplies and materials.
November 2013	Cambridge Bay Daycare	Cambridge Bay	$150.00	Sabina visited the daycare and provided a gift of various daycare supplies and materials.
November 2013	Gjoa Haven Daycare	Gjoa Haven	$150.00	Sabina visited the daycare and provided a gift of various daycare supplies and materials.
November 2013	Kugaaruk Daycare	Kugaaruk	$150.00	Sabina visited the daycare and provided a gift of various daycare supplies and materials.
December 2013	Bathurst Inlet and Bay Chimo Christmas festivities	Bathurst Inlet and Bay Chimo	$350.00	Sabina provided a $100.00 gift certificate and 45 gallons of gasoline for Bathurst Inlet and Bay Chimo's Christmas festivities.
January 2014	Nutarqanut Pairivik Society Day Care	Gjoa Haven	$350.00	Sabina donated 45 gallons of gasoline and two $50.00 gift certificates to the local Co-op for the daycare's fundraising event.
April 2014	Nattiq Frolics	Kugluktuk	$975.00 and in-kind	Sabina sponsored a barbeque for the Nattiq Frolics by providing food and personnel (i.e. John Kaiyogana). Sabina also donated a BBQ, propane tank, and BBQ utensils to the Hamlet of Kugluktuk.
April 2014	Hamlet of Kugluktuk Community Readiness Initiative	Kugluktuk	$1,500.00	Sabina provided a financial donation to cover the costs of a community feast where Kugluktuk's new Community Readiness Initiative was introduced and feedback was solicited. Sabina representatives also attended the feast.
April 2014	Taloyoak Fishing Weir Restoration Project / Youth Camp	Taloyoak	$1,000.00	Sabina provided a financial donation to help cover the costs of a local fishing weir restoration project / youth camp in Taloyoak.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
May 2014	Omingmak Frolics	Cambridge Bay	$650.00 and in-kind	Sabina sponsored a barbeque for the Cambridge Bay Frolics by providing food and personnel (i.e. John Kaiyogana).
May 2014	Hamlet of Cambridge Bay	Cambridge Bay	$1,000.00	Sabina provided funds to support a September 2014 visit by reality TV star Ariel Tweto on her 'Popping Bubbles' tour, to discuss suicide prevention, healthy living, and other topics with local residents.
May 2014	Society for Building a Healthier Kugluktuk	Kugluktuk	$1,000.00	Sabina provided funds to support a September 2014 visit by reality TV star Ariel Tweto on her 'Popping Bubbles' tour, to discuss suicide prevention, healthy living, and other topics with local residents.
May 2014	Hamlet of Taloyoak	Taloyoak	$1,000.00	Sabina provided funds to support a September 2014 visit by reality TV star Ariel Tweto on her 'Popping Bubbles' tour, to discuss suicide prevention, healthy living, and other topics with local residents.
May 2014	Hamlet of Kugaaruk	Kugaaruk	$1,000.00	Sabina provided funds to support a September 2014 visit by reality TV star Ariel Tweto on her 'Popping Bubbles' tour, to discuss suicide prevention, healthy living, and other topics with local residents.
May 2014	Gjoa Haven Search and Rescue	Gjoa Haven	$300.00	Sabina provided a donation of gasoline to help in the search of a lost hunter in Gjoa Haven.
June 2014	Ariel Tweto's Popping Bubbles Tour	Gjoa Haven	$1,000.00	Sabina provided funds to support a September 2014 visit by reality TV star Ariel Tweto on her 'Popping Bubbles' tour, to discuss suicide prevention, healthy living, and other topics with local residents.
June 2014	Cambridge Bay Aboriginal Day Celebrations	Cambridge Bay	$650.00	Sabina provided a number of prizes (e.g. fishing lures, fishing line, fishing rods, stove) for the Cambridge Bay Aboriginal Day celebrations.
July 2014	Ikaluktutiak Square Dance Group	Cambridge Bay	$575.00	Sabina provided a donation of prizes (i.e. 45 gallons of gasoline, 1 Coleman stove, 1 fishing rod) for the Ikaluktutiak Square Dance Group's first annual fishing derby.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
August 2014	Municipality of Cambridge Bay – 2014 Kitikmeot Summer Games	Cambridge Bay	$1,650.00 and in-kind	Sabina sponsored a barbeque for the Kitikmeot Summer Games in Cambridge Bay by providing food and personnel (i.e. John Kaiyogana). Sabina also donated $1,000.00 to support the event.
Summer 2014	Actua	Cambridge Bay Kugluktuk Gjoa Haven Taloyoak Kugaaruk	$10,000.00	Sabina (in addition to MMG Limited and Glencore plc) helped fund a series of week-long science, technology, engineering and mathematics camps for youth in each Kitikmeot community during the summer of 2014. The camps were delivered by Actua, a registered Canadian charity.
July 2014	Ariel Tweto's Popping Bubbles Tour	Cambridge Bay Kugluktuk Gjoa Haven Taloyoak Kugaaruk	$5,000.00	Sabina provided a financial donation to Ariel Tweto's Popping Bubbles tour so that Popping Bubbles t-shirts and autographed photos of Ariel Tweto could be provided to youth in the Kitikmeot Region.
August 2014	Hamlet of Kugluktuk	Kugluktuk	$500.00	Sabina provided a financial donation to support the participation of some Kugluktuk residents in the Nunavut Stars Hockey Camp in Iqaluit.
August 2014	Hamlet of Kugluktuk	Kugluktuk	$500.00	Sabina provided a financial donation to the Hamlet of Kugluktuk's Recreation Department to support a local canoe and kayak clinic that was being offered.
August 2014	Deninu Kue First Nation	Fort Resolution	$500.00	Sabina provided a financial donation to help cover the costs of a funeral of a young woman and the rebuilding of a home that was destroyed by fire.
September 2014	Hamlet of Kugluktuk	Kugluktuk	$1,175.00 and in-kind	Sabina sponsored two barbeques for the grand openings of the Kugluktuk Visitor Heritage Centre and the new Youth Centre by providing food and personnel (i.e. John Kaiyogana).
October 2014	Hamlet of Taloyoak	Taloyoak	$750.00	Sabina provided funds to support the purchase of hockey equipment for Taloyoak youth.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
October 2014	Cambridge Bay Childcare Society	Cambridge Bay	$1,500.00	Sabina donated a sleeping bag, 45 gallons of gasoline, a camp stove, and GPS unit for the Cambridge Bay Childcare Society's annual daycare auction gala.
October 2014	Hamlet of Kugluktuk	Kugluktuk	$500.00	Sabina provided a financial donation to support the Hamlet of Kugluktuk's Christmas festivities.
October 2014	Kuggak Radio Station	Kugluktuk	$650.00	Sabina provided various corporate promotional items to the Kugluktuk radio station.
November 2014	Western Arctic Drum Dance Group	Cambridge Bay	$500.00	Sabina provided a financial donation to the Western Arctic Drum Dance Group for performing during the NIRB Technical Meeting and Pre-Hearing Conference.
November 2014	Cambridge Bay Square Dance Group	Cambridge Bay	$500.00	Sabina provided a financial donation to the Cambridge Bay Square Dance Group.
November 2014	Cambridge Bay Wellness Centre	Cambridge Bay	$500.00 and in-kind	Sabina provided a financial donation and food to the Cambridge Bay Wellness Centre in appreciation for their lending of kitchen smallwares to Sabina during the NIRB Technical Meeting and Pre-Hearing Conference.
December 2014	Cambridge Bay Wellness Centre	Cambridge Bay	$500.00	Sabina provided a financial donation to the Cambridge Bay food bank.
December 2014	Hamlet of Kugluktuk	Kugluktuk	$250.00	Sabina provided a financial donation to the Kugluktuk food bank.
December 2014	Kakayak Daycare Society	Kugluktuk	$250.00	Sabina provided a financial donation to the daycare in Kugluktuk.
December 2014	Gjoa Haven Wellness Centre	Gjoa Haven	$250.00	Sabina provided a financial donation to the Gjoa Haven food bank.
December 2014	Taloyoak Daycare Society	Taloyoak	$250.00	Sabina provided a financial donation to the daycare in Taloyoak.
December 2014	Illaliuvik Daycare Society	Kugaaruk	$250.00	Sabina provided a financial donation to the daycare in Kugaaruk.
December 2014	Bathurst Inlet and Bay Chimo Christmas festivities	Bathurst Inlet and Bay Chimo	$2000.00	Sabina provided a financial donation to support Bathurst Inlet and Bay Chimo's Christmas festivities.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
February 2015	Kitikmeot Regional Science Fair 2015	Cambridge Bay	$300.00	Sabina donated a prize (i.e. iPad mini) for the 2015 Kitikmeot Regional Science Fair.
March 2015	Hamlet of Kugluktuk	Kugluktuk	$500.00	Sabina provided a financial sponsorship of the 2015 Nattiq Frolics in Kugluktuk.
May 2015	Hamlet of Cambridge Bay	Cambridge Bay	$600.00 and in-kind	Sabina helped sponsor a barbeque for the Cambridge Bay Frolics by providing food and personnel (i.e. John Kaiyogana).
June 2015	Cambridge Bay Wellness Centre Kitikmeot Heritage Society Cambridge Bay Youth Centre	Cambridge Bay	In-kind	Sabina and ExploreIT Network Solutions donated three refurbished laptops with software included to local community organizations.
June 2015	Kugluktuk Day Care Kugluktuk Search and Rescue	Kugluktuk	In-kind	Sabina and ExploreIT Network Solutions donated two refurbished laptops with software included to local community organizations.
June 2015	Taloyoak Day Care Taloyoak Search and Rescue	Taloyoak	In-kind	Sabina and ExploreIT Network Solutions donated two refurbished laptops with software included to local community organizations.
June 2015	Kugaaruk Day Care Kugaaruk Search and Rescue	Kugaaruk	In-kind	Sabina and ExploreIT Network Solutions donated two refurbished laptops with software included to local community organizations.
June 2015	Kitikmeot Inuit Association	Kitikmeot Region	$5,000.00	Sabina provided financial support for a KIA-organized Emergency Medical Responder training program in Cambridge Bay for Kitikmeot Region residents in April/May 2015.
July 2015	Hamlet of Taloyoak	Taloyoak	$1,500.00	Sabina provided funds to support the hosting of the Kitikmeot Summer Games and territorial tryouts in Taloyoak in August 2015.
July 2015	Amauligak Dancers	Gjoa Haven	$1,000.00	Sabina provided funds to support the hosting of the 2015-2016 Square Dance Showdown in Gjoa Haven in November 2015.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
July 2015	Kitikmeot Heritage Society	Cambridge Bay	$1,000.00	Sabina provided a donation to support the program titled 'Kuukyuak (Perry River): A Place We Call Home'. This program brought Cambridge Bay residents who are from Kuukyuak onto the land to learn about and document the community of Perry River in August 2015.
September 2015	Kullik Ilihakvik Elementary School	Cambridge Bay	$250.00	Sabina provided a $250.00 Co-op store credit for the purchase of food and supplies to support the Kullik Ilihakvik Elementary School's 2015 Thanksgiving feast.
October 2015	Cambridge Bay Childcare Society	Cambridge Bay	$250.00	Sabina donated a jacket and other corporate promotional items for the Cambridge Bay Childcare Society's annual daycare auction gala.
November 2015	Gjoa Haven Search and Rescue	Gjoa Haven	In-kind	Sabina and ExploreIT Network Solutions donated a refurbished laptop with software included to a local community organization.
November 2015	Hamlet of Gjoa Haven	Gjoa Haven	$500.00	Sabina provided a $500.00 Co-op store credit to the Hamlet of Gjoa Haven to support their 2015 Christmas food and toy hamper program.
December 2015	Cambridge Bay Childcare Society	Cambridge Bay	$500.00	Sabina provided a financial donation to the Cambridge Bay daycare.
December 2015	Cambridge Bay Wellness Centre	Cambridge Bay	$500.00	Sabina provided a financial donation to the Cambridge Bay Wellness Centre for their food bank program.
December 2015	Hamlet of Kugluktuk	Kugluktuk	$500.00	Sabina provided a financial donation to the Kugluktuk food bank.
December 2015	Kakayak Daycare Society	Kugluktuk	$500.00	Sabina provided a financial donation to the daycare in Kugluktuk.
December 2015	Inniitait Daycare Society	Taloyoak	$500.00	Sabina provided a financial donation to the daycare in Taloyoak.
December 2015	Hamlet of Taloyoak	Taloyoak	$500.00	Sabina provided a financial donation to the food bank in Taloyoak.
December 2015	Illaliuvik Daycare Society	Kugaaruk	$500.00	Sabina provided a financial donation to the daycare in Kugaaruk.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
December 2015	Hamlet of Kugaaruk	Kugaaruk	$500.00	Sabina provided a financial donation to the food bank in Kugaaruk.
December 2015	Hamlet of Gjoa Haven	Gjoa Haven	$500.00	Sabina provided a financial donation to the food bank in Gjoa Haven.
February 2016	Kitikmeot Cup Men's Hockey Tournament	Kugluktuk	$1,000.00	Sabina provided a financial donation to support the 2016 Kitikmeot Cup Men's Hockey Tournament in Kugluktuk.
March 2016	Nattiq Frolics	Kugluktuk	$1,000.00	Sabina provided a financial donation to support the 2016 Nattiq Frolics in Kugluktuk.
April 2016	Cambridge Bay Wellness Centre	Cambridge Bay	$5,450.00	Sabina donated a stove, BBQ, fridge, and freezer to the Elder's Palace in Cambridge Bay, in addition to making a financial donation to the Wellness Centre's food drive.
April 2016	Cambridge Bay Frolics	Cambridge Bay	$600.00 and in-kind	Sabina helped sponsor a barbeque for the Cambridge Bay Frolics by providing food and personnel (i.e. John Kaiyogana).
May 2016	Kitikmeot Inuit Association	Cambridge Bay	$5,000.00	Sabina provided a financial donation to support the KIA's 40th Anniversary Celebration.
May 2016	Ikayuqtigiit Project	Gjoa Haven	$1,000.00	Sabina provided a financial donation to support the Ikayuqtigiit Project's on-the–land trips for elders and young parents.
July 2016	Martha Porter (trip coordinator)	Gjoa Haven	$1,000.00	Sabina provided a financial donation to assist with having local boys from Gjoa Haven attend the 'Shoot to Score' hockey camp in Yellowknife.
October 2016	Cambridge Bay Childcare Society	Cambridge Bay	$1,150.00	Sabina donated a new canvas tent to the Cambridge Bay Childcare Society's Annual Dinner and Auction.
November 2016	Kakayak Daycare Centre	Kugluktuk	$500.00	Sabina provided a financial donation to the Kugluktuk daycare.
November 2016	Kugluktuk Christmas Committee	Kugluktuk	$500.00	Sabina provided a financial donation to the Kugluktuk food bank.
November 2016	Cambridge Bay Wellness Centre	Cambridge Bay	$500.00	Sabina provided a financial donation to the Cambridge Bay food bank.

Appendix V3-1F. Record of Donations

Date	Organization	Community	Donation Amount/Value	Notes
November 2016	Anniumapkainiq Food Bank	Gjoa Haven	$500.00	Sabina provided a financial donation to the Gjoa Haven food bank.
November 2016	Inniitait Daycare Society	Taloyoak	$500.00	Sabina provided a financial donation to the Taloyoak daycare.
November 2016	Taloyoak Food Bank	Taloyoak	$500.00	Sabina provided a financial donation to the Taloyoak food bank.
November 2016	Illaliuvik Daycare Society	Kugaaruk	$500.00	Sabina provided a financial donation to the Kugaaruk daycare.
November 2016	Kugaaruk Food Bank	Kugaaruk	$500.00	Sabina provided a financial donation to the Kugaaruk food bank.
January 2017	Nattiq Frolics	Kugluktuk	$1,000.00	Sabina provided a financial donation to support the 2016 Nattiq Frolics in Kugluktuk.
February 2017	Kitikmeot Trade Show	Cambridge Bay	$2,000.00	Sabina helped sponsor the 2017 Kitikmeot Trade Show held in Cambridge Bay.

ADDENDUM APPENDIX V3-1H: DRAFT TERMS OF REFERENCE INUIT ENVIRONMENTAL ADVISORY COMMITTEE (NEW)

INUIT ENVIRONMENTAL ADVISORY COMMITTEE

DRAFT TERMS OF REFERENCE
February 1, 2017

BACKGROUND

Similar to other Projects within the Kitikmeot Region an Inuit Environmental Advisory Committee will be required under agreements between Sabina Gold & Silver Corp. (Sabina) and the Kitikmeot Inuit Association (KIA). These obligations are designed to meet requirements under the Nunavut Agreement. The following Draft Terms of Reference are presented to provide greater clarity on the establishment and ongoing role of the Inuit Environmental Advisory Committee and are based on the public information presented within the Inuit Impact Benefit Agreement between the KIA and TMAC Resources Inc. dated March 30, 2015.

INTENT

Sabina, jointly with the KIA intends to form an Inuit Environmental Advisory Committee for the Back River Project. The use of the Inuit Environmental Advisory Committee will form part of the formal agreements with the KIA.

The purpose of the Inuit Environmental Advisory Committee will be to receive and consider project information that relates to the environment and wildlife, to provide advice to Sabina and KIA about potential environmental or wildlife impacts or concerns, to hear and attempt to resolve concerns from community members related to environmental and wildlife aspects of the Back River Project.

The Parties acknowledge that Sabina has a traditional knowledge licence with KIA, and that while the Inuit Environmental Advisory Committee may further facilitate the exchange of traditional knowledge between the Parties, the Inuit Environmental Advisory Committee is not intended to be the definitive provider of traditional knowledge to the Parties.

INUIT ENVIRONMENTAL ADVISORY COMMITTEE

Within 120 days of the execution of the Commercial Lease, Sabina will establish an Inuit Environmental Advisory Committee. The Inuit Environmental Advisory Committee may develop policies and more detailed terms of reference as required.

MEMBERSHIP OF INUIT ENVIRONMENTAL ADVISORY COMMITTEE

The Implementation Committee will appoint seven (7) Kitikmeot Inuit with knowledge of the Back River Area to be members of the Inuit Environmental Advisory Committee. Inuit Environmental Advisory Committee members will have knowledge about wildlife, fisheries,

traditional land use, archaeology, or water of the Back River Area. Sabina may suggest candidates for the Inuit Environmental Advisory Committee to KIA.

A KIA staff person with responsibility for land, environment and resources will be an ex officio member of the Inuit Environmental Advisory Committee.

The Inuit Environmental Advisory Committee may be supported by KIA staff or appoint additional persons as advisors as required from time to time.

Inuit Environmental Advisory Committee members will serve for a three (3) year term, and may be reappointed for subsequent terms. Appointments will be staggered to ensure that there is continuity of some members at all times. Inuit Environmental Advisory Committee members not acting in accordance with these Terms of Reference may be relieved of membership by KIA.

CONDUCT OF INUIT ENVIRONMENTAL ADVISORY COMMITTEE MEMBERS

Inuit Environmental Advisory Committee members will be required to attend, and actively participate in Inuit Environmental Advisory Committee meetings. A member who fails to attend three successive meetings of the Inuit Environmental Advisory Committee shall be relieved of membership on the Inuit Environmental Advisory Committee. A member may resign from the Inuit Environmental Advisory Committee by submitting written notice to the KIA.

ROLE OF THE COMMITTEE

The Inuit Environmental Advisory Committee will:

a) provide advice to Sabina staff and KIA on potential impacts of the Operations on the environment, wildlife, fisheries, traditional knowledge, traditional land use, and archaeology ; and
b) provide advice to Sabina and KIA on mitigation of potential impacts on the environment, wildlife, fisheries, traditional knowledge, traditional land use, and archaeology.

COMMITTEE RECOMMENDATIONS

All recommendations of the Inuit Environmental Advisory Committee shall be made by consensus of the members.

MEETINGS OF THE COMMITTEE

The Inuit Environmental Advisory Committee will hold an inaugural meeting of the Inuit Environmental Advisory Committee within 1 month of the establishment of the Inuit Environmental Advisory Committee and thereafter hold at least two (2) in-person meetings per year. The Inuit Environmental Advisory Committee may meet more frequently as mutually agreed between KIA and Sabina.

The Inuit Environmental Advisory Committee and its meetings will be governed by this Schedule.

LOCATION OF THE COMMITTEE MEETINGS

The location of the meetings will be in the Kitikmeot Region or at the Back River Project.

CHAIR OF THE COMMITTEE

Sabina senior staff with environment or community responsibilities will chair the Inuit Environmental Advisory Committee.

The chair will be responsible for convening meetings of the Implementation Committee and for setting the agenda for the meetings.

COSTS

Sabina will pay all reasonable costs of all Inuit Environmental Advisory Committee meetings and preparation/production/distribution of materials. Reasonable costs shall be limited to an honoraria at standard KIA rates for members who are not employed by KIA or by Sabina, out-of-pocket travel costs of each member to the location of the meeting from the community from which such member resides, costs of consultants, provision of meeting space, refreshments, production, translation, distribution of meeting materials, and other costs deemed appropriate by Sabina. For greater certainty, these costs are not included in the annual payments by Sabina under the Framework Agreement except for the salary of the ex officio KIA staff member or their designate.

COMMUNICATIONS

Sabina will provide KIA a record of the agenda, minutes, reports, presentation materials, and follow-up items. Sabina will maintain this information in its Kitikmeot Region Office. The KIA Back River Officer will maintain this information on behalf of KIA.

Inuit Environmental Advisory Committee members will direct all news and media inquiries to Sabina and KIA. Any communication to the media will be made by joint Sabina/KIA press release or jointly agreed statements.

If mutually agreed to by KIA and Sabina, the Inuit Environmental Advisory Committee may issue a newsletter or other communications.

SITE VISITS

Sabina will hold at least one site visit annually at the Back River Project for the Inuit Environmental Advisory Committee. Members of the Inuit Environmental Advisory Committee will be permitted to visit any of the Back River Project sites upon reasonable notice to Sabina and when not prohibitive by the nature of site operations.

ADDENDUM APPENDIX V3-2A: RECORD OF MEETINGS WITH GOVERNMENT OFFICIALS (REVISED)

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2012			
June	Fisheries and Oceans Canada – Central and Arctic Region	Yellowknife	Introduction to the Back River Project
July	Northern Projects Management Office - Yellowknife	Yellowknife	Introduction to the Back River Project
	Fisheries and Oceans Canada – Central and Arctic Region	Sudbury	Introduction to the Back River Project and overview of fisheries issues
	Natural Resources Canada	Ottawa	Introduction to the Back River Project
	Fisheries and Oceans Canada – Headquarters	Ottawa	Introduction to the Back River Project
	Aboriginal Affairs and Northern Development Canada - Headquarters	Ottawa	Introduction to the Back River Project
	Environment Canada - Headquarters	Ottawa	Introduction to the Back River Project and discussion of MMER requirements
September	Fisheries and Oceans Canada; Aboriginal Affairs and Northern Development Canada; Transport Canada; Environment Canada; Government of Nunavut; Northern Projects Management Office	Site visit - Back River Project	Familiarization with the Project area and development plans
	Environment Canada – Prairie and Northern Region	Yellowknife	Introduction to the Back River Project; follow-up to site visit
	Northern Projects Management Office	Yellowknife	Project update; follow-up to site visit; discussion of next steps
	Canadian Northern Economic Development Agency	Ottawa	Overview of Sabina's plans for the Back River Project; discussion of opportunities for co-operation across the Kitikmeot Region
	Aboriginal Affairs and Northern Development Canada - Headquarters	Ottawa	Introduction to the Back River Project
	Aboriginal Affairs and Northern Development Canada - Minister's Office	Ottawa	Introduction to the Back River Project
	Senator David Patterson	Ottawa	Introduction to the Back River Project
	Government of Nunavut	Iqaluit	Introduction to the Back River Project
	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Iqaluit	Introduction to the Back River Project
	Aboriginal Affairs and Northern Development Canada – Nunavut Region (technical staff)	Iqaluit	Introduction to the Back River Project; discussion of next steps
	Nunavut Legislature	Iqaluit	Introduction to the Back River Project
	Approximately 25 representatives from various territorial and federal government departments	Iqaluit	General information session
	Northern Projects Management Office	Iqaluit	Discussion of next steps

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2012 (*cont'd*)			
October	Broad cross-section of federal departments organized by the Northern Projects Management Office	Ottawa	General briefing on Kitikmeot Region projects with a presentation on the Back River Project
	Transport Canada – Prairie and Northern Region	Winnipeg	Introduction to the Back River Project
November	Northern Projects Management Office	Yellowknife	Discussion of CanNor's Community Readiness Initiative
December	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Vancouver	Discussion of lands-related issues
2013			
January	Northern Projects Management Office	Yellowknife	Discussion of the Back River Project and its relationship to the Bathurst Inlet Port and Road Project
	Fisheries and Oceans Canada – Central and Arctic Region	Winnipeg	Introduction to the Back River Project
	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Project update
	Transport Canada – Prairie and Northern Region	Teleconference	Project update
	Natural Resources Canada	Teleconference	Project update
	Environment Canada - Headquarters	Teleconference	Project update; MMER review
	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Teleconference	Project update
	Transport Canada – Prairie and Northern Region	Teleconference	Project update; discussion on guidelines for overwintering
	Environment Canada – Prairie and Northern Region	Teleconference	Project update
	Government of Nunavut	Teleconference	Project update
	Northern Projects Management Office	Vancouver	Project update and discussion of next steps
	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Vancouver	Project update and discussion of next steps
	Nunavut Impact Review Board and Nunavut Water Board	Vancouver	Project update and discussion of next steps
	Aboriginal Affairs and Northern Development Canada - Headquarters	Vancouver	Project update
	Senator David Patterson	Vancouver	Project update
	Environment Canada – Prairie and Northern Region	Vancouver	Introduction to the Back River Project
	Government of Nunavut	Vancouver	Project update
February	Northern Projects Management Office	Yellowknife	Discussion of scoping and guidelines related to shipping
	Environment Canada – Prairie and Northern Region	Yellowknife	Discussion of expectations for the analysis of migratory birds along length of shipping route

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2013 (*cont'd*)			
March	Aboriginal Affairs and Northern Development Canada - Headquarters	Toronto	Introduction to the Back River Project
	Northern Projects Management Office	Toronto	Project update
	Natural Resources Canada	Toronto	Project update
April	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Iqaluit	Project introduction
	Northern Projects Management Office	Iqaluit	Project update and discussion of NPMO's co-ordination role
	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Iqaluit	Project update and discussion of next steps
	Environment Canada – Prairie and Northern Region	Iqaluit	Project update and discussion of next steps
	Government of Nunavut	Iqaluit	Project update and discussion of next steps
	Fisheries and Oceans Canada - Headquarters	Ottawa	Project update; discussion of Fisheries Act changes
	Transport Canada - Headquarters	Ottawa	Project introduction
May	Transport Canada – Prairie and Northern Region	Winnipeg	Project introduction; discussion of marine aspects and navigable waters
	Transport Canada – Prairie and Northern Region	Edmonton	Discussion of navigable waters issues
	Environment Canada - Prairie and Northern Region	Edmonton	Project introduction
	Northern Projects Management Office	Teleconference	Project update
	Fisheries and Oceans Canada – Central and Arctic Region	Winnipeg	Project update; discussion of marine aspects and fisheries protection aspects
June	Fisheries and Oceans Canada - Headquarters	Ottawa	Introduction to the Project
	Natural Resources Canada	Ottawa	Introduction to the Project
	Senator David Patterson	Ottawa	Project update
July	Aboriginal Affairs and Northern Development Canada; Fisheries and Oceans Canada; Environment Canada; Natural Resources Canada; Northern Projects Management Office	Site visit - Back River Project	Familiarization with Project location and proposed Project plans
	Government of the Northwest Territories	Yellowknife	Project update and discussion of plans for caribou meetings
August	Fisheries and Oceans Canada - Headquarters	Ottawa	Introduction to the Project; discussion of Fisheries Act changes
	Aboriginal Affairs and Northern Development Canada – Minister's Office	Ottawa	Project update

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2013 (*cont'd*)			
September	Fisheries and Oceans Canada; Environment Canada; Transport Canada; Northern Projects Management Office; Government of Nunavut	Site visit - Back River Project	Discussion of freshwater issues; general familiarization with Project location and proposed plans
	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Iqaluit	Introduction to the Project for new officials
	Aboriginal Affairs and Northern Development Canada – Nunavut Region	Iqaluit	Project update and discussion of next steps; discussion of specific technical issues
	Environment Canada	Iqaluit	Project update and discussion of next steps
	Northern Projects Management Office	Iqaluit	Project update and discussion of next steps
	Government of Nunavut	Iqaluit	Project update and discussion of next steps
October	Fisheries and Oceans Canada - Headquarters	Ottawa	Project introduction and discussion of the Fisheries Act
	Natural Resources Canada	Ottawa	Project introduction and discussion of ARD and permafrost issues
	Canadian Northern Economic Development Agency	Ottawa	Project update and discussion of next steps
	Aboriginal Affairs and Northern Development Canada	Ottawa	Project update and discussion of next steps
November	Northern Projects Management Office	Yellowknife	Project update and discussion of next steps
	Fisheries and Oceans Canada	Yellowknife	Project update and discussion of next steps
	Government of Nunavut; Government of the Northwest Territories	Yellowknife	Project introduction and discussion of caribou
2014			
January	Northern Projects Management Office	Vancouver	Discussion of coordination plans
	Natural Resources Canada	Vancouver	Senior level discussion of issues related to mining in the north
	Government of Nunavut	Vancouver	Senior level briefing for Minister responsible for Mines, staff and officials
	Aboriginal Affairs and Northern Development Canada	Vancouver	Project update and discussion of next steps
February	The Northern Projects Management Office coordinated participation all federal agencies	Teleconference	Informational walk-through of DEIS
	Fisheries and Oceans Canada	Yellowknife	Fisheries offset planning
	Environment Canada	Yellowknife	Project update
	Government of Nunavut and Government of the Northwest Territories	Yellowknife	Discussion on caribou management
March	Aboriginal Affairs and Northern Development Canada	Ottawa	Senior level briefing and Project update
	Northern Projects Management Office	Ottawa	Project update and discussion of next steps

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2014 (*cont'd*)			
April	Aboriginal Affairs and Northern Development Canada	Iqaluit	DEIS discussion and review of next steps
	Environment Canada	Iqaluit	DEIS discussion and review of next steps
	Canadian Northern Economic Development Agency	Iqaluit	Senior level briefing on the Project and how it fits into northern development objectives
	Government of Nunavut	Iqaluit	Senior level Project status briefing
	Government of Nunavut	Iqaluit	DEIS discussion and review of next steps
	Fisheries and Oceans Canada	Yellowknife	Fisheries offset planning
June	Fisheries and Oceans Canada	Yellowknife	Follow-up discussion on fisheries offset planning
July	Fisheries and Oceans Canada	Yellowknife and Bernard Harbour	Site visit to proposed fisheries offset project
	Fisheries and Oceans Canada	Burlington	Senior level briefing on Project status
	Environment Canada	Edmonton	Project update
	Transport Canada	Edmonton	Discussion on Navigation Protection Act requirements
	Aboriginal Affairs and Northern Development Canada	Ottawa	Project update and review of next steps
	Natural Resources Canada	Ottawa	Senior level briefing on Project status
	Canadian Coast Guard (DFO)	Ottawa	Project briefing with a focus on shipping
	Canadian Northern Economic Development Agency	Ottawa	Project update
September	Natural Resources Canada	Teleconference	Discussion on permafrost and acid Rock drainage/metal leaching
October	Aboriginal Affairs and Northern Development Canada	Iqaluit	Discussion on technical comments
	Environment Canada	Iqaluit	Discussion on technical comments
	Government of Nunavut	Iqaluit	Senior level briefing on Project status
	Government of Nunavut	Iqaluit	Discussion on environmental issues
	Northern Projects Management Office	Iqaluit	Preparations for technical meetings
November	Government of Nunavut	Teleconference	Discussion on environmental and socio-economic issues
	All relevant government agencies – NIRB Technical Meeting and Pre-Hearing Conference	Cambridge Bay	NIRB Technical Meeting and Pre-Hearing Conference
2015			
January	Canadian Northern Economic Development Agency	Vancouver	Project update, discussion on shipping and fisheries offsetting
	Aboriginal Affairs and Northern Development Canada	Vancouver	Project update
	Natural Resources Canada	Vancouver	Project update
	Government of Nunavut	Vancouver	Project update

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2015 (*cont'd*)			
March	Aboriginal Affairs and Northern Development Canada	Toronto	Project update
	Canadian Northern Economic Development Agency	Toronto	Project update
April	Aboriginal Affairs and Northern Development Canada	Iqaluit	Senior level briefing
	Aboriginal Affairs and Northern Development Canada	Iqaluit	Technical update
	Canadian Northern Economic Development Agency	Iqaluit	Senior level briefing
	Government of Nunavut	Iqaluit	Senior level briefing
	Government of Nunavut	Iqaluit	Technical update
	Environment Canada	Iqaluit	Technical update
July	All relevant government agencies	Teleconference	Briefing on outcomes of Feasibility Study and next steps
August	GNWT		Project Update/Caribou
September	Environment Canada	Ottawa	Discussion on Metal Mining Effluent Regulations
	Natural Resources Canada	Ottawa	Senior level Project status briefing
	Natural Resources Canada	Ottawa	Technical update
	Canadian Hydrographic Service	Ottawa	Discussion on marine and shipping-related aspects of the Project
	Aboriginal Affairs and Northern Development Canada	Ottawa	Project update
	Aboriginal Affairs and Northern Development Canada	Ottawa	Senior level project briefing
	Fisheries and Oceans Canada	Ottawa	Discussion on fisheries protection
	Transport Canada	Ottawa	Discussion on navigation protection and marine shipping
	Environment Canada	Teleconference	Technical update
	Fisheries and Oceans	Teleconference	Technical Update
October	Transport Canada	Teleconference	Discussion on navigation protection
	Canadian Coast Guard	Teleconference	Marine Shipping
FEIS Submitted			
December	Federal Departments and Agencies	Teleconference	Review of FEIS structure
	Canadian Coast Guard	Teleconference	Marine Shipping
2016			
January	Canadian Northern Development Agency	Yellowknife	Project Update
	Natural Resources Canada	Vancouver	Senior project briefing
	Indigenous and Northern Affairs Canada	Vancouver	Project review
February	Indigenous and Northern Affairs Canada	Toronto	Senior project briefing

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2016 (*cont'd*)			
March	Indigenous and Northern Affairs Canada	Toronto	Senior Nunavut Region Project briefing
	Fisheries and Oceans Canada	Teleconference	Technical Fisheries Discussion
	Environment and Climate Change Canada	Teleconference	Technical Discussion
	Indigenous and Northern Affairs Canada	Teleconference	Technical Discussion
	Government Nunavut	Teleconference	Wildlife Discussion
	Fisheries and Oceans Canada	Teleconference	Fisheries Discussion
April	Indigenous and Northern Affairs Canada	Iqaluit	Project update
	Canadian Northern Development Agency	Iqaluit	Project Update
	Government Nunavut	Iqaluit	Socio-economic discussion
	Indigenous and Northern Affairs Canada	Teleconference	Technical Discussion
Final Hearing			
May	Natural Resources Canada	Ottawa	Project Status
	Canadian Northern Development Agency	Ottawa	Project Status
	Environment and Climate Change Canada	Ottawa	Climate Change; MMER related
	Fisheries and Oceans Canada	Ottawa	Fisheries protection and Fisheries offset
	Indigenous and Northern Affairs Canada	Ottawa	Senior project briefing
	Indigenous and Northern Affairs Canada	Ottawa	Review timelines and status
July	Government Nunavut	Iqaluit	Status and next steps technical
	Government Nunavut	Iqaluit	Senior Project Briefing
	Canadian Northern Development Agency	Iqaluit	Senior Project Briefing
August	Indigenous and Northern Affairs Canada	Ottawa	Update
	Environment and Climate Change Canada	Ottawa	Project Status Briefing
	Fisheries and Oceans Canada	Ottawa	Project Status Briefing
September	Canadian Northern Development Agency	Yellowknife	Project Status Briefing
	Government Nunavut	Yellowknife	Caribou technical discussion
	Government Northwest Territories	Yellowknife	Caribou discussion
2017			
January	Natural Resources Canada	Vancouver	Senior project briefing
	Indigenous and Northern Affairs Canada	Vancouver	Project briefing
	Canadian Northern Development Agency	Vancouver	Project briefing
	Government Nunavut	Vancouver	Senior project briefing

Appendix V3-2A. Record of Meetings with Government Officials

Date	Organization	Location	Purpose
2017 (*cont'd*)			
February	Canadian Northern Development Agency	Ottawa	Senior project briefing and next steps
	Fisheries and Oceans	Ottawa	Fisheries protection and next steps
	Environment and Climate Change Canada	Ottawa	MMER and next steps
March	Natural Resources Canada	Ottawa	Next steps
	Indigenous and Northern Affairs Canada	Ottawa	Next Steps

4. Volume 4 Addenda: Atmospheric Environment

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of the Atmospheric Environment, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

Volume 4 of the FEIS presents the assessment of potential environmental effects to the atmospheric environment associated with proposed Project activities following the application of mitigation and management measures. During development of the FEIS, air quality, and noise and vibration were selected as VECs. Meteorology and climate was considered a Subject of Note and all required information noted in the EIS guidelines was considered.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 8.1.1, 8.1.2, 8.1.3) in respect of the new information provided on the topic of the Atmospheric Environment, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

AIR QUALITY (FEIS VOLUME 4, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

NOISE AND VIBRATION (FEIS VOLUME 4, CHAPTER 2)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

CLIMATE AND METEOROLOGY (FEIS VOLUME 4, CHAPTER 3)

In the Final Hearing Report, the Board expressed that it was not confident that the measures proposed would be sufficient to mitigate effects related to climate change on tailings and waste rock storage areas if the climate continued to warm past the year 2100 where climate change projections are not as well understood. Sabina has prepared new or updated information to address Section 4.2 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.2 under FHR-NIRB-4.2(A) – Effects of Climate Change on Tailings and Waste Rock Storage During Closure.

None of the additional information presented in the FEIS Addendum affects the conclusions presented in the Climate and Meteorology assessment (FEIS Volume 4, Chapter 3).

APPENDICES (FEIS VOLUME 4)

FEIS Appendix	Title	Summary of Change
Appendix V4-1A	Back River Project: 2011-2013 Air Quality Baseline Report	No Changes
Appendix V4-1B	Air Quality Modelling Assessment: Goose Property	No Change
Appendix V4-1C	Air Quality Modelling Assessment: Marine Laydown Area	No Changes
Appendix V4-2A	Back River Project: 2012 Noise Baseline Report	No Changes
Appendix V4-2B	Back River Project: Noise and Vibration Modelling Report	No Changes
Appendix V4-2C	Marine Laydown Area Qualitative Noise Assessment	No Changes
Appendix V4-3A	Back River Project: 2004 to 2014 Meteorology Baseline Report	No Changes
Appendix V4-3B	Climate Change Projections - Model Variation	No Changes
Appendix V4-3C	Climate Change Approach Memo	No Changes
Addendum Appendix V4-3D	Climate Change Memo	New
Addendum Appendix V4-3C	Climate Change Expert Third Party Review	New

4.3 CLIMATE AND METEOROLOGY (ADDENDA)

NIRB Section:	Section 4.2 – Climate and Meteorology	Ref No.:	FHR-NIRB-4.2

Reference to NIRB Report:
Section 4.2 – Climate and Meteorology

Conclusions and Recommendations of the Board (Section 4.2.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board is not confident that the mitigation, monitoring, and adaptive management measures as proposed will be sufficient to mitigate effects related to climate change on tailings and waste rock storage areas because of the highly variable climatic conditions that may be experienced within the project area and the likelihood that covered tailings and support structures would interact with the seasonal active layer sooner and more consistently than predicted. Should the Proponent revise the project proposal for future submission, it is the Board's view that more information about long term monitoring of tailings and tailings storage structures in an Arctic environment with real world examples and discussion of any observed or anticipated climate change effects would be very helpful **[FHR-NIRB-4.2(A)]**.

Issues Highlighted within the Ministers' Referral Letter:
On the issue of climate and meteorology, the Board expressed that it was not confident that the measures proposed would be sufficient to mitigate effects related to climate change on tailings and waste rock storage areas if the climate continued to warm past the year 2100 where climate change projections are not as well understood. However, after reviewing the Board's conclusions, it is not clear why the Board was not confident in the adequacy of the measures put forward by the proponent and interveners to manage the highly variable climatic conditions. Further, it is not clear why, when the coming to pass of any of the predictable scenarios would be detectable early with monitoring and manageable with feasible and implementable measures, the uncertainty was deemed too great. The Report requires further explanation on this point. We also find that further review of these issues is required to give parties the opportunity to address the Board's concerns and develop additional mitigations if necessary.

The Board also expressed its view that more information about tailing storage facilities in an Arctic environment would be helpful. We trust that this information would be sought through further review.

Sabina Response:

For the NIRB's convenience, a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by INAC and agreed to by Sabina that are relevant to the topic of climate and meteorology are provided in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested Text from Final Hearing	Anticipated Party Involvement
Term and Condition	INAC-T-1	The Proponent shall revise the Closure and Reclamation Plan to include an adaptive management component that documents proposed monitoring and mitigation measures to ensure long-term containment of the Tailings Storage Facility and Waste Rock Storage Areas. The revised plan shall include detail on the triggers for implementing alternative mitigation options, and shall be submitted to the Nunavut Water Board during the water licence application process.	INAC

FHR-NIRB-4.2(A) – Effects of Climate Change on Tailings and Waste Rock Storage During Closure

The Board has raised concerns and requested additional information regarding the long-term operations and closure of the waste rock and tailings facilities at the Project. Given the uncertainty associated with a changing climate, the Board identified outstanding concerns with the viability of maintaining freezing conditions beyond closure, as well as proposed mitigation strategies in event the freezing conditions could not be maintained.

Sabina would like to highlight the extensive waste rock and tailings characterization, design, and closure information that was submitted, and made available through the environmental assessment phase. Specifically, the following supporting documents, Information Requests, and Technical Comments were included:

- FEIS Appendix V2-4A: Waste Management Multiple Accounts Analysis Report
- FEIS Appendix V2-7A: Hydrogeological Characterization and Modeling Report
  - Appendix B: Goose Property Talik Thermal Modeling
- FEIS Appendix V2-7C: Site Wide Geotechnical Properties Report
- FEIS Appendix V2-7D: Geochemical Characterization Report
- FEIS Appendix V2-7E: WRSA Design Report
  - Attachment A: Waste Rock Storage Area Thermal Modeling
- FEIS Appendix V2-7G: Tailings Management System Design Report
  - Appendix G: TSF Containment Dam Thermal Modeling
- FEIS Appendix V2-7H: Water and Load Balance Report
- FEIS Appendix V4-3C: Climate Change Approach Memo
- FEIS Appendix V4-3B: Climate Change Predictions
- FEIS Volume 10: Management Plans
  - Chapter 10, Site Water Monitoring and Management Plan
  - Chapter 9, Mine Waste Rock Management Plan
  - Chapter 22, Tailings Management Plan
  - Chapter 29, Mine Closure and Reclamation Plan
- FEIS Information Request Responses (February 2016)
  - F-INAC-IR-4: Tailings Management System Containment Dam Thermal Modeling
  - F-INAC-IR-7: Waste Rock Storage Areas Management Design
  - F-NRCAN-IR-1: Thermal conditions in the Tailings Storage Facility
  - F-GN-IR-2: Tailings Management and Climate Change Modelling
- FEIS Technical Comment Responses (March 2016)
  - F-INAC-TC-7: TMS Thermal Modeling Thawing n-Factor
  - F-INAC-TC-8: TMS Containment Dam Long-Term Thermal Modeling
  - F-INAC-TC-9: Waste Rock Storage Areas Management Design Long-Term
  - F-NRCAN-TC-3: Permafrost and Terrain Stability: Design of Tailing Storage Facility (TSF) - Thermal Conditions
  - F-NRCAN-TC-4: Permafrost and Terrain Stability: Design of Tailings Storage Facility and Waste Rock Storage Area - Cover Thickness

Sabina's objectives for mine closure include the following (FEIS Volume 10, Chapter 29, Section 1.7):

- Design the mine for closure, through the identification of processes and forces that may act upon the mine components after the mine closure and reclamation so that they can be factored into the design and operation of the mine.

- Mine components that will remain after mine closure will be constructed or modified at closure to be physically stable.
- Mine components, including wastes, remaining after mine closure will be chemically stable.
- All practical efforts will be made to ensure that Project components that remain after closure will not require long-term active care.
- Reclamation will consider future use and aesthetics, and the site will be compatible with the surrounding lands once reclamation activities have been completed.

With a focus on these objectives, Sabina developed an approach to climate change (FEIS Appendix V4-3C), and a detailed description of the climate change projections and model variations in which this approach was founded (FEIS Appendix V4-3B).

To further address the concerns raised by the Board in the Final Hearing Report, Sabina commissioned an additional review of this topic by Maritz Rykaart, PhD, PEng, Practise Lead and Principal Consultant (Geotechnical) with SRK, *Back River Project: Considering Climate Change in Tailings Storage Facility and Waste Rock Storage Areas Closure Strategy* (SRK Memo; FEIS Addendum Appendix V4-3D) and a third party peer review of SRK's methodology by Janya Kelly, PhD, Air Quality and Climate Change Specialist and Sean Capstick, PEng, Principal with Golder Associates, *Climate Change Peer Review of Back River Project Waste Rock and Tailings Closure Strategy* (the Golder Memo; FEIS Addendum Appendix V4-3E); both of these documents are attached.

A summary of the key points discussed in both these new documents is provided below:

Best Practices in Arctic Cover Design

Based on the uncertainty associated with future projected climate change, the freezing conditions required for the proposed cover design is difficult to be guaranteed post closure. To address this concern, the proposed cover designs were compared to the cover designs of other mine sites in the Canadian Arctic, including their consideration of climate change, to demonstrate that best practices were being followed.

Freeze encapsulation covers are a well-established practice in northern Canada. These covers have been effectively implemented, or are proposed to be implemented, at least at eight other mines in Nunavut and the Northwest Territories, all of which have taken climate change into consideration.

- Nanisivik Mine, NU
- Mary River Project, NU
- Meadowbank, NU
- Ekati, NWT
- Diavik, NWT
- Snap Lake, NWT
- High Lake, NU (Proposed)
- Meliadine, NU (Proposed)

For a detailed benchmarking of the closure strategies used at these mines compared to the proposed strategy for the Project, see the SRK Memo, Section 4.4.

Through detailed benchmarking, the Project's proposed cover thickness was found to be the thickest compared to cover designs for existing Canadian Arctic mine sites. Based on this assessment, including support by a thermal modelling assessment, the SRK Memo states that any seasonal thawing proposed to take place under current and future projected climate conditions would be contained within the currently proposed 5m cover. With the seasonal thaw taking place within the cover, all intentionally encapsulated materials will remain frozen year round.

Monitoring Program to Observe Freezing Conditions

As part of the ongoing adaptive management plan, performance monitoring will be conducted to measure freeze encapsulation of the cover during Operations and through Closure. This cumulative monitoring will span 21 years and is sufficient monitoring time to inform the decision of whether the freeze encapsulation design needs to be modified or if an alternate mitigation strategy needs to be adopted (SRK Memo, Section 5.1).

This monitoring, along with the most recent projections of future climate change available, will inform whether the freeze encapsulation cover design requires modification through periodic updates to the thermal analysis modelling. Uncertainty is addressed both through the comparison to other existing Arctic mine sites, through the collection of thermal data that would be submitted with annual reports, and through the periodic updates to thermal analysis modelling incorporating the most up to date climate change projections available.

This process will be reviewed annually by an independent, appropriately qualified engineer. If the results deviate substantially from the expected freeze-back monitoring predictions, the variance will be investigated, and if appropriate, the closure strategy will be reviewed and discussed with regulators (SRK Memo, Section 5.3). This is a new, unsolicited commitment not previously stated in the FEIS, the technical review phase, nor the FEIS Final Hearing. This new commitment is meant to add further confidence for the Board that Sabina will ensure adequate monitoring is completed and adaptive management employed.

Mitigation Strategies in the Adaptive Management Plan

The focus of Sabina's adaptive management plan is on determining whether the freeze encapsulation cover design will be robust enough to maintain freezing conditions post-closure under the range of future climate projections, and on the steps to take if freezing conditions are unable to be maintained post-closure. A robust list of mitigation strategies is proposed based on existing strategies in place at other Canadian Arctic mines.

The primary strategy is to increase the cover thickness based on field measurements collected, updated thermal analysis modelling, assuming there is sufficient cover material on site if required. If sufficient material is not available, the storage areas may be consolidated to reduce the need for cover material.

The remaining mitigation strategies involve changing the type of cover considered (water and low infiltration geomembrane) or water treatment. The water treatment would treat the surface drainage and localized seasonal subsurface flow within the active layer emanating from the mine waste facilities.

While the proposed mitigation strategies are less sensitive to a changing climate, the cover designs will still be informed by future climate projections where appropriate, helping to address uncertainty.

Requirements for Additional Mitigation Strategies

Based on Sabina's adaptive management plan, the Project addresses the viability of maintaining freezing conditions post-closure and the uncertainty associated with climate change projections. In addition, as part of demonstrating best practices, the Project provides comparisons to existing Arctic mine sites where the proposed strategies are currently employed.

As part of the closure plan review process, under the Nunavut Water Board, the appropriate regulating agencies will have the opportunity to review the final closure strategy, including the comparison of the modelling and monitoring comparison used to inform the requirement for additional mitigation strategies. There will be opportunity at this point to further refine any requirements for mitigation and what mitigation strategies are being considered. Separate to

the closure plan review process, Sabina will internally review the modelling and monitoring data on a periodic basis.

The Board has stated that they require additional information to support the conclusions or reduce the uncertainty surrounding climate change. Sabina acknowledges the Boards' outstanding and remains willing and able to discuss any issues related to climate change.

With the additional information provided in this Addendum, Sabina has endeavoured to address the concerns of the Board by highlighting the industry leading approach to our waste rock and tailings closure strategy, and our commitment to adaptively manage this strategy. In addition, Sabina is offering a new, unsolicited commitment for an annual geotechnical inspection to be completed by an independent, appropriately qualified engineer.

Using an adaptive management approach, with regularly collected site data and the most current climate change modelling, Sabina is confident that we can continue to employ industry leading practices and implement appropriate mitigation measures should site conditions change in the future.

Attachment:

FEIS Addendum Appendix V4-3D. Climate Change Memo

FEIS Addendum Appendix 4V-3E. Climate Change Expert Third Party Review

ADDENDUM APPENDIX V4-3D: CLIMATE CHANGE MEMO (NEW)

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Memo

To:	Matthew Pickard, VP, Environment & Sustainability,	**Client:**	Sabina Gold & Silver Corp.
From:	Maritz Rykaart, PhD, PEng	**Project No:**	1CS020.008
Cc:	Catherine Paul, Project Engineer	**Date:**	February 14, 2017
Subject:	Back River Project: Considering Climate Change in Tailings Storage Facility and Waste Rock Storage Areas Closure Strategy		

Executive Summary

The Nunavut Impact Review Board (NIRB) has raised concerns regarding the long term operations and closure of the waste rock and tailings facilities at the Back River Project (the Project). Given the uncertainty associated with a changing climate, NIRB identified outstanding concerns with the viability of maintaining freezing conditions beyond closure, as well as proposed mitigation strategies in the event that freezing conditions could not be maintained. This memo provides additional supporting information to address these concerns by:

- Demonstrating that best practices in the field of freeze encapsulation cover design are being followed with comparisons to existing mine sites in the Canadian Arctic;
- Committing to a monitoring program that will observe freezing conditions during the Operations and the Closure phases;
- Outlining the options that would be included as part of Sabina's adaptive management plan to overcome the uncertainties of a changing climate; and
- Providing the triggers that will require mitigation strategies under the adaptive management plan to be implemented if freezing conditions are not maintained Post-Closure.

The proposed Project freeze encapsulation cover designs rely on freezing conditions post closure; however, there is concern that future climate change projections may impact the ability to maintain freezing conditions. The Project has addressed this in a number of ways. First, the proposed freeze encapsulation cover designs were compared to the freeze encapsulation cover designs of other mine sites in the Canadian Arctic. The proposed cover thickness for the Project exceeds current best practice and is thicker than the freeze encapsulation cover designs for all existing mine sites in the Canadian Arctic; any seasonal thawing will take place in the cover and all deposited materials will remain frozen year-round.

As part of ongoing adaptive management, performance monitoring will be conducted to measure the effectiveness of the freeze encapsulation cover during Operations. This monitoring, along with the most recent projections of climate change, will inform whether the freeze encapsulation cover design requires modification through periodic updates to the thermal modeling, including modeling that will be done at the time the application for the closure permit will be filed.

If updated thermal analysis modeling shows freezing conditions are unable to be maintained Post-Closure, the mitigation strategies that are proposed will be implemented. The primary strategy is to increase the cover thickness, and there is sufficient cover material on site if required. The remaining mitigation strategies involve changing the type of cover or water treatment. These strategies have been implemented at other mines in the Canadian Arctic and are less sensitive to a changing climate.

Through Sabina's adaptive management plan, the Project addresses the viability of maintaining freezing conditions in waste rock and tailings Post-Closure and the uncertainty associated with climate change projections.

1 Introduction

1.1 Background

The NIRB identified outstanding concerns regarding the suitability of the long term closure strategy in the Project Final Hearing Report, June 2016 (NIRB, 2016); NIRB cited concerns about the long-term viability of maintaining freezing conditions when considering uncertainty associated with climate change predictions. Furthermore, the NIRB is of the opinion that Sabina did not present credible mitigation strategies in case the proposed closure strategy could not be successfully implemented.

This memo provides additional context pertaining to the proposed waste rock and tailings closure strategy.

The Project will generate two mine waste streams; waste rock and tailings. Geochemical characterization of the waste rock (FEIS Volume 2, Appendix V2-7D) has confirmed that there are two waste rock types; potentially acid generating (PAG), and non-potentially acid generating waste rock (NPAG).

Acid generation of waste rock occurs when sulfides, naturally occurring in the host rock, are exposed to oxygen after it has been mined. This exposure results in a chemical reaction called oxidization. Depending on the type and quantity of sulfides exposed, the reaction time can vary greatly, from days to decades. Acid rock drainage (ARD) occurs if water percolates through oxidized waste rock. The resultant drainage may be acidic and contain elevated concentrations of metals that are also naturally occurring in the host rock.

Tailings geochemical characterization (FEIS Volume 2, Appendix V2-7D) has demonstrated that the tailings deposited into the Tailings Storage Facility (TSF) is PAG; this facility is active for the first two years of mining.

Geochemical testing has also confirmed that reactivity of the PAG tailings and PAG waste rock material is slow (FEIS Volume 2, Appendix V2-7D), suggesting that if left exposed to the natural environment, ARD development would likely not be observed until many decades after the PAG material has been placed.

In order to delay or entirely prevent the onset of ARD, the oxidation process needs to be prevented from happening, i.e., exposure to oxygen must be restricted. Similarly, if oxidation does occur, ARD can be minimized by limiting the amount of water that percolates through the mine waste. Since the potential oxidation rate is very slow, limiting the amount of water percolating through the mine waste would lead to any seepage water staying well within accepted water quality guidelines at the designated downstream receiving environment.

Since the Project is located in the Canadian Arctic, both the waste rock and tailings will naturally freeze (FEIS Volume 2, Appendix V2-7E; FEIS Volume 2, Appendix V2-7G). This frozen state is the most likely future scenario and thus it constitutes an effective means of slowing down the oxidation rate and limiting percolation of water through the mine waste. Therefore, following rigorous thermal analysis, which takes into consideration climate change (FEIS Volume 4, Appendix V4-3C; FEIS Volume 4, Appendix V4-3B), Sabina has proposed a closure strategy for their waste rock storage areas (WRSAs) and TSF tailings, which consists of an NPAG waste rock freeze encapsulation cover of at least 5 m thick. Thus any seasonal thawing would be totally within the NPAG material maintaining all PAG material in the frozen state.

1.2 Previous Work

Waste rock and tailings characterization, design, and closure are described in detail in the Back River Project Final Environmental Impact Statement (FEIS) submitted in November 2015. Specifically, the following supporting documents, Information Requests, and Technical Comments contain the information on which the statements included in this memo are based on:

- Appendix V2-4A: Waste Management Multiple Accounts Analysis Report
- Appendix V2-7A: Hydrogeological Characterization and Modeling Report
  - Appendix B: Goose Property Talik Thermal Modeling
- Appendix V2-7C: Site Wide Geotechnical Properties Report
- Appendix V2-7D: Geochemical Characterization Report
- Appendix V2-7E: WRSA Design Report
  - Attachment A: Waste Rock Storage Area Thermal Modeling
- Appendix V2-7G: Tailings Management System Design Report
  - Appendix G: TSF Containment Dam Thermal Modeling
- Appendix V2-7H: Water and Load Balance Report
- Appendix V4-3C: Climate Change Approach Memo

- Appendix V4-3B: Climate Change Predictions
- Volume 10: Management Plans
  - Site Water Monitoring and Management Plan
  - Mine Waste Rock Management Plan
  - Tailings Management Plan
  - Mine Closure and Reclamation Plan
- FEIS Information Request Responses (February 2016)
  - F-INAC-IR-4: Tailings Management System Containment Dam Thermal Modeling
  - F-INAC-IR-7: Waste Rock Storage Areas Management Design
  - F-NRCAN-IR-1: Thermal conditions in the Tailings Storage Facility
  - F-GN-IR-2: Tailings Management and Climate Change Modeling
- FEIS Technical Comment Responses (March 2016)
  - F-INAC-TC-7: TMS Thermal Modeling Thawing n-Factor
  - F-INAC-TC-8: TMS Containment Dam Long-Term Thermal Modeling
  - F-INAC-TC-9: Waste Rock Storage Areas Management Design Long-Term
  - F-NRCAN-TC-3: Permafrost and Terrain Stability: Design of Tailing Storage Facility (TSF) - Thermal Conditions
  - F-NRCAN-TC-4: Permafrost and Terrain Stability: Design of Tailings Storage Facility and Waste Rock Storage Area - Cover Thickness
- Nunavut Impact Review Board, Final Hearing Report, Back River Gold Mine Project, NIRB File No. 12MN036, June 2016

1.3 NIRB Concerns

The NIRB, in Section 4.2.3 of their Final Hearing Report (NIRB, 2016), makes the following statement:

> *The Board recognizes discussions between federal departments and Sabina regarding the proposed remediation measures for the tailings storage and waste rock areas and their potential future interactions with the seasonal active layer should changes in climatic conditions continue as predicted. During the Final Hearing, the Board questioned Sabina on whether it would apply adaptive management to its model and reclamation plans if climatic conditions were to change in the future (e.g., in 20 years). Sabina clarified that to verify its predictions it would close off certain facilities and conduct tests to assess whether freeze back is occurring and would apply adaptive management measures if required. The Board acknowledges that commitments made by the Proponent sufficiently*

> *addressed concerns raised by federal departments throughout the Review, however, the Board remains uncertain whether the proposed mitigation and monitoring measures, such as the application of a rock cover limited to five metres, would effectively mitigate impacts that could result from climate change on the tailings and rock storage areas. As such, the Board is not confident that the management measures, as proposed, could adapt to greater than expected adverse effects on these project components and maintain the pristine environmental integrity of the project area given the speed that climatic conditions can change and effects can be realized.*

This leads to the NIRB reaching the following conclusions in Section 4.2.4 of their Final Hearing Report (NIRB, 2016):

> *In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board is not confident that the mitigation, monitoring, and adaptive management measures as proposed will be sufficient to mitigate effects related to climate change on tailings and waste rock storage areas because of the highly variable climatic conditions that may be experienced within the project area and the likelihood that covered tailings and support structures would interact with the seasonal active layer sooner and more consistently than predicted. Should the Proponent revise the project proposal for future submission, it is the Board's view that more information about long term monitoring of tailings and tailings storage structures in an Arctic environment with real world examples and discussion of any observed or anticipated climate change effects would be very helpful.*

This memo aims to address these specific concerns and recommendations as outlined by the NIRB.

2 Waste Rock and Tailings Closure Concerns

2.1 Tailings Quantities

At the Project, the life-of-mine ore production is about 19.8 Mt; this is approximately equal to the total amount of tailings that will be produced. Following a rigorous alternatives assessment, it was concluded that the most environmentally protective strategy for tailings management would be constructing a purpose-built TSF to contain the first two years of tailings production. The remaining tailings will be deposited in the exhausted open pits.

The quantity of tailings in the TSF will be 3.8 Mt (3.1 Mm^3); this will be closed by placing at least a 5 m thick cover of NPAG waste rock over the entire facility. The Umwelt Tailings Facility (TF) and Goose Main TF will be closed with a permanent water cover; this is a proven mitigation strategy previously used at Canadian Arctic mines and will ensure appropriate ARD management.

2.2 Waste Rock and Overburden Quantities

At the Project, a total of 64.3 Mt of overburden and waste rock will be generated from open pit and underground operations, and divided as follows:

- Overburden = 5.3 Mt;
- NPAG waste rock = 24.7 Mt (~42%); and
- PAG waste rock = 34.3 Mt (~58%).

Waste rock and overburden will be produced during mining and will be stored in engineered WRSAs located close to each of the open pits. There will be four WRSAs; Umwelt, Llama, TSF, and Echo. Each will be closed by placing at least a 5 m thick cover of NPAG waste rock over the entire facility. At the Project, overburden testing has confirmed this material is NPAG; as such, overburden can be placed either within the frozen zone of the WRSAs, or used as a portion of the cover material.

2.3 Issue

PAG waste rock material will result in ARD, and geochemical source load predictions (FEIS Volume 2, Appendix V2-7D; FEIS Volume 2, Appendix V2-7H) have confirmed that this drainage will not meet discharge water quality criteria. As a result, a mitigation strategy to manage ARD is required.

The best mitigation strategy against ARD is to prevent it before it can develop. This can only be done by preventing the material from oxidizing in the first place, and practically can only be done by sub-aqueously depositing the material immediately after exposure. This option was considered in the rigorous mine waste disposal alternatives assessment (FEIS Volume 2, Appendix V2-4A) completed for the Project, but was not selected since it could not be done without requiring perpetual engineered water retaining structures (i.e., dams).

The Project mine waste rock is however slow to react (FEIS Volume 2, Appendix V2-7D); therefore, the onset of ARD is delayed, potentially by many decades. As a result, the next best strategy for managing ARD can effectively be adopted at the Project. This strategy entails minimizing the amount of percolation that would flow through the mine waste, such that the volume of ARD being released into the environment would be sufficiently small and would not have a detrimental effect (FEIS Volume 2, Appendix V2-7E).

2.4 Waste Rock Exposure Pathways

The Project is located in the continuous permafrost region of Canada. At the Project site, the permafrost is up to 500 m thick, and the active layer thickness averages around 1.5 m. The permafrost is also very cold, having a surface temperature below zero with an annual amplitude of between -6^{o}C and -8^{o}C (FEIS Volume 2, Appendix V2-7C). Climate change projections for the Project site included in FEIS Volume 5, Appendix V4-3B confirmed that continuous permafrost will continue to exist in the region in the very long term. Regional groundwater in this environment is limited to talik zones which are located beneath large natural lakes, and below the deep permafrost. Within this active layer, there is localized seasonal subsurface flow, but this is not connected to the regional groundwater system (FEIS Volume 2, Appendix V2-7A).

Meteoric water (i.e., precipitation in the form of snow and rain) falls on the mine waste rock and some portion of that will percolate into the mine waste and ultimately emerge as drainage. This drainage may appear as surface seepage at the perimeter of the mine waste facility, and will continue as surface flows to overland surface water bodies. In warmer climates without permafrost, drainage may also percolate directly to groundwater underneath the facility without emerging as surface flow; however, at the Project site, a connection between the mine waste facilities and the regional groundwater system is not present.

All of the Project WRSAs and the TSF will be constructed on permafrost (FEIS Volume 2, Appendix V2-7D; FEIS Volume 2, Appendix V2-7E; FEIS Volume 2, Appendix V2-7G), and thermal analysis has demonstrated that within a very short timeframe (less than five years) permafrost aggradation will occur into the mine waste (FEIS Volume 2, Appendix V2-7E). This means there is no hydraulic connection between the mine waste facilities and the regional groundwater system. As a result, none of the mine waste facilities have design elements that would preclude drainage to the regional groundwater since this pathway does not exist.

Therefore, to manage impacts associated with ARD from the mine waste facilities, appropriate mitigation measures should be put in place for managing surface drainage and localized seasonal subsurface flow within the active layer only.

3 Waste Rock and Tailings Closure Options

There are various options available to manage potential for ARD and Sabina has thoroughly investigated these (FEIS Volume 2, Appendix V2-7E). Although some of these options are not viable, there are several possible options that could be implemented if the most favourable option (freeze encapsulation covers) does not work as expected. Below is a summary of the options explored.

3.1 Do Nothing

Leaving the WRSAs and the TSF exposed to the environment will result in the onset of ARD, which will emerge as surface drainage and localized seasonal subsurface flow within the active layer. Geochemical source load predictions (FEIS Volume 2, Appendix V2-7D) and subsequent water and load balance modeling (FEIS Volume 2, Appendix V2-7H) have confirmed that without mitigation this drainage will not meet discharge criteria and therefore the “Do Nothing” closure option is not viable.

3.2 Water Treatment

It would be possible to effectively capture, collect, and treat all surface drainage and localized seasonal subsurface flow within the active layer emanating from the mine waste facilities. The capture and collect methods would entail conventional engineered sub-surface cut-off drains and surface collection channels and ponds. Treatment methods would similarly entail conventional metal treatment systems. This mitigation strategy is completely protective of the environment and has been used, or is currently in use, during the reclamation or progressive reclamation phase at

many northern Canadian mine sites including Lupin Mine, Con Mine, Seabee Mine, Giant Mine, Faro Mine, and Colomac Mine.

Based on geochemical source load predictions (FEIS Volume 2, Appendix V2-7D), water treatment at the Project would have to continue in perpetuity. Therefore, this mitigation strategy is not preferred, but would be an effective final mitigation strategy should all other mitigation strategies prove to be ineffective.

3.3 Relocate and/or Consolidate Waste Rock and/or Tailings

Relocating mine waste to areas where it has better environmental containment is a practical closure strategy and has been adopted at other northern Canadian mines including the Faro Mine, Con Mine, and Giant Mine.

At the Project site, this can best be achieved by relocating PAG material to a natural lake, such that it can be completely submerged and thereby permanently stop ongoing oxidation. This was considered as a proactive mitigation strategy as part of the mine waste disposal alternatives assessment (FEIS Volume 2, Appendix V2-4A) and was in part rejected as the preferred option because Sabina's current understanding is there are no suitable natural lakes in close proximity to the Project. The only way to achieve this would therefore be to construct water retaining structures that would have to be maintained in perpetuity. In addition, placement of PAG mine waste into a natural lake may require listing of the lake under Schedule II of the Metal Mining Effluent Regulations (MMER).

Alternatively, mine waste can be returned to the mined out open pits, which will be flooded into and beyond closure time frames. Sabina is already maximizing this strategy by using open pits as they become available for tailings. At the end of mine life, accounting for the current in-pit water and tailings disposal, additional capacity is available in exhausted open pits that could be used to relocate PAG material. This means a substantial portion of the PAG material on surface could be relocated to these open pits and flooded with a permanent water cover of at least 5 m to mitigate any ongoing ARD concerns.

While this mitigation would be effective, it would be costly to implement, and would have to be carefully evaluated following a rigorous trade-off analysis against other mitigation strategies presented herein.

3.4 Cover System

3.4.1 Concept

Engineered covers are a proven technology to manage PAG mine waste. The cover system is designed to perform specific functions to allow management of the ARD such that the stated closure objectives can be met, which in the case of the Project would be to ensure that all mine waste drainage meets water quality discharge criteria.

3.4.2 Oxygen Reducing Cover

An oxygen reducing cover over the mine waste facilities will prevent or slow down ongoing oxidation. As mentioned in Section 1.1, complete prevention of oxidation is likely not possible, and therefore the attainable and suitable goal would be to slow down oxidation. The most successful oxygen reducing cover is a water cover. This cannot be done with the mine waste facilities at the Project site unless permanent water retaining structures are constructed, which is not deemed a viable long term solution. Relocation to a natural lake or mined out pits was discussed in Section 3.3.

Effective oxygen reducing covers can be constructed using saturated cover materials; however, no suitable fine grained borrow materials are available at the Project site (FEIS Volume 2, Appendix V2-7C). As a result, it was concluded that construction of oxygen reducing covers is not a viable closure strategy.

3.4.3 Infiltration Reducing Cover

By reducing the amount of drainage through the mine waste facility, the volume of ARD is significantly reduced. If this volume of drainage is sufficiently low, the appropriate discharge criteria can be met and thus an infiltration reducing cover can be deemed a viable mitigation strategy.

Infiltration reducing covers in Arctic regions function by shedding water and snow, reducing percolation, or both. Water and snow shedding can be achieved through proper landform design. Reducing percolation can be achieved by constructing the cover with a low-permeability material. There is no suitable natural low-permeability borrow materials at the Project site with which to construct a low infiltration cover (FEIS Volume 2, Appendix V2-7C); therefore, the only viable alternative is to use geosynthetic products such as geomembrane liners. These products are routinely used in the Canadian Arctic for this purpose. Examples include Con Mine, Faro Mine, and Beaverlodge Mine.

Construction of geomembrane covers over the Project mine waste facilities would be an effective means to manage ARD, but it would be very costly to implement. It would therefore have to be carefully evaluated following a rigorous trade-off analysis against other mitigation strategies presented herein.

3.4.4 Freeze Encapsulation Cover

Thermal modeling has demonstrated that the mine waste will naturally freeze back within a short timeframe after placement (FEIS Volume 2, Appendix V2-7E; FEIS Volume 2, Appendix V2-7G). By constructing a freeze encapsulation cover over the PAG material, the material can be kept in a frozen state as a permanent closure strategy. In the frozen state, the rate of oxidation is substantially reduced and the drainage is reduced to zero. This strategy has been successfully applied, or proposed, at many different mines in the Canadian Arctic (Section 4) which is why it has been selected as the preferred mitigation strategy for closure of the Project mine waste facilities.

4 Freeze Encapsulation Mine Waste Cover

4.1 Design Concept

Although there is no suitable natural borrow materials at the Project site with which to construct a freeze encapsulation cover (FEIS Volume 2, Appendix V2-7C), about 58% of the mine waste rock is NPAG and can be used as cover material. The closure strategy therefore entails placing a layer of NPAG material over any PAG material, sufficiently thick that the active layer will be maintained entirely within the NPAG cover material. This will ensure that the underlying PAG material will not produce ARD since the percolation component has been eliminated.

4.2 Thermal Analysis

Comprehensive thermal analysis was carried out to determine what thickness the NPAG cover should be (FEIS Volume 2, Appendix V2-7E; FEIS Volume 2, Appendix V2-7G). Subsequently a cover thickness of at least 5 m was proposed.

The thermal analysis took into consideration climate change in all scenarios, and was based on best practice procedures. All thermal modeling was completed to the year 2100 (FEIS Volume 4, Appendix V4-3C; FEIS Volume 4, Appendix V4-3B). Thermal modeling of coarse WRSAs is a complex process and the analysis outcome is dependent on the modeling assumptions and input variables. Subsequently, the analysis presented (FEIS Volume 2, Appendix V2-7E; FEIS Volume 2, Appendix V2-7G) considered a broad and comprehensive sensitivity analysis to demonstrate uncertainty. The resultant “Base Case” demonstrates that for the duration of the modeling period, the 5 m NPAG cover would achieve the goal of ensuring frozen conditions within the PAG material. However, all thermal analysis results (which includes an allowance for climate change) show a constant and indefinite warming trend, which if extrapolated beyond the year 2100 will inevitably reach a point where frozen conditions in the PAG material cannot be maintained. The reasons for this, and the rationale for limiting thermal analysis to the year 2100 is described further in Section 4.3 below.

Due to the inherent uncertainty associated with the thermal analysis, the “Base Case” was intentionally chosen to be highly conservative. Some of the more “realistic” sensitivity analysis scenarios suggest substantially improved performance of the freeze encapsulation cover. The thermal analysis was reviewed by various technical experts including Dr. Lucas Arenson of BGC Engineering Inc. on behalf of the Kitikmeot Inuit Association (KIA), and Dr. Sharon Smith of Natural Resources Canada. Both of these individuals are preeminent experts in the field of permafrost engineering and thermal analysis, and they concluded that the analysis was appropriate and conservative.

4.3 Climate Change

A rigorous assessment of climate change, in accordance with accepted best practice, was presented (FEIS Volume 4, Appendix V4-3C; FEIS Volume 4, Appendix V4-3B). Although there is no question that climate change is occurring, there is a general understanding regarding the great uncertainty in predicting climate change, particularly regional climate change, into the future. To

that end, it is recognized that predictions beyond the year 2100 are associated with a very significant degree of uncertainty (FEIS Volume 4, Appendix V4-3C; FEIS Volume 4, Appendix V4-3B). The Department of Environment and Climate Change Canada (ECCC) publishes climate change model predictions for all of Canada only to the year 2100 for this very reason. However, the mathematical algorithms allow predictions to be made beyond this timeframe. In doing this, the changes have no upper bound and therefore predict constant climate change trends in perpetuity. For example, mean annual air temperature is predicted to increase up to the year 2100, and if the model is extrapolated beyond that time then climate change is predicted to continue to increase indefinitely. A comprehensive discussion describing the rationale for limiting climate change predictions to the year 2100 was presented in Sabina's March 2016 Responses to Technical Comments, specifically F-INAC-TC-8 and F-INAC-TC-9. This matter was also described in detail by Dr. Maritz Rykaart, PEng. Principal Geotechnical Engineer on behalf of Sabina at the final public hearing (Final Hearing Transcript Volume 5, April 29, 2016, Pages 241-247).

4.4 Closure Strategy Benchmarking

Freeze encapsulation covers are a well-established practice in northern Canada. The covers have been effectively implemented, or are proposed to be implemented, at least at eight other mines in Nunavut and the Northwest Territories, all of which have taken climate change into consideration (Table 1).

Table 1 summarizes measured and modeled waste rock active layer and cover thickness. These results are graphically presented in Figure 1. When directly comparing the waste rock active layer and cover thickness from other mine sites to those estimated for the Project, care must be taken to consider site-specific conditions. Some of these considerations include local climate, waste rock type, material placement history, facility design, stage of operation, and reactivity of the material.

Table 1: Comparative Waste Rock Thickness

Mine	Latitude	MAAT (°C)	Facility	Active Layer Measurement Type	Waste Rock Active Layer Thickness[1]	Proposed or Constructed Cover		
						Cover Type	Cover Details	Cover Thickness
Nanisivik Mine, NU	73°02'	-14.8	Area 14 WRSA	Observed	1.2 m[2]	Freeze Encapsulation Rock Cover	Two-layer cover: 2.0 m NPAG (shale) overlain by 0.35 m soil (sand and silt)[5]	2.30 m
				Modeled (Conduction)	(2.2 m)			N/A
			Oceanic View Pit WRSA	Observed	1.4 m[2]			2.20 m
			West Pit WRSA		2.0 m[2]			2.35 m
			East Pit WRSA		~1.2 m[2]			2.35 m
			Test Cell Tailings	Modeled (Conduction)	(1.25 m)		Two-layer cover: 1 m NPAG (shale) overlain 0.25 m soil	1.25 m[6]
				Observed	~0.95 m			
			Surface Cell Tailings	Observed	1.2 m			
Mary River Project, NU	71°20'	-13.3	Porous waste rock	Modelled (Conduction and Air Convective)	50 - 100 m	Freeze Encapsulation Rock Cover	One-layer cover: 2-3 m NPAG waste rock	2.00 - 3.00 m
			Non-porous waste rock	Modelled (Conduction)	3 m			
High Lake, NU	67°22'	-11.8	Waste rock pile	Modelled (Conduction)	-	Freeze Encapsulation Rock Cover	One-layer cover: 1-3 m NPAG waste rock	1.00 - 3.00 m
Meadowbank, NU	65°01'	-11.1	Portage Rock WRSA	Observed	~1.5 m	Freeze Encapsulation Rock Cover	One-layer cover: 4 m NPAG waste rock	4.00 m
				Modelled	-			
			NPAG Waste Rock over tailings	Modelled	-		One-layer cover: 2 m NPAG waste rock	2.00 m[6]
Back River Project, NU	65°29'	-10.6	WRSAs	Modelled (Conduction)	3.0 - 6.2 m (4.4 - 9.9 m)	Freeze Encapsulation Rock Cover	One-layer cover: 5 m NPAG waste rock	5.00 m
Meliadine Project, NU	65°01'	-10.4	NPAG Waste Rock over tailings	-	-	Freeze Encapsulation Rock Cover	Two-layer cover: 2.5 m NPAG waste rock underlain by 0.5 m soil	3.00 m[6]
Ekati, NWT	64°43'	-10.2	Panda/Koala WRSA	Observed	<2 - 3.8 m	-	-	-
			Panda/Koala WRSA Toe Berm		2 - 3.4 m			
			Fox WRSA (uncovered)		4.8 - 6.0 m			
			Fox WRSA Toe Berm		1.5 - 4.0 m			
			Misery WRSA		2.5 - 14 m[3]	Freeze Encapsulation Rock Cover	One-layer cover: 5 m NPAG waste rock	5.00 m
			Pigron WRSA	Modelled (Conduction)	2.4 m (3.6 m)	Freeze Encapsulation Rock Cover, Latent Heat Layer	Two-layer cover: 1 m NPAG waste rock underlain by 3 m of saturated soil (till)	4.00 m
				Modelled (Conduction)	3.3 m (5.0) m	Freeze Encapsulation Rock Cover	-	-
Diavik, NWT	64°30'	-9.1	Test Pile	Observed (with cover)	2 m	Freeze Encapsulation Rock Cover, Latent Heat Layer	Two-layer cover: 3.0 m NPAG (type 1 rock) underlain by 1.5 m saturated soil (till)	4.50 m
			North Country WRSA	Observed (no cover)	7 m[2]			
				Modeled (Conduction)	~ 3 m (3.9 m)[4]			
				Modelled (Conduction and Air Convection)	~2 m (2.5 m)[4]			
			Processed Kimberlite Tailings	-	-		Two-layer cover: 3.0 m NPAG (type 1 rock) underlain by 0.5 m saturated soil (till)	3.50[6]
Snap Lake, NWT	63°36'	-7.7	North Pile WRSA (active deposition)	Observed	1.6 - 8.6 m	Freeze Encapsulation Rock Cover	One-layer cover: 4 m NPAG	4.00 m

Foot Notes:

[1] Modelled long-term waste rock active layer thickness with consideration of climate change shown in parentheses

[2] Observed active layer continues to decrease with continued heat loss from the underlying waste rock

[3] Deep active layer thought to be associated with proximity to side slopes and accumulation of snow

[4] Modelled active layer for 5 years after cover placement

[5] Minor variability in cover layer thickness for facility

[6] Reduced rock-fill cover thickness for tailings facilities due to tailings properties which alter the thermal regime and reduces active layer thickness

Freeze encapsulation cover thickness is also dependent on cover type and design, which is specific to each waste rock or tailings facility. For example, freeze encapsulation covers consisting of well-drained NPAG waste rock or geochemically suitable quarry rock are expected to exhibit greater active layer thaw when compared to freeze encapsulation covers with a two-layer design (i.e., a coarse rock layer underlain by fine-grained, high moisture content soil forming a latent heat layer).

These two freeze encapsulation cover types inherently have different physical and thermal properties which alter heat transfer and seasonal thaw. Freeze encapsulation covers also include air convection covers (ACC) that are constructed with screened coarse NPAG rock of high air permeability. During the freezing season (winter), thermal gradients result in difference in air density through the cover which allows for greater air circulation and enhanced heat loss. The low heat-transfer properties (low thermal conductivity) of the coarse, well-drained rock also limits the input of heat during the thawing season (summer).

Table 1 shows cover thickness is generally greater at more southerly sites which exhibit warmer mean annual air temperature (MAAT) and longer periods of seasonal thaw. Whereas, northerly sites located at higher latitudes exhibit colder MAAT, shorter periods of seasonal thaw, and require less cover material to maintain the active layer within the cover.

NPAG freeze encapsulation covers for waste rock storage areas range from 2.2 m to 5.0 m in thickness. While for tailings, the freeze encapsulation covers range from 1.2 m to 3.5 m thickness, excluding the 5.0 m cover proposed at the Project site. This is illustrated graphically in Figures 1, 2, and 3.

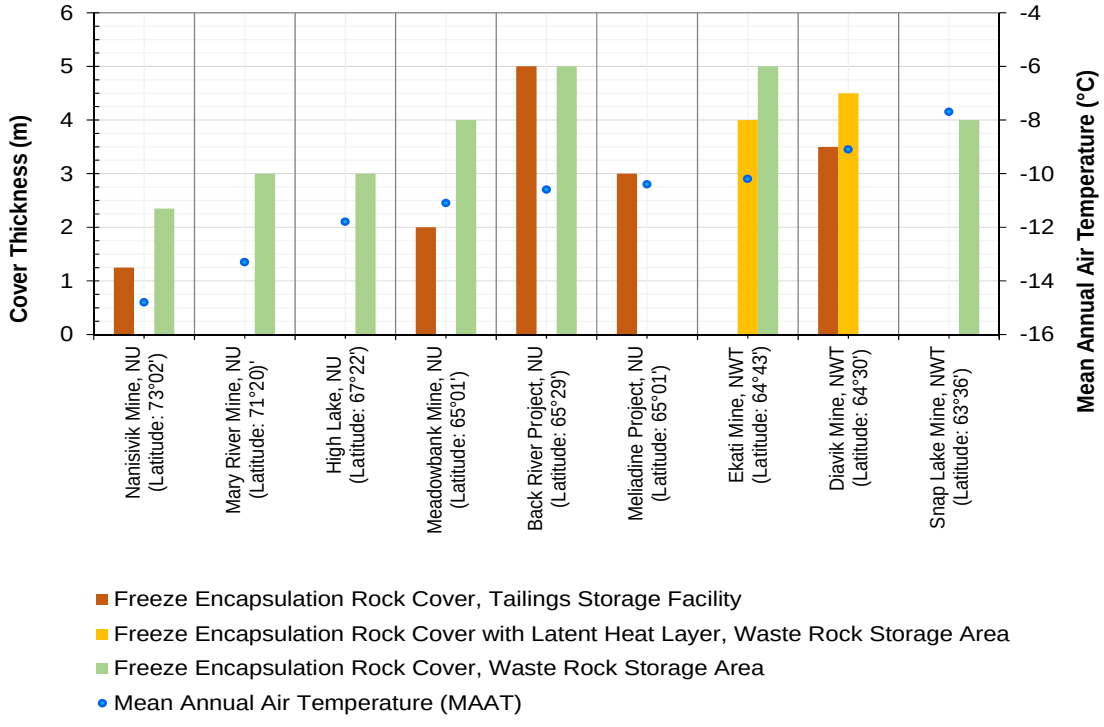

Figure 1: Overall Summary of Freeze Encapsulation Covers in the Canadian Arctic

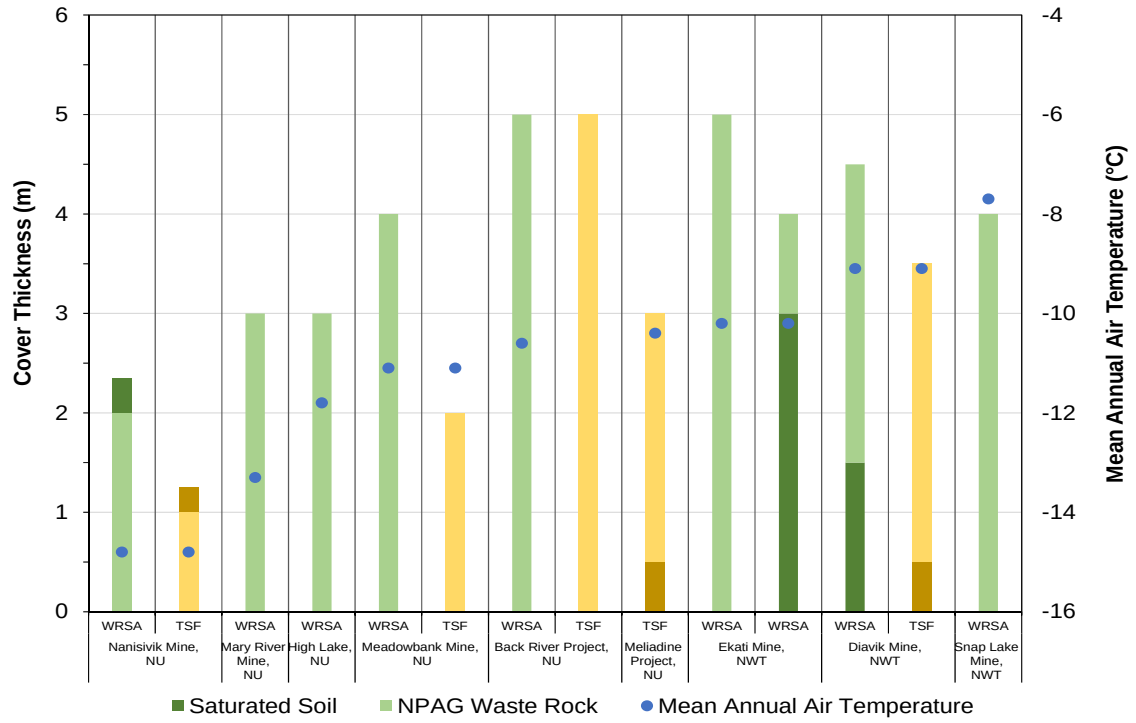

Figure 2: Details of Freeze Encapsulation Covers in the Canadian Arctic

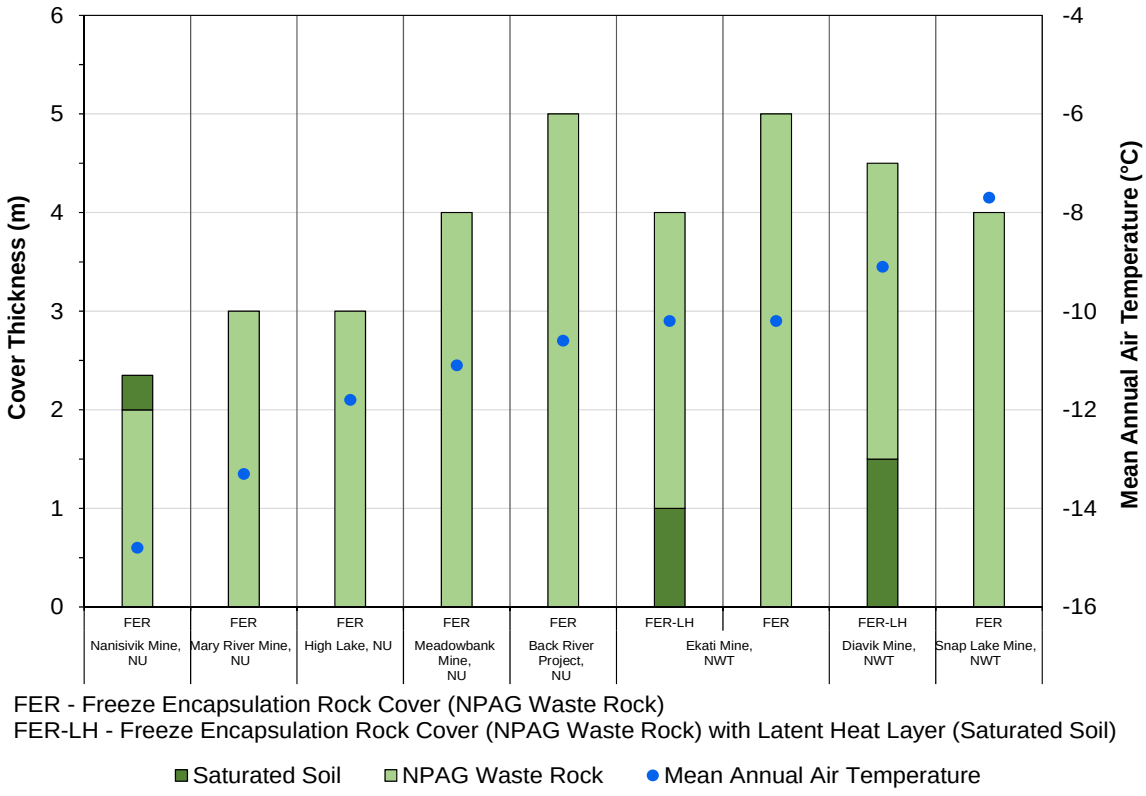

Figure 3: Freeze Encapsulation Covers for WRSAs in the Canadian Arctic

Freeze encapsulation cover thickness is reduced when designed with a latent heat layer. For example, the cover thickness for the Ekati Mine is estimated to be 5 m when constructed completely of NPAG rock and 3.6 m for a freeze encapsulation cover with a latent heat layer (Figure 2). For similar reasons, the required thermal protection cover thickness for tailings is less when compared to waste rock storage areas (Figure 1).

At some sites, the present-day waste rock active layer may exceed the thickness of the thermal protection cover due to ongoing placement of material or the thermal regime which is currently in thermal disequilibrium with surface conditions (Table 1). However, over time and with limited heat generation from the PAG rock, the net heat loss from the waste rock will lead to a decreased active layer thickness as the thermal regime shifts toward colder conditions. The described decreased active layer thickness is consistent with numerical thermal model results for these systems and has been observed at a number of Canadian sites, such as the Nanisivik Mine WRSAs.

Based on the presented benchmarking data, the thickest WRSA freeze encapsulation cover proposed at any Canadian Arctic mine is 5 m. This is proposed at the Ekati Mine and at the Project site. The MAAT at Ekati Mine is however about 4% warmer than the Project site, which means that the proposed minimum 5 m cover at the Project site is more conservative; and therefore, the thickest and most protective freeze encapsulation cover proposed in the Canadian Arctic to date.

At 5 m thick, the TSF cover at the Back River Project is by far the thickest tailings freeze encapsulation cover proposed for any Canadian Arctic mine. The closest comparable cover is the 2 m thick cover at Meadowbank Mine, followed by the 3 m and 3.5 m thick covers at the Meliadine Mine and Diavik Mine, respectively. However, the latter two covers include a 0.5 m thick latent heat layer.

5 Adaptive Management

5.1 Timing

The Project mine plan will result in the first WRSA being completed by Project Year 2. The implication of this would be eight years of performance monitoring data pertaining to the freeze encapsulation cover during Operations that will be available by the time closure activities on the Project site have to be implemented. Monitoring of WRSAs will continue through Closure and into Post-Closure. This cumulative monitoring will span 21 years and is sufficient monitoring time to inform the decisions surrounding whether the freeze encapsulation design needs to be modified, or if an alternate mitigation strategy needs to be adopted. As part of the decision making process, the latest climate change projections will also be considered alongside the monitoring data.

5.2 Monitoring

The primary monitoring method to confirm the performance of the freeze encapsulation cover is ground temperature cables. These cables will be installed through the completed waste rock storage areas (including the TSF WRSA) into the underlying foundation. Ground temperature

beads on the cables will be spaced to allow measurement of the active layer thickness as well as freeze back in the deeper profile. A series of installations will be completed to allow for a comprehensive understanding of different thermal aspects of the WRSAs. Specific shallow thermal seasonal measurements to confirm and calibrate thermal modeling will also be carried out on the mine waste facilities.

Additional monitoring data such as geochemical characterization of the waste material during placement, and ongoing seep surveys over time, will complement the thermal data.

Finally, on-site stations will measure climatic variables, building on the existing site specific climatic database for the Project. These data will be compared to the climate change projections presented as part of the Project, as well as the most recent climate projections available from updated climate change modeling in order to understand how the actual site conditions compare to the information used to inform the Project design.

5.3 Triggers

During Operations, thermal modeling will be periodically recalibrated using the most recent climate observations and climate change projections. Thermal modeling will provide predictions under current climate conditions of freeze back temperatures and rates, active layer thickness, depth of zero annual amplitude, and thermal gradient. It will therefore be possible to track observed freeze back temperatures and rates, active layer thickness, depth of zero annual amplitude, and thermal gradient against modeled values.

If the measured values deviate substantially from predicted values, the source of the variance will be investigated. As part of this investigation, the impact of the variance under future climate change conditions will also be considered. If, based on the analysis under current and future climate conditions, it is concluded that the proposed freeze encapsulation cover closure strategy may no longer be effective, then alternate mitigation strategies will be implemented.

Guidance regarding how effective the mine waste freeze back is; and therefore, the potential success of the freeze encapsulation cover, needs to be provided by an appropriately qualified expert. For this reason, Sabina will, as part of their Annual Geotechnical Inspection, require an independent review of the monitoring data as described in Section 5.2. Based on the third party expert opinion of the qualified Professional Engineer conducting the inspection and subsequent data analysis, supplemented with recalibration thermal analysis if appropriate, Sabina will discuss the need for alternate closure strategies with the appropriate Regulator.

5.4 Mitigation Strategies

Monitoring and modeling will be used to conclude whether the 5 m NPAG cover is sufficient to ensure the underlying PAG rock remains frozen in the Post-Closure phase. If the cover is not sufficient, the following alternative mitigation strategies would be evaluated in the following order of preference:

1. Increase in NPAG cover thickness: Should thermal monitoring demonstrate that an increased cover thickness would yield the required protection under future climate conditions, the NPAG cover thickness would be increased as necessary. Since there is access to additional NPAG waste rock at the Project site, this is a realistic and appropriate mitigation strategy. Additionally, it is possible to further reduce the PAG material footprint by consolidating PAG WRSAs. This would allow for an even greater ability to increase the NPAG cover thickness.

2. Relocation of PAG material to exhausted open pits: As described in Section 3.3, it is possible to relocate much of the PAG material to the Goose Main and Llama open pits during Closure, which would allow the material to be covered with a permanent water cover. This is a proven mitigation strategy previously used at Canadian Arctic mines (see Section 4.3 for examples) and will ensure appropriate ARD management. Should it be concluded that an NPAG waste rock cover of 5 m or greater will not provide the required environmental protection post-closure, a trade-off study will be conducted to determine whether PAG material relocation, construction of a low infiltration cover, water treatment, or a combination of these three mitigation methods would be most suitable for implementation.

3. Design and construction of geomembrane low infiltration cover: Low infiltration geomembrane covers are a proven technology in the Canadian Arctic to manage ARD (see Section 4.4 for examples). If it is concluded that an NPAG waste rock cover of 5 m or greater will not provide the required environmental protection post-closure, a trade-off study will be conducted to determine whether PAG material relocation, construction of a low infiltration cover, water treatment, or a combination of these three mitigation methods would be most suitable for implementation.

4. Water treatment: Water treatment is a tried and tested technology used routinely in Canadian Arctic mines (see Section 4.2 for examples) to manage ARD. If none of the other mitigation strategies can be practically implemented to manage ARD, water treatment will be the final mechanism to be adopted.

6 Conclusions

The Back River Project mine waste rock and tailings contains PAG material that is slow to react. Following a rigorous alternatives assessment, it was concluded that an appropriate environmentally protective strategy for mine waste management would entail construction of a conventional TSF to contain the first two years of tailings production. The remaining tailings will be contained within exhausted open pits with a permanent water cover.

PAG waste rock will be stored on land in four separate WRSAs. Each of these facilities will be clad with at least 5 m of NPAG waste rock or overburden. This cladding serves as a freeze encapsulation cover which will ensure that in the long term the active layer does not penetrate the underlying frozen PAG material. The 5 m cover is based on rigorous thermal modeling taking into consideration best estimates of climate change. Recognizing uncertainty associated with thermal modeling and climate change projections, the thermal analysis included a detailed sensitivity analysis. This analysis demonstrated the considerable conservatism in modeling assumptions, but also recognized that there may be conditions under which a 5 m thick cover may not provide sufficient environmental protection Post-Closure.

Notwithstanding these considerations, the 5 m thick freeze encapsulation covers proposed for the Project are not a new or experimental technology as they are currently being proposed, or are in use, at eight other Canadian Arctic mine sites (Table 1). The waste rock covers proposed for the Back River Project are the thickest and most protective covers proposed to date for any Canadian Arctic mine site. In fact, the Back River Project TSF cover is 43% thicker than the thickest cover currently proposed at other mine sites.

Based on the mine development schedule at the Project site, the first WRSA will be completed in Year 2 of the mine life allowing for performance monitoring of the NPAG cover during the Operations stage, eight years before the final closure plan needs to be implemented. Monitoring of WRSAs will continue through Closure and into Post-Closure. During this time, comprehensive monitoring of the cover system will be completed using routine, well-established monitoring tools, procedures, and systems. The freeze back temperature and rate, active layer thickness, and depth of zero annual amplitude within the WRSA and associated NPAG cover will be monitored and continuously compared with a calibrated thermal model. Along with the consideration of the most recent climate projections, this will allow for a good estimate of whether the performance of the NPAG cover system would be attainable Post-Closure.

Should it be determined that the 5 m NPAG cover is not sufficient to ensure Post-Closure environmental protection against ARD, various mitigation strategies are available. This includes increasing the NPAG cover thickness with material that is available, relocating PAG material to available space within the exhausted open pits, covering the PAG material with a low infiltration geomembrane cover, and finally collection, capture, and treatment of impacted drainage water. All of these mitigation strategies can be implemented at the Project site as they are all proven mitigation strategies currently being used at other Canadian Arctic mine sites.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

ADDENDUM APPENDIX V4-3E: CLIMATE CHANGE EXPERT THIRD PARTY REVIEW (NEW)

February 14, 2017 Project No. 1545534.9000.9002

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PEER REVIEW OF BACK RIVER PROJECT WASTE ROCK AND TAILINGS CLOSURE STRATEGY

Dear Matthew,

Golder Associates Ltd. (Golder) has been retained by Sabina Gold & Silver Corp. (Sabina) to perform an independent third party peer review of the memorandum titled “Back River Project: Considering Climate Change in Tailings Storage Facility and Waste Rock Storage Areas Closure Strategy” (SRK Memo). Overall, the SRK Memo is comprehensive and has sufficient details on how climate change uncertainty can be addressed in the design of the Tailings Storage Facility and Waste Rock Storage Areas. The SRK Memo provides an overview of best practices in cover design, proposes a monitoring plan to reduce the uncertainty associated with projected future climate change, and provides a robust adaptive management plan. The adaptive management plan provides clear recommendations for additional mitigation strategies currently being considered, and the triggers for the implementation of additional mitigation strategies, which are informed by the monitoring and modelling information gathered during the Operations and Closure phases.

Specific comments are provided on each of these areas and additional information on climate change uncertainty analysis is provided for greater context. Golder has been active in the mining community in Canada for over 50 years, with active projects in the Canadian Arctic for more than 25 years. Golder, represented by the authors of this letter, has served as the climate change lead for several mines in Canada and internationally, including the Agnico Eagle Meliadine gold mine in Nunavut. Outside of mining, the authors have acted as the climate change lead for over twelve other Environmental and Social Impact Assessments (ESIAs). Golder also provides a number of climate change adaptation and mitigation services outside of the ESIA framework. Golder provided advisory services to the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) as part of the Project Advisory Council for a review of Climate Change Vulnerability assessments as part of Environmental Impact Assessments in the Mining Sector. Golder also provided advisory services to OCCIAR to develop Climate Change Vulnerability case studies for mining operations include a Cost Benefit Analysis that compared “no action” against implementing adaptive management options. In the Arctic, Golder completed the identification of climate risks for large infrastructure and mining operations in Nunavut for the Regional Adaptation Collaborative (RAC). This work assessed vulnerabilities and recommended adaptive measures and best practices. Golder has conducted a number of workshops using a risk based assessment with Government and mining stakeholders. Additional information on the qualification of the authors is included at the end of the memo (Technical Credentials of Reviewers), and curriculum vitae for both authors are provided in Attachment A.

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Overview of the SRK Memo

The SRK Memo begins with a plain language summary providing an overview of how the comments from the NIRB Letter are addressed. The following table outlines the sections of this memo and what information is contained in each.

Table 1: Description of SRK Memo Contents

Section Title	Description
Introduction	This section provides background information on the Back River Project, the previous work already completed for the Project, and the concerns raised by the NIRB in the FEIS Final Hearing Report.
Waste Rock and Tailings Closure Concerns	This section provides a description of tailings, waste rock, and overburden generation at the Project. Acid rock drainage (ARD) is discussed as a key subject that requires a mitigation strategy. The pathways for waste rock exposure are discussed to understand what types of mitigation strategies could be required.
Waste Rock and Tailings Closure Options	This section discussed the possible mitigation strategies, based on the exposure pathways of the previous section. Four possible strategies are considered, with the emphasis placed on the fourth: designing a cover system to manage the acid rock drainage and meet water quality discharge criteria. Three cover designs are compared including a description of approach and any known limitations.
Mine Waste Freeze Encapsulation Cover	This section describes the freeze encapsulation cover in detail, including how thermal analysis and climate change projections are used to inform the chosen design. Descriptions of the thermal analysis carried out and the climate change projections considered are provided. The Project TSF cover design is benchmarked against other freeze encapsulation covers at existing mines in the Canadian Arctic to establish the design as a best practice.
Adaptive Management	This section provides an overview of the adaptive management plan, including timing, monitoring, and a discussion of when mitigation strategies would be required. The timing refers to when the adaptive management plan will be put in place. The monitoring will be used to inform periodic updates of the thermal analysis which, along with climate change projections, will inform the decision on whether additional mitigation strategies are required. Mitigation strategies are proposed in order of preference, and are based on the current understanding of the exposure pathways.
Conclusions	The conclusion provides an overview of the proposed approach for the closure strategy.

The aim of the SRK Memo is to provide additional supporting information regarding the long-term operations and closure of the waste rock and tailings facilities at the Back River Project, including the viability of maintaining freezing conditions beyond closure. The SRK Memo addresses these concerns by:

- demonstrating that best practices in the field of cover design are being followed with comparisons to cover designs for existing mine sites in the Canadian Arctic;
- committing to a monitoring program that will observe that freezing conditions are occurring during the operations and closure;
- outlining the mitigation strategies that could be included as part of an adaptive management plan to overcome the uncertainties of a changing climate in the future;

- reviewing the requirements for additional mitigation strategies under the adaptive management plan to be implemented if freezing conditions are not maintained post closure; and
- discussing the uncertainty regarding climate change.

The following sections outline the listed approaches in further detail.

Considering Best Practices in Field of Cover Design

In the SRK Memo, Sections 3.4.4 and 4.0 discuss the freeze encapsulation cover design. In essence, the mine waste materials are placed in the ground in a region of continuous permafrost, promoting freeze back within a short time after placement. A thick layer of cover material is added so that the active layer for seasonal thaw will be maintained entirely within the cover material, which is essential for maintaining the freezing conditions of the mine waste material. Based on the uncertainty associated with future projected climate change considered by SRK (Section 4.3), the freezing conditions required for the proposed cover design for the waste rock storage areas (WRSAs) and tailings storage facilities (TSFs) could not be guaranteed post-closure. SRK compares the proposed cover designs to the cover designs of other mine sites in the Canadian Arctic. SRK states that the other mine sites considered have included climate change considerations in their designs (Section 4.4); the cover designs from other mine sites were not reviewed as part of this peer review. The benchmarking exercise compares both the measured and modelled waste rock active layer and the cover thickness. Site-specific conditions are considered including differences in local climate and other factors that may influence the freeze encapsulation cover.

When reviewing other mines in the Canadian Arctic, the thickest WRSA freeze encapsulation cover proposed is 5 m. While this is the same as the proposed thickness for the Back River Project, the climate at other mines is warmer, which adds further conservatism to the Back River Project cover thickness. The Back River Project proposed cover thickness of 5 m is approximately 1 m thicker than the largest cover thickness of 3.5 m at other Arctic mines (including the latent heat layer).

The proposed cover design is consistent or better than the best practices exhibited at other mines in the Canadian Arctic in terms of the thickness considered to maintain the seasonal thaw within the cover, leaving the deposited material frozen year round. The SRK Memo addresses uncertainty in future climate projections through design and the adaptive management plan. As part of the cover design, sensitivity studies were conducted to address the uncertainty around the proposed cover thickness, including future climate change considerations. The documentation available from other mines may have been limited, preventing direct comparisons on the inclusion of climate change projections in their cover designs. However, the thermal modelling analysis used to inform the cover design, including the sensitivity studies, are peer-reviewed by experts in the field of permafrost engineering and thermal analysis. Golder agrees that based on the conservative nature of the proposed thickness and the supporting peer-reviewed thermal analysis, the treatment of future climate projections and their uncertainty is at least consistent with other mines in the Canadian Arctic and has followed best practices.

Considering a Monitoring Program to Observe Freezing Conditions

As part of the ongoing adaptive management, performance monitoring (Section 5.2) will be conducted to measure freeze encapsulation of the cover during Operations and through Closure (approximately 21 years). This monitoring, along with the most recent projections of future climate change available, will inform whether the freeze encapsulation cover design requires modification through periodic updates to the thermal analysis modelling discussed in Section 5.3 of the SRK Memo. This monitoring will help to address the uncertainty in the future climate conditions through the collection of thermal data, comparison to a calibrated thermal model, and through the periodic updates to thermal analysis modelling incorporating the most up to date climate change projections available. Golder understands that Sabina has committed to an independent third party monitoring program that

will include ground temperature and freeze back monitoring. Golder agrees with this approach to reduce the uncertainty surrounding future climate change projections by informing the final cover design with the current state of science for climate change, instead of relying on a static analysis.

In addition to the performance monitoring, on-site stations will be installed to measure climatic variables, improving the site specific current climate database for the project. The observations and trends of the observations will be compared to the most recent future climate change projections to understand how the site conditions compare to the conditions used to inform the Project design. Golder agrees with this approach, however, the methodology for this comparison was not provided in the SRK Memo. In order to follow best practices, the comparison should consider a comparison of the climate normal (30 year averages) from both the observations and the climate projections, and the climate projections should be normalized to the site-specific conditions. Periodic comparisons of the observations and projections will help to address the uncertainty in the climate change projections, however, it should be noted that most scenarios of future climate projections do not begin to diverge until approximately mid-century, around the 2050s.

Considering Mitigation Strategies in the Adaptive Management Plan

The focus of the adaptive management plan is to determine whether the freeze encapsulation cover design will be robust enough to maintain freezing conditions post-closure under the range of future climate projections, and on the steps to take if freezing conditions are unlikely to be maintained post-closure. A robust list of mitigation strategies is proposed in Section 5.4 of the SRK Memo based on existing strategies in place at other Canadian Arctic mines. The primary strategy is to increase the cover thickness if field measurements collected and the updated thermal analysis modelling shows that this is required. SRK states that there is likely sufficient cover material on site if required (Sections 4.1 and 5.4). If, based on the updated thermal modelling, sufficient material is not available, the storage areas may be consolidated to reduce the need for cover material. The remaining mitigation strategies involve changing the type of cover considered (water and low infiltration geomembrane) or water treatment that do not rely on maintaining freezing conditions post closure. The water treatment would treat the surface drainage and localized seasonal subsurface flow within the active layer emanating from the mine waste facilities. The SRK Memo states in the executive summary that the proposed mitigation strategies are less sensitive to a changing climate, and that cover designs will be informed by future climate projections.

Considering Requirements for Additional Mitigation Strategies

Based on the adaptive management section (Section 5.0), the Project adequately addresses the viability of maintaining freezing conditions post-closure and the uncertainty associated with climate change projections. The uncertainty is address by having additional mitigation strategies that are less sensitive to changing climate conditions. In addition, as part of demonstrating best practices, the Back River Project provides comparisons to existing Arctic mine sites where the proposed strategies are currently employed (Section 5.4).

As part of the closure plan review process, under the Nunavut Water Board, the appropriate regulating agencies will have a chance to review the final closure strategy, including the comparison of the modelling and monitoring comparison used to inform the requirement for additional mitigation strategies. There will be opportunity at this point to further refine any requirements for mitigation and what mitigation strategies are being considered. Separate to the closure plan review process, Sabina will internally review the modelling and monitoring data on a periodic basis, investigating any substantial deviations between the planned and monitored freeze back conditions. Sabina will consider additional mitigation strategies the analysis informed by current and future climate conditions show the proposed freeze encapsulation strategy would need to be changed. Sabina will rely on the expert opinion of a qualified Professional Engineer to help determine the potential success of the freeze encapsulation cover and the need for any additional mitigation strategies. As the most recent future climate projections will be incorporated

into the analysis provided by Sabina, the expert should be familiar with climate change projections for the Canadian Arctic to help ensure the uncertainty in the climate projections is appropriately addressed.

Considering Uncertainty in Climate Change Projections

The SRK Memo demonstrates how best practices were incorporated when considering climate change in the tailings storage facility and waste rock storage areas closure strategy. The approach in the SRK Memo is to address the uncertainty in climate projections up to 2100 through design and the adaptive management plan. Golder agrees with this approach to addressing climate change uncertainty to the end of the century (2100). Post-2100, the SRK Memo states climate projections are unbounded beyond 2100 and extrapolates the climate projections to show indefinite increases in mean air temperature. This is not supported by the current projections past 2100 provided by peer-reviewed literature, therefore the following section is provided to give more context on the next century climate projections from literature.

Future Climate Conditions Post 2100

Due primarily to computational limitations in early climate modelling and the uncertainty in climate change modelling, most climate model projections extend only to the year 2100. However, the warming effects and radiative forcing resulting from atmospheric greenhouse gases extends long after emissions have ceased and beyond the atmospheric lifetime of the gas (Lenton et al. 2006). Therefore, while a large portion of warming resulting from anthropogenic carbon dioxide (CO_2) will happen on the century timescale, warming can continue beyond 2100. CO_2 is significantly more abundant than other greenhouse gases and aerosols, and has the largest impact, compared to other species, on the radiative forcing used to drive the climate models.

The projected future climate beyond 2100 is described in a qualitative manner using publicly available, peer-reviewed literature, including Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC 2013; AR5).

The projected ranges of future climate conditions are described using the results accepted by the IPCC for various representative concentration pathways (RCPs). Meinshausen et al. (2011) extends four RCP scenarios (RCP 2.6, 4.5, 6.0 and 8.5) until 2300 in support of AR5 using Earth Models of Intermediate Complexity (EMICs). The results of the EMIC extensions are consistent until 2300 with atmospheric-ocean general circulation models (AOGCM) used in AR5. Zickfield et al. (2013) use the extensions to estimate temperature changes up until the year 3000, assuming that the CO_2 concentration and forcing are held constant at year 2300 levels for all four RCP scenarios. The RCPs are named after the radiative forcing projected to occur by 2100. For example, RCP4.5 represents a scenario where the radiative forcing is stabilized shortly after 2100 at 4.5 W/m^2. The RCPs are described more fully by van Vuuren et al. (2011) in their paper “The representative concentration pathways: an overview”.

As shown on Figure 1, presented in Zickfield et al. (2013), in scenarios RCP4.5 and RCP8.5, rapid warming occurs until the radiative forcing is stabilized (assumed to be 2300), with predicted increases of temperature. After the forcing is stabilized, warming slows but continues at a lesser pace than the current century through the year 3000. Under the RCP2.6 scenario, temperatures peak around 2070 and decreases until 2300 after which it slowly starts to increase again. This significant uncertainty affects the post closure period conditions but the rate of warming is expected to be much less or decrease compared to the current century projections.

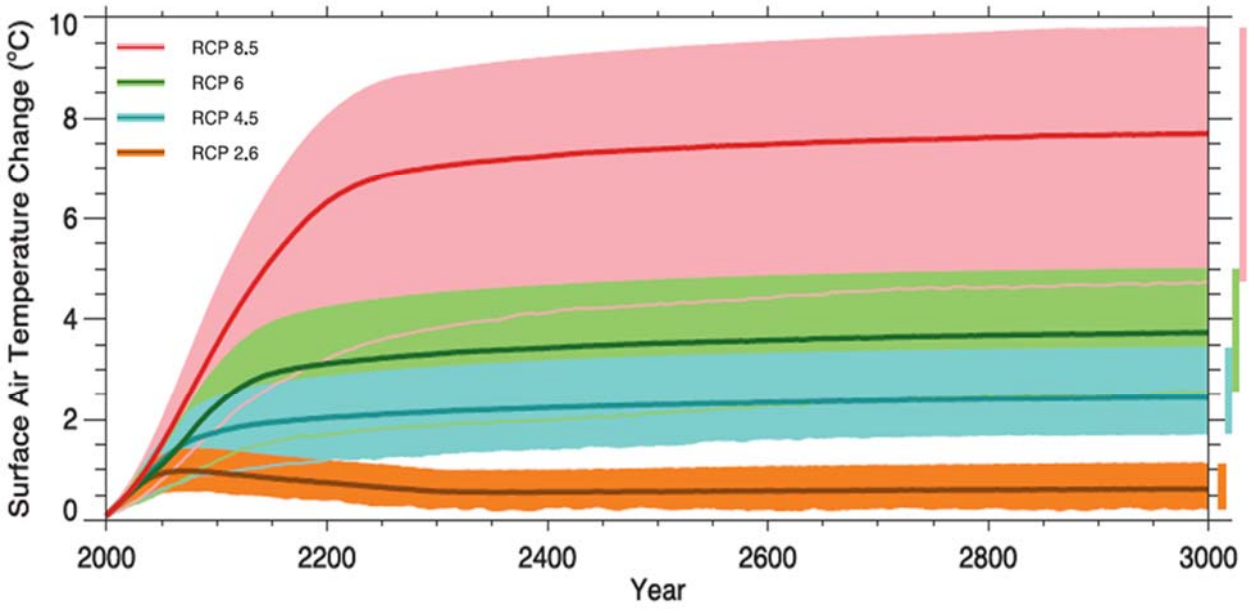

Figure 1: Time evolution of surface air temperature change (from 1985 to 2005 reference period) for the constant composition simulation for all four RCP scenarios (Zickfield et al. 2013)

It is generally accepted that with increased temperature, mean sea levels and global precipitation will also increase. It is estimated that global precipitation will increase by 1-3% per degree Celsius increase in temperature (IPCC 2013). However, the distribution of precipitation will vary spatially, with increases in some regions and decreases in others.

Given the approach described in the SRK Memo in section 5.3, the cover design and the need for additional mitigation strategies will be reviewed on a periodic basis, informed by the most recent climate change projections available. By the end of operations, 21 additional years of climate change information will be available, likely including a new assessment from the IPCC. With the advancements made in climate change projections over that period, uncertainty in the post-2100 climate will likely be reduced, providing more confidence in the final cover design. With the additional context regarding post 2100 projections, Golder agrees with this approach to reduce the uncertainty associated with climate change in the cover design.

Conclusions

Overall, the SRK Memo is comprehensive and provides clear recommendations and triggers for the implementation of adaptive management plans informed by the additional information that will be gathered during the operations phase. Golder agrees with the approach outlined in the memo. The additional information on climate change uncertainty analysis is provided for greater context of the projected climate change post-2100. If you have any questions or comments, please feel free to contact Sean Capstick (scapstick@golder.com).

Technical Credentials of Reviewers

Sean Capstick, P. Eng.
Principal, Senior Air Quality and Climate Change Specialist

Sean Capstick is a Principal in Golder's Greater Toronto Area Office with over 25 years of environmental consulting and government experience. Sean is directing a number of atmospheric and climate change studies on public/private infrastructure, he has extensive experience in the areas of air quality, greenhouse gas (GHG) inventories and climate change. Sean leads Golder's "Climate Change Technical Community", an internal knowledge sharing initiative to promote the use of the latest climate change science and develop best practices to consider both the potential effects of the project on climate change and the effects of climate change on a project.

Sean has expertise in analysis of climate change projections and assessing the significance of project emissions under the Environmental and Social Impact Assessment Framework and has developed best practices to consider the potential effects of climate change on a project. Has prepared the climate change components for ESIA's under the Performance Standards on Environmental and Social Sustainability (IFC, World Bank Group 2012) and the document "Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (CEAA 2003)" both in Canada and internationally. Sean has experience leading of interdisciplinary technical teams that are assessing climate change impacts and vulnerabilities on existing and planned infrastructure using a risk based approach and Cost Benefit Analysis.

Sean was the Climate Change Lead on Agnico Eagle's Meliadine Project that was successfully approved by the Nunavut Impact Review Board. Sean also was the primary author of two reports that identified the climate risk for large infrastructure and mining operations in Nunavut for the Regional Adaptation Collaborative (RAC). These reports assessed potential vulnerabilities and recommend adaptive measures and best practices.

Sean has presented on the topic of Climate Change Adaption widely and published a number of papers on this subject. Specifically, he has presented at the Nunavut Mining Symposium, the Association for Impact Assessment (IAIA) conferences in Chile and Panama, Adaptation 2016 in Ottawa and the Ontario Association for Impact Assessment. Sean is a member of the organizing committee of the upcoming Artic and Nordic Forum that will be part of the 2017 IAIA conference that will examine Climate Change Impacts in Artic and Nordic Areas.

Janya Kelly, Ph.D.
Air Quality and Climate Change Specialist

Dr. Janya Kelly is an Air Quality and Climate Specialist and has over eight years of experience in air quality and climate change for a variety of industry sectors such as: mining, power generation, aggregate processing, and metal manufacturing. She completed a three-year post-doctorate at Environment Canada studying the future impacts of climate change on air quality in North America. The published results of the post-doctoral work were referenced in the Intergovernmental Panel on Climate Change Fifth Assessment Report. Dr. Kelly is an active member of the Golder's "Climate Change Technical Community", an internal knowledge sharing initiative to promote the use of the latest climate change science and develop best practices to consider both the potential effects of the project on climate change and the effects of climate change on a project.

Dr. Kelly has been the climate change lead on a number of projects, with a primary focus on climate change adaption, and secondary focus on climate change mitigation through greenhouse gas emission reduction. She has experience preparing climate change technical supporting documents for Environmental and Social Impact Assessments (ESIAs) under provincial (Ontario and British Columbia), federal (Canada) and international

(Performance Standards on Environmental and Social Sustainability, International Finance Corporation) requirements. Dr. Kelly has coordinated with interdisciplinary technical teams within these requirements and has prepared and supported the preparation of climate change technical supporting documents in both North and South America, and Europe.

Outside of the ESIA framework, Dr. Kelly has completed analyses of climate change projections, climate change and greenhouse gas assessments to support permitting and compliance projects, as well as the development of greenhouse gas emission inventories. This work includes leading interdisciplinary teams in assessing the climate change vulnerabilities on existing and planned infrastructure and assessing the financial impacts through cost benefit analysis. To successfully complete this work, she has developed a number of tools to help transform the scientific analysis into easily accessible reports written in plain language.

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Janya Kelly, Ph.D.
Air Quality and Climate Change Specialist
Specialist

Sean Capstick, P.Eng.
Principal, Senior Air Quality and Climate Change

JK/SC/jr

Attachments: A: Curriculum Vitae

https://capws.golder.com/sites/p1545534typeawaterlicencebackriverproject/p2000_feis/addendum_thirdpartyreviews/climate/golder cc memo wrtailingsclosure strategy final.docx

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ATTACHMENT A

Curriculum Vitae

Education

B.A.Sc. Chemical Engineering, University of Waterloo, 1989

Certifications

Professional Engineer Ontario (P.Eng.)

Languages

English – Fluent

Sean Capstick, P.Eng. is a Principal with over 25 years of environmental compliance experience in Golder's GTA Operations Atmospheric Services Group that provides a full suite of GHG, Climate Change, Permitting and Environmental Assessment services. Sean provides specialized expertise on strategic and regulatory advice to clients regarding the development of emission inventories recognized as a leading expert in Air Quality services including the emerging GHG / carbon costing framework and Climate Change adaptation services. He is Golder's Global Climate Change Technical Community Leader.

Sean has worked for both public sector and private sector clients in a variety of industry sectors such as aggregate processing, buildings, cement, chemical processing, electricity generation fertilizer manufacturing, mining, petrochemical, steel manufacturing, landfills, natural resources, oil and gas and infrastructure management. He is sought after by industry, municipalities and legal firms for guidance and practical solutions in regulatory and technical matters related to the environmental permitting process and adaptation to climate change. Sean has expertise in analysis of climate change projections and assessing the significance of project emissions and climate impacts under International, Canadian and Provincial Environmental Assessment Frameworks. He has presented on these topics widely.

Employment History

Golder Associates Ltd. – Mississauga, Ontario
Principal (2006 to Present)

Ministry of the Environment – Toronto, Ontario
Special Project Engineer, Environmental Assessment and Approvals Branch (2001 to 2006)

Golder Associates Ltd. – Mississauga, Ontario
Associate (1998 to 2001)

Ministry of the Environment – Toronto, Hamilton and Guelph, Ontario
Various positions (1989 to 1998)

PROJECT EXPERIENCE – CLIMATE CHANGE AS PART OF ENVIRONMENTAL ASSESSMENTS

Hearing Nunavut Impact Review Board
Meliadine, Nunavut

The project consisted of the Agnico Eagle Meliadine gold mine and access road development in Nunavut. The project involved the completion of an ESIA in accordance with the Nunavut Impact Review Board Standards. Climate Change and Atmospheric Discipline Lead provided senior technical review of the air quality baseline and climate change assessment reports. Climate change data used in Wildlife Cumulative Effect Assessment and Tailing design calculations.

IFC ESIA, Development of a Power Plant Province of Peravia, Dominican Republic	The project consisted of the development of a 752 MW (gross) thermal power plant in Punta Catalina in the south-central Dominican Republic. This project is to improve the reliability of the Dominican power supply. Climate Change Lead to identified and evaluated the potential risks associated with climate change that may affect public safety and the environment and identified the need for any supplementary mitigation measures to avoid, minimize and/or control any identified risks.
IFC ESIA, Development of a Gold Mine Cocula, Guerrero State, Mexico	The project consisted of the Torex MML El Limon Guajes gold mine development in Mexico. The project involved the completion of baseline studies and an ESIA in accordance with the International Finance Corporation's Performance Standards. Climate Change and Meteorology Discipline Lead and provided senior technical review of the air quality baseline and assessment reports.
IFC ESIA Gap Analysis Development of a Gold Mine Cocula, Guerrero State, Mexico	The proposed project consists of a new underground gold, copper and silver mine development in Mexico. Participated in the analysis of potential climate change and atmospheric gaps, and the identification of a planned course of action to address the gaps.
IFC Climate Change Assessment Cajamarca, Peru	The project consisted of the development of the Minera Yanacocha Conga copper-gold mining project. The project involved the completion of Climate Change Assessment in accordance with the International Finance Corporation's Performance Standards. Climate Change Discipline Lead provided senior technical review of the climate change assessment reports including vulnerability and GHG assessments.
IFC Climate Change Assessment Autazes, Brazil	The project consisted of the development of the Brazil Potash Corporation of Canada underground potash mine, processing facilities, port and a road connecting the mine to the port in the Amazon. The project involved the completion of Climate Change Assessment in accordance with the International Finance Corporation's Performance Standards. Climate Change Discipline Lead provided senior technical review of the climate change assessment reports including vulnerability and GHG assessments.
Ontario Environmental Assessment of Landfill Expansion Brighton, Ontario	The Project consisted of an expansion of the existing Brighton Landfill and subsequent ECA application package. Senior review of the Air Quality assessment and responses to MOE comments. Prepared a qualitative assessment of potential effects of climate change to satisfy MOECC comments.
Ontario Environmental Assessment of Landfill Expansion Niagara Region, Ontario, Canada	The project consisted of the expansion of the existing Humberstone solid waste landfill site to meet the residual waste disposal needs of south Niagara for a period of 25 years. Senior review of Air Quality environmental impact assessment. Prepared a qualitative assessment of potential effects of climate change to satisfy MOECC comments.
Ontario Environmental Assessment for New Waste Management Facility Ottawa, Ontario, Canada	The Project consisted of the proposed Capital Region Resource Recovery Centre. Prepared a qualitative assessment of potential effects of climate change to satisfy MOECC comments.

Municipal Class EA of a Road Widening
Region of Waterloo
Canada

The project consisted of a Municipal Class Environmental Assessment for the proposed Erb Street Widening & Corridor Study, Fischer-Hallman Road to Wilmot Line in the Region of Waterloo. Work was sub-contracted through the Walterfedy Partnership Sr review of an air quality and GHG assessment.

Eastern Mainline Pipeline Project
Eastern Ontario, Canada

The project consist of environmental services for the construction and operation of a new approximately 280 km natural gas pipeline, including modifications to 5 compressor stations, from Iroquois to Markham, Ontario. Senior review for the air quality and climate change assessment to meet NEB requirements and responding to information request from stakeholders during the review process.

NEB Section 58, Vaughan Mainline Project
Vaughan, Ontario, Canada

The project consisted of the construction of approximately 12 km of new 42" natural gas pipeline. Senior review for the air quality and climate change assessment to meet NEB requirements and responding to information request from stakeholders during the review process.

British Columbia Environmental Assessment Office
Howe Sound, British Columbia

The project consisted of the development of the Woodfiber Liquefied Natural Gas production Facility in Lower Mainland British Columbia. The project involved the completion of baseline studies and an ESIA reviewed by the Environmental Assessment Office. Climate Change and Atmospheric Discipline Lead provided senior technical review of the air quality baseline and climate change assessment reports including vulnerability and GHG assessments.

British Columbia Environmental Assessment Office
Giscome, British Columbia

The project consisted of the development of the Graymot Lime production Facility in Northern British Columbia. The project involved the completion of baseline studies and an ESIA in accordance with Environmental Assessment Office. Climate Change Discipline Lead provided senior technical review of the climate change assessment reports including vulnerability and GHG assessments.

Joint Ontario and Canadian ESIA Cliffs Natural Resources
Thunder Bay, Ontario

The project consisted of the development the Cliffs Chromite Project that included three separate but linked components, the mine, the Integrated Transportation Corridor and Furnace in Northern Ontario. The project involved the completion of baseline studies and an ESIA in accordance with CEAA and Ontario Requirements. Atmospheric Component Lead; work involved the development of the climate change assessment, emission inventory, dispersion modelling and EA technical support and document writing. Liaison with the client engineering teams to design projects to reduce the potential impact to local and regional air quality.

Joint Ontario and Canadian ESIA Cliffs Argonaut Gold Corporation
Reno, Nevada

The project consisted of the development of the Magino Mine Project in Northern Ontario. The project involved the completion of baseline studies and an ESIA in accordance with CEAA Requirements. Project Director for Air, Noise, Vibration, Light, Climate Change and Human Health Risk Assessment components of the Environmental Assessment. Work involved the liaison with the various other technical disciplines and EA writing team to develop 5 stand-alone Technical Supporting Documents for the EA submission.

Ontario ESIA Cliffs Osisko Gold Mine Project
Toronto, Ontario

The project consisted of the development of the Hamond Reef Mine Project in Northern Ontario. The project involved the completion of baseline studies and an ESIA in accordance with CEAA and Ontario Requirements. Atmospheric and Climate Change component Lead work involved the development of emission inventory, dispersion modelling and EA technical support document writing.

PROJECT EXPERIENCE – GOVERNMENT/GUIDANCE DEVELOPMENT

Natural Resources Canada
Ottawa/Ontario, Canada

Golder provided advisory services to the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) as part of the Project Advisory Council for a review of Climate Change Vulnerability assessments as part of Environmental Impact Assessments in the Mining Sector.

Natural Resources Canada
Ottawa/Ontario, Canada

Golder provided advisory services to the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) to develop Climate Change Vulnerability case studies for mining operations include a Cost Benefit Analysis that compared no actions against implementing adaptive management options.

Government of Nunavut
Nunavut, Canada

Identification of climate risk for large infrastructure and mining operations in Nunavut for the Regional Adaptation Collaborative (RAC) assess vulnerabilities and recommend adaptive measures and best practices. Conducted as workshop using a risk based assessment with Government and mining stakeholders.

Ontario Reality Corporation
Ontario, Canada

Conducted a Public Infrastructure Engineering Vulnerability Committee (PIEVC) assessment of pubic three buildings in Ontario.

Clean Air Partnership.
Ontario, Canada

Developed climate change data sets and participated in a province wide training program to allow municipalities to conduct vulnerability assessments on municipal infrastructure on behalf of the Ontario Regional Adaptation Collaborative (RAC).

National Resources Canada
Ottawa/Ontario, Canada

Prepare a summary of Green Mining Technologies that can reduce mining footprint, and improve waste management, closure and ecological risk assessments based on a survey of mining professionals conducted by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM).

Centre for Excellence in Mining Innovation

Preparation of Guidance Materials that can be used by the Mining Industry to prepare Fugitive Dust Best Management Practice Plans.

Ontario Ministry of Natural Resources (MNR)
Ontario, Canada

Preparation of a life cycle analysis and greenhouse gas inventory to quantify the GHG emission intensity associated with different scenarios of the Ontario aggregate industry from extraction and transportation. This GHG assessment was part of a larger study concerning the feasibility of alternatives for the Ontario aggregate industry.

Ontario Ministry of the Environment
Toronto/Ontario, Canada

Prepared an overview of GHG emissions from the Large Final Emitters in Ontario, a jurisdictional summary of technology based international regulations and evaluating control options and $/tonne costs to reduce GHG emissions.

Environment Canada
Gatineau/Quebec, Canada

Preparing an overview of dust emissions from the Canadian Iron Ore Sector and assessing best practices for dust control from both fugitive and point sources.

Ontario Ministry of the Environment Toronto/Ontario, Canada	Development of Certificate of Approval sample application packages (ACME Examples) and outreach materials for Air and Noise, Waste Water, Wind Turbines and Waste Approvals.
Ontario Ministry of the Environment Toronto/Ontario, Canada	Technical Evaluation of Options for Air Pollution Control of Volatile Organic Compounds and Particulate Matter from the Wood Products Manufacturing Sub-sector.
Ontario Ministry of the Environment Toronto/Ontario, Canada	Development of guidance materials for a new pilot for delivering expedited service for the Ministry's Approvals program.
Ontario Ministry of the Environment Toronto/Ontario, Canada	Independent third party assessment of Air Quality Reports for compliance with O. Reg. 419/05 submitted under the MOE's STAC program.

PROJECT EXPERIENCE – GHG INVENTORY DEVELOPMENT AND CAP AND TRADE

Canadian Chemical Industry Association Ontario, Canada	Provided strategic advice in assessing how the chemical sector may be affected by the proposed Ontario Cap and Trade Regulation and identifying key mechanisms to discuss with the Ministry of Environment and Climate Change during the development of the regulation.
Canadian Steel Producers Association Ontario, Canada	Provided strategic advice in assessing how the steel sector may be affected by the proposed Ontario Cap and Trade Regulation and identifying key mechanisms to discuss with the Ministry of Environment and Climate Change during the development of the regulation.
Confidential Client Ontario, Canada	Preparation of a study for a quarry including GHG inventory, identification of alternatives for minimizing energy use and GHG emissions and identification of alternatives for offsetting GHG emissions, focusing on a zero carbon operation. The Project include the development of a customized tool for calculation of GHG emissions and removals, allowing the assessment of different GHG scenarios and update the inventory in a cost effective manner.
Confidential Client Ontario, Canada	Preparation of a study for a forestry operation for the potential to generate afforestation carbon offsets including a high level business case and sensitivity analysis.
Glencore Canada Sudbury, Ontario, Canada	Preparation of a customized guideline to prepare greenhouse gas inventories for the Sudbury Operations following the specifications of the GHG Protocol and ISO 14064. Development of a carbon costing tool to allow the operations to assess the impact of potential carbon costing scenarios based on the implementation of a Western Climate Initiative type of GHG reduction program and conducts various scenario assessments for production increases and GHG reduction programs.
Ontario Ministry of the Environment Toronto, Ontario, Canada	Prepared an overview of GHG emissions from the Large Final Emitters in Ontario, a jurisdictional summary of technology based international regulations and evaluating control options and $/tonne costs to reduce GHG emissions.

Canadian Fertilizer Institute
Canada

Golder was retained to provide strategic advice and prepare emission rate calculation and sector wide summaries to support discussions with the Federal Government in setting GHG limits and controlling regulations for Canadian Ammonia and Potash Fertilizer facilities.

Confidential
Ontario, Canada

Project Director of technical analysis and life cycle analysis data using GHG Genius to support the company positions to lobby and negotiate with the federal and provincial government for the support of incentive programs to assist renewable fuels manufacturers and distributors.

Ivaco Rolling Mills
Ontario, Canada

Project Director for a multi-year Air Quality compliance services project (2012 to present) including GHG inventories and reporting, support during GHG emission, assessment of the financial implications of Cap and Trade in Ontario and various technical assistance related to new Climate legislation.

PROJECT EXPERIENCE – ENVIRONMENTAL PERMITS

Environmental Permitting
Canada Wide

Responsible for the completion of hundreds of Environmental Permit applications for the aerospace, aggregate processing, automotive manufacturing and assembly, commercial printing, construction materials, electricity generating, iron and steel plywood, mining, remediation transportation, wood products and waste industries. Successfully, negotiated terms and conditions for the approvals and assisted clients with on-going compliance with these conditions.

PROFESSIONAL AFFILIATIONS

International Association for Impact Assessment

Association of Professional Engineers of Ontario

Air and Waste Management Association

Ontario Mining Association - Environmental Committee

SELECTED PAPERS/PRESENTATIONS

OAIA 16

Presented at Environmental Assessment: Time to Hit the Reset Button, Toronto, Canada October 25, 26, 2016

Capstick S., Zizzo L., Robicheau S. ***Incorporating Climate Change into EA's a Facilitated Discussion***

IAIA Special Symposium

Mega-Infrastructure Symposium, Panama City, Panama December 1 – 3 2015

Capstick S., Kelly J. ***Climate Change Adaptation and Mining: Best Practices***

OAIA 15

Presented at, Environmental Assessment: a Critical Tool for Tackling Climate Change, Toronto, Canada October 25, 26, 2015

Capstick S., Cheyenne M. ***Climate Change Adaptation and Mining: Case Studies from Ontario and the World***

Power of Water

Niagara Falls, Canada May10, 2015

IAIA 15

Presented at: Impact Assessment in the Digital Era, Florence, Italy. April 20-23, 2015

IAIA 14

Presented at: Impact Assessment for Social and Economic Development,
Vina del Mar, Chile. April 8-11, 2014.

Capstick S., Kelly J., Barrett, A. ***How is Climate Change Changing Hydropower?***

Capstick, S., Arnold, S., Barrett, A., Santander, A., and Perez, J. ***Climate Change Adaptation in the Mining Sector***.

Capstick, S., Kelly, J., Barrett, A., and Penailillo, R. ***Incorporating Climate Change Impacts into Environmental Assessments***.

Education

Ph.D. Earth and Space Science and Engineering, York University, Toronto, 2007

B.Sc. (Honours) Physics, Dalhousie University, Halifax, 2002

Languages

English – Fluent

Golder Associates Ltd. – Mississauga

Biography - CC

Dr. Janya Kelly is an Air Quality and Climate Specialist and has over eight years of experience in air quality and climate change in a variety of industry sectors such as: mining, power generation, aggregate processing, and metal manufacturing. She has completed a three year post-doctorate at Environment Canada studying the future impacts of climate change on air quality in North America. The published results of the post-doctoral work were referenced in the Intergovernmental Panel on Climate Change Fifth Assessment Report.

Dr. Kelly has been the climate change lead on a number of projects, with a primary focus on climate change and adaption, and secondary focus on climate change mitigation through greenhouse gas emission reduction. She has completed climate change assessments in support of Environmental and Social Impact Assessments for projects in North and South America, including coastal regions. Dr. Kelly has completed analysis of climate change projections, climate change and greenhouse gas assessments to support permitting and compliance projects, as well as the development of greenhouse gas emission inventories.

Employment History

Golder Associates Ltd. – Mississauga, ON

Air Quality Specialist (2010 to Present)

Janya Kelly is a member of the Air and Noise Group (Environmental Services A) within Golder. Janya joined Golder in 2010 after completing her post-doctoral work studying the projected impacts of climate change on regional air quality.

Janya specializes in climate change, air quality modelling and data representation.

Environment Canada – Toronto, ON

Visiting Fellow in a Government Laboratory (2007 to 2010)

Coupled the chemical transport model, A Unified Regional Air-quality Modelling System (AURAMS), with the Canadian Regional Climate Model (CRCM) to examine the impact of climate change on future (2050) air quality.
Calculated scaling factors that contributed to the projection of future emissions (2050) from current emissions. Improved ground based concentrations of ozone and particulate matter in comparison to observations by implementing a new vertical diffusion calculation from literature.
Prepared a review of scientific literature on climate change and air quality for Canadian Smog Science Assessment.

PROJECT EXPERIENCE – CLIMATE CHANGE ADAPTATION

Confidential Clients - Environmental Assessments Various, International	Developed climate change data sets for numerous mining and resource developments for use in Environmental Impact Assessments in North and South America, including coastal regions. Data sets are prepared following the guidance of Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (CEAA 2003) and Performance Standards on Environmental and Social Sustainability (IFC, World Bank Group 2012). Climate change data is used by other technical disciplines to assess the effects of climate on the project.
Natural Resources Canada Ottawa, Ontario, Canada	Golder provided advisory services to the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) to develop Climate Change Vulnerability case studies for mining operations include a Cost Benefit Analysis that compared no actions against implementing adaptive management options.
Natural Resources Canada Ottawa, Ontario, Canada	Golder provided advisory services to the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) as part of the Project Advisory Council for a review of Climate Change Vulnerability assessments as part of Environmental Impact Assessments in the Mining Sector
Glencore Canada Corporation (formerly Xstrata Nickel) Sudbury, Ontario, Canada	On-going climate change support services dealing with both adaptation and mitigation. Provided analysis and advice on the impacts of the incoming cap-and-trade regulation for Ontario, as well as developing a scenario analysis tool to examine the potential financial impact according to the selected operation scenario. Provided support work for a cost benefit analysis of proposed climate change adaptation based on known climate vulnerable infrastructure at the selected facility. Also provided climate change data sets to support assessment of water management infrastructure. Coordinated annual workshop to communicate results to environmental management team at the involved facilities.
Xstrata Nickel Sudbury, Ontario, Canada	Prepared a climate change vulnerability assessment to link into Xstrata's established risk management framework. Followed PIEVC Engineering Protocol for Climate Change Infrastructure Vulnerability Assessment.
Government of Nunavut Nunavut, Canada	Identification of climate risk for large infrastructure and mining operations in Nunavut for the Regional Adaptation Collaborative (RAC), assessed vulnerabilities and recommended adaptive measures and best practices. Conducted as workshop using a risk based assessment with government and mining stakeholders.
Infrastructure Ontario Ontario, Canada	Conducting a Public Infrastructure Engineering Vulnerability Committee (PIEVC) assessment of three public buildings in Ontario.
Clean Air Partnership Ontario, Canada	Developing climate change data sets for use in a training program to allow municipalities to conduct vulnerability assessments on municipal infrastructure.

PROJECT EXPERIENCE – CLIMATE CHANGE MITIGATION / GREENHOUSE GAS EMISSIONS

Glencore Canada Corporation Sudbury, Ontario, Canada	Developed Excel-based carbon costing tools based on the California, Quebec and Ontario cap-and-trade regulations, in order to understand and estimate the potential financial impact of the Ontario regulatory framework for greenhouse gas emitting facilities. This tool was also used to provide strategic advice on negotiations during the development of the regulation and in determining the financial exposure of the company due to the regulation. Multiple workshop presentations were prepared to educate Glencore on the regulation and to train Glencore on using the carbon costing tool. Work is on-going to provide support during the registration process and the advocacy for the continued development of the regulation.
Canadian Vehicle Manufacturer's Association Ontario, Canada	Developed a carbon costing tool based on the proposed Ontario regulatory framework for the incoming cap-and-trade regulation to understand and estimate the potential financial impact to the automotive sector. This tool was also used to provide strategic advice on negotiations during the development of the incoming regulation.
Canadian Steel Producers Association Ontario, Canada	Developed a carbon costing tool based on the proposed Ontario regulatory framework for the incoming cap-and-trade regulation to understand and estimate the potential financial impact to the steel sector. This tool was also used to provide strategic advice on negotiations during the development of the incoming regulation.
Ministry of the Environment and Climate Change Ontario, Canada	Provided analysis on the greenhouse gas benefits of non-disposal management of organic waste in Ontario
Various Clients Ontario, Canada	Provided assistance and consulting services related to Ontario's Climate Change Mitigation and Low-Carbon Economy Act, 2016, including the Cap and Trade Program. This work includes education and training workshops, carbon costing tools and compliance obligations under the Cap and Trade Program. Provided assistance and consulting services related to annual reporting requirements under the Greenhouse Gas (GHG) Emissions Reporting Program and Ontario's GHG Emissions Reporting Regulation O. Reg. 452/09
Confidential Clients Various, International	Managed the development of greenhouse gas emission data sets for numerous mining and resource developments for use in Environmental Impact Assessments. Data sets are prepared following the guidance of Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (CEAA 2003) and Performance Standards on Environmental and Social Sustainability (IFC, World Bank Group 2012), as well as following national and sub-national requirements.

PROFESSIONAL AFFILIATIONS

Air and Waste Management Association

PUBLICATIONS

Conference Proceedings

Capstick, Sean and Janya Kelly. 2015. *Climate Change Adaptation and Mining: Best Practices*. IAIA Special Symposium: Mega-Infrastructure Symposium, December. Panama City, Panama.

Capstick, Sean, Janya Kelly and Allison Barrett. 2015. *How is Climate Changing Changing Hydropower*. Power of Water, May. Niagara Falls, Canada.

Capstick, Sean, Janya Kelly, Allison Barrett and Rinaldo Penailillo. 2014. *Incorporating Climate Change Impacts into Environmental Assessments*. IAIA 2014: Impact Assessment for Social and Economic Development, April. Vina del Mar, Chile.

Journal Articles

Kelly, J., P.A. Makar and D.A. Plummer. Projections of mid-century summer air-quality for North America: effects of changes in climate and precursor emissions. *Atmospheric Chemistry and Physics*, 12 (2012), 5367-5390.

Kelly, J., D.V. Michelangeli, P.A. Makar, D.R. Hastie, M. Mozurkewich and J. Auld. Aerosol Speciation and Mass Prediction from Toluene Oxidation under High NOx Conditions. *Atmospheric Environment*, 44 (2010), 361-369.

Stroud, C.A., A. Makar, D.V. Michelangeli, M. Mozurkewich, D.R. Hastie, A. Barbu and J. Humble. Simulating Organic Aerosol Formation during the Photo-oxidation of Toluene/NOx Mixtures: Comparing the Equilibrium and Kinetic Assumption. *Environmental Science and Technology*, 38 (2004), 1471-1479.

Lohmann, U., J. Humble, R. Leaitch, G. Isaac and I. Gultepe. Simulations of ice clouds during FIRE.ACE using the CCCMA single column model. *Journal of Geophysical Research*, 106 (2001), 15 123-13 138.

5. Volume 5 Addenda: Terrestrial Environment

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of the Terrestrial Environment, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

Volume 5 of the EIS presents the assessment of potential environmental effects to the terrestrial environment associated with proposed Project activities following the application of mitigation and management measures. During development of the FEIS, the following terrestrial components were selected as VECs: vegetation and special landscape features, caribou, grizzly bear, muskox, wolverine and furbearers, migratory birds, and raptors. Geology, permafrost, and landforms and soils were considered Subjects of Note and all required information noted in the EIS guidelines is included in this volume.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 8.1.4, 8.1.5, 8.1.10, 8.1.11) in respect of the new information provided on the topic of the Terrestrial Environment, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

GEOLOGY (FEIS VOLUME 5, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

PERMAFROST (FEIS VOLUME 5, CHAPTER 2)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

LANDFORMS AND SOILS (FEIS VOLUME 5, CHAPTER 3)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

VEGETATION AND SPECIAL LANDSCAPE FEATURES (FEIS VOLUME 5, CHAPTER 4)

In the Final Hearing Report, the Board has stated that they have uncertainty in relation to the effects predicted for vegetation due to limited baseline information being available. Sabina has provided

additional clarity to address Section 4.10 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.10 under FHR-NIRB-4.10(A) – Limited Vegetation Baseline Information.

In the Final Hearing Report, the Board encouraged Sabina to consider additional mitigation, monitoring, and reclamation and revegetation measures associated with the protection of vegetation, as well as measures for a progressive reclamation plan. Sabina prepared new or updated information to address Section 4.10 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.10 under FHR-NIRB-4.10(B) – Mitigation, Monitoring, Progressive Reclamation, and Revegetation.

In the Final Hearing Report, the Board encouraged Sabina to consider additional measures to limit impacts to prevent the introduction of invasive species from construction and clearing operations. Sabina prepared new or updated information to address Section 4.10 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.10 under FHR-NIRB-4.10(C) – Invasive Species.

In the Final Hearing Report, the Board encouraged Sabina to consider additional measures to quantify impacts from planned annual construction and operation of the winter ice road. Sabina prepared new or updated information to address Section 4.10 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.10 under FHR-NIRB-4.10(D) – Measures to Quantify Impacts to Vegetation from Winter Ice Road.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Vegetation and Special Landscape Features chapter (FEIS Volume 5, Chapter 4)

CARIBOU (FEIS VOLUME 5, CHAPTER 5)

In the Final Hearing Report, the Board indicated that there is uncertainty in relation to the effects predicted on caribou from the Project. Sabina prepared new or updated information to address Section 4.11 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.11.

In the Final Hearing Report, the Board states that they require further information before it can conclude that the mitigation and management measures proposed for caribou, muskox, grizzly bear and wolverine will be sufficient to prevent and limit the potential for cumulative effects. Sabina prepared new or updated information to address Section 6.4 of the Final Hearing Report. This information is referenced in response FHR-NIRB-6.4, but can generally be found in response FHR-NIRB-4.11.

In the Final Hearing Report, the Board concluded that effects on caribou and terrestrial wildlife could result in additional cumulative and transboundary effects on already declining populations. Sabina prepared new or updated information to address Section 6.7 of the Final Hearing Report. This information is referenced in response FHR-NIRB-6.7, but can generally be found in response FHR-NIRB-4.11.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Caribou assessment (FEIS Volume 5, Chapter 5).

GRIZZLY BEAR (FEIS VOLUME 5, CHAPTER 6)

In the Final Hearing Report, the Board states that they require further information before it can conclude that the mitigation and management measures proposed for caribou, muskox, grizzly bear, and wolverine will be sufficient to prevent and limit the potential for cumulative effects. Sabina prepared new or updated information to address Section 6.4 of the Final Hearing Report. This information is referenced in response FHR-NIRB-6.4, but can generally be found in response FHR-NIRB-4.11.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Grizzly Bear assessment (FEIS Volume 5, Chapter 6).

MUSKOX (FEIS VOLUME 5, CHAPTER 7)

In the Final Hearing Report, the Board states that they require further information before it can conclude that the mitigation and management measures proposed for caribou, muskox, grizzly bear, and wolverine will be sufficient to prevent and limit the potential for cumulative effects. Sabina prepared new or updated information to address Section 6.4 of the Final Hearing Report. This information is referenced in response FHR-NIRB-6.4, but can generally be found in response FHR-NIRB-4.11.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Muskox assessment (FEIS Volume 5, Chapter 7).

WOLVERINE AND FURBEARERS (FEIS VOLUME 5, CHAPTER 8)

In the Final Hearing Report, the Board states that they require further information before it can conclude that the mitigation and management measures proposed for caribou, muskox, grizzly bear, and wolverine will be sufficient to prevent and limit the potential for cumulative effects. Sabina prepared new or updated information to address Section 6.4 of the Final Hearing Report. This information is referenced in response FHR-NIRB-6.4, but can generally be found in response FHR-NIRB-4.11.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Wolverine and Furbearers assessment (FEIS Volume 5, Chapter 8).

MIGRATORY BIRDS (UPLAND BIRDS AND WATERBIRDS) (FEIS VOLUME 5, CHAPTER 9)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

RAPTORS (FEIS VOLUME 5, CHAPTER 10)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

OTHER TOPIC-RELEVANT INFORMATION IN FEIS ADDENDUM

In the Final Hearing Report, the Board has stated that they have insufficient confidence in relation to the Tailings Storage Facility design due to limited baseline information being available at the environmental assessment stage. Sabina prepared new or updated information to address Section 4.5 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.5 under FHR-NIRB-4.5(A) – Limited Baseline Data for Tailings Storage Facility.

In the Final Hearing Report, the Board stated it believes that there was lack of detail in the proposed TSF design. Sabina has provided additional clarity to address Section 4.5 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.5 under FHR-NIRB-4.5(B) – Limited Design Detail of Tailings Storage Facility.

In the Final Hearing Report, the Board has expressed insufficient confidence that concerns of the Board and community members regarding the TSF design would be addressed or that sufficient protection of the environment would be in place were the Project to proceed. Sabina prepared new or updated information to address Section 4.5 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.5 under FHR-NIRB-4.5(C) – Community Member Concern Regarding TSF Design.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Terrestrial Environment volume (FEIS Volume 5).

APPENDICES (FEIS VOLUME 5)

FEIS Appendix	Title	Summary of Change
Appendix V5-2A	Back River Project: Cumulative Permafrost Baseline Data Report (2007 to May 2014)	No changes
Appendix V5-2B	Back River Project: 2015 Sub-permafrost Groundwater Quality Baseline Report	No changes
Appendix V5-2C	2012 to 2013 Thermistor String Records Obtained at the Hackett River Project	No changes
Appendix V5-3A	Back River Project: 2012 Terrain and Soils Baseline Report (Updated in July 2015)	No changes
Appendix V5-3B	Back River Project: 2013 Terrain Maps	No changes
Appendix V5-4A	Back River Project: 2012 Ecosystems and Vegetation Baseline Report	No changes
Appendix V5-5A	2013 Wildlife Habitat Suitability Baseline	No changes
Appendix V5-5B	2013 Habitat Selection by Bathurst Caribou during the Post-calving and Summer Periods	No changes
Appendix V5-5C	Back River Project: Wildlife Baseline Report 2012	No changes
Appendix V5-5D	Back River Project: Wildlife Baseline Report 2011	No changes
Appendix V5-5E	Back River and Hackett River Projects: 2010 Caribou and Muskox Baseline Report	No changes
Appendix V5-5F	Back River Project: 2013 Wildlife Baseline Report	No changes
Appendix V5-5G	Back River Project: 2014 Wildlife Camera Baseline Report	No changes
Appendix V5-5H	Back River Project: 2015 Wildlife Camera Baseline Report	No changes
Addendum Appendix V5-5I	Expert Third Party Review of Wildlife Mitigation and Monitoring Program Plan 1 - Golder	New
Addendum Appendix V5-5J	Expert Third Party Review of Wildlife Mitigation and Monitoring Program Plan 2 - EDI	New
Addendum Appendix V5-5K	Sabina Note to the Record – Expert Third Party Review Comments	New
Appendix V5-6A	Back River Project: Grizzly Bear and Wolverine DNA Report, 2012	No changes
Appendix V5-6B	Back River Project: Grizzly Bear and Wolverine DNA Report, 2013	No changes

5.3 LANDFORMS AND SOILS (ADDENDA)

NIRB Section:	Section 4.5 – Geological Features, Surficial and Bedrock Geology and Geochemistry	Ref No.:	FHR-NIRB-4.5

Reference to NIRB Report:
Section 4.5 – Geological Features, Surficial and Bedrock Geology and Geochemistry

Conclusions and Recommendations of the Board (Section 4.5.4):

In the Board's view, the environmental design features and mitigation measures proposed by Sabina to minimize project-specific impacts to geological features, surficial and bedrock geology, and geochemistry, especially with regards to the proposed Tailings Storage Facility, do not provide satisfactory assurance of addressing the concerns raised by parties **[FHR-NIRB-4.5(B)]**. The Board believes that the limited baseline data **[FHR-NIRB-4.5(A)]** and lack of detail in the proposed design of Tailings Storage Facility **[FHR-NIRB-4.5(B)]** during the environmental assessment process did not provide the Board with sufficient confidence that concerns of the Board and community members would be addressed or that sufficient protection of the pristine environment would be in place were the Project to proceed **[FHR-NIRB-4.5(C)]**.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

The Nunavut Impact Review Board (NIRB or Board) believes that limited baseline related to the Tailings Storage Facility (TSF) was available at the environmental assessment stage. Sabina believes that comprehensive environmental baseline information has been made available, and the completed analysis has provided sufficient information to support the FEIS effects assessment in the area of the TSF. Sabina acknowledges the NIRB has outstanding concerns and remains willing and able to discuss any issues related to geotechnical data collection. Sabina also notes that should the Board believe additional specific information to monitor potential effects is required, Sabina has the ability to collect additional specific information prior to the commencement of Project Construction.

The Board believes that there was lack of detail in the proposed TSF design. Sabina believes a sufficient level of TSF analysis and design was completed and provided during the environmental assessment phase. Sabina acknowledges the Board has outstanding concern and Sabina remains willing and able to discuss any issues related to TSF design that the Board should wish to further define. Sabina also notes that should the Board believe additional specific information be required, Sabina has the ability to provide additional specific information prior to the commencement of Project construction.

The Board expressed insufficient confidence that concerns of the Board and community members regarding the TSF design would be addressed. Sabina believes that they have built, and will continue to build upon the positive relationships it has developed with local residents and will regularly provide opportunities for meaningful engagement.

For the NIRB's convenience, a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by the KIA and INAC and agreed to by Sabina that are relevant to the topic of geological features, surficial and bedrock geology, and geochemistry are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested Text from Final Hearing	Anticipated Party Involvement
Commitment	INAC-C-4	The Proponent has committed to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program should include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. The Proponent will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process. Further, where the results of this program show the potential for seepage, the Proponent commits to the establishment of a monitoring program with the capability of determining that contaminants are being contained within the facility. The Proponent shall provide sufficient justification where it is determined that monitoring is not required. The options for monitoring shall be provided for review as part of the Type A Water Licence Application process.	INAC
Commitment	INAC-C-5	The Proponent commits to further thermal modeling to support dam design along critical cross-sections of the Main Dam. This should be presented for review during the Type A Water Licence Application process.	INAC
Commitment	INAC-C-6	The Proponent shall revise their Ore and Waste Rock Management Plan to include monitoring that demonstrates contact water (runoff and shallow groundwater) from the Waste Rock Storage Areas is adequately captured and managed. This shall be submitted to the Nunavut Water Board during the water licence application process.	INAC
Commitment	KIA-C-2	The Proponent commits to provide the Kitikmeot Inuit Association with information regarding the construction of the winter ice road including, but not limited to, fill, quarry and borrow sites required for the construction of the winter road for review and approval prior to construction.	KIA
Commitment	KIA-C-3	The Proponent commits to providing the results of the blast hole cutting sampling and testing program along with other geochemical monitoring results in an annual monitoring report. For at least the first annual report, the Proponent will engage a geochemical specialist to review the results and evaluate whether further changes in the monitoring or management activities is required. If such a recommendation is made, the Proponent will update WRMP accordingly. Regardless of whether such a recommendation is made, the WRMP will be updated at the time of water licence renewal.	KIA
Commitment	KIA-C-4	The Proponent commits to test a mixture of tailings and treatment sludges to evaluate the potential for remobilization of arsenic from this material. Tests will be conducted as sludges are produced. The Proponent commits to provide their proposed testing method to the Kitikmeot Inuit Association for review and approval prior to initiating these tests, and will provide the results of the testing in the annual monitoring report that will be submitted as part of the water licence requirements.	KIA

FHR-NIRB-4.5(A) – Limited Baseline Data for Tailings Storage Facility

The Board has stated that they have insufficient confidence in relation to the TSF design due to limited baseline information being available at the environmental assessment stage.

Baseline Data

Sabina acknowledges the Board's concern, but believes that comprehensive environmental baseline information on all Valued Ecosystem Components (VECs), Valued Socio-economic Components (VSECs), and Subjects of Note has been collected in the Potential Development Area (PDA) (as required in Section 7.3 of the EIS guidelines). Detailed field-collected baseline and analysis has provided sufficient information to support the FEIS effects assessment in the area of the TSF.

During the DEIS technical review, following a request from the KIA, the TSF was moved off of Inuit Owned Land (IOL) and on to Crown land; this TSF relocation remained within the PDA. In 2015, DFO requested additional fisheries baseline data be collected at the new proposed TSF location. Sabina honoured this request, and collected this additional baseline data in 2015; this data was provided in the FEIS Information Request Package (F-DFO-IR-1). Since the DFO request in 2015, no requests for additional baseline data have been made specific to any FEIS VECs or VSECs in the area of the proposed TSF.

Geotechnical and Geochemical Characterization

Sabina has completed multiple geotechnical and geochemical field investigations on the Project site. Table 1 provides a summary of all field drilling and test pitting programs completed to date.

Table 1: Summary of Historic Drilling and Test Pitting Programs

Date	Area	Investigation Type	Installations	Laboratory/In-Situ Testing	Reference
December 2001	South of Marine Laydown Area	6 offshore drill holes	-	Indicator testing (PSD[6], water contents, Atterberg Limits)	Nishi-Khon/SNC Lavalin 2001
August 2010	Goose Lake Airstrip	4 test pits	-	Indicator testing (PSD, water contents), Proctor Compaction	SRK (2010)
December 2011	Goose Lake Airstrip	11 drill holes in airstrip area	1 thermistor	Indicator testing, Proctor Compaction, triaxial shear strength testing	SRK (2011a)
April to August 2013[1]	Goose Property, George Property, MLA	34 drill holes at Goose Property (4 at airstrip, 4 at Goose Property[2], 4 at plant site[3], 21 in tailings area[4]); 67 hand-dug test pits (31 at Goose Property, 28 at George Property, 8 at MLA)	9 thermistors at Goose Property (4 at airstrip, 1 at plant site, 4 at tailings area)	Indicator testing	Knight Piésold (2013)
March to April, June 2015[5]	Goose Property, MLA	36 drill holes at Goose Property (3 at plant site, 9 water management holes, 3 at other planned infrastructure locations, 1 under Llama Lake, 20 at TSF); 11 drill holes at MLA (spread across the Freight and Fuel Storage, Camp, and Laydown Areas); 4 hand-dug test pits at in the MLA Fuel Storage Area	10 thermistors at the TSF	Indicator testing (PSD[6], water content, specific gravity, atterberg limits, in-situ density), pore water salinity, direct simple shear, consolidation, concrete aggregate, groundwater quality	SRK (2015a) SRK (2015b)

Source: FEIS Appendix V2-7C, Table 3

1) Program was completed in support of pre-feasibility study (PFS) to educate engineering design and was based on the mine plan at that time; 2) Goose pit rim has changed slightly in the FS mine plan from the PFS mine plan; 3) The plant site is in a different location in the FS mine plan than in the PFS mine plan; 4) The tailings impoundment area (TIA) was a ring-dyke facility in the PFS mine plan and has been superceded by the FS tailings storage facility (TSF), a valley-fill facility with a Main TSF Dam and small South TSF Dam far to the south of the original TIA in the FS mine plan; 5) Program was completed in support of feasibility study (FS) to educate engineering design and was based on the FS mine plan; 6 Particle Size Distribution (PSD).

Geotechnical and geochemical analysis was completed utilizing the above field collected data and this analysis generated the following relevant geotechnical and geochemical reports. These reports were submitted and made available through the environmental assessment phase; the 15 documents provided with the FEIS are summarized below:

- FEIS Appendix V2-7C: Site-Wide Geotechnical Parameters Report
- FEIS Appendix V2-7D: Geochemical Characterization Report
  - Lithological Descriptions (FEIS Appendix V2-7D, Attachment A)
  - Overburden, Quarry, Other Excavation Area, and MLA Results (FEIS Appendix V2-7D, Attachment C)
  - Mineralogy Results for Waste Rock (FEIS Appendix V2-7D, Attachment D)
  - Trace Element Results for Waste Rock (FEIS Appendix V2-7D, Attachment E)
  - ABA Results for Waste Rock (FEIS Appendix V2-7D, Attachment F)
  - NAG Test Results for Waste Rock (FEIS Appendix V2-7D, Attachment G)
  - Humidity Cell Test Results for Waste Rock (FEIS Appendix V2-7D, Attachment H)
  - Field Barrel Test Results for Waste Rock (FEIS Appendix V2-7D, Attachment I)
  - Trace Element Analyses for Tailings (FEIS Appendix V2-7D, Attachment J)
  - ABA Results for Tailings (FEIS Appendix V2-7D, Attachment K)
  - Humidity Cell Test Results for Tailings (FEIS Appendix V2-7D, Attachment L)
  - Process Water Quality and Aging Test Results for Tailings (FEIS Appendix V2-7D, Attachment M)
  - Compilation of Regional Data (FEIS Appendix V2-7D, Attachment N)

During the FEIS Final Hearing, Sabina jointly submitted two commitments with KIA for further geochemical characterization of both tailings and waste rock (KIA-C3 and KIA-C4, respectively):

> The Proponent commits to providing the results of the blast hole cutting sampling and testing program along with other geochemical monitoring results in an annual monitoring report. For at least the first annual report, the Proponent will engage a geochemical specialist to review the results and evaluate whether further changes in the monitoring or management activities is required. If such a recommendation is made, the Proponent will update WRMP accordingly. Regardless of whether such a recommendation is made, the WRMP will be updated at the time of water licence renewal.
>
> The Proponent commits to test a mixture of tailings and treatment sludges to evaluate the potential for remobilization of arsenic from this material. Tests will be conducted as sludges are produced. The Proponent commits to provide their proposed testing method to the Kitikmeot Inuit Association for review and approval prior to initiating these tests, and will provide the results of the testing in the annual monitoring report that will be submitted as part of the water licence requirements.

During the FEIS Final Hearing, KIA stated that, in consideration of the above commitments, they had no outstanding issues:

> *"The KIA and Sabina have continued to work together to resolve outstanding technical issues. Through careful consideration of the responses provided by Sabina at various steps in the review process, the KIA has determined that the* ***issues on the following slides identify the issues that have reached a resolution that is satisfactory to the KIA****…Technical Comment 9. "Acid Rock Drainage and Waste Rock". Sabina committed to providing a regularly updated waste rock management plan along with submitting results from blast hole cuttings sampling*

> *results to the Nunavut Impact Review Board for distribution to the parties.* ***This commitment is to appear as a component of the project certificate."***[3]

At the FEIS Final Hearing, Sabina jointly submitted with INAC a commitment for further geotechnical characterization with INAC (INAC-C4):

> The Proponent has committed to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program should include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. The Proponent will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process.

As agreed by INAC, this degree of information is not generally required within the environmental assessment process as it relates to construction requirements to meet environmental assessment objectives. During the FEIS Final Hearing, INAC stated that, in consideration of the above commitment, they had no outstanding issues:

> *"Based on responses provided by Sabina to our final written submission and discussions during this final hearing, and as we had previously agreed to with the submission of that list of proposed terms and conditions and commitments as submitted by Sabina,* ***Indigenous and Northern Affairs Canada has no outstanding issues with the proposal."***[4]

The Board believes that limited baseline related to the TSF was available at the environmental assessment stage. Sabina believes sufficient information was presented for the environmental assessment phase however acknowledges the NIRB has outstanding concerns. Sabina and remains willing and able to discuss any issues related to geotechnical data collection. Sabina also notes that should the Board believe additional specific information to monitor potential effects is required, Sabina has the ability to collect additional specific information prior to the commencement of Project Construction.

Attachment:

Not applicable

FHR-NIRB-4.5(B) – Limited Design Detail of Tailings Storage Facility

The Board believes that there was lack of detail in the proposed TSF design.

Sabina would like to highlight the extensive TSF analysis and design that was submitted, and made available, through the environmental assessment phase; the 16 documents provided with the FEIS are summarized below:

- FEIS Appendix V2-7E: WRSA Design Report
  - WRSA Thermal Modeling Memo (FEIS Appendix V2-7E, Attachment A)
  - WRSA Stability Analysis (FEIS Appendix V2-7E, Attachment B)
- Waste Management Multiple Accounts Analysis (Sabina 2016a)
- FEIS Appendix V2-7G: Tailings Management System Design Report
  - 2010 National Building Code Seismic Hazard Calculation (FEIS Appendix V2-7G, Appendix A)
  - Tailings Physical Characteristics Memo (FEIS Appendix V2-7G, Appendix B)

[3] J. Ottenhof, KIA, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 632, Lines 10 to 16; Pg. 633, Lines 19 to 25

[4] K. Costello, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1201, Lines 16 to 22

  - TSF Tailings Deposition Plan Memo (Appendix V2-7G, Appendix C)
  - TSF Containment Dam Wave Run-up and Freeboard Assessment Memo (FEIS Appendix V2-7G, Appendix D)
  - TSF Containment Dan – Seepage Rate through the Liner Memo (FEIS Appendix V2-7G, Appendix E)
  - TSF Dam Stability Analysis Memo (FEIS Appendix V2-7G, Appendix F)
  - TSF Containment Dam Thermal Modeling Memo (FEIS Appendix V2-7G, Appendix G)
  - Tailings Consolidation Modeling Memo (FEIS Appendix V2-7G, Appendix H)
  - TSF Containment Dam Geotechnical Monitoring Instrumentation Memo (FEIS Appendix V2-7G, Appendix I)
- FEIS Appendix V2-7H: Water and Load Balance Report
- FEIS Appendix V2-7I: Side-Wide Water Management Report

During the FEIS Final Hearing, Sabina jointly submitted two commitments with INAC to address additional analysis and design related to the TSF (INAC-C4 and INAC-C5, respectively):

> The Proponent has committed to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program should include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. The Proponent will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process.
>
> The Proponent commits to further thermal modeling to support dam design along critical cross-sections of the Main Dam. This should be presented for review during the Type A Water Licence Application process.

During the FEIS Final Hearing, it was the opinion of INAC that Sabina's commitment to undertake an infill geotechnical characterization program (INAC-C4) resolved the agency's concerns and that Sabina's measures were appropriate:

> *"We note Sabina's commitment to undertake an infill geotechnical characterization program in which they can determine the extent of the fractured bedrock contact zone and apply the necessary mitigation. Sabina's response also outlines how they will undertake permeability testing and seepage analysis.* ***We agreed that these are appropriate measures****."*[5]

Furthermore, during the FEIS Final Hearing, INAC stated that, in consideration of the above commitments, they had no outstanding issues:

> *"Based on responses provided by Sabina to our final written submission and discussions during this final hearing, and as we had previously agreed to with the submission of that list of proposed terms and conditions and commitments as submitted by Sabina,* ***Indigenous and Northern Affairs Canada has no outstanding issues with the proposal."***[6]

The Board believes that there was lack of detail in the proposed TSF design. Sabina believes a sufficient level of analysis and design was completed and provided during the environmental assessment phase. Sabina acknowledges the Board has outstanding concern and Sabina remains willing and able to discuss any issues related to TSF design that the Board wishes to further define. Sabina also notes that should

[5] M. Sewchand, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 561, Lines 17 to 23
[6] K. Costello, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1201, Lines 16 to 22

the Board believe additional specific information to monitor potential effects is required, Sabina has the ability to collect such information prior to the commencement of Project Construction.

References:

Sabina (Sabina Gold & Silver Corp.). 2016a. Final Information Request Responses – Part 2, Appendix N. Submitted to Nunavut Impact Review Board. February 2016.

Attachment:

Not applicable

FHR-NIRB-4.5(C) – Community Member Concern Regarding TSF Design

The Board expressed insufficient confidence that concerns of the Board and community members regarding the TSF design would be addressed or that sufficient protection of the environment would be in place were the Project to proceed.

Sabina has gone through an extensive effort to develop a comprehensive and transparent public consultation and engagement program. This program has provided regular opportunities for local residents to learn about the Project and voice Project-related concerns. Likewise, plans for Project tailings disposal have been reviewed with community members on a number of occasions. Sabina utilized industry and northern best practices to develop its public consultation and engagement program and has received very positive feedback on its approach from community and government representatives, regulators, and other Project stakeholders to-date. Approximately 185 community and stakeholder meetings on the Project were held prior to the November 2015 FEIS submission, during which time a substantial amount of feedback was received by Sabina. This feedback was later input into a community engagement database (containing some 165 topic directories) and analyzed to address key issues and concerns local stakeholders had about the Project. The various plans and designs presented in the FEIS incorporated this feedback and resulted in a number of Project changes.

For example, as stated in Section 4.1.5 of the Project Description and Alternatives (FEIS Volume 2, Chapter 4; Sabina 2016b), the Tailings Storage Facility was relocated at the request of the landowner:

> Alternatives pertaining to the location of the Tailings Storage Facility (TSF) and the management of mine tailings have strongly considered public opinions and preferences. At the request of the Kitikmeot Inuit Association (KIA), for example, the TSF was moved off of Inuit Owned Land (IOL) and on to Crown land even though this was economically less favourable to Sabina.

Comments were received on topics such as tailings (78 comments), climate change (15 comments), permafrost (9 comments), waste rock (6 comments), mine contaminants and waste (77 comments), acid rock drainage (4 comments), and other areas. While various questions, concerns, and suggestions were raised on these topics, Sabina provided timely responses and/or clarifications related to each. Appendices V3-1C and V3-1G of FEIS Volume 3 include detailed information on the comments received by Sabina. Table 1.6-1 in FEIS Volume 3 further summarizes the key issues raised during public consultation and Sabina's commitments to addressing those issues (including mine tailings and contaminants). Furthermore, a considerable amount of support for the Project advancing was expressed during Sabina's public consultation and engagement program. Substantial community support was also received during the FEIS Final Hearing itself, as evidenced in statements made by the KIA and during the final comments made by community representatives during the community roundtable portion of the Final Hearing.

Sabina also actively worked to collect and incorporate regional and Project-specific traditional knowledge (TK) throughout the FEIS. In some instances, topics related to tailings management and climate change were discussed during this TK work. TK sources utilized in the FEIS, included:

- Naonaiyaotit Traditional Knowledge Project (NTKP) database report;
- Theme-based TK workshops;
- Report on existing and publically available TK from selected Aboriginal groups in the Northwest Territories;
- Public consultation and engagement results;
- TK study on the Bernard Harbour Arctic char fishery; and
- Other relevant sources.

TK and community feedback were used for scoping and refining the initial VEC/VSEC list for the Project, and in the baseline against which potential effects were assessed. Sabina's final significance determinations were likewise informed by TK and every effort was made to ensure equal consideration of TK and scientific data in the conclusions that were drawn. TK also helped inform the development of mitigation and monitoring programs for the Project.

Since the November 2015 FEIS submission, nearly 50 additional meetings with community and stakeholder representatives have been held on the Project (for a total of over 230 Project-related meetings to-date). A summary of these meetings along with meeting notes is further discussed in the FEIS Addendum, Volume 3 Addenda. Sabina will continue to build upon the positive relationships it has developed with local residents and will regularly provide opportunities for meaningful engagement. Sabina will continue to work with communities to address concerns throughout the life of the Project. Sabina will also maintain a public consultation and engagement program throughout the life of the Project, as described in its Community Involvement Plan (FEIS Volume 10, Chapter 26).

References:

Sabina (Sabina Gold & Silver Corp.). 2016b. Final Information Request Responses – Part 2, Appendix O. Submitted to Nunavut Impact Review Board. February 2016.

Attachment:

Not applicable

5.4 VEGETATION AND SPECIAL LANDSCAPE FEATURES (ADDENDA)

NIRB Section:	Section 4.10 – Vegetation	Ref No.:	FHR-NIRB-4.10

Reference to NIRB Report:
Section 4.10 – Vegetation

Conclusions and Recommendations of the Board (Section 4.10.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has considerable uncertainty in relation to the effects predicted for vegetation due to limited baseline information being available **[FHR-NIRB-4.10(A)]**. Should the Proponent revise the proposed Project for a future submission, it is encouraged to consider additional mitigation, monitoring, and reclamation and revegetation measures associated with the protection of vegetation **[FHR-NIRB-4.10(B)]**, measures to limit impacts to prevent the introduction of invasive species from construction and clearing operations **[FHR-NIRB-4.10(C)]**, measures to quantify impacts from planned annual construction and operation of the winter ice road **[FHR-NIRB-4.10(D)]**, and measures for a progressive reclamation plan **[FHR-NIRB-4.10(B)]**.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

The Nunavut Impact Review Board (NIRB or Board) has stated that they have uncertainty in relation to the effects predicted for vegetation due to limited baseline information being available. Sabina believes a sufficient level of vegetation baseline data was collected for the environmental assessment phase; this was provided in the 2012 Ecosystems and Vegetation Baseline Report (FEIS Appendix V5-4A). Sabina remains willing and able to discuss any issues related to vegetation baseline data collection which the NIRB wishes to clearly define.

The NIRB has encouraged Sabina to consider additional mitigation, monitoring, and reclamation and revegetation measures associated with the protection of vegetation. In recognition of NIRB's request for additional mitigation and monitoring measures associated with the protection of vegetation, Sabina has developed a new Vegetation Monitoring Plan (FEIS Addendum Volume 10, Chapter 30) which includes specific sections on each topic. Refer to the Section 8 for mitigation measures, and Section 6 for monitoring measures within this plan. Sabina reiterates their commitments to research revegetation options, as made during the FEIS technical review process and FEIS Final Hearing (F-NMSA-TC-13).

The NIRB has stated that Sabina should consider additional measures for a progressive reclamation plan. For NIRB's consideration, Sabina has included additional information to further clarify its approach to progressive reclamation.

The NIRB has encouraged Sabina to consider additional measures to limit impacts to prevent the introduction of invasive species from construction and clearing operations. For NIRB's consideration, Sabina has developed a new Vegetation Monitoring Plan (FEIS Addendum Volume 10, Chapter 30), which includes additional information to further clarify its approach to invasive species.

The NIRB has stated that Sabina should consider additional measures to quantify impacts from planned annual construction and operation of the winter ice road. Since the FEIS Final Hearing, Sabina has developed a new Vegetation Monitoring Plan that quantifies impacts from planned annual construction and operation of the winter ice road (FEIS Addendum Volume 10, Chapter 30).

For the NIRB's convenience a listing of the terms and conditions and commitments that were recommended during the NIRB hearing by the GN and DFO and agreed to by Sabina that are relevant to the topic of vegetation are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Commitment	GN-C-25	In consultation with the KIA, GN, and other relevant parties the Proponent shall develop and implement a vegetation monitoring plan for the winter road that is designed to quantify the potential impacts on vegetation. The plan shall be submitted to the NIRB prior to winter road construction. Findings from these studies will be used to inform reclamation planning as appropriate.	GN
Term and Condition	DFO-T-7	The Proponent will implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of water crossing construction, operation, and decommissioning for all fish-bearing water crossings. The Proponent acknowledges these measures include, but are not limited to, appropriate design of water crossings to facilitate fish passage at both high and low flows, timing windows that incorporate spawning, incubation and hatch times for all species using water courses, sediment and erosion control, protection of riparian vegetation, and other forms of bank stabilization.	DFO, KIA, GN

FHR-NIRB-4.10(A) – Limited Vegetation Baseline Information

The Board has stated that they have uncertainty in relation to the effects predicted for vegetation due to limited baseline information being available.

Sabina would like to note that throughout the review of the DEIS there were a total of 557 individual Information Requests and Technical Comments from subject matter experts. Of these 557 comments received, one related to Sabina's collection of vegetation baseline data (DEIS GN-33), to which Sabina provided a detailed response that addressed the identified GN concern. The issue of limited vegetation baseline data was not raised during the DEIS Pre-hearing Conference, nor in the DEIS Pre-hearing Conference Report. The review of the FEIS resulted in a total additional 272 individual Information Requests and Technical Comments from subject matter experts. None of these 272 comments were related to Sabina's collection of vegetation baseline data. During the FEIS Final Hearing, the topic of limited vegetation baseline data was not raised by any parties, including the NIRB, or the NIRB staff.

We believe there may have been two discussions which were ongoing which may have resulted in confusion and as such generated the Boards concern.

First, in response to TK and a request by the KIA, the winter ice road north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones identified during two local focus group workshops (Cambridge Bay Hunter Focus Group 2012; Kugluktuk Hunter Focus Group 2012). This request was made during review of the DEIS and was captured, and honoured, in commitment (KIA-5 from PHC Report).

As a result, Sabina realigned a 5.5 km section of the winter road alignment away from the area identified. This realignment resulted in the winter road falling outside of the LSA, but 5.3 km (96%) of this relocated alignment is located on lakes. As such approximately 200 m of the 160 km winter road will need to be assessed for vegetation prior to construction (see below commitment). Air photos and remote sensed images were used to perform a table top assessment of the area. The minor deviation of the winter road

alignment outside of the LSA is not expected to change the evaluation of effects nor the identification of potential effects for any of the terrestrial wildlife VECs.

Second, during the review the KIA expressed concern that Sabina would place significant fill material on the over land portions of the winter road alignment, in a similar nature as has been done with the Tibbitt to Contwoyto Ice Road in the NWT. As has been clearly stated by Sabina throughout the review, we believe the winter ice road can be constructed with snow and ice only. However, should minor amounts of granular fill be required, Sabina will ensure proper vegetation, archeology, and other terrestrial based assessments are completed prior to any work being completed. It should be noted that vegetation and archeological assessments have already been completed for the entire alignment with the exception of the 200m mentioned above. Sabina will seek appropriate authorization from the KIA and/or Indigenous and Northern Affairs Canada prior to use.

Sabina believes that sufficient baseline vegetation data was collected and made available during the environmental assessment. Sabina has undertaken extensive vegetation baseline studies as outlined in the 2012 Ecosystems and Vegetation Baseline Report (FEIS Appendix V5-4A). Some of the highlights of this study include:

- Conducting soils and vegetation mapping of a very large local study area of 134,370 ha defined by the local the watersheds;
- Developed an ecological classification system for the area that links soil types with vegetation communities;
- Classified terrain, soils and ecological communities for the entire LSA;
- Conducted 817 field plots to ground truth the mapping, including the project development area, marine laydown area, winter road and control sites; and
- Conducted rare and invasive plant surveys using a qualified botanist.

The Board has stated that they have uncertainty in relation to the effects predicted for vegetation due to limited baseline information being available. Sabina acknowledges the outstanding concern of the NIRB and remains willing and able to discuss any issues related to vegetation baseline data collection. Sabina also notes that should the Board believe additional specific information to monitor potential effects is required, Sabina has the ability to collect additional specific information prior to the commencement of Project construction.

Sabina Proposed Commitment:

Sabina commits to perform a vegetation assessment of the portion of the winter ice road north of Tahikafflok Lake (Bathurst Lake) that was realigned and lies outside of the FEIS LSA.

Attachment:
Not applicable

FHR-NIRB-4.10(B) – Mitigation, Monitoring, Progressive Reclamation, and Revegetation

The NIRB has encouraged Sabina to consider additional mitigation, monitoring, and reclamation and revegetation measures associated with the protection of vegetation, as well as measures for a progressive reclamation plan.

Mitigation and Monitoring
In recognition of NIRB's request for additional visibility on mitigation and monitoring measures associated with the protection of vegetation, the new Vegetation Monitoring Plan (FEIS Addendum Volume 10,

Chapter 30) includes specific sections on each topic. Refer to the Section 8 for mitigation measures, and Section 6 for monitoring measures within this plan.

Revegetation and Reclamation

The NIRB has encouraged Sabina to consider revegetation and reclamation measures as the Project moves forward into Construction and Operations. During the FEIS Final Hearing, Sabina repeated their commitment to ongoing revegetation and reclamation research which was provided in F-NSMA-TC-13.

During the technical review phase, the topic of revegetation was raised by the NSMA; Sabina provided the following response, F-NSMA-TC-13, which outlines Sabina's previous commitment to revegetation research and progressive reclamation measures:

> In the Mine Closure and Reclamation Plan (MCRP; FEIS Volume 10, Chapter 29), Table 4.2-2 provides proposed progressive reclamation activities that will be evolved during the operational phase of the Project before permanent closure.

It is also stated in the closure objectives related to achieving physical stability (FEIS Volume 10, Chapter 29, Section 1.7) that:

> As part of this MCRP, potential revegetation of disturbed sites, including active revegetation, seeding, and soil amendment, were reviewed. At this time, active revegetation of the Property as part of closure is not planned given the cold climate setting of the Project as well as the precedent established for mine closure in Nunavut. Additional research in this field may be considered in future iterations of the MCRP.

Potential research studies to inform revegetation during progressive reclamation and Closure could include any numerous topics. The progress of these possible options would be dependent on the advancement of Project plans and closure plans and timing:

- Substrate and plant species selection trials: trials to identify appropriate local native species mixes for revegetation on reclaimed soils. The goal of this research would be to select native species that are suitable for revegetation of various soil conditions expected on reclaimed areas.
- Soil and plant processes research: identification of the soil processes, and biological, physical, and chemical conditions that are required to successfully regenerate native plants. This would be a comparative study of undisturbed sites and reclaimed soils to identify soil amendments to improve plant establishment.
- Monitoring of progressive revegetation of large footprint areas to provide adaptive feedback to revegetation activities. The goal of this will be to improve revegetation success and long-term site stability and land capability."

The NIRB has encouraged Sabina to consider revegetation and reclamation measures associated with the protection of vegetation. Sabina reiterates their commitment to research substrate and plant species selection trials, soil and plant processes, and progressive revegetation monitoring.

Progressive Reclamation

The NIRB has stated that Sabina should consider additional measures for a progressive reclamation plan. For the NIRB's consideration, Sabina commits to providing the following additional clarity in Section 4.0 to the next version of the Mine Closure and Reclamation Plan (FEIS Volume 10, Chapter 29):

> **1.1 Definition of Progressive Reclamation**
>
> Progressive reclamation takes place prior to permanent closure to reclaim components and/or to decommission facilities that are no longer required for the mine. Progressive reclamation can be initiated during the mine operations once a particular activity has been completed (e.g., the TSF, quarries and borrows), or when the facilities no longer serve a purpose (e.g., starting to

flood disused underground mine workings and open pits). Progressive reclamation is defined as the opportunistic reclamation activities completed during the operational phase of a project before permanent closure (MVLWB/AANDC, 2013). Progressive reclamation can increase efficiencies by utilizing available mining resources to conduct reclamation activities during the revenue-generating phase of the Project. Progressive reclamation typically reduces risks, final closure costs, and the time frame for achieving closure objectives.

1.2 Opportunities for Progressive Reclamation

The key closure activities that have been identified for progressive reclamation are summarized in the following sections for each individual component of the Project. The progressive reclamation activities provided in this MCRP will be updated in future versions to include new opportunities for progressive reclamation identified during Operations.

1.2.1 Waste Rock Storage Areas (WRSAs)

PAG waste rock within the WRSAs, including the TSF WRSA, will be progressively capped using NPAG waste rock and overburden sourced from adjacent or nearby active open pit operations. All WRSAs will be fully developed by the end of Year 6, such that the final cover of NPAG over PAG waste rock can be completed during the Operations Phase. Application of a final NPAG cover over all WRSAs represents the most substantial progressive reclamation effort proposed.

1.2.2 Tailings Storage Facility (TSF)

Tailings deposition in the TSF will cease in Year 2 of Operations. Tailings in the TSF will be progressively capped using PAG waste rock as the TSF is transitioned to a waste rock storage area (called the TSF WRSA). Ultimately, a 5 m NPAG cover, composed of NPAG rock and overburden, will be placed on the tailings and PAG waste rock; this will be fully developed by the end of Year 6. This covering of the TSF WRSA, along with all WRSAs, represents the most substantial progressive reclamation effort proposed.

1.2.3 Open Pits and Tailings Facilities (TFs)

Following completion of mining at each of the open pits, progressive reclamation will commence. In summary, the progressive closure measures for each pit or TF are as follows:

Llama Reservoir – In Year 6, the exhausted Llama Pit will be converted to a water reservoir. Water from the Saline Water Pond will be pumped into Llama Reservoir between Year 6 and Year 9. The Llama Reservoir will continue to passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase, reaching capacity in about Year 13.

Umwelt TF – After open pit mining of the Umwelt Pit concludes, it will be used to store tailings in Years 3 to 6. Umwelt TF will then passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase, reaching capacity in about Year 14.

Goose Main TF – Mining of the Goose Main Pit will conclude in Year 5 and it will then be used for tailings disposal from Year 6 until the end of mining (Year 10). Goose Main TF will then passively flood with site runoff and direct precipitation through the Closure Phase, reaching capacity in about Year 18.

Echo Pit – Once mining of the Echo Pit concludes in Year 5, dewatering will continue until Year 9 (i.e., the end of Echo U/G mining) as the two mines will be connected. Starting in Year 10, Echo Pit will passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase, reaching capacity in about Year 14.

In addition, the following generic reclamation activities will occur for open pits and TFs:

- Establishing boulder fences around open pits and TFs, where physical barriers are required to reduce the likelihood of entry by people or animals;
- Installing proper signage around mine openings and TFs; and
- Constructing open pit outflow structures, where necessary.

1.2.4 Underground Mines

Underground workings will be backfilled with waste rock during the mining process for stability reasons, and to reduce the quantity of exposed PAG waste rock on surface. Once underground mining and backfilling is complete, the remaining void volume will be filled with water as follows:

Llama U/G – In Year 5, the exhausted Llama U/G will be flooded with water pumped from the Saline Water Pond over approximately one year.

Umwelt U/G and Goose Main U/G – In Year 10, the exhausted Umwelt and Goose Main U/Gs will also be flooded with water pumped from the Saline Water Pond, with complete flooding occurring within approximately one year.

Echo U/G – In Year 10, the exhausted Echo U/G will be passively flooded with site water, including water from the Echo Pit which will be connected to the Echo U/G. Complete flooding is expected to occur within a few months.

1.2.5 Buildings, Equipment, and Infrastructure

Potential progressive reclamation activities for the buildings and equipment include:

- demobilize, remove, and decommission equipment and facilities as the facilities are identified as no longer being required for Operations; and
- reduce inventories of consumables leading up to the end of Operations.

1.2.6 Contaminated Materials and Waste Disposal

Materials (e.g., soil, snow, ice) that may become contaminated during Construction and Operations due to fuel or other spills will be cleaned up immediately following the spill. Soil will be remediated on site in lined landfarms. Final disposal will be in a WRSA or reused on site, if appropriate, once the soil meets Nunavut Site Remediation criteria for industrial land use.

Inert, non-hazardous landfills will be established within WRSAs at Goose Property during the Construction and Operations phases. As the various WRSAs are closed, so may some of the landfills within them, if they have reached capacity.

Hazardous wastes will be shipped off site periodically to reduce the amount of waste requiring removal at Closure.

Attachment:
Not applicable

FHR-NIRB-4.10(C) – Invasive Species

The NIRB has encouraged Sabina to consider additional measures to limit impacts to prevent the introduction of invasive species from construction and clearing operations.

Sabina would like to note that throughout the review of the DEIS there were a total of 557 individual Information Requests and Technical Comments from subject matter experts. Of these 557 comments received, one related to invasive species (DEIS GN-33), to which Sabina provided a detailed response that addressed the identified GN concern. The issue of limited vegetation baseline data was not raised during the DEIS Pre-hearing Conference, nor in the DEIS Pre-hearing Conference Report. The review of the FEIS resulted in a total additional 272 individual Information Requests and Technical Comments from subject matter experts. None of these 272 comments were related to invasive species. During the FEIS Final Hearing, the topic of limited vegetation baseline data was not raised by any parties, including the NIRB, or the NIRB staff.

Sabina used two regional classification systems to map ecosystems in the regional study area (RSA); these two system are the West Kitikmeot / Slave Study (WKSS) classification by Matthews, Epp, and Smith (2001), and the Geobase Land Cover data set (Government of Canada 2009). In the 134,370 ha local study area (LSA), these surveys identified 890 plant species, none of which are invasive plant species. The Back River Project 2012 vegetation baseline studies (FEIS Appendix V5-4A) included a combination of ecosystem classification and mapping, field verification, rare plant surveys, invasive plant surveys, and plant tissue collection for baseline metals analysis.

Sabina recognized within the FEIS that the introduction and spread of invasive or exotic plant species could occur as a result of equipment and vehicles, including from aircraft and marine vessels. Sabina is committed to preventing the establishment of invasive plant species and to maintain healthy vegetative cover within, and around, development areas. Sabina will use best management practices to reduce the potential for introduction and spread of invasive plant species as stated in FEIS Volume 5, Chapter 4, Section 4.8.2.

Sabina also recognized within the FEIS that the delivery of material, equipment, and freight to Bathurst Inlet introduces the potential introduction of invasive vegetation species and terrestrial species to the Arctic environment, and in FEIS Volume 9, Chapter 3 committed to the following:

> Sabina will undertake routine inspections of the storage sites within the MLA, however climatic conditions at Bathurst Inlet are expected to be the major barrier to the survival of introduced species. If a foreign species is detected, Sabina will consult with the Government of Nunavut and take appropriate species-dependent actions.

Sabina also committed in the FEIS to adhere to DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (FEIS Volume 9, Chapter 6, Section 6.5.3; FEIS Chapter 7, Section 7.5.3). The following mitigation measure is specific to invasive species:

- Machinery will be in a clean condition and maintained free of fluid leaks, invasive species and noxious weeds.

The NIRB has encouraged Sabina to consider additional measures to limit impacts to prevent the introduction of invasive species from construction and clearing operations. Sabina has developed a new Vegetation Monitoring Plan (FEIS Addendum Volume 10, Chapter 30), which includes additional information to further clarify its approach to invasive species; this includes supplemental invasive plant species mitigation measures as well as an approach to invasive plan species monitoring.

Attachment:
FEIS Addendum Volume 10, Chapter 30. Vegetation Monitoring Plan

FHR-NIRB-4.10(D) – Measures to Quantify Impacts to Vegetation from Winter Ice Road

The NIRB has encouraged Sabina to consider additional measures to quantify impacts from planned annual construction and operation of the winter ice road.

At the FEIS Final Hearing, the GN agreed that the jointly submitted commitment by Sabina and the GN met the requirements to quantify impacts from planned annual construction and operation of the winter ice road:

> The government recommends that the proponent undertake vegetation monitoring along the winter road alignment for the duration of the project in order to quantify the type and scale of impacts on vegetation. Findings from these studies should be used to inform reclamation planning as appropriate. We agree with the proponent's suggested term and condition in its response to final written submissions, with the additional suggestion that the need to consult with the Government of Nunavut and other relevant authorities be integrated into the wording. This will be captured and submitted in writing to the Board before the end of the hearing.

This jointly submitted commitment by the GN and the Sabina at the FEIS Final Hearing is provided for the NIRB's consideration (GN-C-25):

> In consultation with the KIA, GN, and other relevant parties the Proponent shall develop and implement a vegetation monitoring plan for the winter road that is designed to quantify the potential impacts on vegetation. The plan shall be submitted to the NIRB prior to winter road construction. Findings from these studies will be used to inform reclamation planning as appropriate.

Since the FEIS Final Hearing, and in recognition of NIRB's concerns, Sabina has developed a new Vegetation Monitoring Plan that is in line with the above commitment, GN-C-25. This Vegetation Monitoring Plan (FEIS Addendum Volume 10, Chapter 30) quantifies impacts from planned annual construction and operation of the winter ice road.

Attachment:
FEIS Addendum Volume 10, Chapter 30. Vegetation Monitoring Plan

5.5 CARIBOU (ADDENDA)

NIRB Section:	Section 4.11 – Terrestrial Wildlife and Wildlife Habitat	Ref No.:	FHR-NIRB-4.11

Reference to NIRB Report:
Section 4.11 – Terrestrial Wildlife and Wildlife Habitat

Conclusions and Recommendations of the Board (Section 4.12.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that there is considerable uncertainty in relation to the effects predicted on caribou from the Project. Further, the Board is not confident that, should they be encountered, greater than predicted adverse effects on wildlife and wildlife habitat could be adaptively managed because the highest and most protective version of the precautionary approach in called for in this case (FHR-NIRB-4.11)

The Board recognizes the efforts put forward by the Proponent and collaborating parties for the development of the proposed Wildlife Mitigation and Monitoring Program Plan and associated commitments, however, the Board stresses that any impact on caribou in this circumstance would be considered unacceptable (FHR-NIRB-4.11).

Given the uncertainties noted above and the acknowledgement that caribou populations adjacent to the project area cannot sustain any additional pressures as present, the proposed monitoring and adaptive management approaches do not go far enough to satisfy the Board that the Project can proceed as proposed without causing unacceptable effects. (FHR-NIRB-4.11)

Issues Highlighted within the Ministers' Referral Letter:

Caribou and Terrestrial Wildlife

The most challenging issue before the Board relates to caribou. With respect to this issue, the Board has concluded that there is considerable uncertainty in relation to the effects predicted on caribou and has acknowledged that caribou populations adjacent to the project area cannot sustain any additional pressures at present. The Report indicates that the Board is not confident that greater than predicted effects could be adaptively managed and that proposed monitoring and adaptive management approaches do not go far enough.

At the conclusion of the Final Hearing, the Government of Nunavut, Sabina Gold and Silver Corporation and the Kitikmeot Inuit Association jointly submitted proposed terms and conditions for the Board's consideration. Due to the timing of these submissions, the proposed plan and the proposed terms and conditions were not discussed by the participants. Therefore, the Board did not have the opportunity to hear the views of participants as to whether and how this proposal would sufficiently reduce uncertainty over impact mitigation. Although the Report acknowledges the efforts in developing these measures, it does not discuss the shortcomings of these measures in satisfying the Board that effects to caribou would be adequately mitigated. Further in-depth review of the potential effects of the Project on caribou, including full consideration of this submission, would provide an opportunity for the Board and others to clearly understand the effectiveness of the proposed measures.

Perhaps because these issues were not fully canvassed before it, the Board has not expressed its own views on the efficacy or adequacy of the joint Sabina, Government of Nunavut and Kitikmeot Inuit Association proposal. It therefore seems reasonable to believe that there could be an avenue for fruitful discussion that has not been fully explored. While we share the Board's view that it is premature to be confident these measures can be managed adequately, likewise and on the basis of our reasoning of the Report, we believe it is premature to conclude they cannot.

In respect of terrestrial wildlife other than caribou, it is difficult to determine from the Report what the Board concluded, how it came to its conclusions and on what evidence. The proposed mitigation measures drawn from the Wildlife Mitigation and Monitoring Plan and the Wildlife Effects Monitoring Plan were aimed at mitigating potential effects on terrestrial wildlife to an acceptable level. Before the Board can find them to be irremediably wanting, the parties should be given an opportunity to better understand the Board's concerns and propose ways to address them."

Sabina Response:

To address the uncertainties identified in the Final Report, the potential for resubmitting the Project as indicated in the Final Report, and to ultimately respond to the further reconsideration requested by the Minister and information request by the NIRB, Sabina has undertaken extensive additional consultations with communities, government agencies and the KIA, and has undertaken an extensive revision of its WMMP Plan for the protection of caribou and other wildlife.

Sabina has organized its response to this topic using the following headings:

1. Introduction
2. Caribou Herd Summary
   - (a) Beverly/Ahiak Herd
   - (b) Bathurst Herd
   - (c) Dolphin Union Herd
3. Background
   - (a) FEIS Wildlife Effects Assessment
   - (b) FEIS Caribou Effects Assessment
4. Overview of WMMP Plan
   - (a) Collaborative approach to WMMP Plan development
     - i. Table 1 Joint Proposal of Terms and Conditions and Commitments by Sabina and the KIA (presented at end of Final Hearing)
     - ii. Table 2 Joint Proposal of Terms and Conditions and Commitments by Sabina and the GN (Presented at end of Final Hearing)
   - (b) WMMP Plan Monitoring Measures
   - (c) Mitigation and Management Actions included in WMMP Plan
   - (d) Effectiveness of Mitigation and Management
5. Specific Topics Identified by Board in Final Report
   - (a) Herd vulnerability
   - (b) Mitigation measures should caribou herd experience a range shift
   - (c) Decline of caribou herds
   - (d) Interactions with winter ice roads for caribou
   - (e) Precautionary Principle
   - (f) Regulatory capacity
   - (g) Attractiveness of the site for grizzly bears and wolverine
   - (h) Suitability of mitigation for muskox, grizzly bear and wolverin**e**

1. INTRODUCTION

The purpose of this response is to review the monitoring and mitigation measures for the protection of caribou proposed by Sabina to address the Board's concerns respecting uncertainty of impacts to caribou and wildlife. In this response, Sabina provides an overview of the key caribou herds that occur at or near the Project site (namely, Beverly/Ahiak Herd, Bathurst Herd, and Dolphin and Union Herd), summarizes the steps it has taken to develop and revise the Wildlife Mitigation and Monitoring Program Plan (WMMP Plan), summarizes the new information and key measures included in the current WMMP Plan, and

addresses various specific related issues identified by the Board as outstanding concerns in the Final Report.

Since the FEIS was completed, Sabina has significantly expanded its proposed mitigation measures (as reflected in the current version of the WMMP Plan). Our conclusion that there would be no significant adverse effects on caribou and terrestrial wildlife is further strengthened by the inclusion of these additional mitigation measures, and as a result there are no changes to the FEIS characterization of impact or determination of residual, significant or cumulative effects.

Sabina has undertaken a comprehensive and collaborative approach to respond to the concerns of the Board set out in the Final Hearing Report:

- First, Sabina undertook a detailed and comprehensive review of the Board's views and recommendations set out in the Final Report. Sabina also reflected on the submissions to the Board made by participants during the review and Final Hearing, including community members, HTOs, government agencies, NWT First Nations and the KIA.
- Next, during July 2016 Sabina engaged the Kitikmeot communities to obtain feedback on the Final Report and identify further opportunities for improvement to Sabina's approach to caribou management.
- Sabina then revised the WMMP Plan in September 2016 to incorporate the measures that Sabina agreed to with GNWT, GN, and KIA at the end of the Public Hearing.
- This draft WMMP was reviewed in October 2016 with technical reviewers from GN and KIA to confirm that the changes were responsive to KIA and GN's concerns, the concerns expressed in the Final Report and community feedback. Sabina also met with GNWT.
- Following these meetings, the WMMP Plan was revised once again in November 2016. During November 2016, Sabina then carried out focus group sessions in Kitikmeot communities including Hunters and Trapper Organizations (HTO) members to obtain further community feedback on the WMMP Plan.
- Sabina then retained two third party experts in the area of caribou and wildlife management (Golder Associates Ltd. [Golder] and EDI Environmental Dynamics [EDI]) to carry out separate third party reviews of the WMMP Plan (these third party review memos are attached at FEIS Addendum Appendix V5-5I and FEIS Addendum Appendix V5-5J, respectively).
- Finally the WMMP Plan was revised again in February 2017 to respond to the recommendations included in the Golder and EDI third party review memos. This is the version of the WMMP Plan included in this FEIS Addendum Volume 10, Chapter 20.

As a result, the current WMMP Plan includes considerable changes and additions in response to comments, suggestions and requests from the reviewers of the previous versions of the WMMP Plan. The new WMMP Plan includes a suite of mitigation and management actions that are the most conservative, pro-active, and which we believe offers the best protection to caribou of any industrial site in the Arctic. The WMMP Plan includes commitments and plans to continue to engage and work with stakeholders to further update the WMMP Plan as the Project proceeds. These measures can be described in four broad categories:

- Mitigation – these are measures included in the Project design and activities that are conducted at all times, regardless of whether caribou are present, to limit potential effects on caribou.
- Staged Reductions – these are management actions (including cessations) that are undertaken when caribou are observed near the Project site to limit potential effects to caribou.
- Operational Shutdowns – Rapid Operational Shutdowns and Planned Operational Shutdowns are undertaken to limit potential effects to caribou if a herd shifts their calving or post-calving range to overlap the Project.

- Other Management Measures – these management actions pertain to special cases, such as caribou on the roads or runway.

The WMMP Plan also includes enhanced monitoring measures. With these and other detailed mitigation, management and monitoring measures in place, Sabina is confident that the responsible development of the Project can proceed while minimizing or eliminating any potential effects on caribou. Sabina is confident that these steps and measures and changes address the uncertainties relating to caribou and wildlife as set out in the Final Report.

Sabina is committed to maintaining proper mitigation and monitoring protocols for the life of the Project. During the years that Sabina has been working in Nunavut, we have raised substantial funds in the capital markets and have invested over $260 million in the Project. Sabina's ethics and commitments to the region and its constituents are a matter of public record, and our practices have been upheld as benchmarks for other companies. Sabina confirms that the Project remains feasible with the mitigation and monitoring proposed in the WMMP Plan.

In summary, as Sabina has always maintained, the protection of caribou from any effects of the Project is of paramount concern. Given all the above steps we have taken we are confident that the mitigation measures that we have adopted provide the most stringent measures for protection of the caribou. In addition our monitoring program and adaptive management program are at the highest standard. With all these measures in place we are confident that the project can proceed without any significant effects on the caribou.

2. CARIBOU HERD SUMMARY

(a) Beverly/Ahiak Herd

The Beverly/Ahiak herd occurs in the wildlife RSA, and can overlap the Project site primarily during the summer, fall and winter; and was included as a VEC in the assessment. This herd numbered 124,189 (± 13,996) in 2011 (Campbell et al. 2012). The population of this herd is within the historic range of population values measured since the 1980s, reaching a peak in the late 1990s.

The Project is located approximately 145 km away from the edge of the core calving grounds and 165 km away from the edge of the core post-calving range of the Beverly/Ahiak herd. This conclusion was corroborated by the GN on page 47 of their Final Written Submission:

> Currently, there is little or no overlap between the Project and nearby caribou herds during the calving and post-calving periods; as concluded in the FEIS.

The Project footprint is approximately 1/37,000th of the Beverly herd summer range and 1/66,000 of the total Beverly herd range.

Figure 7.1-1 of the WMMP Plan is a map which shows the Calving, Post-Calving and Total Herd Ranges of the Beverly/ Ahiak Caribou in relation to the Project.

(b) Bathurst Herd

Caribou from the Bathurst herd occur to the west of the Project primarily during the post calving period (late June and early July). The Project Application Information Requirements (AIR) specified that the Bathurst herd be included as a VEC in the EIS.

The seasonal range of each herd was calculated for the last 20 years using satellite collar data (1996-2015) (see maps in Final Hearing Exhibits 21-25) by Sabina and the Nunavut Planning Commission. During this period, the seasonal ranges of the Bathurst herd did not overlap the Project site. This fact is

corroborated by results of aerial survey and remote camera data, and by wildlife biologists from the GNWT who are experts in the use and interpretation of satellite collar data, who stated during the hearing:

> *"The Government of the Northwest Territories acknowledges that Sabina's removal of the George Property from the Back River Project means that the annual range of the Bathurst herd based on analysis of collaring locations does not overlap either geographically with the project development area of the Goose Property and marine laydown area, nor reasonably with the winter road between the two sites."* (NIRB Final Hearing File No. 12MN036 Transcript, page 1236)

It is important to note that the Project does not interact with the calving or post-calving ranges of the Bathurst caribou herd. The Project is located approximately 160 km from the edge of the core calving grounds and approximately 80 km from the edge of the core post-calving range for the Bathurst herd as defined in the most recent Draft Nunavut Land Use Plan by the Nunavut Planning Commission.

The main Project components including the Mine Site and Marine Laydown Area (MLA) are outside of the range of the Bathurst caribou herd, and the winter ice road does not interact seasonally with the Bathurst caribou range.

Sabina understands the critical link between caribou and the culture and wellbeing of Inuit in Nunavut and Aboriginal Peoples from the NWT. In particular, Sabina is sensitive to the decline of the Bathurst herd and its negative effects on community members. As result, Sabina is committed to minimizing its impacts to caribou and to aligning its monitoring and mitigation activities to be consistent with recovery planning for the Bathurst herd.

Even though the current Bathurst herd range does not overlap the Project site, mitigation is planned specifically for this herd to limit any potential disturbance should the herd move near the Project site.

Figure 7.1-2 of the WMMP Plan is a map which shows the Calving, Post-Calving, and Total Herd Ranges of the Bathurst Caribou in relation to the Project.

(c) Dolphin Union Herd

The Dolphin and Union herd uses the sea ice in the marine RSA, but does not overlap the Project site. Sabina committed to open-water shipping, so there is no temporal overlap between the Project and the Dolphin and Union caribou herd, which were scoped out of the effects assessment.

Figure 7.1-of the WMMP Plan is a map which shows the Calving, Post Calving and Total Herd Ranges of the Dolphin and Union Caribou Herd in relation to the Project.

3. BACKGROUND

(a) FEIS Wildlife Effects Assessment

The FEIS for the Project evaluated potential effects of the Project on wildlife and wildlife habitat. Following the NIRB guidelines for the Project, the FEIS evaluated potential effects on eight terrestrial wildlife Valued Ecosystem Components (VECs) and two marine wildlife VECs, including: caribou (Bathurst, Beverly/Ahiak, and Dolphin and Union herds), grizzly bear, muskox, furbearers (wolverine), migratory birds (waterbirds and upland birds), raptors, marine mammals (ringed seals) and marine birds. The current status of each wildlife population in a regional study area (RSA) and local study area (LSA) as well as a broader geographic area was described using Traditional Knowledge (TK), regional reports, scientific studies, and baseline studies conducted between 2007 and 2015 for the Project.

The FEIS considered six potential direct effects, including: habitat loss, disturbance due to noise, disruption of movement, direct mortality and injury, indirect mortality, and attraction; and one potential

indirect effect: reduction in reproductive productivity. Each potential effect was evaluated using TK and the best available scientific data.

Sabina presented a DEIS to interested parties in 2014. During the Pre-hearing Conference, Sabina made 141 commitments to update the wildlife components of the DEIS and made significant improvements to the effects assessment and WMMP Plan, which were submitted as part of the FEIS.

For each wildlife VEC, residual effects were predicted to be not-significant, based on the species biology, degree of interaction with the Project, and mitigation, monitoring and adaptive management outlined in the WMMP Plan.

(b) FEIS Caribou Effects Assessment

Traditional Knowledge is integral to any assessment of caribou and terrestrial wildlife. Sabina commissioned three TK studies in the Back River area:

- Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River Project, Naonaiyaotit Traditional Knowledge Project (NTKP) report (FEIS Appendix V3-3A);
- Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (FEIS Appendix V3-3C; and
- Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (FEIS Appendix V3-3B).

Sabina also referenced the following studies/workshops where landusers shared their thoughts on the Project location and potential effects:

- The Nunavut Impact Review Board (NIRB) Public Scoping Meetings Summary Report (NIRB 2013). This report summarizes the public scoping meetings held at five Kitikmeot communities, including residents/families from Bathurst Inlet and Bay Chimo as well as a public scoping meeting in Yellowknife, Northwest Territories; and
- Focus group sessions with hunters from the Kitikmeot communities (Rescan 2013).

Inuit TK information indicated that the Bathurst caribou herd historically calved on both sides of Bathurst Inlet, north of the Project site, which is supported by aerial survey information from the 1950s to present. TK information described the seasonal movement patterns of caribou and identified a variety of locations where caribou have been consistently observed, including river and lake crossings (nadlok) and crossing locations in the islands of Bathurst Inlet. Some of these areas were consistently used by caribou and supported hunting camps and settlements. The closest of these to the Project is the crossing on the east end of Beechey Lake, approximately 35 km south of the Project.

Inuit TK also identified that calving has been observed at Contwoyto, Nose and Beechey lakes. Females with calves are observed at these locations by scientific studies, with the current post-calving and summer range occurring near these lakes. TK also identified several important nadlok for caribou and harvesting including two esker complexes north of Nose Lake used for movement. Baseline studies reported that caribou continue to use these sites in moderate to large numbers.

As noted above, the wildlife effects assessment evaluated the potential for three principal herds to interact with the Project; Bathurst, Beverly/Ahiak (referred to as “Beverly” in the FEIS), and the Dolphin and Union caribou.

Sabina has produced a robust effects assessment that describes the past, current and potential future effects on caribou. Sabina drew from TK reports, collar data and baseline studies using aerial survey, remote cameras and habitat mapping to evaluate potential effects of the Project on caribou.

The FEIS considered six potential direct effects for caribou (FEIS Volume 5), as directed in the EIS Guidelines, including:

1) Habitat loss – evaluated as the loss of habitat compared to the size of seasonal ranges where caribou may overlap the Project site and compared to the total herd range (FEIS Section 5.5.2.1).
2) Disturbance – evaluated using scientific literature of wildlife avoidance of similar projects in the Arctic, and by calculating noise levels and comparing them to literature values where wildlife react to noise (FEIS Section 5.5.2.2).
3) Disruption of movement – the location of the Project was compared to migration routes identified from TK and satellite collars, and the traffic level on roads was compared to threshold values that can result in a barrier effect to caribou (FEIS Section 5.5.2.3).
4) Direct mortality and injury – the mortality of caribou from injury and accidents was compared across mining projects in the Arctic (FEIS Section 5.5.2.4).
5) Indirect mortality (increased access) – the wildlife assessment references the socioeconomic impact assessment to determine how many hunters may travel from Cambridge Bay 375 km to use the winter ice road (FEIS Section 5.5.2.5).
6) Attraction – the potential for wildlife (primarily grizzly bear and wolverine) to be attracted to Project camps and buildings was evaluated by comparing the mortality rates of problem bears across similar projects in the Arctic (FEIS Section 5.5.2.6).

and one potential indirect effect:

1) Reduction in reproductive productivity – was evaluated through a literature review of productivity and energetics studies on caribou (FEIS Section 5.5.2.7).

Sabina understands from TK information that certain areas, like east and west of Bathurst Inlet are consistently used by caribou for calving and that caribou will return each year to their calving grounds. However, Sabina recognizes that land use by caribou can change through time. Sabina addressed changes in land use and potential uncertainty in Project effects on caribou in five ways in the FEIS:

First, Sabina evaluated the area of habitat loss due to the Project on caribou herds using a Potential Development Area that is approximately seven times larger than the actual proposed Project footprint thereby overestimating the potential effects of the Project.

Second, during the Pre-hearing Conference, Sabina addressed regulator concerns that the Bathurst herd may shift its calving range in the future by evaluating three potential future scenarios for the Bathurst herd:

- The most likely scenario is status quo, where the Bathurst herd continues to calve where it has calved for the last 20 years on the west side of Bathurst inlet between the Hood and Burnside Rivers. In this case, the Bathurst herd would continue to not overlap the Project site.
- A scenario where the Bathurst herd shifts its calving range to the historic calving range identified by TK and aerial surveys during the 1960s-1980s east of Bathurst Inlet. In this case, the Project could interact with the spring and fall migration ranges of the Bathurst herd.
- A scenario where the Bathurst caribou shift their calving range to Contwoyto Lake (approximately 160-223 km west of the Project), and to a lesser degree surrounding Nose (approximately 120 km west) and Beechey Lakes (approximately 30-70 km). In this case, the Project would be approximately 30-70 km from the closest calving area.

The FEIS evaluated the degree of potential overlap with seasonal ranges in each case and concluded that there would be no effect on Bathurst caribou (in the status quo scenario) and non-significant effects on the herd in the other two scenarios.

Third, the FEIS evaluated the potential effects of disturbance due to noise, dust and aircraft overflights on caribou by evaluating a zone of influence (ZOI) and evaluating the area influenced compared to the seasonal and annual range. For both the effects assessment and the cumulative effects assessment, the FEIS evaluated a likely scenario where fewer caribou occupy the area within 4 km of the Project site, a distance supported by multiple published reports. The FEIS also evaluated a worst-case scenario of caribou avoiding mining projects by 14 km, a distance reported in a single journal article discussing the Ekati and Diavik mines, which combined are approximately 10.4 times larger than the footprint of the Project. The potential effects of both scenarios were evaluated and reported in the FEIS as not-significant for caribou.

Fourth, the FEIS determined that the Project will interact with the Beverly/Ahiak herd, but will result in not-significant effects on this herd. Given that the Bathurst herd does not overlap the Project site, no residual effects were predicted for this herd. However, due to the level of concern surrounding the Bathurst herd, both herds were advanced to the cumulative effects assessment.

Fifth, the FEIS WMMP Plan included provisions for the Project to anticipate and react to shifts in the distribution of calving and post-calving ranges and managed Project activities accordingly should these ranges overlap the Project site. Following discussions with the KIA and GN during and after the Final Hearing, the monitoring and management measures used to response to shifts in calving and post-calving range have been extensively updated.

The cumulative effects assessment evaluated potential interactions between past, present and reasonably foreseeable future projects. Together these projects will remove less than 0.1% of the annual range of either caribou herd and potential effects were rated as not-significant.

The FEIS evaluated the potential effects on caribou using TK information and the results of government, academic and baseline studies. The general philosophy of the wildlife assessment was to discuss and evaluate a range of possible outcomes from the most likely scenario to the worst case scenario. This allowed for a robust assessment that addressed future changes in caribou distribution and population.

4. OVERVIEW OF WMMP PLAN (Caribou)

(a) Collaborative approach to WMMP Plan development

The FEIS included a WMMP Plan which was updated three times prior to the Final Hearing. The GN and GNWT are the responsible agencies with the regulatory mandate to monitor and manage the caribou herds that overlap with or are adjacent to the Project site. Throughout the environmental assessment, Sabina has encouraged discussion and collaboration on the WMMP Plan.

- Version 1 (2013) – The original draft of the WMMP Plan was included in the DEIS application.
- Version 2 (2015) – During the pre-hearing conference, Sabina made 66 commitments to update the WMMP Plan following discussions with the KIA, GN and GNWT. The updated plan was submitted with the FEIS.
- Version 3 (March 2016) – The FEIS WMMP Plan was updated following Information Requests, Technical Comments and technical meetings with the KIA and GN and presented to the NIRB and reviewers prior to the FEIS hearings in April, 2016.

During the FEIS Final Hearing, the GN and GNWT initially expressed concerns over potential uncertainty in the effectiveness of proposed mitigation measures. To address their concerns, these agencies proposed a series of Terms and Conditions and Commitments in their Final Submissions that would increase their confidence in the proposed monitoring, mitigation and management to be conducted by Sabina.

During the FEIS Final Hearing, Sabina continued to discuss outstanding concerns with respect to caribou with the KIA, GN and GNWT. As noted by the Minister in its letter to the NIRB, at the conclusion of the

FEIS Final Hearing, Sabina provided joint submissions to the NIRB on wildlife, with both the KIA (Table 1) and GN (Table 2).

Table 1. Joint Proposal of Terms and Conditions and Commitments by Sabina and the KIA (presented at end of Final Hearing)

Identifier	Proposed Term and Condition
KIA-2	The Wildlife Mitigation and Monitoring Plan will be updated as needed during the life of the project in conjunction with the KIA and submitted to the NIRB for review. Updates may be triggered by significant changes in the project plan, results reported in the annual Wildlife Effects Monitoring Plan report that indicate changes in conditions that are likely to be biologically meaningful, significant update to the scientific understanding or methods relevant to wildlife at the project site, or as necessary.
Identifier	**Proposed Commitment**
KIA-C13	The Proponent will update the Wildlife Mitigation and Monitoring Plan to include a plan that will be implemented immediately in the event of calving caribou shifting their range to overlap with the Project Development Area. The Proponent will update the Wildlife Mitigation and Monitoring Plan to reflect the following measures in order to identify the presence of an aggregation (group) of caribou calving near the Project site during the calving period, post calving and summer. If a group of greater than 250 caribou are observed by active monitoring within 4 km of the Project site, then staged reduction of helicopter use and heavy vehicle use will be triggered. The threshold for cessation of blasting will be the greater of 4 km, or according to Commitment KIA-C14 of this table. The aggregation group size definition may be updated based on best available science in subsequent Wildlife Mitigation and Monitoring Plan updates.
KIA-C14	The Proponent commits to decreasing the sound levels as indicated in the Wildlife Mitigation and Monitoring Plan use to calculate the distance that caribou must be from the blasting prior to explosion detonation from 108 dB to a level more protective of caribou. These levels will be reduced to 96 dB.
KIA-C9	The Proponent commits to providing a more detailed description of activities, with reference to what equipment will be operating and how often, during the different stages of a staged reduction in project activities in the next Wildlife Mitigation and Monitoring Plan update. This will include a quantitative description of the noise produced by these activities and the area over which continuous noise thresholds for caribou will be exceeded.
KIA-C10	Sabina will work in conjunction with the KIA to develop a plan for winter road use cessation and/or management in April to protect the spring migration of the Beverly caribou herd to be a component of their land tenure agreement.
KIA-C11	Sabina commits to developing an adaptive management plan, in conjunction with the KIA, to manage caribou access to the TSF if caribou are observed to be drinking from the tailings water.
KIA-C12	Sabina commits to increase the visual observation distance trigger for enhanced mitigation for caribou around roads (in Table 6.10-2 of Version H.1 of the Wildlife Mitigation and Monitoring Plan, for fall and winter seasons) from 250 to 500 m.

Table 2. Joint Proposal of Terms and Conditions and Commitments by Sabina and the GN (Presented at end of Final Hearing)

Identifier	Proposed Commitment
GN 11	The Proponent will revise the WMMP to remove remaining areas that refer only to the Bathurst herd and apply all monitoring and mitigation measures (including mitigation for shifts in calving and post-calving range) to both Bathurst and Beverly caribou herds except where another commitment refers to a specific herd.
GN 12a	In consultation with the GN, the Proponent shall revise the WMMP to more clearly define the technical specifications and requirements of the proposed collar-based regional monitoring programs designed to monitor Project effects on caribou (i.e., the ZOI monitoring), and to monitor caribou range use for the purpose of mitigation (i.e., seasonal ranges use monitoring), including details on required statistical power, sample size, sampling schedule and frequency of data acquisition. Prior to construction Sabina will also update the WMMP to (1) Confirm that data suitable to meet these technical specifications and monitoring needs are available and 2) demonstrate that relevant data sharing agreement are in place with government data suppliers. The revised WMMP shall be submitted to NIRB for review.

(continued)

Identifier	Proposed Commitment
GN 12b	Sabina will update the WMMP Plan to include a commitment to contribute to cumulative effects/regional monitoring for caribou, grizzly bear, wolverine and/or muskox following proposals from the GN/GNWT to a maximum total combined value, to be determined. Commentary: In Section 7.3.1.5 of the WMMP (April 11, 2016), the reference to limiting the annual contribution for caribou cumulative effects monitoring to either the Bathurst or the Beverly herd will be removed. Contributions may be made to monitoring efforts on both herds in the same year, subject to a maximum total combined value to be determined.
GN 13a	Prior to construction, in consultation with the GN and other relevant parties, the Proponent shall revise the WMMP to address concerns regarding caribou monitoring and mitigation methods as submitted by the GN in its final submission and as further revised and clarified by the commitments made during the NIRB public hearings. The revised WMMP shall be submitted to the NIRB for review and approval.
GN 13b	The Proponent will update the WMMP Plan to include reductions of project activities (e.g., planned cessation in above-ground blasting, heavy truck hauling and use of helicopters (except where such activities are required in order to address regulatory compliance or health and safety) should the core calving or post-calving ranges of the Bathurst or Beverly caribou herds overlap the Project site. The cessation of these activities will be planned for the period of time when the core calving and post-calving distribution of caribou overlaps the project, based on recent years of caribou collar and monitoring data. This planned period will be of sufficient duration to take into account annual variation in the timing and distribution of calving and post-calving caribou interactions with the Project. This plan will be updated with the WMMP Plan in consultation with the KIA, GN and other relevant parties. Note to the NIRB: Note that Sabina has already committed to the KIA to provide a full description of any remaining project activities proposed during a planned cessation of above-ground blasting and heavy truck hauling, and to provide a noise model for these activities and to compare this predicted noise to the noise produced by indoor activities only. Sabina has already committed to updating the proposed mitigation actions in the WMMP Plan in consultation with the KIA, GN and other interested parties.
GN 14a	During construction of the ice road, if a bear den is identified by pre-construction monitoring, the Proponent will avoid the den by 1 km. Under special circumstances an exception to the 1 km buffer may be implemented for logistical reasons following consultation with the GN.
GN 16	The Proponent will update the WMMP Plan to include the following commitment: Prior to removal or deterrence of raptors, the Proponent will contact GN-DOE to discuss proposed mitigation options, as listed in the WMMP Plan, and will obtain the required permit prior to undertaking any activity that can lead to the destruction of raptor nests or the deterring of raptors from nesting sites.
GN 17a	To be more protective of muskox, the Proponent commits to updating the WMMP Plan to: (1) Increase the trigger distances for blasting mitigation measures for muskox (table 6.3-1 in the current April 2016 version of the WMMP); and (2) Specify mitigation measures, trigger distances and group size thresholds for the operation of heavy equipment on site roads and aircraft (vertical and horizontal distance buffers).
GN 20c	To the extent possible, and with the appropriate mitigation and monitoring in place, the Proponent shall take into consideration the higher potential of caribou presence in the area when planning outdoor construction activities (including site clearing, blasting, and operation of heavy equipment) during the period of July 26 to August 31).
GN 21	In consultation with the GN and other relevant authorities, the Proponent shall develop criteria and procedures governing the deterring of wildlife from blast zones and relaxation of mitigation measures for animals deemed Project-Tolerant. These criteria and procedures shall be submitted to the NIRB for review and approval prior to construction. For clarity, caribou will only be deterred if their safety is at direct risk. Reference to deterring wildlife from blasting zones will be removed from the blasting management plan (FEIS Volume 7, Chapter 13, Section 7)" Commentary: Draft information was included in the April 11, 2016 WMMP Plan update but further details will be added.
GN 22b	The Proponent shall include in the WMMP specific details on additional monitoring and mitigation that will be triggered when large groups of caribou occur near the ice roads.

(continued)

Identifier	Proposed Commitment
GN 23a	The Proponent commits to updating the WMMP to include the trigger that should the existing incidental observation program record >5 persons per year using the road for harvesting purposes then the Proponent will implement a more direct monitoring program for persons using the ice road and reported as part of the Socio-Economic Monitoring Report to NIRB.

NIRB issued its Final Report in June 2016. Sabina reviewed the Final Report in detail, with particular emphasis on NIRB's comments relating to wildlife and caribou. During July 2016, Sabina also carried out a community tour to obtain additional feedback from Kitikmeot communities.

In September 2016, Sabina produced Version 4 of the WMMP Plan incorporating the terms and conditions and commitments summarized in Table 1 and Table 2 above, as well as revisions arising out of the NIRB's comments in the Final Report. Sabina also incorporated the eight recommendations/requests included in GNWT's technical comments to the NIRB in Version 4. Version 4 of the WMMP Plan was re-organized by species, instead of by activity, and significant improvements were made following regulator comments.

Sabina met with the KIA in September 2016 to discuss Version 4 of the WMMP Plan, and a further Version 5 was issued which reflected 26 further improvements and additions.

Version 5 of the WMMP Plan was then presented to KIA, GN, and GNWT in October 2016. These meetings included a meeting with the GNWT on October 24, 2016 in Yellowknife and a two day workshop with the KIA and GN on October 25 and 26, 2016. These meetings resulted in an additional 86 commitments and text changes to the WMMP Plan (it is noted that the majority of these changes were small changes, or clarifications to the text of proposed monitoring programs).

These changes are reflected in Version 6 of the WMMP Plan (November 2017). During November and December, 2016, Sabina conducted a community tour to the Kitikmeot communities to describe the updated WMMP Plan. Sabina met with Kugluktuk HTO, Cambridge Bay HTO, community meetings in Kugluktuk and Cambridge Bay, community members from Bathurst Inlet and Bay Chimo including the Burnside HTO, and we set up open houses in Cambridge Bay. To illustrate the operation of the WMMP Plan at community meetings we presented the infographics which are included as Appendix 2 to the WMMP Plan [FEIS Addendum Volume 10, Chapter 20]. These provide pictures and graphics to support understanding of the application of the caribou protection measures in different situations.

As a general comment, all of the groups we met with were very supportive of the revised WMMP Plan and told Sabina that the revised WMMP Plan (including the infographics) was presented more clearly than the FEIS WMMP Plan and that the new mitigation measures were a significant improvement.

Version 6 of the WMMP Plan was then submitted for additional peer reviews, conducted by Golder Associates and EDI in January 2017.

In February 2017, Version 6 of the WMMP Plan was further revised to incorporate improvements recommended by Golder and EDI. The current version of the WMMP Plan submitted with this FEIS Addendum is Version 7 (February 2017).

(b) WMMP Plan Monitoring Measures

Early versions of the WMMP Plan submitted with the DEIS and FEIS included a two-step process to trigger management to limit disturbance on caribou (Staged Reductions in Project activities). First, Sabina would receive collar data and when caribou appeared to be approaching the Project site, wildlife monitors would then be brought to site to conduct ground-based monitoring for caribou.

In response to comments from the KIA, GN and GNWT that monitoring should be more protective of caribou, Sabina has committed to staffing wildlife monitors on-site year round to monitor for caribou every day, with collar data used to supplement information collected by the wildlife monitors.

Sabina plans to utilize several types of monitoring tools for caribou that will be used to trigger management actions (current WMMP Plan). Each of these monitoring programs is conducted at some or all Arctic mining projects in Canada. The detailed methods of these monitoring programs will be finalized during the permitting stage, in consultation with the KIA, GN and GNWT. The results of these monitoring programs will be reported in the annual Wildlife Effects Monitoring Program (WEMP) report which is described in the WMMP Plan.

With these updated and improved monitoring programs in place, Sabina will be able to determine when caribou are approaching the Project site and trigger appropriate mitigation and management actions. These programs will also enable Sabina, the NIRB, KIA, GN, GNWT and other interested parties to comprehensively evaluate the effects of the Project on caribou.

A description of the full monitoring program for caribou in the current WMMP Plan is included below:

1) Active caribou monitoring (Section 7.2.1.3)

Active wildlife monitoring will be conducted on-site every day, year-round by trained wildlife monitors. Daily monitoring will be conducted for caribou, grizzly bear, and muskox. The WMMP Plan includes three options for active caribou monitoring:

i. High-powered closed-circuit television (CCTV) cameras - The preferred option using military-grade observation cameras mounted on towers. These cameras can detect animals the size of a caribou to greater than 4 km. These cameras are a proven technology, used by military facilities in a variety of climates. Using 2-3 cameras, Sabina can observe the majority (>90%) of the area within 4 km of the Project and beyond that distance.
ii. Observation blinds – The secondary option is to conduct active monitoring from observation blinds on the Project site.
iii. Vehicle-based observers – The third option is to conduct active monitoring from vehicles on the high points of Project on-site roads.

Sabina prefers and is planning to use the high-powered CCTV cameras. The other options are available while the cameras are being installed or in the event that the cameras malfunction or other unforeseen circumstances.

Data on caribou presence, distance to the Project site, and group size collected during active caribou monitoring will be used to trigger Staged Reductions in Project activities – cessation of blasting, heavy mobile equipment, helicopters and vehicles on the Project roads.

These data will also be used to trigger Rapid Operational Shutdown if large groups of caribou are observed within 4 km of the site during calving or post-calving.

Following the FEIS Final Hearing, the KIA and GN requested additional detail be added to the WMMP Plan concerning the use of CCTV cameras to detect caribou. These additions have been made to the current version of the WMMP Plan.

Monitoring is regularly conducted using high-powered CCTV cameras. Monitoring from observation blinds and vehicles is commonly conducted by researchers. For example, both the Ekati and Diavik diamond mines utilize wildlife technicians deployed around site by vehicle, either during scheduled surveys or in response to wildlife observations that require additional monitoring.

2) Mapping caribou ranges (Section 7.2.1.1)

Sabina will map the seasonal ranges of the Bathurst and Beverly/Ahiak caribou herds, including the calving and post-calving ranges, to determine if these ranges are remaining in the same general area or are shifting. This type of mapping is conducted regularly by proponents and government agencies that collect collar data. Should the calving or post-calving range of a herd shift to overlap the Project site, a Planned Operational Shutdown will be triggered to minimize any disturbance to caribou. This Planned Operational Shutdown includes cessation of all major activities on-site and reduction in the number of personnel on-site.

3) Near real-time collar monitoring (Section 7.2.1.2)

Collar data provided by the GN and GNWT will be used to monitor the near real-time location of the caribou herds. This is already being done to monitor the Mobile Core Bathurst Caribou Conservation Areas, in force on January 23, 2016 under the *NWT Wildlife Act* (R-006-2016). The Conservation Areas have been established as a wildlife management unit for barren-ground caribou to ensure the conservation of the Bathurst Caribou herd. No one is allowed to harvest barren-ground caribou in the Conservation Areas.

During the sensitive calving, post-calving and early summer periods the caribou herds are generally aggregated into large groups in a relatively small, defined area, making collar data suitable for monitoring. This type of monitoring is already incorporated by mining projects in the NWT. For example, the GNWT provides weekly collar updates to both the Ekati and Diavik diamond mines as part of their monitoring programs.

4) Incidental observations (Section 7.2.1.4)

Observations of caribou by any Project personnel (e.g., helicopter pilots, drivers, camp personnel) will be reported to the Environment Department. These data may trigger additional Active Caribou Monitoring and can also trigger management. Reporting incidental wildlife observations, including caribou observations, is conducted at all mining operations in the Arctic.

5) Zone of Influence monitoring (Section 7.2.2.4)

Throughout the life of the Project, Sabina will conduct a regular analysis of satellite collar data to determine if caribou are avoiding the Project site. Satellite collar data collected before construction (approximately 25 years of data) will be compared to satellite collar data following construction to determine if caribou are avoiding the Project site. Results of this program will trigger adaptive management actions, as required. Zone of influence monitoring is a commonly-conducted scientific analysis technique.

During the FEIS review, Sabina discussed this monitoring program with the GN, and made the following commitment as part of its joint submission with the GN.

GN 12a	In consultation with the GN, the Proponent shall revise the WMMP to more clearly define the technical specifications and requirements of the proposed collar-based regional monitoring programs designed to monitor Project effects on caribou (i.e., the ZOI monitoring), and to monitor caribou range use for the purpose of mitigation (i.e., seasonal ranges use monitoring), including details on required statistical power, sample size, sampling schedule and frequency of data acquisition. Prior to construction Sabina will also update the WMMP to (1) Confirm that data suitable to meet these technical specifications and monitoring needs are available and 2) demonstrate that relevant data sharing agreement are in place with government data suppliers. The revised WMMP shall be submitted to NIRB for review.

These items have been updated in the current WMMP Plan. Results of this program will be used to adaptively manage Project activities to reduce any effects on caribou.

6) Behaviour monitoring (Section 7.2.2.2)

Behaviour monitoring will be conducted by wildlife monitors to determine how caribou respond to stimuli at varying distances from the mine, and whether their activity budgets (the time spent feeding and resting vs. being alert) is different near and far from the Project. Behaviour monitoring is conducted at most mining operations in the NWT.

Results of this study will be used to adaptively manage Project activities to reduce effects on caribou. Note that the GNWT is updating the standard methods used to conduct behaviour monitoring in the NWT. Following a request from the GNWT, Sabina will work with the GNWT to adopt standard protocols so that data is comparable across mining projects.

7) Stress hormone study (Section 7.2.2.3)

A stress hormone study will be conducted to determine if caribou have higher stress levels near the Project site. Analysis of stress hormones in fecal pellets is a common scientific method employed for a variety of wildlife species, including caribou. Results of this study will be used to adaptively manage Project activities to reduce effects on caribou.

8) Noise monitoring (Section 7.2.2.5)

Noise monitoring will be conducted to determine what noise levels are produced by the Project.

9) Dust monitoring (Section 7.2.2.6)

Dust monitoring will be conducted to determine how much dust is deposited on the landscape and how much additional dust is deposited due to Project activities.

10) Motion-triggered cameras on-site (Section 7.2.1.5)

Motion-triggered cameras, similar to trail cameras used by harvesters, will be used to address specific questions about how caribou (and other wildlife) interact with the Project. For example, do caribou use road crossing ramps? Are wildlife attracted to the waste management facility? These cameras will be used to trigger adaptive management, as needed.

11) Collaborative herd-scale monitoring (Section 7.2.2.7)

Sabina has committed to working with the GN and GNWT to help monitor the regional population of caribou. During the FEIS review, Sabina discussed this program with the KIA, GN and GNWT and made the following commitment in its joint submission with the GN.

	Sabina will update the WMMP Plan to include a commitment to contribute to cumulative effects/regional monitoring for caribou, grizzly bear, wolverine and/or muskox following proposals from the GN/GNWT to a maximum total combined value, to be determined.
GN 12b	Commentary: In Section 7.3.1.5 of the WMMP (April 11, 2016), the reference to limiting the annual contribution for caribou cumulative effects monitoring to either the Bathurst or the Beverly herd will be removed. Contributions may be made to monitoring efforts on both herds in the same year, subject to a maximum total combined value to be determined.

This update has been made in the current WMMP Plan.

12) Regional camera monitoring program (Section 7.2.2.8)

Remote cameras are proposed as a regional monitoring tool for grizzly bear, wolverine and muskox. During the WMMP Plan workshop held in October, the KIA requested that these cameras also be used for caribou. The same type of motion-triggered cameras used to monitor caribou crossing ramps and the waste management facility will be placed in a grid to monitor the number of wildlife observations with increasing distance from the Project site to supplement collar data for ZOI analysis. Motion-triggered cameras will

also be placed at important habitat sites (i.e., river crossings identified by TK) to determine the level of caribou activity at these locations before and after the Project is constructed.

13) Over the horizon monitoring (Section 7.2.1.6)

During a review of an early version of the WMMP Plan, the GNWT requested that Sabina commit to monitoring at a greater distance than the planned 1-2 km. The use of high-powered CCTV cameras has addressed this request. In addition, Sabina has committed to developing methods in the future to observe caribou at greater distances, should the need arise.

14) Human activity monitoring

Sabina will record incidental observations of harvesters using the winter ice road and the area surrounding the Project.

15) Footprint monitoring (Section 7.2.2.1)

Sabina will record and report the area of the constructed footprint of the Project.

(c) Mitigation and Management Actions included in WMMP Plan

Sabina has a suite of mitigation and management actions that are the most conservative, pro-active, and offering the best protection to caribou of any industrial site in the Arctic. These measures can be described in four broad categories:

- Mitigation – these are activities that are conducted at all times, regardless of whether caribou are present, to limit potential effects on caribou.
- Staged Reductions – these are management actions (including cessations) that are undertaken when caribou are observed near the Project site to limit potential effects to caribou.
- Operational Shutdowns – Rapid Operational Shutdowns and Planned Operational Shutdowns are undertaken to limit potential effects to caribou if a herd shifts their calving or post-calving range to overlap the Project.
- Other Management Measures – these management actions pertain to special cases, such as caribou on the roads or runway.

The following sections describe these measures and provide background on the effectiveness of the proposed mitigation and management measures.

Mitigation Measures

Mitigation measures are activities that are conducted at all times, regardless of whether caribou are present. The objective of these measures is to minimize Project effects on the environment and subsequently on caribou, other terrestrial wildlife and fish. General mitigation measures for caribou are largely unchanged between the version of the WMMP Plan discussed at the FEIS Final Hearing (WMMP Version 3) and the current version. General mitigation measures are typically industry-standard best management practices or are legislated by international, federal or territorial bodies.

The general mitigation measures are listed in the current WMMP Plan in Sections 6.1.1, 6.1.2, 6.1.3, 7.1.4, and 7.1.7. Note that in previous versions of the WMMP Plan, these measures were generally referred to in other plans or were dispersed through the WMMP Plan. The current WMMP Plan lists these measures together to provide better readability for reviewers.

There are three wildlife policies that will be followed at the Project:

- no feeding of wildlife;
- no littering; and

- no firearms and no hunting by Project personnel while on an active shift at the Project site.

An education program will include training in the following areas:

- employees and contractors will be educated on basic local wildlife ecology (including wildlife information from TK) and possible Project-related effects on wildlife and biodiversity;
- road restrictions and operating protocols (e.g., wildlife right-of-way, speed limits, check-ins, road-wildlife reporting programs);
- awareness of wildlife-sensitive locations (e.g., movement corridors, breeding areas) and wildlife-sensitive periods;
- local wildlife species of concern and threats to native biodiversity;
- wildlife attractant management;
- bear-aware training for relevant staff who work outdoors;
- wildlife incidental observation reporting;
- wildlife incident/accident reporting and response procedures;
- anonymous reporting system for employees to voice concerns and inform management of non-compliance; and
- compliance requirements and disciplinary action that will be enforced by Project management.

Noise abatement will be conducted throughout the life of the Project to meet safety regulations for Project personnel and to reduce any disturbance to wildlife. Mitigation measures will include:

- ensuring equipment is fitted with appropriate mufflers and silencers;
- ensuring equipment is well maintained;
- identifying enclosures, berms, acoustic screening, and shrouding where stationary sources require control;
- strategic placement of waste rock piles to block plant sources of noise;
- housing stationary sources of noise in buildings; and
- other possible general noise abatement measures that can be implemented on-site to minimize static noise due to generators, vehicles, and other sources.

Measures will be taken to limit the area of caribou habitat that is removed within the Project footprint:

- Sabina has designed the Project footprint to be as small as possible.
- Sabina has designed the Project footprint to fall outside of important areas for caribou wherever possible. Special locations were identified from TK and baseline studies and include river and lake crossing points, eskers used as movement corridors, hills and ridges used as insect relief, and important traditional Inuit harvesting sites. The nearest of these are the crossing of the Back River at the east end of Beechey Lake (more than 35 km south of the Goose site), a lake crossing on the northern arm of Beechey Lake (more than 30 km south), two large eskers used for movement (more than 65 km west of the Project), the Western River (more than 30 km east of the Goose site), and the islands east of Kingaun (Bathurst Inlet Lodge) used by caribou to cross Bathurst Inlet (more than 40 km north of the MLA). These special locations are all more than 30 km from Project sites and will not be affected by the Project.
- Dust will be managed on the Project site by setting and enforcing speed limits on all-season on-site roads and applying dust suppressants, as needed. Dust suppressants will be approved and non-toxic for wildlife. Dust deposition rates and potential effects on vegetation will be monitored as described in the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).
- Areas of the Project will be reclaimed progressively during operations and at closure to minimize the area of disturbance to wildlife as described in the Mine Closure and Reclamation Plan (FEIS Volume

10, Chapter 29). Post-closure environmental monitoring will continue until it has been verified that reclamation has successfully met closure and reclamation objectives.

Fuels and hazardous chemicals are also managed to reduce the chance that any chemicals can enter the environment and will be promptly cleaned up if any spills occur. These plans include:

- The Fuel Management Plan (FMP) (FEIS Addendum Volume 10, Chapter 4) outlines the approach for managing hydrocarbon products that are to be stored and managed at the Project. The FMP meets Federal and Territorial statutory requirements and is included with this FEIS Addendum
- The Spill Contingency Plan (SCP) (FEIS Addendum, Volume 10, Chapter 5) is designed to protect worker and public safety and minimize any effects of a spill on the environment. It addresses all potential spills of fuel, soluble solids, liquids like solvents or paint, flammable gases and other hazardous substances at all Project sites. It meets all Canadian legislation.
- The Oil Pollution Management Plan (OPMP) (FEIS Addendum Volume 10, Chapter 6) is a requirement of the *Canada Shipping Act* (2001) and describes the responses to oil spill scenarios at the MLA to minimize environmental damage and ensure worker safety.
- The Shipboard Oil Pollution Emergency Plan (SOPEP) (FEIS Volume 10, Chapter 15) is a requirement of the International Maritime Organization (IMO) for all ships transporting fuel; it describes the equipment, training and procedures that the ship must have on board to manage and address any fuel spills during shipment or unloading to minimize any effects on the environment.
- The Hazardous Materials Management Plan (HMMP) (FEIS Volume 10, Chapter 12) outlines the safe handling requirements, storage, transportation, disposal, and reporting of hazardous materials at the Goose site and the MLA throughout the life of the Project.

Roads will be managed to minimize any potential effects on Caribou:

- Speed limits will be monitored and enforced, and set at 60 km/h on the winter ice road and 60 km/h on all season on-site roads.
- Wildlife will have the right-of-way on all Project roads.
- Any wildlife mortalities on Project roads will be recorded through a reporting system and this information will be distributed to drivers. If a location is found where more than one wildlife mortality has occurred, then this location will be relayed to drivers and site-specific mitigation may be conducted, such as additional signage to alert drivers of speed limits, identified wildlife movement corridors, and wildlife sensitive areas (e.g., nearby active carnivore den).
- Any road-kill on Project roads will be removed and disposed of using approved methods (i.e., incineration or transport away from the Project site) as quickly as possible to avoid attracting other animals to the road side. The KIA, GN and relevant HTOs will be contacted to report and discuss what to do with the carcasses following any wildlife mortalities.
- The Project will conduct regular road and camp cleanups to ensure that no hazardous substances, wires, or loose materials are present to endanger wildlife, and ensure proper storage and disposal of wastes and hazardous wastes as per the Waste Management Plan (Volume 10, Chapter 10).
- Road-crossing structures will be built on permanent on-site roads at crossing locations identified by land users. Road-crossing structures may include ramps, stretches of the road shoulder made of smaller rocks, or other methods identified through TK, land user information, scientific literature, or based on best practice.

In addition to the WMMP Plan, which deals directly with mitigation and monitoring for wildlife, Sabina submitted a total of 29 plans to the NIRB, many of which include environmental protection measures (Volume 10) for wildlife. Many of these plans protect the environment from chemical releases:

- Site Water Monitoring and Management Plan (FEIS Volume 10, Chapter 7);
- Waste Management Plan (FEIS Volume 10, Chapter 10);

- Incineration Management Plan (FIES Volume 10, Chapter 11);
- Hazardous Materials Management Plan (FEIS Volume 10, Chapter 12)

Other plans protect wildlife from harm and disturbance:

- Road Management Plan (FEIS Volume 10, Chapter 14);
- Shipping Management Plan (FEIS Volume 10, Chapter 15);
- Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17); and
- Noise Abatement Plan (FEIS Volume 10, Chapter 18).

Staged Reductions in Project Activities

Staged Reductions in Project Activities refers to management measures meant to reduce potential effects to caribou and other terrestrial wildlife once they have been observed in the vicinity of the Project site. In general, research indicates that most wildlife, including caribou, react to sudden noises or moving objects (e.g., aircraft and vehicles). As a consequence, management measures are directed towards managing activities that are known to cause reactions in wildlife, particularly caribou.

These measures include the management of:

- Blasting in open pits and quarries;
- Operation of heavy mobile equipment such as loaders, haul trucks, graders, etc.;
- Operation of light vehicles; and
- Operation of helicopters and fixed-wing aircraft.

The majority of the content in the Final Submissions of the KIA, GN, and GNWT were related to the specific triggers and management actions taken as part of Staged Reductions in Project Activities. Sabina engaged in discussions with these agencies during the FEIS Final Hearing and provided joint submissions of commitments to improve these management measures.

Part of the mandate of each of the GN and GNWT is to monitor and manage caribou. As part of the FEIS, Sabina presented a literature review of studies that examined the effects of industrial activities on caribou. Subsequent to the FEIS Final Hearing, Sabina has updated the WMMP Plan to include additional commitments, met to review the WMMP Plan with these agencies, and updated the WMMP Plan again following their comments.

During technical discussions these agencies have consistently argued for the most conservative interpretation of these scientific studies. As a result, Sabina has proposed a highly conservative suite of mitigation measures that are protective of caribou.

The following sections review the current WMMP Plan and summarize the updates that have been made since the FEIS Final Hearing.

Applicability of the WMMP Plan

The WMMP Plan included in the FEIS directed the majority of management actions towards the Bathurst herd because of the status of this herd, and public and regulator interest. The KIA, GN, and GNWT indicated that the Project actually interacts with the Beverly/Ahiak caribou herd (referred to as the Beverly herd in the FEIS) and that mitigation and management actions should be directed at that herd.

Sabina agreed and made the following commitment as part of its joint submission with the GN to the Board at the end of the FEIS Final Hearing:

GN 11	The Proponent will revise the WMMP to remove remaining areas that refer only to the Bathurst herd and apply all monitoring and mitigation measures (including mitigation for shifts in calving and post-calving range) to both Bathurst and Beverly caribou herds except where another commitment refers to a specific herd.

The updated WMMP Plan now refers to and manages all caribou, regardless of herd.

Blasting

Blasting in open pits and quarries can produce loud noises, which have been shown to produce adverse reactions in caribou. Blasting noise is known as "overpressure" and is measured in Sound Exposure Level (SEL), expressed in decibels (dB (SEL)). Note that blasting is measured on a different decibel scale than continuous and ambient noise (expressed as dB) and they cannot be compared directly.

The FEIS discussed a variety of scientific studies relevant to acoustics (noise and vibration). These were associated with construction and operational noise (including traffic/haulage), blasting overpressure and vibration; and aircraft noise. Blasting overpressure and aircraft noise are the focus of this discussion as reported in the **A.1 - App V4-2B. Noise Modelling Report** technical study and documented in the FEIS.

Blasting overpressure is a type of inaudible sound from air-blasts. The overpressure technical study considered environmental emissions associated with potential project blasting events. The study applied a threshold of 108 to 120 dB, Lpeak to establish human and wildlife effects from blasting. The FEIS then considered indirect habitat loss for caribou and proposed trigger distances for management of blasting. The FEIS also noted that some studies on other species reported short term reactions or physiological reactions at lower dB (Lpeak) values. These thresholds were derived with due regard various American National Standards Institute (ANSI) guidelines, and other international standards relevant to blasting overpressure.

The aircraft noise technical study considered environmental emissions associated with fixed wing aircraft and helicopter operations (arrivals and departures) from the project airstrip. The outcomes of the study highlighting consideration for effects on human and wildlife (e.g., noise effects on caribou) receptors. The FEIS indicated that caribou typically reacted to short term noises (e.g., jet fighter overflights) at fairly high dBA (SEL or LAE) values. The study applied a threshold of 85 to 90 dBA, SEL to establish human and wildlife effects from aircraft. These thresholds were derived with due regard to the Ollerhead, J.B. et al,1992, *A Field Study of Aircraft Noise and Sleep Disturbance*, Department of Transport, London (Ollerhead, J.B. et al,1992) guideline relevant to aircraft noise.

The FEIS also discussed the results of noise effects on caribou, particularly whether caribou avoid industrial operations that produce significant noise. The majority of studies of this type come from the north slope of Alaska, where studies examine caribou response to oil field operations. The majority of these studies show that caribou will move away from oil field operations to approximately 2 km during the calving season, but return during the post-calving season. A minority of these studies reported that caribou avoided oilfield operations by 4 km during calving, but returned to use the areas adjacent to oilfields during post-calving and summer.

The WMMP Plan (Version 3) included for the FEIS Final Hearing proposed trigger distances to stop blasting when groups of caribou were within 2.5 km during calving and post-calving and 1.5 km the rest of the year. In their Final Submission to the Board, the KIA, GN and GNWT commented on these proposed distances, suggesting that because a range of values were reported in these noise and avoidance studies, a more conservative trigger distance be used for management. The GNWT requested a 4 km trigger distance as a recommendation/request in its Final Submission.

After extensive discussion with the KIA and GN, Sabina committed in its joint submission to the Board at the end of the FEIS Final Hearing to conduct additional overpressure noise modeling using a reduced noise threshold of 96 dB (SEL).

KIA-C14	The Proponent commits to decreasing the sound levels as indicated in the Wildlife Mitigation and Monitoring Plan use to calculate the distance that caribou must be from the blasting prior to explosion detonation from 108 dB to a level more protective of caribou. These levels will be reduced to 96 dB.

The results of this modeling indicated that 96 dB (SEL) would be reached at approximately 3.7 km from the Project site. To be more conservative, and to satisfy the request from the GNWT, Sabina updated the trigger distance in the WMMP Plan to 4 km, which will be applied year-round. As a consequence, Sabina has committed to ceasing blasting year-round when groups of 30 or more caribou are observed within 4 km of the blasting site. In addition, blasting will be delayed if small groups (< 30) of caribou are observed by wildlife monitors within 500 m of blasting sites until the animals have moved off.

Also during the review of the WMMP Plan, the KIA and GN requested changes to the rules governing resumption of blasting activities. Earlier versions of the WMMP included a rule where blasting could be resumed if the same group of caribou was spotted on-site for greater than 24 hours. It was assumed that this group was acclimated to the Project if they spent this much time near the Project site. The WMMP Plan was updated with a provision that should large groups (> 250) of caribou be observed on-site, then blasting can only resume once the group of caribou moves off beyond the 4 km trigger distance.

These updates to the WMMP Plan make this Project the most protective of caribou of any mining project in the Canadian Arctic.

Heavy Mobile Equipment

Heavy mobile equipment is managed in the WMMP Plan separately from light vehicles such as pickup trucks because heavy equipment is much larger, and produces more noise and dust than small vehicles. Heavy mobile equipment is managed in a similar fashion as blasting. Should wildlife monitors observe groups of caribou within a specified trigger distance, then heavy equipment operators cease operations within a specific portion of the mine, which is within the trigger distance to caribou. Following a commitment with the KIA made during the FEIS Final Hearing, Sabina committed to a trigger distance of 1 km during calving and post-calving and 500 m during the rest of the year. This is double the distance included in the FEIS WMMP Plan.

KIA-C12	Sabina commits to increase the visual observation distance trigger for enhanced mitigation for caribou around roads (in Table 6.10-2 of Version H.1 of the Wildlife Mitigation and Monitoring Plan, for fall and winter seasons) from 250 to 500 m.

This form of mitigation allows for a systematic reduction in surface activity of heavy mobile equipment when caribou are present, thereby reducing any potential effects on caribou.

Light Vehicles

Light vehicles include pickup trucks and other smaller vehicles. The management for these vehicles are conducted by their drivers if they observe caribou, or by a central dispatch if larger groups of caribou are on the road.

The trigger distances for caribou near the road presented at the end of the FEIS Final Hearing was 250 m. Following discussions at the FEIS Final Hearing with the KIA and GN, Sabina made the following commitment as a joint submission with the KIA and updated the WMMP Plan accordingly:

KIA-C12	Sabina commits to increase the visual observation distance trigger for enhanced mitigation for caribou around roads (in Table 6.10-2 of Version H.1 of the Wildlife Mitigation and Monitoring Plan, for fall and winter seasons) from 250 to 500 m.

Following additional discussions with the KIA and GN in the review of the WMMP Plan following the FEIS Final Hearing, Sabina further updated these measures:

- If a driver observes a caribou (or other large mammal) within 500 m of any road, the driver will slow to 40 km/hr, alert other drivers and proceed with caution.
- If a driver on an all-season road observes that caribou are on the road or within 50 m of the road and moving towards the road with the intention to cross the road, then the vehicle will stop, the driver will alert the Environment Department, and will proceed when the animals have crossed the road and moved off or may then proceed slowly after a wait of 20 minutes.
- If a driver on the all-season road observed caribou on the road, they will stop the vehicle until the caribou move off.

Compared to earlier versions of the WMMP, the trigger distances have doubled, from 250 and 20 m to 500 and 50 m, and the group size of caribou was reduced from 30 to a single caribou. Also, if a single caribou is observed resting on the road, drivers will stop indefinitely. These measures are to be implemented by individual drivers. However, if drivers report large groups of caribou near the Project roads, causing them to stop their vehicles, then the Environmental Manager can close that section of the road.

Helicopters and Fixed-Wing Aircraft

Studies indicate that ungulates, including caribou, can react to helicopters and fixed-wing aircraft when the aircraft are nearby or at low elevation. Management direction on aircraft avoidance of caribou is relatively standard across jurisdictions, including the NWT, British Columbia, Yukon, and Nunavut. The WMMP Plan includes standard management measures to avoid groups of caribou by 610 m vertically or 2 km horizontally during sensitive seasons, and 300 m vertically or 1 km horizontally during the rest of the year. Following comments from the GNWT, the definition of sensitive seasons was updated following the FEIS Final Hearing to include calving, post-calving and early summer.

During the review of the WMMP Plan following the FEIS Final Hearing, the KIA and GN requested two additional mitigation measures for aircraft. These include:

- During calving, post-calving, and early summer (June 5 – July 31), large groups of caribou (more than 250) will be avoided by 610 m vertically or 4 km horizontally.
- The helicopter pads at the Project site were included in the setback distances. Therefore, if groups of caribou are within the trigger distance from the helicopter pads, then helicopters will be grounded. If helicopters are already airborne, and groups of caribou are within the trigger distance at the helicopter pad, then the helicopter will land elsewhere at the Project site, outside of the buffer distances for caribou.

The standard mitigation of avoiding ungulates, including caribou, by setback distances has been shown to be protective of wildlife and is the standard mitigation guidance by neighbouring jurisdictions and in the 2014 Draft Nunavut Wildlife Plan (although this only applied to the calving and post-calving range). Extension of these measures to include the helicopter pads, and the addition of a larger setback for large groups of caribou makes this mitigation more protective of caribou.

Rapid and Planned Operational Shutdowns

Following the FEIS Final Hearing and discussions with the KIA, GN and GNWT, Sabina has committed to two new management actions – Rapid Operational Shutdown and Planned Operational Shutdown. Rapid operational shutdown is triggered if large groups of caribou are observed within 4 km of the Project site

during the calving and post-calving seasons. Planned Operational Shutdowns are triggered if analysis of satellite collar data indicate that a caribou herd has moved its calving or post-calving range to permanently overlap the Project site.

More information on these Operational Shutdowns can be found in the response to **(b)** "**Mitigation measures should a caribou herd experience a range shift**" in Section 4 below, under the heading "Specific Topics Identified by Board in Final Report".

Other Management Measures

Other management measures are designed to capture special cases, including management of caribou at the TSF, management of Project-tolerant animals, and management of caribou if they are occupying the runway (current WMMP Plan, Section 7.1.10).

Caribou and the TSF

The KIA expressed concern during the FEIS review that caribou may be attracted to the TSF as a source of salty water. The TSF will have water in it during the first part of operations, but will be covered with an impermeable layer during closure and will be inaccessible to wildlife.

As part of its joint submission with the KIA at the FEIS Final Hearing, Sabina made the following commitment:

KIA-C11	Sabina commits to developing an adaptive management plan, in conjunction with the KIA, to manage caribou access to the TSF if caribou are observed to be drinking from the tailings water.

This commitment is incorporated in the WMMP Plan as:

- The Project will monitor the quality of water in the TSF as outlined in the Site Water Monitoring and Management Plan (Chapter 7 of Volume 10 of the FEIS).
- If the water quality in the TSF does not meet wildlife guidelines, then the TSF will be monitored to determine if caribou are drinking from the TSF.
- If caribou are using the TSF ponds and the water quality does not meet wildlife guidelines, then Sabina will develop an adaptive management plan, in conjunction with the KIA, to manage caribou access to the TSF.

With this commitment to develop an adaptive management plan, caribou will be protected from any negative effects of the TSF.

Project-Tolerant Caribou

In their Final Statement to the NIRB, and during the FEIS Final Hearing, the GN expressed concern that caribou could be deterred from the Project site to facilitate continued operations of the Project or to allow landing and taking off of aircraft. Following discussions, Sabina made the following commitment as part of its joint submission with the GN at the end of the FEIS Final Hearing:

	In consultation with the GN and other relevant authorities, the Proponent shall develop criteria and procedures governing the deterring of wildlife from blast zones and relaxation of mitigation measures for animals deemed Project-Tolerant. These criteria and procedures shall be submitted to the NIRB for review and approval prior to construction.
GN 21	For clarity, caribou will only be deterred if their safety is at direct risk. Reference to deterring wildlife from blasting zones will be removed from the blasting management plan (FEIS Volume 7, Chapter 13, Section 7)" Commentary: Draft information was included in the April 11, 2016 WMMP Plan update but further details will be added.

Discussions on this topic continued during the review of the WMMP Plan after the FEIS Final Hearing. The WMMP Plan was updated with the following text in Sections 7.1.5.6 and 7.1.1.

- Caribou may be deterred from the Project site should their immediate safety be in jeopardy. Examples of situations when deterrence would be acceptable include:
  - caribou have become acclimated to the camp and are posing a safety risk to Project personnel;
  - caribou are attracted to the TSF or other features as a salt source, but TSF water quality does not meet wildlife guidelines;
  - an individual or small group of caribou are occupying the airstrip and have the potential to be alarmed and run into the airstrip during landing or takeoff (but see Section 7.1.5.6 for a description of when this is allowed); and
  - a caribou has entered the open pit or other facility and has become disoriented.

and

- Prior to aircraft landing on the airstrip, a visual inspection will be conducted to identify the presence of any wildlife on the airstrip. Small groups of wildlife will be escorted off the airstrip; the flight crew will be notified by radio that such action is taking place and aircraft will not be approved to land until the airstrip is clear. If groups of greater than 30 caribou are observed on the airstrip then no action will be taken. If the wildlife cannot be escorted from the airstrip within a reasonable length of time, the flight crew will be instructed to divert to another location.

With these management activities, caribou will be protected from disturbance from Project personnel.

(d) Effectiveness of Mitigation and Management

Sabina has proposed mitigation and management measures to reduce the potential for disturbance or other negative effects on caribou and other terrestrial wildlife. The proposed mitigation measures are largely standard industry best practices, which are well proven to be effective over time.

For instance, it is well known that speed limits protect terrestrial wildlife from mortality due to collisions, and that the number of collisions is related to the speed of vehicles. Speed limits are set at all Arctic mining projects and have been effective at limiting effects on caribou. During the 18 years of operation of the Tibbitt to Contwoyto Lake Winter Road supplying the diamond and gold mines in NWT, only five caribou mortalities have been reported (Golder 2014). The Doris North Project, which was in construction and operations for several years after 2009, has had no reports of caribou mortalities or injuries due to vehicle collisions (ERM 2015a). No direct caribou mortality or injury from vehicle strikes has been documented at the Ekati Diamond Mine since full operations began in 1997, located approximately 250 km south of the RSA, and within the spring and fall migration pathway of Bathurst Caribou (ERM 2016).

Other mitigations, such as the minimum flight elevation of helicopters and fixed-wing aircraft are standard mitigation techniques applied across a variety of jurisdictions, including British Columbia, Yukon, NWT, and Nunavut. The elevations used in this plan are consistent with those in the recent Mobile Caribou Conservation Measures for the Kivalliq Region, Nunavut (Poole and Gunn 2016). Each of these groups

researches and determines the best management technique to use. Following these guidelines will therefore be protective of caribou. The management for shifts in calving and post-calving ranges (Section 7.1.5.3 of the WMMP Plan) and associated 'rapid' and 'planned' (longer-term response) operational shutdowns if these ranges overlap with the Project site is precautionary and incorporates Mobile Caribou Conservation Measures (Poole and Gunn 2016).

As part of the FEIS, Sabina presented literature reviews and the results of TK studies to show a range of caribou responses to various stimuli. The initial versions of the WMMP Plan proposed management measures, including trigger distances and group sizes that represented well established, often average responses by caribou and other ungulate species to disturbances. Through the FEIS comments, and through discussions with the KIA, GN, and GNWT during and subsequent to the FEIS Final Hearing, these groups have requested more conservative management strategies. Where there is a range of values that caribou may react to particular stimuli, Sabina has adopted the most conservative, reasonable value for trigger distances, group sizes, and proposed activities. By adopting conservative values proposed by biologists with the KIA, GN, and GNWT, Sabina has committed to measures that are the most protective of caribou anywhere in the Arctic.

The Board stated that it was concerned about whether the proposed mitigation and management would be protective of caribou. By focusing on those features of mining projects that are known to disturb caribou, and adopting conservative trigger distances and management measures to cease these activities that disturb caribou, Sabina is confident that undue disturbance to caribou can be controlled. Sabina has also proposed an adaptive management approach that relies on an extensive and industry leading monitoring program to evaluate the effectiveness of mitigation and management, which includes feedback mechanisms to update mitigation and management if needed. For more information on monitoring that is used to trigger management, see response A) on monitoring programs. For more information on the Rapid Operational Shutdown and Planned Operational Shutdown see response (C).

It should be noted that most of the proposed management measures in the WMMP Plan are not new, nor are they untested. Each management measure is used by some or all mining projects in the Canadian Arctic. For instance, the Ekati Diamond Mine, which interacts with the Bathurst caribou herd, uses many of the proposed management measures included as part of Staged Reductions in Project Activities. New measures included by Sabina in the WMMP Plan go further than the established measures to provide greater certainty and protection.

Similar to what Sabina has proposed in the current version of the WMMP, DDEC practices successive levels of management activities, starting with site wide notification about the presence of wildlife, wildlife awareness presentations, road sign postage about reduced speed limits, behaviour monitoring, road closures, and delays in blasting.

Sabina has proposed Rapid Operational Shutdown and Planned Operational Shutdown management activities that surpass those currently used by other mining projects in the Canadian Arctic. These Operational Shutdowns represent a stepwise addition of standard mitigation measures to existing mitigation and management measures. None of the measures are new, and rely on effective mine management on the part of Sabina to employ. These measures are routinely employed when conducting necessary maintenance, crew changes, and equipment replacement at mining sites.

By managing those aspects of the Project that TK and scientific studies report cause disturbance to caribou, Sabina will effectively be limiting the potential for disturbance effects on caribou.

5. SPECIFIC TOPICS IDENTIFIED BY BOARD IN FINAL REPORT

In this section, Sabina responds to the following topics specifically identified as uncertainties by NIRB in the Final Report.

(a) Herd Vulnerability

The Board expressed concerns about whether Sabina would prevent or limit impacts to caribou given the present population health of the herds and those that could be experienced during the life of the Project.

Sabina Response

Following the FEIS Final Hearing Sabina has added a section to the WMMP Plan to address concerns that the population health of caribou herds may change in the future. Sabina also updated the section that describes how the WMMP Plan will be updated in the future.

The Beverly and Qamanirjuaq Caribou Management Plan 2013-2022 (BQCMB 2014) describes a process where "herd vulnerability" is determined by the BQCM Board and appropriate management actions are defined for each level of herd vulnerability. Sabina will adopt this approach for its mitigation activities and has included a section in the WMMP Plan that describes this process (WMMP Plan V6, Section 7.1.3: 7.1.3 "*Herd Vulnerability and the Sabina Adaptive Management Approach*"). When herd vulnerability increases, likewise the mitigation, management and monitoring measures will also increase.

During the WMMP Plan workshop in October, 2016, the KIA and GN requested that Sabina clarify who would determine herd vulnerability. Sabina has affirmed that herd vulnerability would be determined by the appropriate government agencies and then applied by Sabina accordingly.

(b) Mitigation measures should a caribou herd experience a range shift

The Board agreed with Sabina that the range of the Bathurst herd does not currently overlap the Project site. However, the Board was concerned that this herd may change its range in the future and could overlap the Project site. The Board was also concerned that if caribou were to move their calving or post-calving ranges to overlap the Project site, that these caribou could be disturbed before monitoring triggered appropriate management. Finally, the Board was concerned that proposed mitigation and monitoring measures would be ineffective to prevent disturbance to caribou if they moved their calving or post-calving ranges to overlap the Project site short of a complete project shutdown.

Sabina Response:

In the following, Sabina describes the background on how the calculation of seasonal ranges for caribou included conservative assumptions and methodologies, and how the FEIS assessment considered the potential for the calving and post-calving ranges to overlap the Project site in the future.

In particular, Sabina understands that the Board is concerned that the Bathurst or Beverly/Ahiak caribou may shift their calving or post-calving range to overlap the Project site. In response, Sabina has updated the WMMP Plan to include a Rapid Operational Shutdown during the year that a calving range shift occurs and a Planned Operational Shutdown during subsequent years. These significant, new commitments are further discussed in the following sections. Sabina is confident that these new commitments and plans will provide the Board the confidence that should a shift in the calving or post-calving grounds occur and overlap the Project site, that appropriate monitoring and management will be triggered to ensure that potential effects on caribou are minimized and remain not significant.

<u>Estimating Overlap of Seasonal Ranges with the Project</u>

The analysis that was conducted followed standard methods for estimating seasonal ranges from satellite collar data using fixed kernel utilization distribution on over 20 years of data. The Nunavut Planning Commission reflected a similar methodology in the Draft Nunavut Land Use Plan when calculating the calving and post-calving ranges of these herds. These analysis methods incorporate any uncertainty in the data; when there are few data available, or that data is dispersed non-uniformly on the landscape, the kernel distribution produces larger seasonal range polygons. Therefore, this type of analysis addresses any

uncertainty in the underlying data, including there being a limited number of collars on the herds at any one time.

This analysis showed that the summer, fall, and winter ranges of the Beverly/Ahiak caribou herd overlaps with the Project. The Bathurst herd is closest to the Project location during post-calving period, although it does not overlap either the MLA or the Goose Property.

The results of these analyses were corroborated by aerial survey and remote camera data. Likewise, wildlife biologists from the GNWT, experts in the use and interpretation of satellite collar data, agreed that the Project does not interact reasonably with the Bathurst herd range and biologists from the GN agreed that the Project does not interact with the calving or post-calving areas for these herds.

Range Shifts in the Future

During the Pre-hearing Conference the KIA and GN expressed concerns that the Bathurst herd could shift its range in the future and could possibly overlap with the Project. Sabina addressed regulator concerns by evaluating three potential future scenarios for the Bathurst herd:

1) The most likely scenario is status quo, where the Bathurst herd continues to calve where it has calved for the last 20 years on the west side of Bathurst inlet between the Hood and Burnside Rivers. In this case, the Bathurst herd would continue to not overlap the Project site.
2) A scenario where the Bathurst herd shifts its calving range to the historic calving range identified by TK and aerial surveys during the 1980s east of Bathurst Inlet. In this case, the Project could interact with the spring and fall migration ranges of the Bathurst herd.
3) A scenario where the Bathurst caribou shift their calving range to Contwoyto Lake (approximately 160-223 km west of the Project), and to a lesser degree surrounding Nose (approximately 120 km west) and Beechey Lakes (approximately 30-70 km). In this case, the Project would be approximately 30-70 km from the closest calving area.

The current, most likely scenario was not rated as a residual effect on caribou, while scenarios two and three were rated as residual, not significant effects on caribou. The proposed changes in the current version of the WMMP Plan are designed to address the unlikely events of scenarios two and three. These measures have been designed in consultation with the KIA, GN, and GNWT. Sabina is confident that the proposed measures will effectively manage any unanticipated changes in the range boundaries that might result in subsequent interactions with the Project.

Updates to the WMMP Plan – Operational Shutdown in response to Range Shifts

During the FEIS Final Hearing, Sabina committed to two forms of Project shutdowns if a caribou herd shifts its calving or post-calving range to overlap the Project site. This commitment is reflected in the most recent WMMP Plan. This new mitigation is termed "Operational Shutdown" to differentiate it from the Staged Reductions in Project Activities, which is the standard suite of mitigation applied to smaller groups of caribou year-round. The Operational Shutdown includes all activities that produce noise and disturbance and could therefore disturb caribou. This new mitigation is triggered immediately when large groups of caribou are observed on-site (during calving and post-calving).

Note that the proposed mitigation for range shifts included in the FEIS was triggered by analysis of satellite collars and could only be implemented in the year following a range shift. The current version of the WMMP Plan enables immediate management of the site in response to a range shift.

The proposed terms and conditions presented at the end of the FEIS Final Hearing are summarized below:

Identifier	Proposed Commitment
KIA-C13	The Proponent will update the Wildlife Mitigation and Monitoring Plan to include a plan that will be implemented immediately in the event of calving caribou shifting their range to overlap with the Project Development Area. The Proponent will update the Wildlife Mitigation and Monitoring Plan to reflect the following measures in order to identify the presence of an aggregation (group) of caribou calving near the Project site during the calving period, post calving and summer. If a group of greater than 250 caribou are observed by active monitoring within 4 km of the Project site, then staged reduction of helicopter use and heavy vehicle use will be triggered. The threshold for cessation of blasting will be the greater of 4 km, or according to Commitment KIA-C14 of this table. The aggregation group size definition may be updated based on best available science in subsequent Wildlife Mitigation and Monitoring Plan updates.
GN 13b	The Proponent will update the WMMP Plan to include reductions of project activities (e.g., planned cessation in above-ground blasting, heavy truck hauling and use of helicopters (except where such activities are required in order to address regulatory compliance or health and safety) should the core calving or post-calving ranges of the Bathurst or Beverly caribou herds overlap the Project site. The cessation of these activities will be planned for the period of time when the core calving and post-calving distribution of caribou overlaps the project, based on recent years of caribou collar and monitoring data. This planned period will be of sufficient duration to take into account annual variation in the timing and distribution of calving and post-calving caribou interactions with the Project. This plan will be updated with the WMMP Plan in consultation with the KIA, GN and other relevant parties. Note to the NIRB: Note that Sabina has already committed to the KIA to provide a full description of any remaining project activities proposed during a planned cessation of above-ground blasting and heavy truck hauling, and to provide a noise model for these activities and to compare this predicted noise to the noise produced by indoor activities only. Sabina has already committed to updating the proposed mitigation actions in the WMMP Plan in consultation with the KIA, GN and other interested parties.

These have now been incorporated in the WMMP Plan. In response to concerns expressed by the KIA, GN, GNWT and NIRB Board that caribou may shift their ranges in the future to overlap the Project, Sabina has introduced a new section to the WMMP Plan (Section 7.1.5.3; *Management for Shifts in Calving Range*). An Operational Shutdown has 2 components:

Rapid Operational Shutdown

Rapid Operational Shutdowns will be triggered and implemented immediately by the Environmental Manager if a large group of caribou is observed within 4 km of the Project site during calving or post-calving. A Rapid Operational Shutdown includes additional activities to those that are managed as part of the Staged Reduction in Project Activities described in an earlier version of the WMMP Plan included with the FEIS and presented at the FEIS Final Hearing. A complete list of suspended activities is included in Section 7.1.5.3 of the current WMMP Plan and summarized below:

- Daily communication with regulators.
- Stop open pit blasting and other surface blasting.
- Stop open pit activities.
- Stop heavy equipment on surface.
- Stop helicopter usage including landings & take-offs.
- Reduction of fixed wing aircraft use.
- Reduction in the number of light vehicles on surface.
- Underground activities not requiring heavy mobile equipment use on surface may continue.

Planned Operational Shutdown

Monitoring of satellite collars will be conducted on a yearly basis through all Project phases to determine the extent of the calving and post-calving ranges of both the Bathurst and Beverly/Ahiak herds. A Planned Operational Shutdown will be triggered and implemented in the years following a shift of the core calving or post-calving ranges of the Bathurst and Beverly/Ahiak herds to overlap the Project site.

The Planned Operational Shutdown includes all of the activities conducted as part of a Rapid Operational Shutdown, as well as a reduction in the number of on-site personnel and shutting down the mill. A complete list of suspended activities is included in Section 7.1.5.3 of the current WMMP Plan and summarized below:

- Daily communication with regulators.
- Stop open pit blasting and other surface blasting.
- Stop open pit activities.
- Stop heavy equipment on surface.
- Stop helicopter usage including landings & take-offs.
- Stop fixed wing aircraft use.
- Restriction to essential light vehicles only.
- Stop underground activities.
- Discussion with all relevant parties 6 months prior to planned operational shutdown.
- A planned reduction in the on-site workforce.
- Reduction in mill operations.

While the calving and post-calving ranges of the Bathurst or Beverly/Ahiak caribou herds do not overlap the Project site today, or in the past according to TK and aerial surveys, the proposed Rapid and Planned Operational Shutdowns will protect caribou from disturbance should these ranges shift to overlap the Project in the future.

(c) Decline of Caribou Herds

During the public hearings, some participants provided their opinion that that mining has had deleterious effects on barren-ground caribou populations, particularly the Bathurst herd.

Sabina Response

Noting first that the Project does not have any interaction with the Bathurst Herd, the combined footprints of all past and existing mines occupy 0.018% of the Bathurst range (FEIS Volume 5, Section 5.6.2.1). The GNWT indicated during the FEIS Final Hearing that in their view, the decline of the Bathurst herd was caused by natural fluctuations and over-harvest and may currently be affected by summer drought conditions, and did not suggest mining as a cause for the decline in the Bathurst herd:

> *"In terms of the Bathurst herd, we believe that a large part of the decline was natural. It fits with declines right across the board in just about all the herds that we work with in the Northwest Territories. Certainly there was a period from 2000 to 2006 when we saw six consecutive years of very low calf numbers in the Bathurst herd, and that's -- again, that's just common sense. If the herd isn't producing calves, then it's going to go down. We do believe with the Bathurst herd that the harvest certainly didn't drive the overall decline but because it was still a large harvest when the herd got smaller, that increasingly, especially from 2006 to 2009, that added to probably a natural declining trend and accelerated that, that downward trend. The reality is that the herd, even as it was reaching lower numbers, was still very accessible on winter roads, and some of the harvest was not skidoos. It was not dog teams. It was people filling up pickup trucks on the winter roads. And so at that time we do believe that the harvest became*

a major contribution in that decline." (NIRB Final Hearing File No. 12MN036 Transcript, page 703 - 704)

Sabina acknowledges that many people have an opinion that mining does, or has the potential to have, an effect on caribou populations, but studies and monitoring have not shown a clear link between mining activities and the decline of the caribou herds, or suggest that such activities would limit their recovery.

However, the WMMP Plan meets and in most cases exceeds the mitigation and management measures for any mining project in the Canadian Arctic. The monitoring program used to trigger mitigation and management activities for potential Project effects is likewise the most advanced and comprehensive monitoring program in the Canadian Arctic.

(d) Interactions with winter ice roads for caribou

The Board expressed concern about whether the proposed mitigation for the winter ice road would be sufficient to protect caribou.

Sabina Response

Concerns raised by agencies about the winter ice road at the FEIS Final Hearing fall into two types: 1) concerns related to the road functioning as an impediment to movement by caribou, and 2) concerns over the use of the road by harvesters to access new areas.

Caribou Movement Across the Winter Road

Construction of the winter ice road would begin in December, connecting the MLA to the Goose site, and operated until the end of April or early May. The winter ice road is in the north-western extent of the wintering range of the Beverly/Ahiak herd. During spring migration, starting after April 15, approximately 1.5% of the Beverly/Ahiak herd migrates from the west across the road towards their calving grounds in the Queen Maud Gulf Migratory Bird Sanctuary (QMGMBS).

The FEIS WMMP Plan included mitigation to limit the height and slope of snowbanks, and included management to slow and stop trucks when caribou are observed near the road. The FEIS concluded that the low traffic rate on the road of 2-3 vehicles per hour was far below the threshold of 20-30 vehicles per hour where caribou are reported to avoid crossing roads.

During the FEIS review process, the KIA and GN expressed concern that the winter ice road may impede the spring migration of the Beverly/Ahiak herd. Through discussions with the KIA and GN during the FEIS Final Hearing, Sabina committed to additional mitigation for the winter ice road:

Identifier	Proposed Commitment
KIA-C10	Sabina will work in conjunction with the KIA to develop a plan for winter road use cessation and/or management in April to protect the spring migration of the Beverly caribou herd to be a component of their land tenure agreement.
GN 22b	The Proponent shall include in the WMMP specific details on additional monitoring and mitigation that will be triggered when large groups of caribou occur near the ice roads.

The following new measures were included in Section 7.1.6 of the current WMMP Plan:

- Sabina will plan to close the winter ice road by April 15, before the Beverly/Ahiak caribou begin their spring migration.
- If collar data or ground-based monitoring indicate that large groups of caribou are near or crossing the winter ice road, then the Environmental Manager can close the ice road.

- Additional management was added for drivers - should the road operate after April 15th then the distance at which caribou trigger vehicles to stop to allow caribou to cross the ice road is increased to greater than 500 m.

With these measures in place, and the commitments to continue to work with the KIA and GN to monitor and update associated mitigation measures as needed, the potential effects on the Beverly/Ahiak caribou spring migration will be effectively managed.

Managing Use of the Road by Harvesters

The FEIS evaluated the potential use of the winter ice road by hunters as unlikely because the winter ice road starts approximately 375 km from the nearest populated centre. In addition, caribou are dispersed on the landscape at a very low density in the Project area during the winter period. There are other populations of caribou, primarily the Dolphin and Union (Island) caribou, which are closer to populated centres and available for hunting.

The FEIS WMMP Plan includes human activity monitoring (Section 7.2.1.7) where observations of hunters using the road and Project area are reported to vehicle dispatch and recorded. Note that all vehicles are regularly checking in with vehicle dispatch to provide location and direction information, so this incidental monitoring should provide information on whether hunters are using the road.

During the FEIS Final Hearings, Sabina committed to additional monitoring and reporting in their joint submission with the GN:

GN 23a	The Proponent commits to updating the WMMP to include the trigger that should the existing incidental observation program record >5 persons per year using the road for harvesting purposes then the Proponent will implement a more direct monitoring program for persons using the ice road and reported as part of the Socio-Economic Monitoring Report to NIRB.

The current WMMP Plan includes the following mitigation to limit the use of the winter ice road by harvesters:

- All Project and contractor employees will be prohibited from carrying personal firearms and hunting on the Project site, except in the case of a certified wildlife monitor who is carrying a firearm for the safety of workers in the field when a problem bear, wolf, or wolverine has been identified.
- The winter ice road will be closed to the public.
- The winter ice road will be monitored and should people be observed hunting or using the winter ice road this information will be recorded.
- Should more than five groups of people be seen in a calendar year, then enhanced management will be implemented to further limit use of the winter ice road (Section 7.1.6), and a more direct monitoring program such as remote cameras of people using the winter ice road will be triggered and reported as part of the Socio-Economic Monitoring Report to NIRB.

The GN requested additional edits that were subsequently incorporated in the current WMMP Plan:

- If triggered, Sabina will liaise with the relevant HTOs to discuss possible options for enhanced management to limit hunter use of the winter ice road.
- Note that Section 89(1) of the Nunavut Wildlife Act prohibits a person from discharging a firearm along or across a trail, road or highway or within 1 km of a dwelling or building."

With these mitigation and management measures in place, and particularly given the distance of approximately 375 km between the nearest community and the start of the winter ice road, potential effects on caribou populations will be effectively mitigated.

(e) Precautionary Principle

The Board considered the Precautionary Principle in the Final Report.

Sabina Response:

Sabina is committed to minimizing any potential effects of the Project on caribou. Before, during and after FEIS Final Hearing, Sabina has worked with government agencies, the KIA, GN and GNWT, to update the WMMP Plan and enhance protective measures in particular with respect to caribou. It is Sabina's view that the precautionary principle has been properly considered in accordance with the standard set out in the EIS Guidelines.

The Back River EIS Guidelines defines the precautionary principle as:

> 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.

As stated in section 2.4 of the EIS Guidelines, "One of the purposes of environmental assessment is to ensure that projects are considered in a careful and precautionary manner before authorities take action in connection with them, in order to ensure that such projects do not cause significant adverse environmental effects." The EIS Guidelines require,

> In applying a precautionary approach to its planned undertakings, the Proponent must:
>
> - Demonstrate that the proposed Project is examined in a manner consistent with the precautionary principle 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 Project and the approaches to minimize these effects, including assumptions that are developed where scientific uncertainty exists;
> - 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.

Sabina has applied the precautionary principle in three important ways in the effects assessment to protect caribou in the absence of full scientific certainty:

1) Where there was any uncertainty in scientific evidence for potential effects on caribou, Sabina either used the worst case scenario or a range of potential effects in the effects assessment for wildlife VECs. Examples from the caribou assessment include (and are discussed in greater detail in the introduction):

- Evaluating the effects of habitat loss using a Potential Development Area (PDA) that is approximately seven times larger than the actual proposed footprint;
- Using a range of values for noise modeling;
- Evaluating a range of possible future scenarios for the location of the Bathurst caribou calving ground – the status quo, east of Bathurst Inlet and surrounding Contwoyto, Nose and Beechey Lakes; and
- Evaluating caribou disturbance by the Project using a variety of Zones of Influence reported in the literature.

2) Following the assessment methods listed in Volume 9 of the FEIS, the Bathurst caribou herd could reasonably have been excluded from the cumulative effects assessment because it does not currently, nor in the past 20 years, interact with the proposed Project. However, following the precautionary principle

and public interest in this herd, the Bathurst herd was advanced to the cumulative effects assessment (FEIS Volume 5, Section 5.5.2.1):

> In conclusion, the proposed Project PDAs do not overlap the seasonal herd ranges of the Bathurst herd during the last 20 years for which seasonal distribution is available from satellite collars (1996-2015). However, if the calving range were to shift, then a residual effect could be encountered. Despite the fact that the proposed Project does not overlap the seasonal home ranges of the Bathurst herd, given the level of concern for this herd, the potential effect of habitat loss is rated as a residual effect following the precautionary principle.

3) Following the FEIS Final Hearing, Sabina has significantly updated the WMMP Plan to be the most protective industry management plan for caribou in Nunavut or the NWT). Sabina has updated the WMMP Plan to protect caribou based on extensive consultations with agencies responsible for the management and monitoring of caribou the GN and GNWT, the KIA, and Kitikmeot communities close to the Bathurst caribou range.

Taking into account the monitoring and mitigation programs developed for caribou protection, in collaboration with the governmental agencies that have responsibility for the management and conservation of caribou, the Project would not result in any significant impact or "*additional pressures*" on "*caribou populations adjacent to the Project area*". Every effort has been made by Sabina, and each of the responsible agencies to develop caribou protection measures to mitigate against this result.

The proposed WMMP Plan, including its provisions for adaptive management was developed in collaboration for the purpose of mitigating any unacceptable effects. Sabina has thoroughly addressed the issue of potential effects on caribou through an FEIS application that used the precautionary principle to evaluate effects, in proposing a comprehensive WMMP Plan that is highly protective of caribou, and in committing to ongoing dialogue with the KIA, GN, and GNWT to review and update the WMMP Plan as needed.

(f) Regulatory capacity

In Section 6.5.2 of the Report at pages 317-318, the Board expresses concerns regarding regulatory capacity and the number of ongoing initiatives for caribou management.

Sabina Response:

No regulator (nor KIA) indicated that they have any issues with respect to capacity or fiscal restraint which would affect their regulatory oversight of the Project or with respect to the ongoing initiatives for caribou management.

Further, if the Board has concerns regarding government monitoring, it has the ability pursuant to the Nunavut Agreement to add terms and conditions in the Project Certificate to fully address the concern. Article 12.7.1 explicitly states that the Board may establish conditions which specify responsibilities for the proponent, the Board or government:

> 12.7.1 - Project Monitoring
>
> The terms and conditions contained in:
>
> (a) a NIRB project certificate issued pursuant to Section 12.5.12 or 12.6.17;
>
> (b) a recommendation of NIRB pursuant to Sub-section 12.4.4(a); or
>
> (c) any approvals issued by the NWB,

> may provide for the establishment of a monitoring program for that project which may specify responsibilities for the proponent, NIRB or Government.

The Nunavut Agreement also explicitly grants NIRB the ability to require regulatory agencies to supply NIRB with information as part of project monitoring:

> 12.7.3 Without limiting the generality of Section 12.7.2, the monitoring program set up pursuant to that section may include:
>
> > (a) a requirement that regulatory agencies and the proponent supply NIRB with reports and information respecting project operations and impacts, and the implementation of mitigative measures;
> >
> > (b) a requirement for a periodic evaluation by NIRB of monitoring programs for projects; and
> >
> > (c) based on Sub-section (b), a requirement that NIRB compile a report on the adequacy of the monitoring program and on the ecosystemic and socio-economic impacts of the project.

Finally, the Nunavut Agreement legally requires responsible government agencies and departments to continue to fulfil their responsibilities for monitoring and data collection:

> 12.7.4 Responsible government agencies and departments shall continue to fulfill their responsibilities for monitoring and data collection. Any monitoring responsibilities assigned to NIRB shall not be a duplication of those functions.
>
> 12.7.5 Any monitoring program established for a project under Section 12.7.1 shall be designed so as to avoid duplication of duties and to facilitate coordination of monitoring activities, and may, in addition to any other relevant matters, provide for the variables to be monitored and the program specifications.

(g) Attractiveness of the site for grizzly bears and wolverine

The Board expressed concern that the proposed mitigation may not limit grizzly bears and wolverine from being attracted to the Project site.

Sabina Response

As part of the FEIS, Sabina evaluated the potential for grizzly bears and wolverine to be attracted to the site, and disturbed by Project activities. Mitigation and management to prevent attraction of grizzly bears and wolverine/furbearers focuses on management of wastes and infrastructure design to prevent wildlife from being attracted to or accessing the Project. Measures to reduce the attractiveness of mining projects are well understood and are successful when followed. Mitigation and Management for this potential effect was included in the FEIS WMMP Plan. This plan has been updated, as described below. With these mitigation, monitoring and management measures in place, any potential effects of attraction on grizzly bears and wolverine will be effectively managed, as has been done at other Arctic mining projects.

A review of existing developments indicates that strict compliance with waste management and site cleanliness policies will result in low incidences of grizzly bears being attracted to project sites. From 2000 to the present, there was one instance of an attraction-related mortality (2004) at Diavik and four instances where bears were presumed to be attracted to the Diavik site and relocated for safety reasons (2001, 2003, 2012, and 2013) (Golder 2014). No further instances of attraction-related mortality has

occurred at Diavik since 2004, though on two recent occasions (2012 and 2013) grizzly bears were relocated for safety reasons (Golder 2014).

At the Ekati Diamond Mine, there was one occasion in 2000 where a sow and a cub were reported to be attracted to the Misery landfill site, and the cub was subsequently destroyed for safety reasons (Golder 2001). Since then, the Ekati Diamond Mine has continually improved waste management protocols, and no further incidences of attraction that required relocation or destruction have been recorded (Rescan 2013f; ERM Rescan 2014c; ERM 2016a).

In the years that personnel have been at the Doris North Project site (2006 - 2016), the number of grizzly bear incidents and interactions were generally low with the exception of 2009 (ERM 2016b). Excluding 2009, the number of grizzly bear incidents per year ranged from 1 to 7, with an average of 4.5 incidents requiring deterrents per year. However, in 2009 bears were attracted to improper garbage disposal at the Windy camp, following the closure of Windy camp in late 2008. Since cleanup of the camp, the number of bear incidents has declined significantly.

In general, there were few comments from interested parties on these proposed mitigation measures, other than that they were distributed throughout the FEIS WMMP Plan. Sabina has updated the WMMP Plan to amalgamate all of the mitigation and management dealing with attraction of grizzly bear and wolverine in one section for easy reference (current WMMP Plan, Section 9.1.7).

Standard design features and management actions to reduce the attractiveness of the camp to bears and wolverines has been reorganized and updated in the current WMMP Plan and includes:

Design Mitigation (Section 9.1.7.1)

Buildings will be designed and constructed to exclude wildlife, including grizzly bear and wolverine. Monitoring of buildings will identify any problems and these will be promptly repaired to exclude wildlife.

Wildlife Attractant Management (Section 9.1.7.2)

Wildlife attractants will be managed to reduce the attractiveness of the site, including storage of wastes in bear-proof containers, incineration or transport of attractants off site, regular camp cleanups, and monitoring of waste management with follow-up adaptive management to rectify any identified problems.

General Mitigation and Management to Reduce Human-Wildlife Interactions (Section 9.1.7.3)

These general mitigation measures include policies on no littering and no feeding of wildlife, identification of responsible supervisors for monitoring and management, education of on-site personnel, training of wildlife monitors and disciplinary actions should any of these management measures be broken.

Protocol for Responding to Observations of Grizzly Bear and Wolverine (Section 9.1.7.4)

This section provides guidance to Project personnel for responding to grizzly bears, and to a lesser extent, wolverine, should they be observed on or near site.

The philosophy of responding to grizzly bears and wolverine can be summarized as:

1) Reduce risk to Project personnel through training and immediate response to possible grizzly bear/wolverine interactions.
2) Dissuade grizzly bears and wolverines from the Project site through management activities (managing wastes, eliminating wildlife attractants, maintaining skirting and fencing, etc.) to make the site less appealing to wildlife.

3) Only if #2 above has been implemented and if grizzly bears or wolverine persistently approach the site, or Project personnel are at risk, would any action towards the animal be taken.

This section also includes detailed protocols for responding to observations of grizzly bears and wolverine on-site with the emphasis on improving waste management and dissuading wildlife by reducing the attractiveness of the Project site.

Protocol for Management of Problem Wildlife (Section 9.1.7.5)

If an animal has been identified as a "problem animal", then this protocol is triggered. The Protocol is written to address problem bears and wolverine; however, it can be modified to address other problem wildlife if necessary.

(h) Suitability of mitigation for muskox, grizzly bear and wolverine

The Board expressed concerns that the proposed mitigation and management, including proposed setback distances, may not be protective of muskox, grizzly bear and wolverine.

Sabina Response

During the FEIS review process, the GN indicated they would like to see additional protection measures for grizzly bear and wolverine. Following the FEIS Final Hearing, Sabina updated the WMMP Plan. After additional comments from the KIA and GN, the WMMP Plan was further updated to include mitigation measures similar to those identified for caribou, understanding that grizzly bear and wolverine are much more likely to be attracted to the Project site, and that the populations of these species are healthy in the Project area. These mitigations include:

Blasting Management

The FEIS WMMP Plan included provisions to cease blasting when muskox and grizzly bear were within 500 m of the blasting area. During the FEIS Final Hearing, Sabina met with the KIA and GN and committed to update the WMMP Plan to extend this distance to 1 km, which is double that of any other Project in Nunavut and the NWT.

GN 17a	To be more protective of muskox, the Proponent commits to updating the WMMP Plan to: (1) Increase the trigger distances for blasting mitigation measures for muskox (table 6.3-1 in the current April 2016 version of the WMMP); and (2) Specify mitigation measures, trigger distances and group size thresholds for the operation of heavy equipment on site roads and aircraft (vertical and horizontal distance buffers).

Vehicles and Heavy Equipment

The FEIS WMMP Plan included provisions to maintain a speed limit of 60 km/h and slow vehicles if wildlife were observed within 250 m of the road. Following discussions with the KIA and GN, this distance has been doubled to 500 m and the following management actions will be taken:

- Traffic on all roads will be managed and monitored through a central dispatch.
- To reduce the frequency of traffic on the winter ice road that may deter muskox from crossing, trucks may be grouped into convoys.
- If a driver observes a group of more than 10 muskox (or individual grizzly bear, wolves and wolverine) within 500 m of any road, the driver will slow to 40 km/hr.
- Trucks will stop when groups of muskox (also grizzly bears, wolves and wolverine) are crossing the road.

- If an individual or small group of wildlife (also grizzly bears, wolves and wolverine) are standing on the road, then the driver will stop for up to 20 minutes, then proceed slowly to encourage the wildlife to move off the road.

Helicopters and Fixed Wing Aircraft

Management for helicopters and fixed wing aircraft has remained the same through the various versions of the WMMP for wildlife other than caribou.

- Fixed wing aircraft will maintain 610 m elevation except when landing or taking off.
- Helicopters will maintain 300 m elevation above all wildlife (but see specific rules for caribou).
- Prior to aircraft landing on the airstrip, a visual inspection will be conducted to identify the presence of any wildlife on the airstrip. If possible, the wildlife will be escorted off the airstrip; the flight crew will be notified by radio that such action is taking place and aircraft will not be approved to land until the airstrip is clear. If the wildlife cannot be escorted from the airstrip within a reasonable length of time, the flight crew will be instructed to divert to another location.

Construction of the Ice road

The winter ice road is scheduled to be constructed during December each year, generally after grizzly bear have denned for the winter. FEIS WMMP Plan included monitoring for potential bear dens and establishment of a buffer surrounding that den of at least 250 m. During the FEIS review, the GN commented that a larger buffer should be used, and Sabina made the following commitment during its joint submission with GN:

GN 14a	During construction of the ice road, if a bear den is identified by pre-construction monitoring, the Proponent will avoid the den by 1 km. Under special circumstances an exception to the 1 km buffer may be implemented for logistical reasons following consultation with the GN.

The text of the WMMP Plan was updated to:

- The road portages between lakes will be planned to avoid areas with a higher chance of supporting grizzly bear denning (e.g., eskers).
- If the planned portages occur in areas preferred by grizzly bears as den sites, then pre-construction surveys will be conducted (Section 9.2.1.5).
- The following actions will be taken if a likely grizzly bear den is discovered during pre-construction surveys to reduce the chance of disturbance or mortality of bears:
  - marking the location of the bear den with a GPS;
  - communicating the location of the den to construction personnel;
  - avoiding the bear den by 1 km; and
  - under special circumstances, implementing an exception to the 1 km buffer for logistical reasons following consultation with the GN.

With these requested updates to the WMMP Plan, Sabina has produced a set of management actions that are protective of muskox, grizzly bear, and wolverine and that meet or exceed those at other mines in the Canadian Arctic.

References

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Rescan. 2013. Back River Project: 2012 Socio-economic and Land Use Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.: Vancouver, BC.

NIRB Section:	Section 6.4 – Cumulative Effects	Ref No.:	FHR-NIRB-6.4

Reference to NIRB Report:
Section 6.4 Cumulative Effects

Conclusions and Recommendations of the Board (Section 6.4.4):

As outlined in greater detail in Section 4.11.4: Terrestrial Wildlife and Wildlife Habitat, when the Board applies a highly protective and precautionary approach to management of potential effects on caribou, the Board is not confident that the implementation of proposed monitoring, mitigation, and adaptive management measures would be sufficient to prevent and limit the potential for cumulative effects. The Board has also concluded that measures to limit the potential for cumulative effects on grizzly bear, wolverine, and muskox populations as proposed may also be insufficient to mitigate the potential for adverse effects. [FHR-NIRB-6.4.4]

Issues Highlighted within the Ministers' Referral Letter:

The Board has also concluded that effects on caribou and terrestrial wildlife could result in additional cumulative and transboundary effects on already declining populations.

Sabina Response:

Section FHR-NIRB-4.11 of this FEIS Addendum addresses the matters addressed in FHR-NIRB-6.4.4.4. Sabina has worked diligently to produce a WMMP Plan that is protective of caribou and other terrestrial wildlife, including muskox, grizzly bear, and wolverine. The WMMP Plan is summarized in detail in FHR-NIRB-4.11 of this FEIS Addendum.

In summary, the WMMP Plan meets or exceeds the mitigation and management measures of all other mining projects in the Canadian Arctic. The WMMP Plan will be protective of caribou and other terrestrial wildlife, ensuring that the potential for Project-related and cumulative effects is minimized. Sabina has committed to continuing to work with the KIA, GN, GNWT, and other interested parties to update and refine the WMMP Plan so that is protective of caribou and other terrestrial wildlife. Sabina will continue to work with these groups and the NIRB to ensure that the WMMP Plan protects caribou and terrestrial wildlife.

Attachment:

Not applicable

NIRB Section:	Section 6.7 – Transboundary Effects	Ref No.:	FHR-NIRB-6.7

Reference to NIRB Report:
Section 6.7 Transboundary Effects

Conclusions and Recommendations of the Board (Section 6.7.4):

The Board has concluded that the Project as proposed poses a risk of significant transboundary effects on caribou that cannot be prevented or otherwise adequately mitigated. [FHR-NIRB-6.7.4]

Issues Highlighted within the Ministers' Referral Letter:

The Board has also concluded that effects on caribou and terrestrial wildlife could result in additional cumulative and transboundary effects on already declining populations.

Sabina Response:

Section FHR-NIRB-4.11 of this FEIS Addendum addresses the matters addressed in FHR-NIRB-6.7.4. As summarized in FHR-NIRB-4.11 of this FEIS Addendum, the updated WMMP Plan will be protective of caribou and other terrestrial wildlife, ensuring that the potential for current or future Project related residual effects on wildlife is minimized. Sabina is of the view that with the additional management and mitigation measures outlined in the updated WMMP Plan, the Project as proposed does not pose a risk of significant transboundary effects on caribou.

Attachment:

Not applicable

ADDENDUM APPENDIX V5-5I: EXPERT THIRD PARTY REVIEW OF WILDLIFE MITIGATION AND MONITORING PROGRAM PLAN 1 - GOLDER (NEW)

February 9, 2017 Project No. 1545534.9000

Matthew Pickard, Vice President, Environment & Sustainability
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TECHNICAL REVIEW OF SABINA GOLD & SILVER CORP. BACK RIVER PROJECT WILDLIFE MITIGATION AND MONITORING PROGRAM PLAN

Dear Matthew,

This Technical Memorandum provides a third party independent review of the Wildlife Mitigation and Monitoring Program Plan (WMMP or Plan) dated November, 2016 developed by Sabina Gold & Silver Corp. (Sabina) for the Back River Project (Project). Overall, the WMMP is comprehensive and has sufficient details on the objectives and methods for testing impact predictions, evaluating the effectiveness of mitigation, and providing feedback and triggers for the adaptive management of mining operations to protect people, wildlife, and wildlife habitat. The integration of Traditional Knowledge and Inuit Qaujimajatuqangit (IQ) Principals is also observed, which is an important pillar of current wildlife mitigation and monitoring programs in the Northwest Territories (NWT) and Nunavut. Relative to operating mines in the NWT and Nunavut, the WMMP meets the mitigation and monitoring actions for caribou and other wildlife valued ecosystem components (VECs), and in some cases exceeds that of other projects by providing unique and highly protective actions. As a result, the Plan contains rigorous and adequate mitigation and monitoring methods for avoiding and minimizing potential effects to wildlife, protecting human safety, and evaluating environmental assessment predictions and mitigation actions.

Specific comments are first directed at the general mitigation and monitoring elements of the WMMP, which are similar across VECs and implemented to avoid, minimize and monitor effects such as direct physical disturbance to habitat from the Project footprint, indirect habitat loss, direct and indirect mortality, changes in animal movement, and attraction to the Project. A review of each VEC or group of VECs is then provided that focusses on mitigation and monitoring specific or unique to those species.

General Mitigation and Monitoring

Mitigation

The general mitigation and management of direct and indirect effects to wildlife is similar and consistent with the programs for operating mines in the NWT (Snap Lake, Gahcho Kué, Ekati and Diavik mines) and Nunavut (Meadowbank, Mary River and several others proposed). Mitigations utilized by Northern operations are well tested and have been developed by regulatory authorities, proponents and aboriginal groups and are based on scientific evidence as well as Traditional Knowledge and Inuit Qaujimajatuqangit Principals. This includes the policies and actions provided in Section 6.1 to avoid and reduce the risk of potential harmful interactions between people and wildlife, and mitigate adverse effects from noise and hazardous spills. In addition, there are several

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mitigations related to direct and indirect effects that are included in all or most VEC-specific sections, which are similar or equivalent with other projects, such as:

Direct Habitat Loss

- Minimize direct loss by making the Project footprint as small as possible.
- Undertaking progressive reclamation throughout the life of the mine, where practicable.

Indirect Habitat Loss

- Implementing best practice noise abatements and dust suppressants to reduce changes in habitat quality and the behaviour, movement and distribution of wildlife.
- All wildlife have the right-of-way.
- Traffic management actions (e.g., stopping traffic when certain triggers have been met) and reducing vehicle speeds when wildlife are approaching roads.
- Maintain minimum flying altitudes for aircraft.

Direct Mortality

- Enforcing speed limits, and reducing speed as caribou approach roads within certain distances.
- All wildlife have the right-of-way.
- Communication between drivers and Environment personnel of wildlife approaching or on roads.
- Site alerts and notifications of likelihood of caribou near or on the project site.
- Staff and contractors to report all wildlife observations (particularly caribou, muskox, grizzly bear and wolverine) to Environment staff.
- Assessment of the causes of mortality on roads, and implement adaptive management, if required.
- Hazardous materials will be handled and secured safely and regular road and camp cleanups will be conducted.
- Blasting Management Plan, and associated cessation of blasting when caribou, muskox and carnivores are within specified distances of the blasting area.

Indirect Mortality

- No hunting policy while staff are on-site.
- Closure of the winter road to the public.
- Monitoring of winter road for public use to implement adaptive management, if required.

Attraction to the Project

- Implementing a rigorous Waste Management Plan to separate food, fuel, and inert wastes, and minimize access to food garbage for carnivores, gulls and ravens and other scavengers.
- No feeding wildlife policy.

- No littering policy.
- Design buildings to exclude wildlife and prevent access for shelter (e.g., skirting bottom of buildings).
- Provide training and education for all staff regarding attractants for wildlife and proper disposal of food and other wastes.
- Educate staff on responding to wildlife encounters and emergency protocols and communications.

Exposure to Contaminants

- Implementing a Fuel Management Plan, Spill Contingency Plan and Hazardous Materials Management Plan.
- Monitoring water quality in the TSF and applying adaptive management for deterring wildlife from the area, if required.

Monitoring

The objectives of the monitoring component of the Plan are consistent with other monitoring programs in the NWT and Nunavut; determining the effectiveness of mitigation policies and procedures, providing feedback for adaptive management triggers to alter, modify and/or increase mitigation, and test predictions in the environmental assessment (FEIS). Some monitoring programs for other projects also include the objective of reducing the uncertainty in impact predictions, which is largely related to the level of confidence in ecological models used in the assessment and the abundance and seasonal distribution of animals. Monitoring not only decreases uncertainty in the effects predictions and mitigation success for the Project, but also increases confidence in future environmental assessments for other projects in similar regions and species. For example, long-term monitoring (1996 to 2013) at operating diamond mines has demonstrated successful mitigation for direct mine-related mortality on caribou and other wildlife. While seven caribou died from becoming entangled in fences, no caribou have been killed or injured from vehicle and aircraft collisions, open pits, fly rock from blasting, and waste rock piles.

In addition, there are several monitoring components that are included in all or most VEC-specific sections, which meet or for some elements exceed other projects, such as:

Project footprint

Annual measurement of the area of the Project footprint to calculate combined year-to-year direct habitat loss to test the effect prediction.

On-site Surveillance with Cameras

Objectives are to determine how caribou, muskox, and carnivores interact with the Project (e.g., roads, pits, buildings), and the frequency of interactions through the year and over the life of the Project to direct and trigger mitigation. Sabina proposes the use of high resolution tower surveillance cameras. An estimate of the number of cameras to be deployed would further improve the WMMP. Cameras have been shown to be effective at measuring responses of wildlife to developments. The Ekati Mine also uses cameras to monitor caribou and other wildlife interactions with roads. As an alternative to using cameras, other projects such as Diavik and Gahcho Kué use systematic surveys of wildlife and wildlife sign at set locations around the mine site to determine the frequency of encounters, guide mitigation actions, and implement behavioural monitoring (scan and focal) of caribou. The difference in the effectiveness between cameras and systematic surveys has not been examined; however, the proposed tower surveillance cameras have the unique advantage of producing continuous, real time data.

Incidental Observations

Objectives are to alert Environmental personnel of caribou and other wildlife that are approaching or on-site, triggering mitigation for avoiding animal collisions with aircraft and vehicles, avoiding and reducing risk of harmful encounters between people and wildlife, deterring wildlife from hazardous areas, and recording unexpected interactions with the Project. As with other projects (e.g., Snap Lake, Gahcho Kué, Meadowbank, Mary River and Ekati) the WMMP will also use incidental observations to maintain a species log for the area, and track changes in the frequency of occurrence of rare or uncommon species (i.e., potential shifts in species distributions).

Monitoring in Relation to Blasting

Objective is to trigger appropriate mitigation if caribou, muskox, grizzly bear and wolverine are observed within certain distance from above-ground blasting, which is equivalent to or more stringent than other projects in the NWT and Nunavut.

Caribou

Mitigation

The application of the WMMP to all caribou herds, independent of the likelihood of interacting with the Project, is highly protective and adopted by existing mines in the NWT and Nunavut. Sabina's adaptive management approach of integrating herd vulnerability with increasing levels of protection to reduce risks to caribou populations reflects the current science of adaptive management (Section 7.1.3). Similarly, the tiered management system to reduce disturbance to caribou fits within the adaptive management framework, and the elements of scaled monitoring are consistent with the recent mitigation and monitoring program for the Jay Project at the Ekati Mine (Section 7.1.5.1). The analysis of collar data to detect shifts in calving and post-calving core ranges provides a robust method to deal with the unpredictability of caribou and the uncertainty in effects predictions.

The different levels of management for caribou (i.e., Level 1, 2, 3 and 4) (Section 7.1.5.2) are also similar to the approach developed for the Diavik Mine (Caribou Traffic Advisory) and Jay Project (Caribou Road and Mitigation Plan). For example, the WMMP includes pre-designed actions for drivers to implement when caribou are within certain distances of the road, such as reducing vehicle speed or stopping for a designated period of time to allow caribou to cross the road (Section 7.1.6). The exact triggers among projects differ, but the approach is similar and recommended by Poole and Gunn (2016) as mitigation to avoid and minimize caribou sensory disturbance and mortality.

The WMMP includes changing from Normal Operations (Level 1) to Site Notification (Level 2) during sensitive caribou seasons (June 5 to July 31) to increase site awareness, then to Site Alert (Level 3) to notify staff that blasting, heavy mobile equipment and mine activities may be stopped or shut down, and then to Staged Reduction in Project Activities (Level 4) that involves stopping activities when certain triggers have been met. For example, at Level 4 during all seasons, groups of 30 or more caribou within 4 km of open pits will cause cessation of blasting, which is highly protective relative to other projects in the NWT and Nunavut. During the sensitive seasons, groups of 30 or more caribou within 1 km of the Goose site will trigger stopping all heavy mobile equipment, which exceeds the precautionary actions at operating projects in the NWT. During all seasons, vehicles will slow down for caribou within 500 m of a road, stop for up to 20 minutes when caribou are within 50 m of the road with the intention to cross the road, and give the right-of-way to caribou on the road.

Some points of clarification pertaining to the triggering of mitigation for heavy equipment and blasting that would improve the WMMP include:

- Provide rationale for the values of 30 or more caribou within 500 m, 1 km or 4 km of activities.
- Provide rationale for values of more than 250 caribou within 4 km of activities.

The management for shifts in calving and post-calving ranges (Section 7.1.5.3) and associated 'rapid' and 'planned' (longer-term response) operational shutdowns if these ranges overlap with the Project site is precautionary and incorporates Mobile Caribou Conservation Measures (Poole and Gunn 2016). The proposed use of rapid and planned operational shutdowns is highly protective to deal with uncertainty of potential shifts in caribou seasonal ranges, and not common in NWT and Nunavut. Specific points of clarification in this section that would improve the WMMP include:

- Provide rationale for the trigger of more than 250 caribou within 4 km of on-site activities to implement further reduction of Project activities.
- Give the rationale for 50% and 80% core calving and core post-calving ranges as triggers for planned operational shutdown.
- Provide the proposed duration of rapid and planned operation shutdowns.

Monitoring

The continued monitoring of seasonal ranges for Bathurst and Ahiak/Beverly caribou herds during the life of Project is unique to this WMMP, but necessary considering the location of the Project relative to the seasonal range boundaries of these herds and providing an adaptive management response to a shift in distribution (e.g., mobile caribou conservation measures). The near real-time collar monitoring is consistent to that being used at Ekati; however, the effectiveness depends on the frequency of collar locations and the speed of communication between the GN or GNWT and Sabina.

Several of the monitoring programs for testing predicted effects are consistent and standardized with the methods used at other projects in the NWT and Nunavut, such as behavioural monitoring (focal and scan sampling), using regional collar data to determine avoidance of the project (i.e., zone of influence estimation), and dust deposition monitoring. The stress hormone study is another example of protective measures unique to the Project, which could increase our understanding of mine-related effects on caribou. The collection of noise levels as part of the WMMP is not a component of most monitoring programs for projects in the NWT and Nunavut, but has been proposed for the Gahcho Kué Mine. Collaborating with government and providing financial and in-kind support for herd-scale monitoring is also consistent with the practices of operating mines in the NWT and Nunavut.

Muskox

Mitigation

The blasting management for protection of muskox is precautionary (i.e., stopping a blast when 10 or more muskox are within 1 km of open pits). Operating mines in the NWT do not have muskox as a VEC, which is largely due to the low frequency of occurrence of this species near the projects. Some proposed mining operations in Nunavut (e.g., Meliadine) have muskox as a VEC; however, it is a secondary VEC as most monitoring and mitigation actions being applied for caribou will hold true for muskox. As mentioned above (General Mitigation), the Plan includes sufficient mitigation actions to avoid and minimize other direct and indirect effects on muskox, and other wildlife.

Monitoring

The regional monitoring using cameras to test predicted effects on muskox and behaviour monitoring of muskox to determine effects from Project stressors (aircraft, vehicles, blasting) is unique relative to operating mines in the

NWT. The study design and methods used in both monitoring programs are scientifically credible; however, the ability to measure effects will depend on the frequency of occurrence of muskox in the study area and the number of camera and behavioural observations obtained.

Grizzly Bear, Wolverine, Wolf and Fox

Mitigation

The mitigation concerning active carnivore dens within specified distances of the Project site during construction and operation appears adequate and sufficient to minimize effects to grizzly bear, wolverine, wolf and fox. The mitigation actions for minimizing attraction of carnivores to the Project and reducing the risk of human-wildlife interactions are comprehensive and detailed. Based on similarities and long-term results from operating mines in the NWT and Nunavut, these mitigation policies and practices are predicted to be successful if fully implemented, maintained and monitored for rapid adaptive management. The protocols for responding to observations of grizzly bear and wolverine, and management of problem wildlife are precautionary and provide an appropriate hierarchical approach (i.e., increasing levels of mitigation intensity with increasing degree of threat) for reducing the risk of harmful human-wildlife interactions, and protecting people and animals.

Monitoring

The objective, methods and analysis for monitoring the effectiveness of waste management are consistent with existing operating mines, and predicted to be adequate and sufficient for mitigating attractants for carnivores. It is important to note that adverse effects, such as increased wolverine encounters and issues, on mine sites are typically the result of a lapse in due diligence in waste management policies, practices, monitoring, and quick responses in adaptive management.

As with muskox, the study design and methods used for regional monitoring are scientifically credible; however, the ability to measure effects will depend on the frequency of occurrence of grizzly bear and wolverine in the study area and the number of camera observations obtained.

Raptors

Mitigation

Many of the mitigation actions to avoid and minimize disturbance and direct mortality of raptors are also completed at existing operating mines, such as deterring nesting on project infrastructure and pit walls, providing set back distances from raptors that have established a nest on the mine site, and completing pre-clearing surveys if clearing needs to occur during the breeding season. These policies and procedures have been highly effective at mitigating effects to raptors. Initiating communication with government to discuss mitigation when raptors have established a nest on Project infrastructure or pit walls is an important element of the WMMP.

Monitoring

The Plan contains adequate and effective monitoring for mitigation triggers and testing predicted effects, which are generally consistent with existing operating mines. The exception is the frequency of surveys for nest occupancy and productivity to provide regional monitoring data (Section 10.2.2.2). The WMMP states that these surveys will be completed every three years. Operating mines in the NWT (Snap Lake, Gahcho Kué, Diavik and Ekati) are completing equivalent surveys every five years to contribute to the NWT regional raptor database. The next survey is scheduled for 2020. It is suggested that Sabina change the frequency of raptor nest occupancy and productivity surveys to match the timing of projects in the NWT to provide broader inter-regional data on the population status of raptors in the Arctic.

Waterbirds

Mitigation

The mitigation actions to avoid and minimize disturbance and direct mortality of waterbirds are also completed at existing operating mines, such as providing buffers from established nests on the mine site, and completing pre-clearing surveys if clearing needs to occur during the breeding season. These policies and procedures have been highly successful at mitigating effects to waterbirds. Initiating communication with government to discuss buffer distances for nests is an important element of the WMMP.

Monitoring

The WMMP uses the trigger of water quality not meeting wildlife guidelines to implement monitoring of ponds for waterbirds on the Project site. The methods for monitoring waterbirds on ponds are adequate for determining adaptive mitigation. However, some operating mines (Diavik and Ekati) have and continue to monitor the use of mine-altered waterbodies by waterbirds, independent of water quality, which Sabina should consider.

The level of detail, study design and application of standardized methods to the regional monitoring program is anticipated to be sufficient and effective for testing predicted effects from the Project on waterbirds. A similar program was implemented at the Doris North Gold Mine Project; however, surveys of this nature to test mine-related effects on waterbirds are currently not completed at operating mines in the NWT.

Upland Birds

Mitigation

As with raptors and waterbirds, the mitigation actions provided in the WMMP to limit disturbance and direct mortality of upland birds are similar to other projects in the NWT and Nunavut, and considered to be effective.

Monitoring

Regional monitoring using PRISM and point-count surveys are standard and scientifically credible methods for determining project-related effects on upland birds. Currently, operating mines in the NWT have no monitoring programs for specifically testing mine-related effects on upland birds. However, the Ekati and Gahcho Kué mines contribute regional data on upland birds through the North American Breeding Bird Survey and PRISM surveys, respectively. Sabina may also consider providing the observations of breeding bird surveys to a regional database.

Marine Birds, Seals and Polar Bear

The Project is predicted to have no to little residual effects on seaducks, seabirds, seals and polar bear. Some small changes in forage availability may occur for marine birds. There is also potential for small alterations in habitat and access for marine birds and seals due to the Lightering Barge Terminal, but the effects would be temporary and short in duration. Accidental fuel spills are the greatest concern for polar bear, but the risk is anticipated to be minimized with the Fuel Management Plan, Spill Contingency Plan, and Oil Pollution Prevention and Emergency plans (Section 15.1.1). Based on these predictions, the mitigation and monitoring for these species provided in the Plan appears sufficient for their protection. The monitoring for marine birds could likely contribute to a regional database on population status given that the same standard protocols used for waterbirds (Section 11.2.2.2) will be applied to surveys for seaducks and seabirds.

References

Poole, K and A. Gunn. 2016. Management of caribou post-calving area in the Kivalliq Region, Nunavut. Report for the Kivalliq Inuit Association. 17 pages.

Technical Credentials of Reviewers

John A. Virgl, Ph.D.
Principal, Senior Ecologist

John has over 20 years of experience in the design, statistical analysis, interpretation, and practical and theoretical application of ecological studies in research and environmental and socio-economic impact assessment. John's career at Golder has included the continuous development of rigorous scientific approaches and methods for environmental assessment, particularly cumulative effects analysis, and effects monitoring and mitigation programs. He has led the assessment of cumulative effects for biophysical, socio-economic and cultural components in several environmental assessments. His focus is on understanding the incremental contribution of a project to the cumulative effects from previous and existing developments and natural factors, and potential future activities. The application of appropriate project-specific designs and mitigation is important to conserve the structure and function of aquatic and terrestrial ecosystems, and continue to provide the ecological services for traditional and non-traditional land users.

John has written over 50 reports and published 19 articles in refereed scientific journals on a wide range of taxonomic groups including fish, songbirds, peregrine falcon, small mammals, black bear, and tundra and woodland caribou. In 1998, John was one of the principal scientists involved in the development of study designs and statistical analyses of environmental effects monitoring programs for diamond mines in the Northwest Territories. John continues to be involved in the monitoring and mitigation programs for these projects, which include or have included barren-ground caribou, grizzly bear, wolverine, upland breeding birds, waterbirds, and raptors.

His main area of practice is the mining industry, but he has also worked with clients in the forestry, power and energy sectors. John has provided his expertise clients in British Columbia, Alberta, Saskatchewan, Ontario, the Northwest Territories, and Nunavut. He has performed as an expert witness at several technical sessions and public hearings, and presented a number of papers at professional conferences. His involvement with these projects, and his ongoing communication with government biologists, regulators, and communities has provided him with an understanding of the environmental and cultural issues that are important to all stakeholder groups.

Corey De La Mare, M.Sc. [cand]
Principal, Senior Ecologist

Corey is a professional biologist with more than 21 years of experience. He practices in wildlife biology and vegetation ecology, wildlife and vegetation assessments, wildlife management and monitoring, and environmental impact assessment (EIA). His experience includes: vegetation inventory; mitigation and monitoring; soils inventory and mitigation; and, wildlife inventory, mitigation and monitoring. He has worked on Projects across Canada and in Canada's north, in the United States, and South America. Corey has worked on several oil sands mining and in situ projects in north east Alberta since 2001 and has worked on several hard rock mining projects, including diamond mines, in Canada's north (i.e., Northwest Territories, Nunavut and the Yukon) and in south America and west Africa. This work has primarily included environmental impact assessments (EIAs) and follow-up monitoring programs for wildlife and wetlands. In addition, Corey has worked on several conventional oil and gas projects throughout Alberta (i.e., foothills, prairies, parkland and boreal), Saskatchewan, northeast BC and the Northwest Territories, where he participated in an environmental hearing. His involvement in all of these projects is primarily around wildlife, wetlands and species at risk issues. Corey has been the senior wildlife and terrestrial advisor for several pipeline projects in Alberta and BC that have went through the ERCB or NEB regulatory process. His involvement in these projects has included consultation with regulators and First Nations, determining information

needs, terrestrial ecology assessment and design and implementation of follow-up monitoring programs, if necessary.

His main area of practice is the development and implementation of mitigation and monitoring programs (MMP) for vegetation (e.g., wetlands) and wildlife. He has developed MMPs for the oil sands mining industry where he developed a large-scale, multi-company, multi-jurisdictional (i.e., industry, government and academia) collaborative program (Wildlife Habitat Effectiveness and Connectivity or WHEC) that was eventually handled by the University of Alberta to support several graduate students. For the mining and oil and gas industry, he has developed 9 wildlife monitoring programs in northeast Alberta, 4 wildlife monitoring programs in Nunavut, two wildlife monitoring programs in Peru and several other smaller scale monitoring programs for a variety of industries and geographies. He has performed as an expert witness at several technical sessions and public hearings, and presented a number of papers at professional conferences. His involvement with these projects, and his ongoing communication with government biologists, regulators, and communities has provided him with an understanding of the environmental and cultural issues that are important to all stakeholder groups.

GOLDER ASSOCIATES LTD.

John Virgl, Ph.D.
Principal, Senior Ecologist

Corey De La Mare, M.Sc. [cand]
Principal, Senior Ecologist

JV/CDLM/jr

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ADDENDUM APPENDIX V5-5J: EXPERT THIRD PARTY REVIEW OF WILDLIFE MITIGATION AND MONITORING PROGRAM PLAN 2 - EDI (NEW)

ENVIRONMENTAL DYNAMICS INC.

2195 – 2nd Avenue
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February 10, 2017

EDI Project No: 170047:1

Sabina Gold & Silver Corp.
Suite 375 – 555 Burrard Street
Vancouver, B.C. V7X 1M7

Attention: Matthew Pickard, Vice President, Environment & Sustainability
Merle Keefe, Environmental Engineer

RE: Critical review of the Back River Project Wildlife Mitigation and Monitoring Plan

EDI Environmental Dynamics Inc. (EDI) was retained by Sabina Gold & Silver Corporation (Sabina) to conduct a review of their Wildlife Mitigation and Monitoring Plan (WMMP; November 2016) for the Back River Project. Specifically, you asked us to consider and provide our expert opinion on the following questions:

1. How does the Sabina WMMP generally compare to the WMMPs of other Arctic projects?
2. Does the WMMP incorporate adequate measures to deal with uncertainty in the future habitat use by caribou (i.e., shifts in the calving and post-calving range)?
3. Does the WMMP adequately address mobile protection measures objectives?
4. Does EDI have any suggestions which, in its professional opinion, would improve the WMMP?

EDI's review is based on knowledge garnered through the evaluation of data, traditional knowledge and Inuit Qaujimajatuqangit (IQ), and experience with other northern resource projects. The objective of the review was focused on how the WMMP addressed caribou; however, our comments generally apply to all species described in the WMMP.

The NIRB's Final Hearing Report concluded that the Back River Project should not proceed due to unmanageable and immitigable ecosystemic and socioeconomic effects, and in particular, the potential for significant adverse effects on caribou and other wildlife. In their Report, the Board states:

"…the Board has concluded that a higher standard of the precautionary principle is called for, the Board requires evidence of ***positive and preventative actions*** *that will be taken to ensure that where there is potential for a serious risk of environmental degradation, and high levels of uncertainty, the measures proposed to limit or reduce the potential for adverse impacts are highly protective and* ***do not require evidence of impact before they are triggered****"*

"The Board feels strongly that ***any additional impact to these caribou populations would be unacceptable****, and accordingly the Board believes that approval of the Project with such uncertainties in the effectiveness of the planned approaches to monitoring and adaptive management would not represent the required precautionary approach towards caribou management…the proposed monitoring and adaptive management approaches do not go far enough to satisfy the Board that the Project can proceed as proposed without causing unacceptable effects"* (emphasis is EDI's).

Further, the Board "*…stresses that any impact to caribou in this circumstance would be considered unacceptable.*" This position effectively nullifies any efforts to minimize adverse effects to caribou and deems only those that avoid all effects as acceptable, leaving Sabina with limited opportunity to improve the WMMP.

The NIRB's statement about effects does not distinguish between potential effects to individuals versus populations. Further, the statement does not provide an indication of how to better measure, evaluate, or ensure population-level effects are prevented, other than seemingly suggesting that any new industrial activity not proceed within or near the annual ranges of these herds. That evaluation does not place any regard on the Back River effects assessment that shows a small to negligible effect on the caribou herds that interact with the Project. Regardless, the Final Hearing Report leaves Sabina with no option other than providing an excess of mitigation and monitoring commitments in an attempt to minimize all interactions, irrespective of the significance of effects. To that end, Sabina has demonstrated a willingness to plan and operate a project with care and precaution for caribou populations regardless of their potential sensitivity to the Project.

Sabina's approach to mitigation and monitoring exceeds generally accepted mitigation principles in that it does not rely on the presence or prediction of adverse Project effects to trigger a protective mitigation measure. This includes an unprecedented number of stop work commitments that are triggered by thresholds that are comparably more protective than any other similar project in the North. This highlights the breadth and detail provided by Sabina, which is beyond what is typically required for projects of this nature and duration, and attempts to eliminate interactions (be they favourable or adverse), between the Project and wildlife. The WMMP also ensures mitigations are in place should caribou change their use of the land, whether gradually or rapidly. For example, this WMMP provides detailed plans and actions to address the potential for caribou to interact with the Project footprint during calving and post-calving — an occurrence that has not happened based on existing knowledge (the closest calving and post-calving areas are 145 and 60 km away, respectively) and is unlikely to occur within the life of the Project.

Sabina's updated WMMP is exhaustive in its approach to mitigation and monitoring and exceeds accepted practices of applying a hierarchy of mitigation, focusing first on avoiding and then on minimizing potential for impact. For example, to prevent potential effects to caribou given existing habitat use and to account for future habitat use, Sabina proposes to automatically apply the most protective mitigation and management actions for caribou based on the Bathurst herd's vulnerability score (an approach outlined by the Beverly-Qamanirjuaq Caribou Management Board and partners). This would result in virtually continuous monitoring of the Project footprint by wildlife monitors and on-site cameras in addition to incidental reporting by pilots or drivers to trigger immediate mitigation actions. Proposed monitoring plans also involve multiple studies to detect effects to caribou (and other wildlife), including collar monitoring to

evaluate the zone of influence, behavioural monitoring, stress hormone levels, and collaboration with regional programs and studies. Additionally, Sabina demonstrates their efforts to collaborate and reach consensus with government and aboriginal groups regarding appropriate and precautious mitigation and monitoring actions throughout the WMMP. In our experience in either working on or reviewing other northern projects' WMMPs (including Mary River, Hope Bay, Meadowbank, Diavik, Ekati, Red Dog mines), this level of mitigation and monitoring effort is unprecedented.

Sabina is proposing a tiered approach to avoid or minimize interactions with caribou during sensitive periods (calving and post-calving) ranging from monitoring caribou approaching the site (collar locations within 15 km), to rapid operational shutdown (>250 caribou, <4 km away), to planned shutdowns (collar data indicating calving or post-calving range overlaps the Project site). The upper tier levels seem extremely precautious given the predicted small magnitude and predicted not significant effects. Some mitigation measures do adequately reflect appropriate action given predicted effects. For example, operations involving blasting, road use, aircraft, or heavy mobile equipment, are logical, linked to predicted effects, and simplified for operational purposes using caribou decision tree diagrams (Appendix 1). This demonstrates Sabina's willingness to employ both standard, practical mitigative efforts in addition to decidedly precautionary ones to prevent and ameliorate interactions between the Project and caribou. Together, these efforts leave little uncertainty regarding the ability of the proponent to effectively apply mobile caribou conservation measures, as described in the *Mobile Caribou Conservation Measures for the Kivalliq Region* (Kivalliq Inuit Association, 2015). These measures aim to respond to changes in caribou movement and habitat use on the landscape in an adaptive manner instead of assuming static habitat use by caribou throughout the life of the Project (often termed Mobile Caribou Protection/Conservation Measures).

There should be general acknowledgement by all parties that there will be effects, because the Project does interact with wildlife, and there will be some uncertainty about the effects of the interactions. Those interactions are quantified in the effects assessment and will be not significant to the interacting caribou herds. Although the measures described in the WMMP are designed to address and account for uncertainty, it could be improved by explicitly detailing Sabina's overall approach to managing uncertainty. Additionally, the WMMP could further emphasize the integral flexibility to adapt mitigation and monitoring efforts to what preliminary data indicates. Some of the suggested monitoring programs are akin to academic research and not typical of proponent mitigation or monitoring. For example, results from the first year of the stress hormone study may demonstrate the need for study design refinement and/or that the study does not provide information that is relevant for effects assessment purposes. We recommend that Sabina collaborate with communities, government, and other organizations over the life of the Project to confirm that the studies reflected in the WMMP continue to provide useful information.

In summary, Sabina's WMMP meets or exceeds that of other northern mines. Sabina is placing substantial effort on preventing impacts to wildlife, particularly caribou. Regardless of the breadth and commitment of Sabina, the ability to accurately measure project effects on wildlife can be extremely difficult. Sabina's response to this uncertainty is to apply a comprehensive, precautionary WMMP. The inability to detect or diminish any not significant effect presents a rather paradoxical situation: Mitigating and monitoring for a potential effect that is likely not an effect at all.

Yours truly,

EDI Environmental Dynamics Inc.

Mike Setterington, M.Sc., R.P. Bio., C.W.B.
Director/Senior Biologist

Kelsey Russell, B.Sc.
Biologist

Attachments:
- Authors' technical qualifications

AUTHORS' TECHNICAL QUALIFICATIONS

Mike Setterington (M.Sc., R.P.Bio., C.W.B., EDI Environmental Dynamics Inc., Whitehorse, YT) is a senior terrestrial biologist who has worked since 1995 on projects related to wildlife and bird ecology, habitat management, impact assessment, and post-environmental assessment monitoring in western and northern Canada. He has managed a number of projects related to environmental assessments and has coordinated the submission of technical reports to environmental and socio-economic impact review boards. Mike has experience both as a government regulator/expert witness and as a project proponent representative. He was also the technical regulator at several mining project hearings and was the Government of Nunavut representative on a number of Federal/Provincial/Territorial working groups including those for wildlife recovery planning, species at risk, and protected areas planning.

Kelsey Russell (B.Sc., M.Sc. candidate, EDI Environmental Dynamics Inc., Whitehorse, YT) has taken on roles in a variety of disciplines including environmental impact assessment, wildlife and habitat research and monitoring, modelling, and GIS analyses. She has worked on numerous research projects and reports for various projects in Yukon, British Columbia, and Nunavut and has 5+ years of experience working on wildlife in the north, with a focus on barren-ground and woodland caribou herds. Kelsey has conducted field work and research projects for a number of organizations and throughout her experiences, has become very familiar with national and regional regulatory and research agencies and individuals. She is also currently a Master's of Science candidate at the University of Northern British Columbia studying the effects of wildfire on caribou habitat selection strategies.

ADDENDUM APPENDIX V5-5K: SABINA NOTE TO THE RECORD – EXPERT THIRD PARTY REVIEW COMMENTS (NEW)

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MEMORANDUM

SUBJECT: Sabina Note to the Record – Expert Third Party Review Comments
DATE: February 15, 2017

Sabina has prepared this memo in order to record its response to the recommendations and comments of EDI and Golder included in the memos referenced below.

> Golder Associates. 2017. Technical Review of Sabina Gold & Silver Corp. Back River Project Wildlife Mitigation and Monitoring Program Plan. Report prepared for Sabina Gold & Silver Corp. by Golder Associates Ltd.: Edmonton, AB.
>
> EDI Environmental Dynamics Inc., 2017. Critical Review of the Back River Project Wildlife Mitigation and Monitoring Plan. Report prepared for Sabina Gold and Silver Corp. by EDI Environmental Dynamics Inc.: Whitehorse, YK.

Sabina has made certain revisions to the Wildlife Mitigation and Monitoring Plan (WMMP Plan) in response to EDI and Golder's individual respective third party reviews. In the table below, Sabina has also provided further rationale on certain topics highlighted in the Golder and EDI memos.

Third Party Reviewer	Comment/Recommendation	Sabina Response
EDI	Although the measures described in the WMMP are designed to address and account for uncertainty, it could be improved by explicitly detailing Sabina's overall approach to managing uncertainty.	Managing uncertainty was the focus of extensive discussions during the review of the FEIS and the Final Hearing, which resulted in a series of terms and conditions presented as a joint submission with the KIA and GN (FEIS Addendum Appendix V1-9). A high degree of conservatism has been built into the terms and conditions, which are designed to manage uncertainty, and have been captured in the latest version of the WMMP.
EDI	Additionally, the WMMP could further emphasize the integral flexibility to adapt mitigation and monitoring efforts to what preliminary data indicates.	The following paragraph has been inserted into the Introduction of the WMMP Plan in order to specifically respond to EDI's recommendation: *Sabina is committed to minimizing its impacts to wildlife and has designed its monitoring and mitigation activities to be flexible and adaptable as part of its overall management strategy to be responsive to concerns regarding uncertainty in potential effects to wildlife, particularly caribou, raised during the FEIS. As a result, the WMMP Plan meets and in most cases exceeds the mitigation and management measures for any mining project in the Canadian Arctic. The monitoring program used to trigger mitigation and management activities for potential Project effects is likewise the most advanced and comprehensive monitoring program in the Canadian Arctic.*
Golder	Some points of clarification pertaining to the triggering of mitigation for heavy equipment and blasting that would improve the WMMP include: • Provide rationale for the values of 30 or more caribou within 500 m, 1 km or 4 km of activities. • Provide rationale for values of more than 250 caribou within 4 km of activities. • Provide rationale for the trigger of more than 250 caribou within 4 km of on-site activities to implement further reduction of Project activities. • Give the rationale for 50% and 80% core calving and core post-calving ranges as triggers for planned operational shutdown. • Provide the proposed duration of rapid and planned operation shutdowns.	The trigger distances and caribou group numbers are the result of extensive discussions with the KIA, GN, and GNWT, and are designed to be highly conservative and responsive to uncertainty regarding potential effects to caribou. They are based on science, TK and northern experience. The EIS included a Wildlife Mitigation and Monitoring Program Plan (WMMP Plan) which was updated three times prior to the Final Hearing. At the Final Hearings, Sabina continued to engage with the KIA, GN and GNWT to resolve any outstanding issues. At the conclusion of the Final Hearing, Sabina provided joint submissions to the NIRB on wildlife: o With the KIA of one (1) Term and Condition, and six (6) commitments; and o With the GN of twelve (12) Commitments. These terms and conditions are listed in Table 1 and Table 2 of Section 4.11 of the FEIS Addendum. Some examples of how we choose triggers include: The KIA requested at the Final Hearing that a more conservative noise threshold (96 dB) be used for open bit blasting near groups of caribou. The result, from noise modeling, was a setback of 3.7 km. Sabina choose to extended that to 4 km to provide an additional conservatism. 4 km also matches a GNWT request made in their final written submission. Sabina originally proposed a group size of 50 caribou in line with a NIRB accepted approach on the Meliadine Project. After discussions with the KIA we agreed to utilize a more conservative group size and thus lowered it to 30. Utilizing a 50% and 80% core ranges for planned operational shutdown was a result of the GN requesting both be considered annually to ensure our approach is more conservative. Usually only the 80% would be used.
Golder	Some monitoring programs for other projects also include the objective of	Sabina has developed an extensive monitoring program as a means to evaluate impacts predictions and be responsive to

Third Party Reviewer	Comment/Recommendation	Sabina Response
	reducing the uncertainty in impact predictions, which is largely related to the level of confidence in ecological models used in the assessment and the abundance and seasonal distribution of animals.	unexpected and unlikely changes in caribou distribution. In response to comments from the KIA, GN and GNWT that monitoring should be more protective of caribou, Sabina has committed to staffing wildlife monitors on site year round to monitor for caribou every day, with collar data used to supplement information collected by the wildlife monitors. Sabina plans to utilize several types of monitoring tools for caribou that will be used to trigger management actions (current WMMP Plan). Each of these monitoring programs is conducted at some or all Arctic mining projects in Canada. The detailed methods of these monitoring programs will be finalized during the permitting stage, in consultation with the KIA, GN and GNWT. The results of these monitoring programs will be reported in the annual Wildlife Effects Monitoring Program (WEMP) report which is described in the WMMP Plan. With these updated and improved monitoring programs in place, Sabina will be able to determine when caribou are approaching the Project site and trigger appropriate mitigation and management actions. These programs will also enable Sabina, the NIRB, KIA, GN, GNWT and other interested parties to comprehensively evaluate the effects of the Project on caribou.
Golder	As with other projects (e.g., Snap Lake, Gahcho Kué, Meadowbank, Mary River and Ekati) the WMMP will also use incidental observations to maintain a species log for the area, and track changes in the frequency of occurrence of rare or uncommon species (i.e., potential shifts in species distributions).	Observations of caribou by any Project personnel (e.g., helicopter pilots, drivers, camp personnel) will be reported to the Environment Department. These data may trigger additional Active Caribou Monitoring and can also trigger management. Details on how Sabina will manage incidental observations are provided in Section 7.2.1.4 of the WMMP Plan.

6. Volume 6 Addenda: Freshwater Environment

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of the Freshwater Environment, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

Volume 6 of the EIS presents the assessment of potential environmental effects to the freshwater environment associated with proposed Project activities following the application of mitigation and management measures. During development of the FEIS, the following freshwater components were selected as VECs: surface hydrology, freshwater water quality, freshwater sediment quality, freshwater fish/aquatic habitat, and freshwater fish communities. Groundwater, limnology and bathymetry were considered Subjects of Note and all required information from the EIS guidelines (NIRB 2013) is included in this volume.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 8.1.6, 8.1.7, 8.1.8, 8.1.9) in respect of the new information provided on the topic of the Freshwater Environment, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

SURFACE HYDROLOGY (FEIS VOLUME 6, CHAPTER 1)

In the Final Hearing Report, the Board has concluded that there is limited baseline data available and that additional data is necessary at the environmental assessment stage to provide assurance that hydrogeology and hydrological features would be adequately mitigated. Sabina has provided additional clarity to address Section 4.6 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.6 under FHR-NIRB-4.6(A) – Limited Baseline Data at Environmental Assessment Stage.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Surface Hydrology assessment (FEIS Volume 6, Chapter 1).

GROUNDWATER (FEIS VOLUME 6, CHAPTER 2)

In the Final Hearing Report, the Board expressed concern regarding the probability of through taliks forming under the open pits or the TSF. Sabina has provided additional clarity to address Section 4.6 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.6 under FHR-NIRB-4.6(B) – Probability of Taliks under Open Pits or the TSF.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Groundwater assessment (FEIS Volume 6, Chapter 2).

LIMNOLOGY AND BATHYMETRY (FEIS VOLUME 6, CHAPTER 3)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

FRESHWATER WATER QUALITY (FEIS VOLUME 6, CHAPTER 4)

In the Final Hearing Report, the Board has concluded that there is uncertainty in relation to the effects predicted for water quality due to the limited development of the Aquatics Effects Management Plan. In addition, the Board expressed concern that insufficient seasonal baseline data was considered when establishing the Aquatics Effects Management Plan. Sabina has prepared new or updated information to address Section 4.7 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.7 under FHR-NIRB-4.7(A) – Aquatic Effects Management Plan.

In the Final Hearing Report, the Board noted uncertainty in relation to arsenic management at the site as a result of the elevated naturally occurring arsenic. Sabina has prepared new or updated information to address Section 4.7 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.7 under FHR-NIRB-4.7(B) – Arsenic Management.

In the Final Hearing Report, the Board noted uncertainty in relation to the lack of finalized Site Specific Water Quality Objectives did not allow the Board to have sufficient confidence in the Proponent's ability to plan for or implement appropriate water quality measures to meet the unspecified site-specific criteria. Sabina has prepared new or updated information to address Section 4.7 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.7 under FHR-NIRB-4.7(C) – Site Specific Water Quality Objectives (SSWQOs).

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Freshwater Water Quality assessment (FEIS Volume 6, Chapter 4).

FRESHWATER SEDIMENT QUALITY (FEIS VOLUME 6, CHAPTER 5)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

FRESHWATER FISH/AQUATIC HABITAT (FEIS VOLUME 6, CHAPTER 6)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

FRESHWATER FISH COMMUNITY (FEIS VOLUME 6, CHAPTER 7)

In the Final Hearing Report, the Board has concluded that it is not confident that the proposed mitigation measures would be sufficient to mitigate effects due to limited consideration of Inuit Qaujimaningit principles in the planned fish-out and dewatering of waterbodies. Sabina has prepared new or updated information to address Section 4.9 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.9 under FHR-NIRB-4.9(A) - Planned Fish-Out and Dewatering.

In the Final Hearing Report, the Board has identified that limited data was presented on the lakes that could be disrupted due to water extraction associated with the winter ice road. Sabina has prepared new or updated information to address Section 4.9 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.9 under FHR-NIRB-4.9(B) – Winter Ice Road Water Extraction.

In the Final Hearing Report, although the Board recognizes that the Bernard Harbour offsetting plan is clearly supported by key parties, the Board has stated that it currently lacks assurance that it would be sufficient to offset all anticipated serious harm to fish. Sabina has prepared new or updated information to address Section 4.9 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.9 under FHR-NIRB-4.9(C) – Bernard Harbour Offsetting Plan.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Freshwater Fish/Aquatic Habitat (FEIS Volume 6, Chapter 6).

APPENDICES (FEIS VOLUME 6)

FEIS Appendix	Title	Summary of Change
Appendix V6-1A	Back River Project: 2011 Hydrology Baseline Report	No changes
Appendix V6-1B	Back River Project: 2012 Hydrology Baseline Report	No changes
Appendix V6-1C	Back River Project: 2013 Hydrology Baseline Report	No changes
Appendix V6-1D	Back River Project: 2014 Hydrology Baseline Report	No changes
Appendix V6-1E	Effects of Proposed Development and Water Withdrawal on Hydrologic Indices of Goose and Propeller Lakes	No changes
Appendix V6-1F	Effects of Proposed Development and Water Withdrawal on Hydrologic Indices of Big Lake	No changes
Appendix V6-2A	Analytical Results of the Umwelt Westbay Groundwater Sampling Program	No changes
Appendix V6-2B	Completion Report, Westbay System Monitoring Well: 13-GSE-319	No changes
Appendix V6-2C	2012 Geotechnical and Hydrogeological Drilling Program Factual Data Report	No changes
Appendix V6-2D	2013 Geomechanical and Hydrogeological Site Investigation	No changes
Appendix V6-3A	Back River Project: 2010 Lake Water and Sediment Quality Baseline Report	No changes
Appendix V6-3B	Back River Project: 2011 Freshwater Baseline Report	No changes
Appendix V6-3C	Back River Project: 2012 Freshwater Baseline Report	No changes
Appendix V6-3D	Back River Project: Bathymetric Surveys of Lakes in the Goose and George Property Areas	No changes
Appendix V6-3E	Geophysical Survey — Sabina Back River Project	No changes
Appendix V6-3F	2014 Bathymetric Survey Report	No changes
Appendix V6-4A	2015 Goose Lake Hydrodynamic Modelling Report: Arsenic Predictions	No changes
Appendix V6-4B	Back River Project: 2013 Freshwater Baseline Report	No changes
Addendum Appendix V6-4C	Site Specific Water Quality Objectives Memo	New
Appendix V6-6A	Back River Project: 2010 Fish and Fish Habitat Baseline Report	No changes
Appendix V6-6B	Back River Project: 2011 Fish and Fish Habitat Baseline Report	No changes
Appendix V6-6C	Back River Project: 2012 Fish and Fish Habitat Baseline Report	No changes
Appendix V6-6D	Back River Project: 2013 Fish and Fish Habitat Baseline Report	No changes
Appendix V6-6E	Back River Project: 2014 Fish and Fish Habitat Assessment of the Tailings Impoundment Alternatives Site	No changes
Addendum Appendix V6-6F	Rascal Stream Fishway Memo	New
Addendum Appendix V6-6G	Winter Ice Road Fish Habitat Memo	New
Addendum Appendix V6-6H	Bernard Harbour Report and Baseline	New

6.1 SURFACE HYDROLOGY (ADDENDA)

NIRB Section:	Section 4.6 – Hydrological Features and Hydrogeology	Ref No.:	FHR-NIRB-4.6

Reference to NIRB Report:
Section 4.6 – Hydrological Features and Hydrology

Conclusions and Recommendations of the Board (Section 4.6.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that due to the limited baseline available in the FEIS **[FHR-NIRB-4.6(A)]** and the probability of taliks forming under the pits or the Tailings Impoundment Area **[FHR-NIRB-4.6(B)]**, the Board is not confident that the proposed mitigation measures in conjunction with a commitment from Sabina to collect additional baseline data would sufficiently mitigate the project-specific impacts. The Board appreciates Sabina's commitments to collect additional baseline data, however, views this data as necessary at the environmental assessment stage to provide the required assurance that negative impacts to hydrogeology and hydrological features would be adequately mitigated **[FHR-NIRB-4.6(A)]**.

Issues Highlighted within the Ministers' Referral Letter:

On the issues of ground and surface water quality, the Board concluded that there was "considerable uncertainty" on a number of fronts. The Report indicates that while the Board recognizes that further consideration would be given to these issues through the water licensing process, the Board is not satisfied that sufficient analysis has been undertaken. Further elaboration is required to explain why the information presented is not adequately developed to be confident that the regulatory process would manage them appropriately.

Sabina Response:

The Board has concluded that there is limited baseline data available and that additional data is necessary at the environmental assessment stage to provide assurance that hydrogeology and hydrological features would be adequately mitigated. Sabina believes a sufficient level of hydrological and hydrogeological baseline data was collected and provided during the environmental assessment phase.

The Board has expressed concern regarding the probability of through taliks forming under the open pits or the TSF. Sabina completed additional thermal modelling and submitted a Technical Comment to NRCAN regarding through taliks beneath open pits (F-INAC-TC-8), and Sabina has shown through thermal modelling that no through talik will exist under the TSF (FEIS Appendix V2-7G, Appendix G). Sabina believes this appropriately addresses the Board's concerns.

For the NIRB's convenience a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by INAC and agreed to by Sabina that are relevant to the topic of hydrological features and hydrogeology are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested Text from Final Hearing	Anticipated Party Involvement
Commitment	INAC-C-4	The Proponent has committed to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program should include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. The Proponent will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process. Further, where the results of this program show the potential for seepage, the Proponent commits to the establishment of a monitoring program with the capability of determining that contaminants are being contained within the facility. The Proponent shall provide sufficient justification where it is determined that monitoring is not required. The options for monitoring shall be provided for review as part of the Type A Water Licence Application process.	INAC
Commitment	INAC-C-5	The Proponent commits to further thermal modeling to support dam design along critical cross-sections of the Main Dam. This should be presented for review during the Type A Water Licence Application process.	INAC

FHR-NIRB-4.6(A) – Limited Baseline Data at Environmental Assessment Stage

The Board has concluded that there is limited baseline data available and that additional baseline data is necessary at the environmental assessment stage to provide assurance that hydrogeology and hydrological features would be adequately mitigated.

During the DEIS technical review phase, INAC requested Sabina provide further characterisation of permafrost distribution (DEIS Technical Comment AANDC-4). In response, Sabina committed to provide the following information in the FEIS, which was captured as a commitment in the Pre-hearing Conference Report (Pre-hearing Conference Report Appendix 2, Commitment #64):

> Sabina commits to providing an updated analysis of permafrost distribution at depth through thermal modelling, updated data analysis, and any other means required to depict any groundwater connections with the mine openings. This analysis will provide an updated account of the potential formation/decline of taliks, including any potential through-taliks. Requested information will be presented in the FEIS.

In the FEIS, Commitment #64 was addressed in two locations:

- Section 6.0 of the Hydrological Characterization and Modelling Report (FEIS Appendix V2-7A); and
- Section 2.4.1 of FEIS Volume 5, Chapter 2.

During the FEIS Final Hearing, no questions regarding hydrogeological characterization were raised by INAC[7], NIRB[8], KIA[9], ECCC[10], GN[11], DFO[12], or GNWT[13].

Sabina would like to highlight the extensive hydrological and hydrogeological baseline data that was submitted, and made available, through the environmental assessment phase; the 14 appendices provided with the FEIS are summarized below.

- FEIS Appendix V5-2A: Cumulative Permafrost Baseline Data Report (2007 to May 2014)
- FEIS Appendix V5-2B: 2015 Sub-permafrost Groundwater Quality Baseline Report
- FEIS Appendix V5-2C: 2012 to 2013 Thermistor String Records Obtained at the Hackett River Project
- FEIS Appendix V6-1A: Back River Project: 2011 Hydrology Baseline Report
- FEIS Appendix V6-1B: Back River Project: 2012 Hydrology Baseline Report
- FEIS Appendix V6-1C: Back River Project: 2013 Hydrology Baseline Report
- FEIS Appendix V6-1D: Back River Project: 2014 Hydrology Baseline Report
- FEIS Appendix V6-1E: Effects of Proposed Development and Water Withdrawal on Hydrologic Indices of Goose and Propeller Lakes
- FEIS Appendix V6-2A: Analytical Results of the Umwelt Westbay Groundwater Sampling Program
- FEIS Appendix V6-2B: Completion Report, Westbay System Monitoring Well: 13-GSE-319
- FEIS Appendix V6-2C: 2012 Geotechnical and Hydrogeological Drilling Program Factual Data Report
- FEIS Appendix V6-2D: Geomechanical and Hydrogeological Site Investigation
- FEIS Appendix V6-3D: Back River Project: Bathymetric Surveys of Lakes in the Goose and George Property Areas
- FEIS Appendix V6-3F: 2014 Bathymetric Survey Report

Sabina believes a sufficient level of hydrological and hydrogeological baseline data was collected and provided during the environmental assessment phase. Sabina acknowledges the Board's outstanding concern and Sabina remains willing and able to discuss any issues related to hydrological and hydrogeological baseline data collection that the NIRB should wish to further define. Sabina also notes that should the Board believe additional specific information to monitor potential effects is required that Sabina has the ability to collect additional specific information prior to the commencement of Project construction.

Attachment:

Not applicable

FHR-NIRB-4.6(B) – Probability of Taliks under Open Pits or the TSF

Open Pits

The Board has expressed concern regarding the probability of through taliks forming under the open pits.

Sabina would like to note that throughout the review of the DEIS there were a total of 557 individual Information Requests and Technical Comments from subject matter experts. Of these 557 comments

[7] K. Costello, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 617, Lines 1 to 5
[8] E. Copland, Board, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 625, Lines 18 to 20
[9] G. Clark, KIA, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 616, Lines 13 to 16
[10] L. Ransom, ECCC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 616, Lines 20 to 23
[11] L. Kamermans, GN, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 616, Lines 17 to 19
[12] M. D'Aguiar, DFO, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 616, Lines 24 to 26
[13] M. Wendt, GNWT, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 617, Lines 10 to 14

received, approximately 15 related to the subject of taliks and hydrogeology, to which Sabina provided detailed responses.

The review of the FEIS resulted in a total additional 272 individual Information Requests and Technical Comments and of those, the number of requests related to the subject of taliks and hydrogeology decreased from 15 to a total of these eight, which are listed below:

- F-GN-IR-2
- F-INAC-IR-11
- F-KIA-IR-60
- F-INAC-TC-10
- F-NRCAN-TC-6
- F-NRCAN-TC-7
- F-NRCAN-TC-8
- F-NRCAN-TC-9

Furthermore, during the FEIS technical review phase, Sabina completed additional thermal modelling in response to NRCan's recommendation that Sabina consider the potential for through taliks to form beneath flooded open pits and the long-term effects on water quality and quantity (F-NRCAN-TC-8). Sabina provided NRCan with the following response:

> Sabina considered the potential for through taliks to develop and the long term effects on water quality and quantity in the FEIS (Volume 2, Appendix V2-7A). This topic was further considered in two FEIS Information Request responses to INAC: F-INAC-IR-11 and F-INAC-IR-22.
>
> The thermal modeling presented in the FEIS indicated that taliks will develop beneath pit lakes and become connected to the subpermafrost. The timing for open taliks to develop for base case conditions was estimated to be 85 years for Goose Main Pit, 111 years for Umwelt Pit, and 227 years for Echo Pit; the Llama pit is already located within a through talik associated with the Llama Lake.
>
> SRK modified the FEIS numerical groundwater model (in response to F-INAC-IR-22) to simulate the Post-Closure conditions and assess the potential changes to the hydrogeological system with the newly formed open taliks. The results showed that at Post-Closure:
>
> - The taliks formed by pit lakes will not significantly change the directions of the regional groundwater flow system. Groundwater flows will continue from higher elevation lakes towards lower elevation lakes;
> - Pit lakes are predicted to infiltrate into the groundwater system and travel down through the respective open taliks via the deep groundwater system;
> - The ultimate receptor for all pit lake water will be Goose Lake; and
> - Groundwater velocity is extremely slow. Predicted travel time between the flooded open pits and Goose Lake are all greater than 1,000 years.
>
> At Post-Closure, once the pit lakes taliks are connected, the Goose Lake long-term water quality is expected to meet CCME guidelines. The water and load balance model (FEIS Volume 2, Appendix V2-7H) included loadings from pit overflows to Goose Lake at Closure; therefore, the model already conservatively assumed that 100% of the source load (i.e., tailings and waste rock) from the pit lakes reaches Goose Lake at Closure. Since the salinity of the groundwater contained in the rock mass at depth is much higher than the predicted salinity of the pit lake water, the formation of pit lake taliks are not expected to affect the groundwater salinity discharged into Goose Lake.

During the FEIS Final Hearing, NRCan stated that Sabina's final submission had addressed all of their concerns regarding taliks:

> *"The additional analysis conducted by the proponent provides a better understanding of the current and future configuration of permafrost and taliks. Natural Resources Canada is of the view that the* ***results of this analysis support the development of appropriate groundwater models and assessments of the effects of the project on water quality and quantity."***[14]

> *"Natural Resources Canada has provided recommendations regarding explosives storage and manufacture, permafrost and terrain conditions, and hydrogeology for the Back River Goldmine Project. In their final submission from March 31st, 2016,* ***the proponent has addressed Natural Resources Canada's recommendations****."*[15]

The Board has expressed concern regarding the probability of through taliks forming under the open pits. Sabina believes that the analysis included during the environmental assessment phase appropriately addresses the Board's concerns. Sabina remains open to further discussion with the Board on open pit through taliks.

Tailing Storage Facility

The Board has expressed concern regarding the probability of through taliks forming under the TSF.

Sabina would like to highlight that thermal modelling shows that no through taliks will form under the TSF (FEIS Appendix V2-7G, Appendix G).

During the FEIS Final Hearing, Sabina jointly submitted two commitments with INAC (INAC-C4 and INAC-C5):

> The Proponent has committed to undertake an infill geotechnical characterization program to determine the extent of the fractured bedrock contact zone and apply proposed mitigation as necessary. This program should include permeability testing, seepage analysis, and planning for thermal monitoring of the western ridge, where appropriate. The Proponent will provide details of the program, including how the information gathered will be used to establish appropriate mitigation and monitoring measures as part of the Type A Water Licence Application process.
>
> The Proponent commits to further thermal modeling to support dam design along critical cross-sections of the Main Dam. This should be presented for review during the Type A Water Licence Application process.

During the FEIS Final Hearing, it was the opinion of INAC that Sabina's commitment to undertake an infill geotechnical characterization program (INAC-C4) resolved the agency's concerns and that Sabina's measures were appropriate:

> *"We note Sabina's commitment to undertake an infill geotechnical characterization program in which they can determine the extent of the fractured bedrock contact zone and apply the necessary mitigation. Sabina's response also outlines how they will undertake permeability testing and seepage analysis. We agreed that these are appropriate measures."*[16]

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[14] R.Besner, NRCan, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 608, Lines 19 to 26

[15] R.Besner, NRCan, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 616, Lines 4 to10

16 M. Sewchand, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 561, Lines 17 to 23

The Board has expressed concern regarding the probability of through taliks forming under the TSF. Sabina believes they have shown with thermal modelling that no through talik exists under the TSF. Sabina remains open to further discussion with the Board on TSF through taliks.

Attachment:

Not applicable

6.4 FRESHWATER WATER QUALITY (ADDENDA)

NIRB Section:	Section 4.7 – Groundwater and Surface Water Quality	Ref No.:	FHR-NIRB-4.7

Reference to NIRB Report:
Section 4.7 – Groundwater and Surface Water Quality

Conclusions and Recommendations of the Board (Section 4.7.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that there is considerable uncertainty in relation to the effects predicted for ground and surface water quality due to the limited development of the Aquatics Effects Management Plan which has been restricted by insufficient seasonal baseline data on which to plan appropriate mitigation measures **[FHR-NIRB-4.7(A)]**. In addition, the Board noted considerable uncertainty in relation to arsenic management at the site as a result of the elevated naturally occurring arsenic associated with the Project Development Area **[FHR-NIRB-4.7(B)]**. Further, the lack of clear criteria for arsenic in overall site water management, and limits for arsenic release rates which have yet to be developed by Environment and Climate Change Canada in consultation with the Kitikmeot Inuit Association, does not allow the Board to have sufficient confidence in the Proponent's ability to plan for or implement appropriate water quality measures to meet the unspecified site-specific criteria **[FHR-NIRB-4.9(C)]**.

Issues Highlighted within the Ministers' Referral Letter:

On the issues of ground and surface water quality, the Board concluded that there was "considerable uncertainty" on a number of fronts. The Report indicates that while the Board recognizes that further consideration would be given to these issues through the water licensing process, the Board is not satisfied that sufficient analysis has been undertaken. Further elaboration is required to explain why the information presented is not adequately developed to be confident that the regulatory process would manage them appropriately.

Sabina Response:

The Board has concluded that there is uncertainty in relation to the effects predicted for ground and surface water quality due to the limited development of the Aquatics Effects Management Plan. In addition, the Board is concerned that insufficient seasonal baseline data was considered when establishing the Aquatics Effects Management Plan.

In response to the Boards concern, since the FEIS Final Hearing, Sabina has further developed the Aquatic Effects Management Plan in line with commitment KIA-C-1 and is providing an updated Plan in FEIS Addendum Volume 10, Chapter 19. Sabina reiterates the commitment made during the FEIS Final Hearing to also collect additional freshet and fall water quality data prior to construction (KIA-C-8) to further assist in the validation of predicted effects.

The Board noted uncertainty in relation to arsenic management at the site as a result of the elevated naturally occurring arsenic. Sabina believes arsenic management, consistent with best practice, can be appropriately addressed through: understanding of the natural environment and the conditions that could cause arsenic release; management procedures to mitigate the onset of those conditions; mitigation and monitoring to verify management practices are successful; and established procedures to implement adaptive management if necessary.

The Board noted uncertainty in relation to the lack of finalized Site Specific Water Quality Objectives (SSWQO) did not allow the Board to have sufficient confidence in the Proponent's ability to plan for or implement appropriate water quality measures to meet the unspecified site-specific criteria.

The Board has noted insufficient confidence in the Sabina's ability to plan for or implement appropriate water quality measures to meet the proposed SSWQOs. In response to NIRB's concern, and in line with the term and condition (KIA-T-1), a technical memo further justifying the proposed SSWQOs is provided in FEIS Addendum Appendix V6-4C.

For the NIRB's convenience a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by the KIA and INAC and agreed to by Sabina that are relevant to the topic of groundwater and surface water quality are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested Text from Final Hearing	Anticipated Party Involvement
Term and Condition	KIA-T-1	The Proponent will derive a site-specific water quality objective for arsenic in a way that is satisfactory to both the Kitikmeot Inuit Association and Environment and Climate Change Canada prior to the first technical meeting as part of the Nunavut Water Board water licensing process.	KIA, ECCC
Commitment	INAC-C-1	The Proponent commits to modeling of total metal concentrations, as may be required, to establish appropriate discharge criteria and predict downstream compliance. For parameters not requiring total metals modeling, appropriate justification should be provided. This information is expected for review as part of the Type A Water Licence Application process.	INAC
Commitment	INAC-C-2	The Proponent commits to monitor water quality of the pit sump to validate water quality predictions and implement mitigation should monitoring show that pit walls are a more appreciable source of loading than indicated by current modeling. The Proponent commits to providing details of options for mitigation for review as part of the Type A Water Licence Application process.	INAC
Commitment	INAC-C-3	The Proponent commits to providing additional information on the proposed waste water treatment plant to show that adequate treatment capacity is in place, and that there is sufficient capacity available to address spills, accidents and malfunctions. This should be presented for review during the Type A Water License Application process.	INAC
Commitment	KIA-C-1	The Proponent commits to developing the Aquatic Effects Monitoring Program and adaptive management thresholds in conjunction with the Kitikmeot Inuit Association prior to the first technical meeting as part of the Nunavut Water Board water licensing process.	KIA
Commitment	KIA-C-8	The Proponent commits to collect additional baseline water quality data from the lakes in the project area during freshet and fall as confirmed by measurements of higher flow prior to construction. The Proponent commits to use this data to update the water and load balance model.	KIA

FHR-NIRB-4.7(A) – Aquatic Effects Management Plan

The Board has concluded that there is uncertainty in relation to the effects predicted for ground and surface water quality due to the limited development of the Aquatics Effects Management Plan. In addition, the Board is concerned that insufficient seasonal baseline data was considered when establishing the Aquatics Effects Management Plan.

During the FEIS Final Hearing, ECCC stated that they appreciated the work completed on the Aquatic Effects Monitoring Program and that further discussions during the regulatory stage would be appropriate:

> *"**We appreciate the work Sabina has done to date on the Aquatic Effects Monitoring Program**. And I would just like to note that **there will be further discussions at the regulatory stage** on this monitoring program. Environment and Climate Change Canada is **satisfied with the monitoring activities that Sabina has committed to** and their commitment to responding to monitoring results with adaptive management as appropriate."*[17]

It was the opinion of KIA during the FEIS Final Hearing that the Aquatic Effects Monitoring Program could be appropriately further developed as part of the water licensing process:

> *"The KIA would be satisfied with a commitment from Sabina to work with the KIA to develop the Aquatic Effects Monitoring Program and adaptive management thresholds prior to the first technical meeting as part of a Nunavut Water Board water licencing process."*[18]

It was also the opinion of ECCC during the FEIS Final Hearing that a commitment to additional season-specific sampling would mitigate aquatic effects monitoring uncertainty, and ECCC acknowledged the additional detail requested is typically executed during the water licence stage. It should be noted that this information is being collected to further validate predictions and is not baseline required for the significance determination:

> *"So what Environment and Climate Change Canada **would like to see is a commitment going forward on the part of Sabina to add fall and freshet sampling for their lakes**. This would be important for future comparisons in the monitoring program and could be used in future to validate model predictions as they update their model with real-world data**. That typically, I acknowledge, does go ahead into the water licence stage**."*[19]

At the FEIS Final Hearing, Sabina jointly submitted the following commitments with the KIA (KIA-C-1 and KIA-C-8):

> The Proponent commits to developing the Aquatic Effects Monitoring Program and adaptive management thresholds in conjunction with the Kitikmeot Inuit Association prior to the first technical meeting as part of the Nunavut Water Board water licensing process.
>
> The Proponent commits to collect additional baseline water quality data from the lakes in the project area during freshet and fall as confirmed by measurements of higher flow prior to construction. The Proponent commits to use this data to update the water and load balance model.

In response to NIRB's concern, since the FEIS Final Hearing, Sabina has continued to develop the Aquatic Effects Management Plan in line with the above commitment, KIA-C-1. This draft document provided in FEIS Addendum Volume 10, Chapter 19. Sabina reiterates their commitment to also collect additional freshet and fall water quality data prior to construction (KIA-C-8) to further assist in the validation of predicted effects.

Attachment:

FEIS Addendum Volume 10, Chapter 19. Aquatic Effects Management Plan

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17 A. Wilson, ECCC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1154, Lines 20 to 26; Pg. 1155, Lines 1 to 2

[18] J. Ottenhof, KIA, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 639, Lines 13 to 18

19 A. Wilson, ECCC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 446, Lines 4 to 12

FHR-NIRB-4.7(B) – Arsenic Management

The Board noted uncertainty in relation to arsenic management at the site as a result of the elevated naturally occurring arsenic.

Sabina believes arsenic management, consistent with best practice, can be appropriately addressed through: understanding of the natural environment and the conditions that could cause arsenic release; management procedures to mitigate the onset of those conditions; mitigation and monitoring to verify management practices are successful; and established procedures to implement adaptive management if necessary.

Arsenic is naturally occurring in rock and already present in water within the Project Development Area, as indicted by baseline sediment sampling (FEIS Volume 6, Chapter 5, Section 5.5.4.3):

> The baseline sampling program found naturally elevated concentrations of arsenic in lake and stream sediments throughout the LSA, including Goose Lake.

Arsenic is naturally released from exposed rock over time. Arsenic release (a type of metal leaching (ML)) can occur in the presence of acid generation in waste rock (in material called potentially acid generating (PAG)). As stated in FEIS Addendum Appendix V4-3D:

> Acid generation of waste rock occurs when sulfides, naturally occurring in the host rock are exposed to oxygen after it has been mined. This exposure results in a chemical reaction called oxidization. Depending on the type and quantity of sulfides exposed, the reaction time can vary greatly, from days to decades. Acid rock drainage (ARD) occurs if water percolates through oxidized waste rock. The resultant drainage may be acidic and contain elevated concentrations of metals that are also naturally occurring in the host rock.

Sabina is aware of this potential release of natural arsenic from the Project waste rock and from Project-generated tailings; this has been indicated by the geochemical testing completed on the Project to date (FEIS Appendix V2-7D). As outlined in the FEIS, the Project will generate two mine waste streams; waste rock and tailings. Geochemical characterization of the waste rock has confirmed that there are two waste rock types; potentially acid generating (PAG), and non-potentially acid generating waste rock (NPAG) (FEIS Appendix V2-7D).

In response to this geochemical understanding, Sabina has outlined comprehensive waste and water management and segregation measures during Construction, Operations, and throughout Closure. Key management plans that prescribe management, monitoring, and mitigation are listed:

- Borrow Pits and Quarry Management Plan (FEIS Volume 10, Chapter 16);
- Mine Waste Rock Management Plan (FEIS Volume 10, Chapter 9);
- Tailings Management Plan (FEIS Volume 10, Chapter 22);
- Site Water Monitoring and Management Plan (FEIS Volume 10, Chapter 7); and
- Mine Closure and Reclamation Plan (FEIS Volume 10, Chapter 29).

Validation and verification of the successful management plan implementation will rely on mitigation and monitoring. The acceptable limit for arsenic is outlined in the Sabina's arsenic SSWQO, which is considered protective under Canadian Council of Ministers of the Environment (CCME) guidelines (CCME 2007); see response FHR-NIRB-4.7(C) for additional information. The monitoring program, which includes arsenic management, is outlined in the Aquatic Effects Management Plan; see response FHR-NIRB-4.7(C) for additional information. For the NIRB's convenience, these two document are appended to this submission:

- Aquatic Effects Management Plan (FEIS Addendum Volume 10, Chapter 19)

- Site Specific Water Quality Objectives – Arsenic (FEIS Addendum Appendix V6-4C)

Sabina would like to restate that arsenic is not added during the milling process and naturally-occurring arsenic in the ore would not be converted to arsenic trioxide, as summarized by the Board in Final Hearing Report, Section 4.7.3:

> Sabina noted that its proposed extraction process (conventional milling) would be different than that used at the Giant Mine (roasting) in the Northwest Territories due to differences in ore characteristics between the Back River area (non-refractory) and the Giant Mine area (refractory). Sabina added that by using conventional milling processes at the Back River Gold Mine site, naturally-occurring arsenic in the ore would not be converted to arsenic trioxide.

In addition, the placement as well as the management of Project infrastructure has been extensively considered throughout the Feasibility Study (JDS 2015). This has also been heavily considered through the FEIS, examples of which can be seen in the Integrated Mine Waste Disposal Alternatives Assessment (IR Submission, Appendix N [Sabina 2016]), as well as the updated FEIS Alternatives Chapter submitted during the information request phase (updated V2-4C [Appendix O, Sabina 2016]). These documents are specific examples of where Sabina has reviewed, considered and chosen alternatives in consideration of arsenic management, as well as other environmental, economic, and Project related factors.

The Board noted uncertainty in relation to arsenic management at the site as a result of the elevated naturally occurring arsenic. Sabina believes arsenic management, consistent with best practice, can be appropriately addressed through the documents and measures outlined above. Sabina remains willing and able to discuss any issues related to arsenic management should the Board have additional, specific concerns.

References:

CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, 1999, Winnipeg.

JDS (JDS Energy & Mining Inc.). 2015. Technical Report for the Initial Project Feasibility Study on the Back River Gold Property, Nunavut, Canada. Prepared for Sabina Gold & Silver Corp. October 28, 2015.

Sabina (Sabina Gold & Silver Corp.). 2016. Final Information Request Responses – Part 2. Submitted to Nunavut Impact Review Board. February 2016.

Attachment:

FEIS Addendum Volume 10, Chapter 19. Aquatic Effects Management Plan
FEIS Addendum Appendix V6-4C. Site Specific Water Quality Objectives – Arsenic

FHR-NIRB-4.7(C) – Site Specific Water Quality Objectives (SSWQOs)

The Board noted uncertainty in relation to the lack of finalized SSWQOs did not allow the Board to have sufficient confidence in the Proponent's ability to plan for or implement appropriate water quality measures to meet the unspecified site-specific criteria.

A review of other Projects in the North, including Nunavut, show that finalized SSWQOs generally fall within the associated water license process. During the FEIS Final Hearing, it was the opinion of ECCC that the arsenic SSWQO provided in the FEIS was appropriate for the environmental assessment stage:

> *"One threshold that it's going to be very important to have will be an appropriate site specific water quality guideline for arsenic. And a preliminary one has been* ***developed that is appropriate for the environmental assessment stage."***[20]

It was the opinion of the KIA that a term and condition for Sabina to derive an arsenic SSWQO prior to the first technical meeting of the NWB water licencing process would be satisfactory:

> *"The KIA would be satisfied with the project certificate condition stating that Sabina will derive a site specific water quality objective for arsenic in a way that is satisfactory to both the KIA and Environment Canada and Climate Change -- sorry, Environment and Climate Change Canada* ***prior to the first technical meeting as part of the Nunavut Water Board water licencing process."***[21]

Sabina and KIA jointly submitted the following term and condition (KIA-T-1) at the FEIS Final Hearing:

> The Proponent will derive a site-specific water quality objective for arsenic in a way that is satisfactory to both the Kitikmeot Inuit Association and Environment and Climate Change Canada prior to the first technical meeting as part of the Nunavut Water Board water licencing process.

Since the FEIS Final Hearing, Sabina has advanced the SSWQO in line with the above term and condition (KIA-T-1). Sabina undertook additional analysis to develop an arsenic SSWQO in accordance with CCME standard methods for the development of a long-term guideline for freshwater environments (CCME 2007). This additional work generated a maximum long term arsenic value of 0.028 mg/L (FEIS Addendum Appendix V6-4C). The KIA was provided with an advanced copy of the Back River Project – Development of a Site-Specific Water Quality Objective for Arsenic and based on their preliminary review it was communicated to Sabina that a long term arsenic value of less than 0.017 mg/L is acceptable.

It is important to note that both Sabina and KIA's analysis produced arsenic SSWQO limits higher than Sabina's FEIS proposed limit of 0.01 mg/L, which provides additional confidence that this value is appropriate for the environmental assessment stage.[22]

The Board noted uncertainty in relation to arsenic management and the lack of finalized SSWQOs. In response to NIRB's concern, and in line with the above term and condition, the updated arsenic SSWQO is provided in FEIS Addendum Appendix V6-4C.

References:

CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, 1999, Winnipeg.

Attachment:

FEIS Addendum Appendix V6-4C. Site Specific Water Quality Objectives – Arsenic

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20 A. Wilson, ECCC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 447, Lines 20 to 24

21 J. Ottenhof, KIA, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 640, Lines 22 to 26; Pg. 641, Lines 1 to 3

22 A. Wilson, ECCC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 447, Lines 20 to 24

6.6 FRESHWATER FISH/AQUATIC HABITAT (ADDENDA)

NIRB Section:	Section 4.9 – Freshwater Aquatic Environment	Ref No.:	FHR-NIRB-4.9

Reference to NIRB Report:
Section 4.9 – Freshwater Aquatic Environment

Conclusions and Recommendations of the Board (Section 4.9.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that it is not confident that the mitigation measures as proposed would be sufficient to mitigate effects because of limited consideration of Inuit Qaujimaningit principles in the project design regarding the planned fish-out and dewatering of multiple lakes **[FHR-NIRB-4.9(A)]**, and limited data presented on the lakes that could be disrupted due to water extraction associated with the winter ice road **[FHR-NIRB-4.9(B)]**. Although the Board recognizes that the Bernard Harbour offsetting plan is clearly supported by key parties, there is currently a lack of assurance that it would be sufficient to offset all anticipated serious harm to fish **[FHR-NIRB-4.9(C)]**.

Issues Highlighted within the Ministers' Referral Letter:
In regard to the issue of fish, the Board concluded "that it is not confident that the mitigation measures as proposed would be sufficient to mitigate effects because of limited consideration of Inuit Qaujimaningit principles in the project design regarding the planned fish-out and dewatering of multiple lakes, and limited data presented on the lakes that could be disrupted due to water extraction associated with the winter ice road. Although the Board recognizes that the Bernard Harbour offsetting plan is clearly supported by key parties, there is currently a lack of assurance that it would be sufficient to offset all anticipated serious harm to fish." We understand this conclusion to mean that additional and more detailed information and refinement of offsetting, dewatering and fish-out plans would be necessary at the appropriate stage.

On day 3 of the final hearing, the Kitikmeot Inuit Association (KIA) mentioned "The KIA would be satisfied with a commitment from Sabina to actively involve the KIA in adaptive management of the fish offsetting plan" (p.638 of the final hearing transcript, volume 3). They also mentioned "The KIA would be satisfied with a commitment from Sabina to actively involve the KIA in evaluating early outcomes from monitoring and in updating the fish offsetting plans." (p. 639 of the final hearing transcript, volume 3). During the closing comments of their presentation, they concluded that "while several technical issues remain, the KIA is confident that remaining issues will be resolved by continuing discussions with Sabina" (p.641 of the final hearing transcript, volume 3). Fisheries and Oceans Canada understands that consideration of Inuit Qaujimaningit principles in the project design regarding the planned fish-out and dewatering of multiple lakes will be required. We agree, and would have expected that the Board would be confident that the *Fisheries Act* Authorization process would be ideally suited to this purpose, in the event the other important issues raised in the Report could be addressed.

Sabina Response:

The Nunavut Impact Review Board (NIRB or Board) has concluded that it is not confident that the proposed mitigation measures would be sufficient to mitigate effects due to limited consideration of Inuit Qaujimaningit (IQ) principles in the planned fish-out and dewatering of waterbodies. In recognition of the NIRB's concern, Sabina has advanced its Conceptual Fish-out Plan while also ensuring IQ principles are properly considered. This plan can be found in FEIS Addendum Volume 10, Chapter 31.

The NIRB has identified that limited data was presented on the lakes that could be disrupted due to water extraction associated with the winter ice road. Sabina remains committed to ensuring that all withdrawal of water for the construction of winter ice roads is completed in a manner that avoids or minimizes the potential for serious harm to fisheries. An innovative plan has been developed to identify

those water bodies that would reduce the potential effects on fish and fish habitat due to water withdrawal from lakes along the winter ice road. A memo describing Sabina's new strategy in further detail can be found in FEIS Addendum Appendix V6-6G.

Although the Board recognizes that the Bernard Harbour offsetting plan is clearly supported by key parties, the Board has stated that it currently lacks assurance that it would be sufficient to offset all anticipated serious harm to fish. Since the time of the FEIS Final Hearing, Sabina has continued to advance baseline studies at Bernard Harbour (specifically Nulahugyuk Creek) in preparation of a detailed offsetting plan to be submitted with a *Fisheries Act* Authorization application for the Project. For the NIRB's convenience, the 2016 Bernard Harbour Report and Baseline is attached in FEIS Addendum Appendix V6-6H. Sabina has also revised Conceptual Fish Offsetting Plan; this is presented in FEIS Addendum Volume 10, Chapter 21. For the NIRB's convenience, Sabina has included additional information on the design, construction, and operation, and monitoring program of fish passage mitigation via RSW (FEIS Addendum Appendix V6-6F).

For the NIRB's convenience a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by the DFO and KIA and agreed to by Sabina that are relevant to the topic of the freshwater aquatic environment are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	DFO-T-1	The Proponent shall engage with Fisheries and Oceans Canada in exploring possible Project specific thresholds, mitigation and monitoring for blasting that would exceed the requirements of Fisheries and Oceans Canada's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (D.G. Wright and G.E. Hopky, 1998).	DFO
Term and Condition	DFO-T-2	The Proponent commits to engage DFO and other interested parties during the regulatory phase on the design, construction, and operation of adequate fish passage to permit migration of Arctic Grayling from Goose Lake to natural spawning and rearing habitat located in upper Rascal Stream East, south of the planned airstrip. Any additional information required to ensure the design of the fish passage will be completed prior to significant construction activities at the Goose Property.	DFO, KIA
Term and Condition	DFO-T-3	The Proponent will provide Fisheries and Oceans Canada (DFO) with the bathymetry, depth and location of proposed water withdrawal sites, volumes to be extracted, anticipated water level decreases, and fish habitat features within each waterbody proposed to be used for winter water withdrawal in support of the construction of the winter ice roads. This will be provided primarily during the regulatory phase however in certain cases waterbodies may be added in the future. If additional waterbodies are required the Proponent commits to provide all required information on the additional proposed lakes, to DFO for review prior to use of these waterbodies.	DFO
Term and Condition	DFO-T-4	The Proponent will implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of the construction, operation, and decommissioning of winter ice roads, and from under ice water withdrawals. This includes adequately screening the water intakes pipes to prevent impingement and entrainment of fish.	DFO

(continued)

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	DFO-T-7	The Proponent will implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of water crossing construction, operation, and decommissioning for all fish-bearing water crossings. The Proponent acknowledges these measures include, but are not limited to, appropriate design of water crossings to facilitate fish passage at both high and low flows, timing windows that incorporate spawning, incubation and hatch times for all species using water courses, sediment and erosion control, protection of riparian vegetation, and other forms of bank stabilization.	DFO
Term and Condition	DFO-T-8	The Proponent's proposed monitoring program for culverts on fish bearing watercourses during the Operations and Closure phases will include measures to ensure that barriers to fish passage do not form over time as a result of crossing damage due to ice blockage, flooding, or movement of debris all of which may occur at freshet. Detailed design drawings and an updated monitoring program will be produced prior to construction during the regulatory phase.	DFO
Commitment	DFO-C-1	The Proponent will continue to work with Environment and Climate Change Canada and Fisheries and Oceans Canada at the regulatory approval stage to reconcile the regulatory requirements related to the use of Umwelt Lake as a Saline Water Management Pond.	DFO, ECCC
Commitment	DFO-C-2	The Proponent will continue to work with Fisheries and Oceans Canada (DFO) and the impacted communities at the regulatory approval stage to develop a detailed fish-out and offsetting plan.	DFO
Commitment	KIA-C-5	The Proponent commits to working in conjunction with Kitikmeot Inuit Association in the permitting phase as it relates to fisheries impacts and compensation, to review the offsetting plan as required under the Fisheries Act.	KIA
Commitment	KIA-C-6	The Proponent commits to actively involve the Kitikmeot Inuit Association in the adaptive management of the fish offsetting plan.	KIA
Commitment	KIA-C-7	The Proponent commits to actively involve the Kitikmeot Inuit Association in evaluating early outcomes from monitoring and updating fish offsetting plans.	KIA

FHR-NIRB-4.9(A) - Planned Fish-Out and Dewatering

The Board has concluded that it is not confident that the proposed mitigation measures would be sufficient to mitigate effects due to limited consideration of Inuit Qaujimaningit principles in the planned fish-out and dewatering of waterbodies.

Sabina respectfully notes that IQ values have been incorporated into the design of Sabina's overall Project management approach, and have helped guide Sabina's decision making for the Project (Table 3.1-2 in Volume 3, Chapter 3 of the FEIS outlines the ways in which IQ values have been incorporated into the Back River Project).

Sabina initiated a comprehensive community engagement program in the Kitikmeot Region to ensure all regional residents were provided with opportunities to learn about the Project and provide feedback. Likewise, a considerable amount of TK was collected by Sabina and integrated into the FEIS submission. The following reports were prepared by Sabina and later reviewed for TK specific information related to Valued Ecosystem Component (VEC) features:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project, Naonaiyaotit Traditional Knowledge Project (NTKP) (KIA 2012) (*FEIS Appendix V3-3A*);*

- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014) (KIA 2014) (*FEIS Appendix V3-3B*);*
- *Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (*FEIS Appendix V3-3C*); and*
- *Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut (*FEIS Appendix V3-3D*).*

TK related to the freshwater aquatic environment from these reports included:

- Harvesting and ecological information related to different fish species (e.g., Arctic Char, Tomcod, Lake Trout, Broad Whitefish, Arctic Cisco, Arctic Grayling, Longnose Sucker) in the Project area and broader region.
- Inuit harvesting locations on lakes and rivers in the Project area and broader region.
- Information on water sources and quality (e.g., locations on the land where Inuit obtained water, changes in water quality) in the Project area and broader region.
- Other general land use, harvesting, and ecological information relevant to the Project area and broader region.
- Land use, harvesting, and ecological information related to the Bernard Harbour area (to support planned stream restoration efforts at this location, to offset fisheries habitat effects at the Project).

TK relevant to the Project was also provided by residents of the Kitikmeot Region during Sabina's community engagement process. This information was collected (e.g., in meeting notes and reports) and later integrated into Sabina's community engagement database (containing some 165 topic directories) and FEIS submission. At the time of the Public Hearing, over 250 engagements or major correspondences had been held with communities in Nunavut and the Northwest Territories on the Project. Since the November 2015 FEIS submission, nearly 50 additional meetings with community and stakeholder representatives have been held on the Project. Sabina also remains committed to meaningful community engagement throughout the Project's lifespan, as described in Sabina's Community Involvement Plan (FEIS Volume 10, Chapter 26).

Throughout these engagement activities, communities provided comments and expressed interest in the planned fish-out and dewatering of waterbodies. Their interest led to a number of suggestions and a discussion of ideas on how to best utilize the fish resource and conduct dewatering activities. A summary of topics raised during public consultation and engagement can be found in the FEIS Appendix V3-1G.

Ideas raised during the community meetings included, but were not limited to, the following:

- Harvest fish during times when the fish can be used by the communities, and will stay fresh longer.
- Have a community member participate in both the Bernard Harbour offsetting and the planned fish-out.
- Use all fish for communities. Fish of lower quality (fish waste and small fish) can be provided to trappers and dog handlers for bait and food.
- Involve community members in all phases of the fish-out.
- Use methods that have been proven to work.
- Continue to involve communities during detailed design of the fish-out plan and provide adequate time for notification.

Land user TK was also collected through a number of additional methods. For example, land use focus groups were held with residents of Cambridge Bay, Kugluktuk, Bathurst Inlet, and Bay Chimo as a component of the Project's socio-economic studies. These workshops were conducted in order to better understand potential Project interactions with land user activities in the Project area. Beyond these, a

report on existing and publically available Northwest Territories TK (which focused primarily on caribou) was also prepared and incorporated into the FEIS, to ensure relevant TK from Aboriginal organizations in the Northwest Territories was considered by Sabina. Put together, these various methods and studies have provided Sabina with a comprehensive amount of TK on the Project area from residents of the Kitikmeot Region and Northwest Territories. This information was more than sufficient for the Project's effects assessment and arguably represents a 'best practice' approach to TK collection and community engagement in Canada's Arctic.

However, Sabina also recognizes that TK has a valuable role to play throughout the life of the Project. For this reason, Sabina will continue to maintain its TK agreement with the KIA in good standing and has committed to implementing a Project-specific Inuit Environmental Advisory Committee (IEAC). The IEAC will be established jointly with the KIA, be composed of nominated community members knowledgeable of the Project area, and will serve in an advisory capacity to the Project on TK, wildlife, and on other related matters. The IEAC may also be used to help plan any future TK studies and initiatives that are required. Sabina acknowledges the NIRB has concerns over the lack of clarity presented during the FEIS Final Hearing with regards to the establishment of a Project-specific IEAC with the KIA. For this reason, Sabina has included a draft Terms of Reference (TOR) for the IEAC (FEIS Addendum Appendix V3-1H) which outlines the proposed structure and operation of the IEAC. However, this TOR will require further discussion with the KIA before it is finalized, as it is expected to become a component of the IIBA that is currently being negotiated with KIA. Sabina trusts this draft TOR provides sufficient detail for the NIRB at this time.

Furthermore, Sabina will continue to support relevant TK initiatives in the Kitikmeot Region through its donations program, as described in the Community Involvement Plan in the FEIS (Volume 10, Chapter 26). Likewise, community organizations will continue to be encouraged to submit donation requests for TK-related programming in the Kitikmeot communities and/or Project area. To-date, Sabina has provided over $155,000 and various in-kind supports to Kitikmeot Region causes and initiatives through its donations program. The IIBA that will be negotiated with the KIA for the Project may include additional provisions related to TK programing in the Kitikmeot Region.

The NIRB has also stated that appropriate tissue sampling to establish a baseline is an important component to ensure the public are informed about the safety of consuming fish which may be impacted by Project activities. Sabina agrees and would like to highlight that adequate tissue sampling of lakes within the LSA and RSA was conducted over four separate years of baseline study: 2011, 2012, 2013, and 2015. Lakes were chosen throughout the baseline study period for their proximity to infrastructure or Project activity. Goose Lake, the nearest lake in the receiving environment has a total of four years of baseline fish tissue metal analysis on three different species, Lake Trout, Round Whitefish, and Slimy Sculpin. Two years of fish tissue metal analysis has been conducted on Llama, Umwelt, and Propeller lakes. Three years of data have been collected from the Reference B Lake. Baseline information can be found in the FEIS Appendices V6-6B, V6-6C, and V6-6D along with the 2015 baseline report (Rescan 2015).

During the FEIS Final Hearing, it was the opinion of DFO that any remaining uncertainties would be resolved at the regulatory stage:

> *"During the regulatory review phase, Fisheries and Oceans Canada will continue to work with the proponent to determine whether the construction of the water intakes and discharge pipes in Big Lake and Goose Lakes -- sorry -- and other impacted ponds and streams within the project area will require a Fisheries Act authorization. As a result of the uncertainty regarding the requirements for scheduling Umwelt Lake under the Metal Mining Effluent Regulations, Fisheries and Oceans recommended that the proponent continue to work with Environment and Climate Change Canada to determine the regulatory requirements related to the use of Umwelt Lake as a saline water management pond. Fisheries and Oceans Canada also recommended that the proponent continues to work with Fisheries and Oceans Canada, the Kitikmeot Inuit Association, the Kugluktuk Hunters and Trappers Organizations, and the impacted communities to finalize the offsetting plan and develop a detailed fish-out and dewatering plan.* ***The proponent has agreed to our recommendations, and this technical issue has been resolved to the -- sorry -- to the satisfaction of Fisheries and Oceans Canada. Fisheries and Oceans Canada would also like to invite the impacted communities and Elders to provide comments to Fisheries and Oceans on the Bernard Harbour offsetting project."***[23]

At the FEIS Final Hearing, Sabina jointly submitted the following commitment with DFO (DFO-C-2):

> The Proponent will continue to work with Fisheries and Oceans Canada (DFO) and the impacted communities at the regulatory approval stage to develop a detailed fish-out and offsetting plan.

The Board has concluded that it is not confident that the proposed mitigation measures would be sufficient to mitigate effects due to limited consideration of Inuit Qaujimaningit principles in the planned fish-out and dewatering of waterbodies. In recognition of the NIRB's concern, Sabina has advanced its Fish-out and Dewatering Plan while further considering Inuit Qaujimaningit principles. This plan can be found in FEIS Addendum Volume 10, Chapter 31.

Attachment:

FEIS Addendum Volume 10, Chapter 31. Conceptual Fish-out Plan

FHR-NIRB-4.9(B) – Winter Ice Road Water Extraction

The NIRB has identified that limited data was presented on the lakes that could be disrupted due to water extraction associated with the winter ice road.

It was the opinion of DFO at the FEIS Final Hearing that any remaining uncertainties would be resolved at the regulatory stage:

> *"Fisheries and Oceans Canada notes that two winter roads are proposed to be constructed for the Back Rivet Project; see the inlet picture. Although the proponent has provided some information on the depths of several lakes and ponds along the proposed winter road, the locations, depths, as well as fish and fish habitat information for all of the proposed water bodies used for winter water withdrawal in support of the winter road construction has not been provided. Fisheries and Oceans Canada recommended that the proponent provide the depths, location, and fish habitat features, specifically overwintering and shoreline habitat, for each water body that will be used as a water source to construct the ice road. Fisheries and Oceans Canada also recommended that Sabina implement all available best management practices to prevent impacts to fish and fish habitat as a result of the construction, operation, and removal of winter ice roads and from the*

[23] M. D'Aguiar, DFO, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1176, Lines 9 to 26; Pg. 1177, Lines 1 to 10

> *under-ice water withdrawals. This also includes using a fish screen on the water intake pipes.* ***The proponent has agreed with these recommendations, and this technical issue has been resolved to the satisfaction of Fisheries and Oceans Canada****."*[24]

During the technical review phase of the FEIS winter ice road water withdrawal was evaluated by DFO. DFO submitted the following Technical Comment (F-DFO-TC-6):

> Fisheries and Oceans Canada recommends that the Sabina provide Fisheries and Oceans Canada with the bathymetry, location and fish habitat features within the selected waterbodies used for winter water withdrawal in support of the construction of the winter ice roads. This may be provided during the regulatory phase.

Sabina agreed with DFO and jointly submitted the following term and condition with DFO (DFO-T-3) at the FEIS Final Hearing:

> The Proponent will provide Fisheries and Oceans Canada (DFO) with the bathymetry, depth and location of proposed water withdrawal sites, volumes to be extracted, anticipated water level decreases, and fish habitat features within each waterbody proposed to be used for winter water withdrawal in support of the construction of the winter ice roads. This will be provided primarily during the regulatory phase however in certain cases waterbodies may be added in the future. If additional waterbodies are required the Proponent commits to provide all required information on the additional proposed lakes, to DFO for review prior to use of these waterbodies.

Sabina also submitted the following term and condition with DFO (DFO-T-4):

> The Proponent will implement all applicable DFO best management practices to avoid and mitigate serious harm to fish as a result of the construction, operation, and decommissioning of winter ice roads, and from under ice water withdrawals. This includes adequately screening the water intakes pipes to prevent impingement and entrainment of fish.

FEIS Volume 6, Chapter 6 focuses on Freshwater Fish/Aquatic Habitat. The Valued Ecosystem Components (VECs) selected to assess the potential effects of the Project on freshwater fisheries species in the Local Study Area and the Regional Study Area (including the Winter Ice Road) included:

- Fish/aquatic habitat; and
- Fish community (Lake Trout and Arctic Grayling).

The fish/aquatic habitat VEC comprises both the physical habitat and the biological resources that are essential to the productivity of fish species. The potential interactions of Project activity with the VEC freshwater fish/aquatic habitat were determined using the initial matrix provided in the Project Description, and further refined using the EIS guidelines, professional judgement, and experience at other projects in Nunavut and the Northwest Territories. Freshwater fish/aquatic habitat may interact and be affected by Project activities in two ways: serious harm occurring through a loss or reduction of fish habitat by permanent alteration or destruction (PAD), or through changes to water and sediment quality arising from the deposition of deleterious substances.

Sabina agrees with the NIRB that water withdrawal from lakes along the proposed Winter Ice Road has the potential to affect fish/aquatic habitat. Sabina included water withdrawal as a potential direct effect of Project activities on the physical habitat of fish within the FEIS. To mitigate these potential affects to fish/aquatic habitat due to winter water withdrawal for construction of winter ice roads Sabina

has always committed to adhering to the following DFO guidelines taken from the *Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010):*

- In one ice-covered season, total water withdrawal from a single waterbody is not to exceed 10% of the available water volume;
- In cases where there are multiple users withdrawing water from a single waterbody, the total combined withdrawal volume is not to exceed 10% of the available water volume; and
- Only waterbodies with maximum depths that are ≥1.5 m than their corresponding maximum expected ice thickness should be considered for water withdrawal.

The construction of ice bridges and snow fill approaches at the land-water interface will utilize only clean, compacted snow and ice to a sufficient depth to protect the shoreline. Speed limits will be enforced to prevent ice scour along shorelines.

It should also be noted that in the FEIS Sabina committed to adhering to the following DFO guidelines based upon the Nunavut *Operational Statement for Ice Bridges and Snow Fills* (DFO 2007):

- Use existing trails or winter ice roads wherever possible as access routes to limit unnecessary clearing of additional vegetation and prevent soil compaction;
- Construct approaches and crossings perpendicular to the watercourse wherever possible;
- Construct ice bridge and snow fill approaches using clean, compacted snow and ice to a sufficient depth to protect the banks of the lake, river or stream;
- The use of material other than ice or snow to construct a temporary crossing over any ice covered stream is prohibited under section 11 of the Northwest Territories Fishery Regulations, unless authorized by a Fishery Officer;
- Install sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and decommissioning activities and make all necessary repairs if any damage occurs;
- Operate machinery on land or on ice and in a manner that minimizes disturbance to the banks of the lake, river or stream.
    - Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks;
    - Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water or spreading onto the ice surface;
    - Keep an emergency spill kit on site in case of fluid leaks or spills from machinery; and
    - Restore banks to original condition if any disturbance occurs.
- Ensure that the intakes are sized and adequately screened to prevent debris blockage and fish mortality. Mesh size will not be larger than 2.54 mm;
- Crossings do not impede water flow at any time of the year;
- When the crossing season is over and where it is safe to do so, create a v-notch in the centre of the ice bridge to allow it to melt from the centre and also to prevent blocking fish passage, channel erosion and flooding. Compacted snow should be removed from snow fills prior to the spring freshet;
- Stabilize any waste materials removed from the work site to prevent them from entering the lake, river, or stream. This could include covering spoil piles with biodegradable mats or tarps; and
- The site should be stabilized using effective sediment and erosion control measures. In areas with permafrost, care should be exercised to ensure these measures do not cause thawing or frost heave.

The NIRB has identified that limited data was presented on the lakes that could be disrupted due to water extraction associated with the winter ice road. Sabina remains committed to ensuring that all

[24] M. D'Aguiar, DFO, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1173, Lines 15 to 26; Pg. 1174, Lines 1 to 12

withdrawal of water for the construction of winter ice roads is completed in a manner that avoids or minimizes the potential for serious harm to fisheries. An innovative plan has been developed to identify those water bodies that would reduce the potential effects on fish and fish habitat due to water withdrawal from lakes along the winter ice road. This plan includes collecting the following information to support this decision making process:

- Identify the location of and generate bathymetric maps of all potential water withdrawal source lakes along the Winter Ice Road Alignment using methods based on satellite imagery;
- DFO's protocol for winter water withdrawal will be applied, where no more than 10% of the under ice volume for lakes deeper than 3.5 m will be extracted;
- Provide locations of proposed water withdrawal sites, calculate the depth, volume, maximum withdrawal limits and maximum reduction in depth for each lake;
- Identify any potential for changes in overwintering capacity for fish; and
- Identify any potential for changes to spawning shoal habitat for fall spawning fish species.

A memorandum describing Sabina's new strategy in further detail can be found in FEIS Addendum Appendix V6-6G.

Attachment:

FEIS Addendum Appendix V6-6G. Winter Ice Road Water Withdrawal Memorandum

FHR-NIRB-4.9(C) – Bernard Harbour Offsetting Plan

Although the Board recognizes that the Bernard Harbour offsetting plan is clearly supported by key parties, the Board has stated that it currently lacks assurance that it would be sufficient to offset all anticipated serious harm to fish.

Since the time of the FEIS Final Hearing, Sabina has continued to advance baseline studies at Bernard Harbour (specifically Nulahugyuk Creek) in preparation of a detailed offsetting plan to be submitted with a *Fisheries Act* Authorization application for the Project. For the NIRB's convenience, the 2016 Bernard Harbour Report and Baseline is attached in FEIS Addendum Appendix V6-6H. The 2016 scope of work provides a numerical estimate on the Arctic Char (*Salvelinus Alpinus*) run which will be combined with data collected in 2014 to describe a reference condition for future quantification of the benefits of creek remediation efforts. The 2016 scope of work also provides baseline data on habitat conditions for directing remediation efforts on Nulahugyuk Creek (the creek). The 2016 field program was timed to occur within the known migration window for Arctic Char (char) at Nulahugyuk Creek, but also to overlap during low-flow conditions in early to mid-summer when fish passage barriers (e.g., boulders) are prevalent.

The 2016 field program was designed to address five general baseline objectives at Nulahugyuk Creek:

1) Monitor the adult char (lake-bound) migration using a two-way fyke net trap (fyke trap) during low-flow conditions; results from this objective are intended to confirm that suitable conditions for fish passage are not present during the upstream migration period;
2) Monitor the juvenile char (seaward) migration using a fyke trap during the peak period of outmigration early to mid-summer results from this work objective are intended to help understand spawning and migration successes associated with the run that produced the offspring observed during the outmigration (which are assumed to be 4 to 5-year-old fish);
3) Monitor rates of movement and successful upstream passage of adult char using Passive Integrated Transponder (PIT) tags (e.g., Puffer et al. 2015); the movement data provide a direct measurement of the effects of migrations conditions (e.g., low-flows) on char in the creek for the study year

under examination and are anticipated to provide a baseline condition (when combined with 2014 data) as a measurement indicator for evaluating the benefits of future remediation efforts;

4) Survey creek habitat to identify and describe problem locations where low-flow channels and/or directional weirs could be constructed to effectively increase fish passage success and hence production; and

5) Evaluate the structural integrity and performance of previously constructed (2012) low-flow channels as part of a feasibility assessment of using low-flow channels to improve upstream passage for fish; this work objective is a direct follow-up from work initiated in 2012, and related to monitoring work completed in 2014 and 2015.

In addition to the objectives outlined above, the 2016 field program integrated conservation and community-capacity objectives of the Kugluktuk Hunters' and Trappers' Organization (HTO). This was achieved by incorporating local students and community members and by designing a study that fosters education, stewardship, and community involvement in conservation initiatives. Past studies (e.g., Stern et al. 2008) have demonstrated a lasting positive change in environmental attitude, awareness, action, and knowledge following environmental education programs, such as the program being implemented at Bernard Harbour. For the NIRB's convenience, the 2016 Bernard Harbour Report and Baseline is attached in FEIS Addendum Appendix V6-6H.

During the technical comment phase following submission of the FEIS, DFO commented on the assessment of impacts of the Project on the Arctic Grayling population of Goose Lake (F-DFO-TC-9). Of concern was the ability of Arctic Grayling from Goose Lake to access high quality spawning and rearing habitat within the upper reaches of Rascal Stream East (RSE; a tributary to Goose Lake) following construction of Project infrastructure expected to result in habitat losses in lower RSE.

Sabina acknowledged DFO's concern over the migration potential between Goose Lake and spawning and rearing habitat in upper RSE via RSW. In response to Technical Comment F-DFO-TC-9, and following DFO's preference to mitigate rather than offset, Sabina proposed mitigation by design to ensure adequate fish passage between Goose Lake and upper RSE. The proposed fish passage mitigation included design, construction, and operation of a migratory fishway (i.e., the Rascal Fishway) between Gosling Pond 1 and upper RSE and the engineering/diversion of flow such that stream flow in RSW is sufficient to promote migration through the entire route from Goose Lake to upper RSE. Based on Sabina's response, the following proposed term and condition was generated by DFO and agreed to by Sabina during the FEIS Final Hearing (DFO-T-2):

> The Proponent commits to engage DFO and other interested parties during the regulatory phase on the design, construction, and operation of adequate fish passage to permit migration of Arctic Grayling from Goose Lake to natural spawning and rearing habitat located in upper Rascal Stream East, south of the planned airstrip. Any additional information required to ensure the design of the fish passage will be completed prior to significant construction activities at the Goose Property.

This memorandum (FEIS Addendum Appendix V6-6F) presents additional information on the design, construction, and operation of fish passage mitigation (i.e., the Rascal Fishway and subsequent flow diversion through RSW) with the primary objective of ensuring the migration potential of Arctic Grayling from Goose Lake to natural spawning and rearing habitat located in upper RSE via RSW. A monitoring program has also been proposed to determine if the fish passage mitigation, once operating, meets this objective.

The purpose of this Conceptual Fish Offsetting Plan is to summarize anticipated serious harm to fish based on the assessment provided in the FEIS, and to describe the offsetting option to counterbalance any unavoidable serious harm to fish, as defined in the *Fisheries Act*. In accordance with the federal *Fisheries Act* (1985), Sabina continues to follow DFO guidance to protect Commercial, Recreational and Aboriginal (CRA) fisheries. DFO's recommended model incorporates a hierarchy of objectives to first

avoid serious harm through project design. Where avoidance of serious harm could not be achieved, the Sabina committed to mitigate serious harm through a comprehensive list of approved best management practices and operational standards. Lastly, where Project activity could not be avoided or mitigate serious harm, a fisheries offsetting plan was developed fully counterbalance losses in fisheries productivity with gains in productivity elsewhere in the landscape. The Conceptual Fish Offsetting Plan for the Project is also the result of continued community and regulatory engagement associated with the Project. In addition to the offsetting plan, a number of mitigation measures will be in place for the Project to avoid or minimize the potential effects on the productivity of the CRA fishery. These mitigation measures will be supplemented by the use of adaptive management, as required.

The Board expressed a lack of assurance that the Fish Offsetting Plan would be sufficient to offset all anticipated serious harm to fish. In light of the Boards' outstanding concern a revised Conceptual Fish Offsetting Plan is presented in FEIS Addendum Volume 10, Chapter 21. The Conceptual Fish Offsetting Plan will be finalized and presented as a Final Fish Offsetting Plan during the permitting phase of the Project and submitted as part of the Application for Authorization under the *Fisheries Act*. Sabina will continue to work with DFO and the impacted communities through this regulatory approval stage to develop the final offsetting plan, as per commitments DFO-C-2 and KIA-C-5, KIA-C-6, and KIA-C-7 below.

During the FEIS Final Hearing, Sabina jointly submitted the following commitment with DFO (DFO-C-2):

> The Proponent will continue to work with Fisheries and Oceans Canada (DFO) and the impacted communities at the regulatory approval stage to develop a detailed fish-out and offsetting plan.

Sabina also jointly submitted the following commitments with the KIA (KIA-C-5, KIA-C-6, and KIA-C-7):

> The Proponent commits to working in conjunction with Kitikmeot Inuit Association in the permitting phase as it relates to fisheries impacts and compensation, to review the offsetting plan as required under the *Fisheries Act*.
>
> The Proponent commits to actively involve the Kitikmeot Inuit Association in the adaptive management of the fish offsetting plan.
>
> The Proponent commits to actively involve the Kitikmeot Inuit Association in evaluating early outcomes from monitoring and updating fish offsetting plans.

The final plan will be based on feedback from both the KIA and DFO and would ultimately be approved by DFO as a condition of the Authorization required for the development of the Project.

DFO has the expertise, jurisdiction and the mandate to ensure that impacts to fish and fish habitat are minimized, and to consider plans for offsetting residual impacts, all in accordance with the *Fisheries Act* and its regulations. It was the opinion of DFO at the FEIS Final Hearing, that these uncertainties should be resolved at the regulatory stage:

> *"During the regulatory review phase, Fisheries and Oceans Canada will continue to work with the proponent to determine whether the construction of the water intakes and discharge pipes in Big Lake and Goose Lakes -- sorry -- and other impacted ponds and streams within the project area will require a Fisheries Act authorization. As a result of the uncertainty regarding the requirements for scheduling Umwelt Lake under the Metal Mining Effluent Regulations, Fisheries and Oceans recommended that the proponent continue to work with Environment and Climate Change Canada to determine the regulatory requirements related to the use of Umwelt Lake as a saline water management pond. Fisheries and Oceans Canada also recommended that the proponent continues to work with Fisheries and Oceans Canada, the Kitikmeot Inuit Association, the Kugluktuk Hunters and Trappers Organizations, and the impacted communities to finalize the offsetting plan and develop a detailed fish-out and dewatering plan.* ***The proponent has agreed to our recommendations, and this technical issue has been resolved to the -- sorry -- to the satisfaction of Fisheries and Oceans Canada." Fisheries and Oceans Canada would also like to invite the impacted communities and Elders to provide comments to Fisheries and Oceans on the Bernard Harbour offsetting project."***[25]

Although the Board recognizes that the Bernard Harbour offsetting plan is clearly supported by key parties, the Board has stated that it currently lacks assurance that it would be sufficient to offset all anticipated serious harm to fish.

Since the time of the FEIS Final Hearing, Sabina has continued to advance baseline studies at Bernard Harbour (specifically Nulahugyuk Creek) in preparation of a detailed offsetting plan to be submitted with a *Fisheries Act* Authorization application for the Project. For the NIRB's convenience, the 2016 Bernard Harbour Report and Baseline is attached in FEIS Addendum Appendix V6-6H. Sabina has also revised Conceptual Fish Offsetting Plan; this is presented in FEIS Addendum Volume 10, Chapter 21. For the NIRB's convenience, Sabina has included additional information on the design, construction, and operation, and monitoring program of fish passage mitigation via RSW (FEIS Addendum Appendix V6-6F).

References:

Puffer M, Berg OK, Huusko A, Vehanen T, Forseth T, Einum, S. 2015. Seasonal Effects of Hydropeaking on Growth, Energetics, And Movement of Juvenile Atlantic Salmon (*Salmo salar*). River Research and Applications 31: 1101-1108.

Stern MJ, Powell RB, Ardoin NM. 2008. What Difference Does It Make? Assessing outcomes from participation in a residential environmental education program. Reports & Research 39: 31–43.

Attachment:

FEIS Addendum Appendix V6-6F. Rascal Stream Fishway Memorandum

FEIS Addendum Appendix V6-6H. 2016 Bernard Harbour Report and Baseline Report

FEIS Addendum Volume10, Chapter 21. Conceptual Fish Offsetting Plan

[25] M. D'Aguiar, DFO, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1176, Lines 9 to 26; Pg. 1177, Lines 1 to 10

ADDENDUM APPENDIX V6-4C: SITE SPECIFIC WATER QUALITY OBJECTIVES MEMO (NEW)

TECHNICAL MEMORANDUM

DATE February 2017 **PROJECT No.** Doc 008-1545534 Ver 1

TO Merle Keefe, Environmental Engineer (EIT)
Sabina Gold & Silver Corp.

CC Matthew Pickard, Dionne Filliatrault, Jen Range

FROM Tammie Morgan-Gray, Rein Jaagumagi (Golder) **EMAIL** tmorgan-gray@golder.com

BACK RIVER PROJECT – DEVELOPMENT OF A SITE-SPECIFIC WATER QUALITY OBJECTIVE FOR ARSENIC

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Sabina Gold & Silver Corp. (Sabina) to develop a long-term site-specific water quality objective (SSWQO) for arsenic for the protection of freshwater aquatic life for the Back River Project (the Project) in Nunavut, Canada. Golder understands that Environmental Resources Management (ERM) proposed a SSWQO for arsenic for Goose Lake as part of the Final Environmental Impact Statement (FEIS) for the Project, and that there have been Information Requests and Technical Comments on the SSWQO that was developed. This technical memorandum describes the methods and results of the development of the long-term SSWQO for arsenic for Goose Lake.

2.0 GENERAL APPROACH

The SSWQO for arsenic was developed in general accordance with standard methods provided for the development of a long-term guideline for freshwater environments by the Canadian Council of Ministers of the Environment (CCME) in the guidance document "*A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007*" (CCME 2007). The CCME has developed a refined, stepwise method for site-specific derivations that is preferred by regulators and provides a consistent framework for evaluations. In an earlier guidance document, the CCME (2003) outlines several procedures that can be used to modify the generic water quality guidelines for the protection of freshwater aquatic life, including the background concentration procedure, recalculation procedure, water effect procedure and resident species procedure. However, these approaches were not selected as options to develop the SSWQO for arsenic for Goose Lake at this time. It is noted that where warranted, species resident in Goose Lake and Nunavut were taken into consideration in the development of the SSWQO using the CCME (2007) protocol based on guidance provided by the CCME in their 2003 document.

The CCME (2007) guidance document provides two approaches for deriving water quality guidelines that depend on the adequacy of the toxicity data (availability and quality) for the substance. These approaches are:

- **Statistical Derivation Approach** – This approach is the preferred approach and is based on the statistical distribution (i.e., a species sensitivity distribution [SSD]) of the available and acceptable toxicity data. Guidelines derived using this approach are called Type A Guidelines; and

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- **Lowest Endpoint Derivation Approach** – This approach is used if the data are inadequate for the Statistical Derivation Approach. This approach is based on extrapolation from the lowest available and acceptable toxicity data and application of uncertainty or safety factors, where warranted. This approach is based on the original federal guideline development protocol (CCME 1991). Guidelines derived using this approach are called Type B Guidelines, and are further divided into Type B1 and Type B2 guidelines based on the adequacy (availability and quality) of toxicity data.

Based on the CCME (2007) protocol, the general approach for development of the long-term SSWQO for arsenic for Goose Lake followed a four-step process:

1) Toxicity data compilation – Available freshwater chronic toxicity data for arsenic was compiled into a database with a focus on data for algae, aquatic plants, aquatic invertebrates, fish and amphibians;

2) Toxicity data evaluation, categorization and endpoint selection – The available toxicity data was evaluated for suitability and categorized as acceptable or unacceptable for developing a long-term SSWQO. Once the data were evaluated and categorized, preferred endpoints were selected;

3) Determination of the applicable SSWQO derivation approach - Depending on the adequacy of the toxicity data, it was determined whether the Statistical Derivation Approach or the Lowest Endpoint Derivation Approach should be used to develop the SSWQO for arsenic; and

4) Development of the SSWQO for arsenic using either the Statistical Derivation Approach or the Lowest Endpoint Derivation Approach.

These steps are described in detail in the sections below.

3.0 TOXICITY DATA COMPILATION

Available toxicity data for arsenic were compiled into a database with a focus on long-term or chronic data for algae, aquatic plants, invertebrates, fish and amphibians in freshwater environments, per the recommendations of CCME (2007). The compilation of toxicity data began with the primary chronic toxicity data from the fact sheet used to derive the current CCME Canadian Water Quality Guideline for the Protection of Freshwater Aquatic Life (CWQG-PFAL) for arsenic (CCME 2001). The compilation included querying the ECOTOX Database administered by the United States Environmental Protection Agency (U.S. EPA 2016) and other journal databases (e.g., PubMed, Cambridge Scientific Abstracts) for the time period prior to, coinciding with and subsequent to the CWQG-PAL derivation (from the year 1915 to the year 2016). The query for the time period subsequent to the CWQG-PAL derivation was done to ensure that recently generated freshwater toxicity data were included in the development of the SSWQO.

The definitions of long-term exposure durations provided by the CCME (2007) were followed in identifying chronic toxicity data. The definitions are:

- For fish and amphibians, exposure durations of ≥21 days for tests with juvenile or adult life stages and ≥7 days for tests with eggs and larvae.
- For short-lived invertebrates (e.g., *Ceriodaphnia dubia*), exposure durations of ≥96 hours for non-lethal effects measures (e.g., growth, reproduction) and <21 days for lethality on a case-by-case basis.
- For long-lived invertebrates (e.g., *Daphnia magna*), exposure durations of ≥7 days for non-lethal effects measures and ≥21 days for lethality.

- For aquatic and semi-aquatic plants, exposure must be through the water column. All tests for *Lemna* sp. following standard test protocols are generally considered long-term exposures. Data for other species is considered on a case-by-case basis.
- For algae, exposure durations of >24 hours or on a case-by-case basis (e.g., >72 hour tests with *Pseudokirchneriella subcapitata* were considered chronic).

Arsenic naturally occurs in several valence states: elemental arsenic (As^0), trivalent arsenic (As^{+3} or As[III]), pentavalent arsenic (As^{+5} or As[V]) and arsenide (As^{-3}). The toxicity of arsenic is affected by its chemical form and valence state. In aquatic systems, As(III) and As(V) are the most common states, with As(V) dominating under oxidizing conditions (i.e., high pH, high redox potential (Eh), high dissolved oxygen [DO]) and As(III) dominating under reducing conditions (Eisler 1988). However, because the dissolved oxygen in an aquatic system varies both temporally and spatially, which affects the redox potential, the equilibrium position of the As(III) and As(V) reaction is constantly shifting (i.e., both As[III] and As[V] are thermodynamically unstable and interchangeable) (Fodor 2001; Smedley and Kinniburgh 2002). Consequently, aquatic biota are likely exposed to a mixture of As(III) and As(V), with the relative proportion dependent on, among other things, the dissolved oxygen concentration. This coexistence of As(III) and As(V) has been observed in natural aquatic systems (Bright et al. 1994, Nagorski and Moore 1999). Some studies have demonstrated that As(V) is less toxic than As(III) in aquatic systems (Borgmann et al. 1980; Naumann et al. 2007).

Based on these considerations, arsenic speciation in Goose Lake likely includes both As (III) and As (V), and is likely somewhat variable depending upon the various modifying factors. As described above, it is possible that both oxic and anoxic conditions can potentially occur in freshwater systems and thus both As(III) and As(V) may occur in different areas or at different times in Goose Lake. Thus, all available arsenic toxicity data, regardless of speciation were compiled in the database.

Aquatic organisms may be exposed to substances in water directly via uptake from the water or indirectly via diet. The SSWQO for arsenic is intended to be used in the assessment and management of arsenic in the water column. That is, the SSWQO is related to the concentration of arsenic in the water. The exposure pathway of greatest relevance to arsenic toxicity is via direct uptake from water, rather than through bioaccumulation or biomagnification into organism tissue (CCME 2001) supporting the development of an SSWQO rather than a tissue residue-based guideline. This approach is consistent with the CCME (2007) protocol which indicates that while bioaccumulation is an important consideration, it is not part of the protocol for the derivation of a CWQG-PAL. Therefore, the compilation focussed on toxicity data where the route of uptake was directly from the water. Experiments in which test organisms were injected with arsenic or fed arsenic in the diet were not compiled because these types of exposure are not reflective of what would occur in the receiving environment.

4.0 TOXICITY DATA EVALUATION, CATEGORIZATION, AND ENDPOINT SELECTION

Once the available toxicity data were compiled in the database, the data were evaluated for suitability and categorized as acceptable (primary or secondary data) or unacceptable for developing a long-term SSWQO consistent with CCME (2007) guidance. Data suitability was confirmed by consulting the original publication or report, reviewing the test methods and verifying the test results.

Consistent with CCME (2007) guidance, toxicity data for Canadian species were considered suitable for developing the long-term SSWQO for arsenic, and data for species non-resident to Canada were used if the species could be considered suitable surrogates for Canadian resident species (e.g., fall within the same taxonomic group) and the toxicity tests were conducted under exposure conditions representative of Canadian

waters. The recalculation procedure for deriving SSWQOs provided in CCME (2003) allows removal of toxicity data from the data set on species that are known not to occur or do not have the potential to occur at a site; however, this was not done in the current assessment. This is because with removal of these data, the minimum data requirements for fish for development of an SSWQO would not be met. However, consideration was given to whether the species is known to occur or has the potential to occur in Nunavut. For example, Indian major carp (*Catla catla*) has not been identified in Goose Lake; however, other fish species of this family (family Cyprinidae) are known to occur in Nunavut. Therefore, the toxicity data for this species were considered suitable for SSWQO development for Goose Lake. Flagfish (*Jordanella floridae*) has not been identified in Goose Lake and other fish species of this family (family Cyprinodontidae) are not known to occur in Nunavut. Therefore, the toxicity data for this species were not considered to be suitable for SSWQO development for Goose Lake.

Other criteria used to evaluate the suitability of the toxicity data included the following and are consistent with CCME (2007) guidance:

- The preferred test endpoints were measures of survival, growth, reproduction and development. Non-traditional endpoints, such as pathological changes or swimming speed were not considered suitable because the ecological relevance of these endpoints is uncertain.
- Appropriate documentation was required for test design/conditions (e.g., flow-through, renewal, static), test concentrations, environmental variables (e.g., temperature, hardness, pH, etc.), experimental design (controls, number of replicates) and description of statistics.
- Studies were considered suitable if they included control or reference organisms that have been exposed to similar conditions as the experimental organisms.
- Data generated from studies evaluating synergistic, antagonistic or compensatory responses of organisms, such as tolerance (acclimation, adaptation), were considered unsuitable.
- Tests using field-collected organisms were not considered suitable because the life history of these organisms and their rate of exposure to arsenic is not generally clearly defined.
- Tests using organic forms of arsenic were not considered suitable because inorganic arsenic is the form likely to be found in water.
- Tests were not considered suitable if the original publication or report could not be located because this prevented a review of the test methods and verification of the test results.

Once the data were evaluated and categorized, endpoints were selected. For the statistical derivation approach, the order of priority by which the endpoints are selected is as follows (CCME 2007):

- EC_x/IC_x representing a no-effects threshold;
- EC_{10}/IC_{10};
- $EC_{11\text{-}25}/IC_{11\text{-}25}$;
- Maximum Allowable Toxicant Concentration (MATC), as defined below;
- No Observed Effect Concentration (NOEC);
- Lowest Observed Effect Concentration (LOEC);

- EC_{26-49}/IC_{26-49}; and
- Non-lethal EC_{50}/IC_{50}.

MATCs were calculated by taking the geometric mean of the NOEC and LOEC reported for a given test. The procedure can yield results that are comparable to IC_{25} results, as discussed for example in US EPA (2007).

If a study yielded multiple results for a single endpoint, then the results were reduced to a single measurement to avoid biasing the database towards the results of a single study. For example, if inhibition concentrations (ICs) to 10%, 25% and 50% of the test population were reported for the growth of fathead minnow exposed to arsenic, then only one of the three values (i.e., the IC_{10} value) was included in the database.

The CCME (2007) protocol allows for the incorporation of exposure and toxicity modifying factors (ETMFs) in the development of water quality guidelines. As noted previously, chemical speciation of arsenic (i.e., valency) is an important ETMF; however, there is uncertainty as to whether As(V) or As(III) predominates in Goose Lake. Therefore, endpoints for both As(V) and As(III) were included in the database. If a toxicity study tested both arsenic species for a given test species, then the lower of the two endpoints was included in the database. For example, Naumann et al. (2007) reported EC_{10}s of 11,600 and 1,270 µg/L for growth of *Lemna minor* exposed to As(V) and As(III), respectively. The lower EC_{10} of 1,270 µg/L for *Lemna minor* exposed to As(III) was included in the database.

The bioavailability (and toxicity) of arsenic is reduced by the presence of phosphorus, organic matter and clays, metal sulfides, and iron, aluminum, and manganese oxides and oxyhydroxides (Eisler 1988; Senn and Hemond 2003; Sharma and Sohn 2009). Additionally, an increase in As(V) toxicity has been observed with increasing temperatures (ANZECC and ARMCANZ 2000; McGeachy and Dixon 1989). However, these parameters were reported in very few studies and their potential influence on arsenic toxicity could not be readily quantified. As such, the influence of these parameters were not incorporated into the development of the SSWQO for arsenic.

5.0 DETERMINATION OF THE APPLICABLE SSWQO DERIVATION APPROACH

The minimum data set requirements for the derivation of a long-term guideline for freshwater environments outlined in CCME (2007) were used to determine whether the statistical derivation approach or the lowest endpoint derivation approach should be used to develop the SSWQO for arsenic. The available chronic toxicity data for arsenic in freshwater met the minimum data set requirements for the derivation of a long-term guideline using the statistical derivation (SSD) approach. Therefore, the statistical derivation approach was used to derive a long-term SSWQO for arsenic for Goose Lake.

6.0 DEVELOPMENT OF THE SSWQO FOR ARSENIC USING THE STATISTICAL DERIVATION APPROACH

The chronic toxicity data used in the SSD are summarized in Table 1. Note that Table 1 provides only the chronic toxicity data that were used in the SSD to develop the SSWQO. It does not include all of the studies and data that were compiled and evaluated for suitability for developing the long-term SSWQO. A full description of how the data provided in Table 1 were selected was provided in Section 4.0. Therefore, all of the data presented in Table 1 are categorized as acceptable (i.e., primary or secondary data as per CCME [2007]).

Table 1: Chronic Toxicity Data used in the Development of the SSWQO for Arsenic

Test Species	Common Name	Taxa Group	Arsenic Species	Test Duration (days)	Biological Measurement	Endpoint	Effect Concentration (µg As/L)	Source	Rank
Daphnia pulex	Water Flea	Invertebrate	As(V)	26	Reproduction	LOEC	10	Chen et al. 1999	1
Scenedesmus obliquus	Green Algae	Aquatic Plant/Algae	As(V)	14	Growth	EC_{50}	48	Vocke et al. 1980; See note (a)	2
Melosira granulata	Algae	Aquatic Plant/Algae	As(V)	8-24	Growth	IC_{35}/LOEC	75	Planas and Healey 1978; See note (a)	3
Ochromonas valesiaca	Algae	Aquatic Plant/Algae	As(V)	8-24	Growth	IC_{20}/LOEC	75	Planas and Healey 1978; See note (a)	4
Monoraphidium arcuatum	Freshwater Algae	Aquatic Plant/Algae	As(V)	3	Growth	LOEC	81	Levy et al. 2005	5
Gammarus pseudolimnaeus	Scud	Invertebrate	As(III)	14	Survival	LC_{15}	88	Spehar et al. 1980	6
Lemna gibba	Inflated Duckweed	Aquatic Plant/Algae	As(V)	21	Growth	MATC	224	Mkandawire et al. 2006; See note (b)	7
Cryptomonas erosa	Algae	Aquatic Plant/Algae	As(V)	8-24	Growth	IC_{22}	225	Planas and Healey 1978	8
Ankistrodesmus falcatus	Green Algae	Aquatic Plant/Algae	As(V)	14	Growth	EC_{50}	256	Vocke et al. 1980	9
Baetis tricaudatus	Mayfly	Invertebrate	As(III)	12	Survival	MATC	300	Irving et al. 2008	10
Cyclops vernalis, C. bicuspidatus thomasi, Diaptomus sp.	Copepods	Invertebrate	As(III)	14	Growth	EC_{20}	320	Borgmann et al. 1980; See note (a)	11
Ceriodaphnia dubia	Water Flea	Invertebrate	As(III)	7	Reproduction	EC_{19}	891	Spehar and Fiandt 1986	12
Pimephales promelas	Fathead Minnow	Fish	As(V)	30	Growth	MATC	892	De Foe 1982; see Note (b)	13
Daphnia magna	Water Flea	Invertebrates	As(III)	28-31	Survival/Growth/ Reproduction	MATC	914	Lima et al. (1984)	14
Pteronarcys dorsata	Stonefly	Invertebrate	As(III)	28	Survival	NOEC	961	Spehar et al. 1980	15
Helisorna campanulata	Snail	Invertebrate	As(III)	28	Survival	LC_{10}	973	Spehar et al. 1980	16
Stagnicola emarginata	Snail	Invertebrate	As(V)	28	Survival	LC_{10}	973	Spehar et al. 1980	16

Test Species	Common Name	Taxa Group	Arsenic Species	Test Duration (days)	Biological Measurement	Endpoint	Effect Concentration (µg As/L)	Source	Rank
Lithobates pipiens	Leopard Frog	Amphibian	As(V)	113	Growth	NOEC	1026	Chen et al. 2009	17
Chlorella sp.12	Green Algae	Aquatic Plant/Algae	As(V)	3	Growth	MATC	1243	Levy et al. 2005; See note (b)	18
Lemna minor	Duckweed	Aquatic Plant/Algae	As(III)	7	Growth	EC_{10}	1270	Naumann et al. 2007	19
Anabaena variabilis	Algae	Aquatic Plant/Algae	As(V)	8-24	Growth	IC_{10}	2250	Planas and Healey 1978	20
Chlamydomonas reinhardtii	Algae	Aquatic Plant/Algae	As(V)	8-24	Growth	MATC	3182	Planas and Healey 1978; See note (b)	21
Oncorhynchus mykiss	Rainbow Trout	Fish	As(III)	21	Growth	MATC	4243	Speyer 1975; See note (b)	22
Catla catla	Indian Major Carp	Fish	As(V)	35	Survival	NOEC	4378	Kavitha et al. 2010	23
Microcystis sp.	Blue-Green Algae	Aquatic Plant/Algae	As(V)	14	Growth	NOEC	7492	Gong et al. 2009	24
Selenastrum capricornutum	Green Algae	Aquatic Plant/Algae	As(V)	14	Growth	EC_{50}	30761	Vocke et al. 1980	25
Scenedesmus quadricauda	Algae	Aquatic Plant/Algae	As(V)	12	Growth	EC_{50}	61000	Fargasova 1994	26
Microcoleus vaginatus	Green Algae	Aquatic Plant/Algae	As(V)	14	Growth	NOEC	100000	Vocke et al. 1980	27

[a] Data used in the development of the current CWQG-PFAL for arsenic (CCME 2001).

[b] MATCs were calculated by Golder by taking the geometric mean of the NOEC and LOEC reported for a given study.

µg As/L = micrograms arsenic per litre; MATC = maximum acceptable toxicant concentration; As(V) = pentavalent arsenic; LOEC = lowest observed effect concentration; IC_X = X% inhibitory concentration; As(III) = trivalent arsenic; LC_X = X% lethal concentration; NOEC = no observed effect concentration; EC_x = X% effect concentration.

It is noted that there were some studies that were included by the CCME in the development of the current CWQG-PFAL for arsenic that were not included in the SSD for the Project. These include the following:

- 28-d LC_{50} of 550 µg/L for rainbow trout (Birge et al. 1978);
- 7-d LOEC of 500 µg/L and a 72-h LOEC for survival for climbing perch (Jana and Sahana 1989);
- 7-d LOEC of 970 µg/L for catfish (Jana and Sahana 1989);
- 21-d EC_{16} (reproduction) of 520 µg/L for *Daphnia magna* (Biesinger and Christensen 1972);
- 96-h EC_{50} (immobility) of 850 µg/L for *Bosmina longirostris* (Passino and Novak 1984);
- 7-d LC_{80} of 960 µg/L for *Gammarus pseudolimnaeus* (Spehar et al. 1980);
- 7-d LOEC (immobilization) of 1000 µg/L for *Ceriodaphnia dubia* (Spehar and Fiant 1986); and
- 20-d VSUE (very severe unfavourable effect) of 960 µg/L for *Scenedesmus obliquus* (Fargasova 1993).

The 96-h LC_{50} for rainbow trout, the 7-d LC_{80} for *Gammarus pseudolimnaeus* and the 20-d VSUE for *Scenedesmus obliquus* were not included in the SSD because lethal effect levels of 50% or greater are not acceptable for guideline development using the SSD approach as per the CCME (2007) protocol. The data for climbing perch and catfish were not included in the SSD because the Jana and Sahana (1989) reference could not be located for review and verification of test methods and results. The 96-h EC_{50} for *Bosmina longirostris* was not included in the SSD because the exposure duration is considered to be short-term based on current CCME (2007) guidance. The 21-d EC_{16} for reproduction in *Daphnia magna* was not included in the SSD because a more applicable endpoint was identified for this species. While the 7-d LOEC for immobilization for *Ceriodaphnia dubia* from Spehar and Fiandt (1986) was not included in the SSD, the 7-d EC_{19} for reproduction of 819 µg/L from the same study was included. The EC_{19} rather than the LOEC was included in the SSD because an EC_{11-25}/IC_{11-25} endpoint is preferred over a LOEC endpoint based on CCME (2007) guidance.

Overall, 28 species were included in the SSD. The species list consisted of:

- three fish species (one salmonid and three non-salmonids);
- one amphibian species;
- nine aquatic invertebrate species (including crustaceans, insects [mayflies and stoneflies] and gastropods),
- two aquatic plant species; and
- 13 algal species.

The CCME (2007) protocol specifies that if multiple comparable records for the same endpoint are available for a species, they are to be combined by the geometric mean of the records to represent the averaged effects endpoint for that species. The determination of which records are “comparable” is subject to professional judgement; ideally, comparable records would have identical life stage, test duration, exposure protocol, biological endpoint, statistical response measure and water quality characteristics. However, in practice, obtaining perfect concordance among toxicity data collected by different investigators is rare. There were no suitably comparable records identified in the arsenic toxicity dataset; therefore, no geometric means were calculated for the SSD.

The software package, SSD Master Version 3.0 (CCME 2013), was used to generate the SSD. In brief, the software ranks each species according to sensitivity to arsenic (from lowest effect concentration to highest effect concentration) and its centralized position on the SSD (Hazen plotting position) is determined using the following equation (Alderberg et al. 2002; Newman et al. 2002):

Percent Species Affected = (*X* - 0.5) / *N*

Where *X* is the species rank, with 1 being the most sensitive species (lowest effect concentration), and *N* is the total number of species included in the SSD. The percent species affected and the corresponding effect concentrations are then plotted in the SSD. Several cumulative distribution functions (Normal, Logistic, Extreme Value and Gumbel) are fit to the data (both in arithmetic and log space) using regression methods. One of the models is then chosen as the best fit to the data based on a goodness-of-fit test (Anderson-Darling Goodness-of-Fit) and an overall visual assessment of model fit.

Of the models tested, the Normal model was considered to provide the best fit of the data. The equation of the Normal model is:

$$F(x) = \frac{1}{2\left(1 + erf\left(\frac{x-\mu}{\alpha\sqrt{2}}\right)\right)}$$

Where:
F(x) = proportion of taxa affected at the given arsenic concentration; 0.05;
x = arsenic concentration (µg/L);
µ = mean or expectation of the distribution (also its median and mode); 2.9; and
α = standard deviation; 0.86.

The long-term SSD is shown on Figure 1.

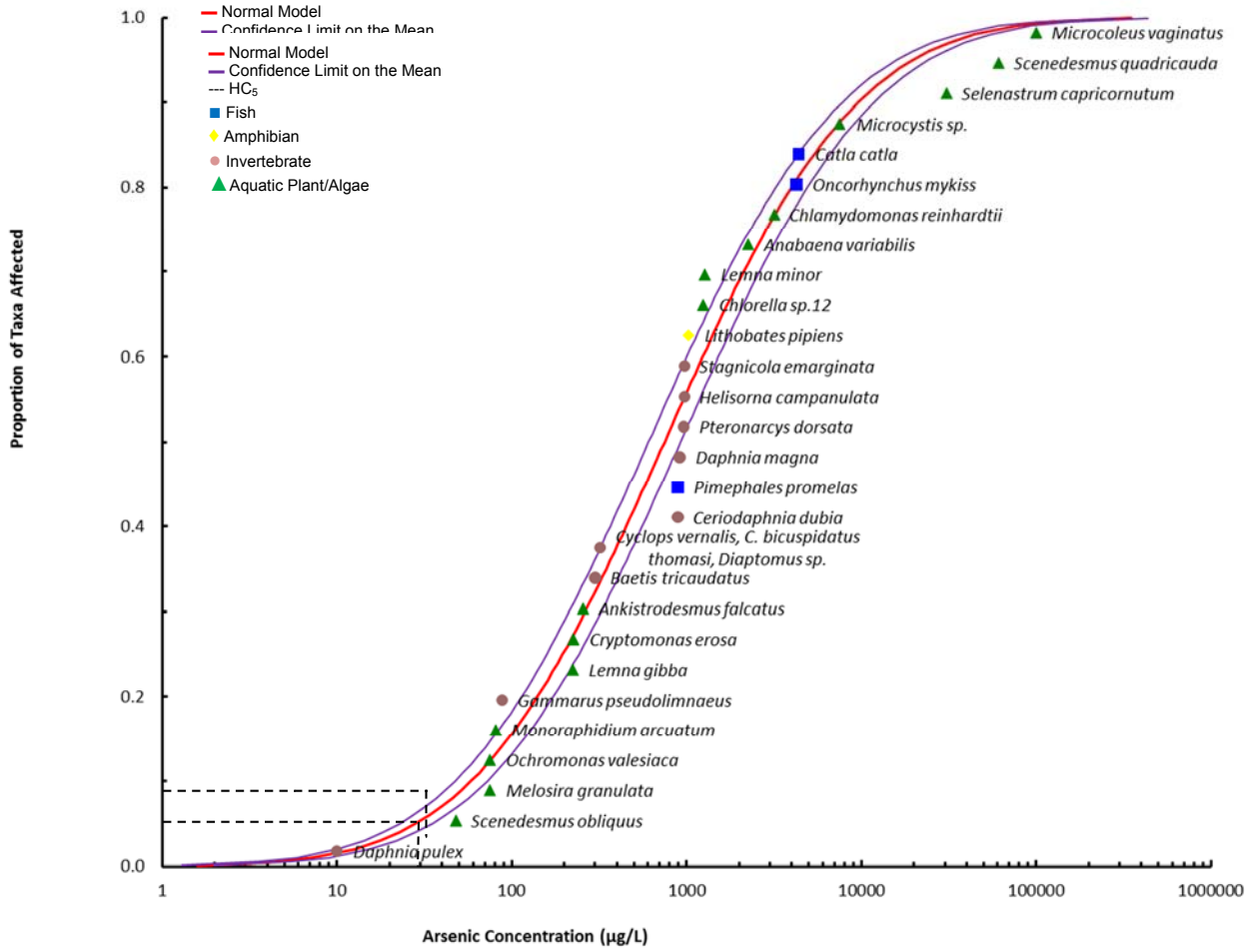

Figure 1: Species Sensitivity Distribution for Arsenic

CCME (2007) defines the long-term guideline as the intercept of the 5th percentile of the y-axis with the fitted SSD curve (or the HC_5, or hazardous concentration to 5% of species). The 5th percentile on the long-term SSD (HC_5) and the SSWQO for arsenic for Goose Lake is 28 µg/L. The lower confidence limit on the mean is 22 µg/L and the upper confidence limit on the mean is 35 µg/L.

The HC_5 for arsenic is almost three times higher than the current CCME water quality guideline for the protection of freshwater aquatic life of 5 µg/L (CCME 1999/2016). The HC_5 is higher than the most sensitive species used in the SSD derivation. The most sensitive species used in the SSD was *Daphnia pulex*, with a 26-day LOEC for reproduction of 10 µg/L (Chen et al. 1999). Other daphnids were considerably less sensitive, with effect concentrations of 891 µg/L for *Ceriodaphnia dubia* (Spehar and Fiandt 1986) and 914 µg/L for *Daphnia magna* (Lima et al. 1984). The likelihood of an endpoint on an SSD falling below the 5th percentile increases with sample size, and is therefore inherent in the SSD approach.

In cases where an endpoint falls below the 5th percentile (or SSWQO), consideration may be given to applying the protection clause which was developed by the CCME (2007) to ensure that the long term guideline is sufficiently protective. The clause is invoked under the following circumstances:

- If an acceptable single (or, if applicable, geometric mean) no-effect or low-effect level endpoint (e.g., EC_x for growth) for a species at risk is lower than the proposed guideline, then that endpoint becomes the recommended guideline value. If the endpoint is a moderate- or severe-effect level endpoint (i.e., EC_x with x ≥50 or a lethality endpoint [LC_x]), then the guideline value is determined on a case-by-case basis (e.g., by using an appropriate safety factor).
- If an acceptable single (or, if applicable geometric mean) lethal-effects endpoint (i.e., LC_x, where x ≥15) for any species is below the proposed guideline, then that endpoint becomes the recommended guideline value.
- Special consideration is required if multiple endpoints for a single taxon (e.g., fish, invertebrates, plant/algae) and/or an elevated number of secondary studies are clustered around the 5th percentile.
- If it can be demonstrated that an endpoint below the 5th percentile is for a species at risk within a given province/territory or region/site, for a species of commercial or recreational importance, or for an "ecological important" species, than that data point may be used for deriving the guideline.

In considering the long-term acceptable dataset, only one endpoint fell below the 5th percentile on the SSD; the 26-d LOEC for reproduction in *Daphnia pulex* of 10 µg/L. The dataset did not contain any acceptable endpoints below the 5th percentile that represent effects to either species at risk or lethal effects, or for species of commercial, recreational or ecological importance. Multiple endpoints for a single taxon and an elevated number of secondary studies were not clustered around the 5th percentile. Therefore, the protection clause was not invoked in the development of the SSWQO for arsenic.

7.0 UNCERTAINTY

The main sources of uncertainty associated with the development of the long-term SSWQO for arsenic for the protection of freshwater aquatic life in Goose Lake were:

- **Inclusion of Data for Both As(V) and As(III)** – Arsenic speciation is an important ETMF; however, arsenic speciation in Goose Lake is not well understood. It is possible that both oxic and anoxic conditions can potentially occur in freshwater systems and thus both As(V) and As(III) may occur in different areas or at different times in Goose Lake. As a result, endpoints for both As(V) and As(III) were included in the development of the SSWQO. Some studies have demonstrated that As(V) is less toxic than As(III) in aquatic systems (Borgmann et al. 1980; Naumann et al. 2007). The SSWQO may be conservative if one species (e.g., As(V)) predominates in Goose Lake.
- **Lack of Incorporation of other ETMFs** –The toxicity of arsenic is ameliorated by the presence of phosphorus, organic matter and clays, metal sufides, and iron, aluminum and manganese oxides and oxyhydroxides. Given the limited data, it was not possible to quantify the effect of these ETMFs on arsenic bioavailability and toxicity. It is possible that these ETMFs are lower in concentration in laboratory toxicity tests relative to Goose Lake; therefore, toxicity may be overestimated in the laboratory-based studies. As a result, the SSWQO may be conservative for the Project.
- **Selected SSD Model** – The Normal model was selected as the best fit to the toxicity data based on the Anderson-Darling Goodness-of-Fit test (A^2 = 0.456) and an overall visual assessment of model fit. It is noted that the Logistic model also provided a good fit to the data and yielded an HC_5 of 22 µg/L. For the Logistic Model, the Anderson-Darling Goodness-of-Fit test provided an A^2 of 0.370 which was lower than that for the Normal model; however, model fit in the lower tail of the distribution which determines the HC_5 was not as good as for the Normal model based on the visual assessment. This was supported by a slightly higher mean

square error in the lower tail for the Logistic model (0.0386 versus 0.0374 for the Normal model). As well, the confidence limit on the mean was wider for the Logistic model (from 16.29 to 30.41 µg/L) than for the Normal model (from 22.96 to 35.06 µg/L).

8.0 SUMMARY

In summary, there were sufficient chronic toxicity data to derive a long-term SSWQO for arsenic for the protection of aquatic life in Goose Lake using an SSD. In total, 28 aquatic species were included in the long-term SSD. The Normal model provided the best fit to the toxicity data and was used to derive the long-term SSWQO of 28 µg/L.

9.0 CLOSURE

We trust that this technical memorandum meets your needs at the present time. If you have any questions or require clarification, please do not hesitate to contact the undersigned at your convenience.

GOLDER ASSOCIATES LTD.

Tammie Morgan-Gray
Environmental Risk Assessor

Rein Jaagumagi
Senior Environmental Specialist

TMG/RJ/

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ADDENDUM APPENDIX V6-6F: RASCAL STREAM FISHWAY MEMO (NEW)

Memorandum

Refer to File: B.1 - 0333261-0004 (Back River Fishway Memo).docx

Date: February 10, 2017

To: Merle Keefe, Sabina Gold & Silver Corp.

From: Kathryn Kuchapski, ERM (M.Sc., P. Biol.)

Cc: Deborah Muggli, ERM (Ph.D., R.P. Bio.); Geneviève Morinville, ERM (Ph.D.); Korina Houghton, ERM (B.Sc.)

Subject: **Rascal Stream Fish Passage Mitigation**

1. INTRODUCTION

1.1 Overview

The Sabina Gold & Silver Corp. (Sabina) Back River Project (the Project) is a proposed gold mine located in the West Kitikmeot region of Nunavut (Figure 1.1-1).

A Final Environmental Impact Statement (FEIS) for the Project was submitted to the Nunavut Impact Review Board (NIRB) in November of 2015 (Sabina 2015). The FEIS included an assessment of all phases of the proposed Project including ongoing Exploration, Mobilization and Construction, Operations, Closure and Post Closure.

During a technical comment phase following submission of the FEIS, Fisheries and Oceans Canada (DFO) commented on the assessment of impacts of the Project on the Arctic Grayling population of Goose Lake (Technical Comment No. F-DFO-TC-9). Of concern was the ability of Arctic Grayling from Goose Lake to access high quality spawning and rearing habitat within the upper reaches of Rascal Stream East (RSE; a tributary to Goose Lake) following construction of Project infrastructure expected to result in habitat losses in lower RSE (Figure 1.1-2).

Stream habitat losses in lower RSE will result from blocking fish access to the Goose Inflow East (GIE) and Goose Inflow South (GIS) streams. Reduced flow in these channels because of lost upstream catchment area may be sufficient to allow fish to enter and become stranded, perish, or to spawn and strand eggs (Figure 1.1-2). A 1.1 km section of RSE upstream of the airstrip culverts, nearest to the upstream Rascal Lake, will remain undisturbed and will continue to provide approximately 0.7 ha of habitat for spawning, rearing, and foraging Arctic Grayling, in addition to forage fish (e.g., Ninespine Stickleback, Slimy Sculpin, and Burbot). Following habitat losses in lower RSE, access to habitat in upper RSE from Goose Lake will require migration through Rascal Stream West (RSW; including Gander Outflow, Gander Pond, and Gosling Ponds 1 and 2; Figure 1.1-2). DFO has expressed concerns that Arctic Grayling will not be able to access upper RSE through RSW due to stream habitats in RSW that may, under certain open-water flow conditions, restrict the movement of fish (i.e., intermittent channelization, shallow depths, ephemeral flows, and poor connectivity with overwintering habitat, observed during baseline surveys).

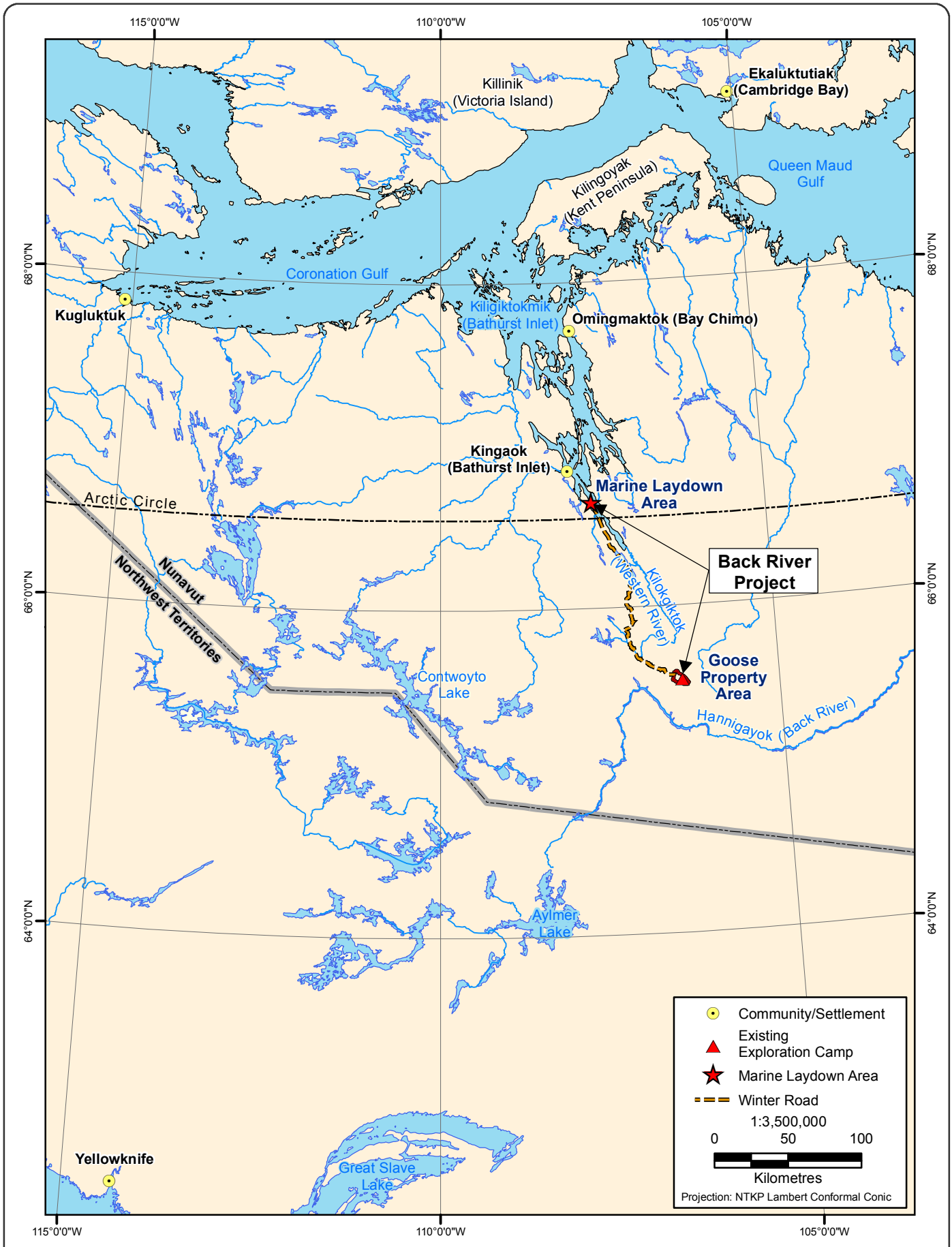
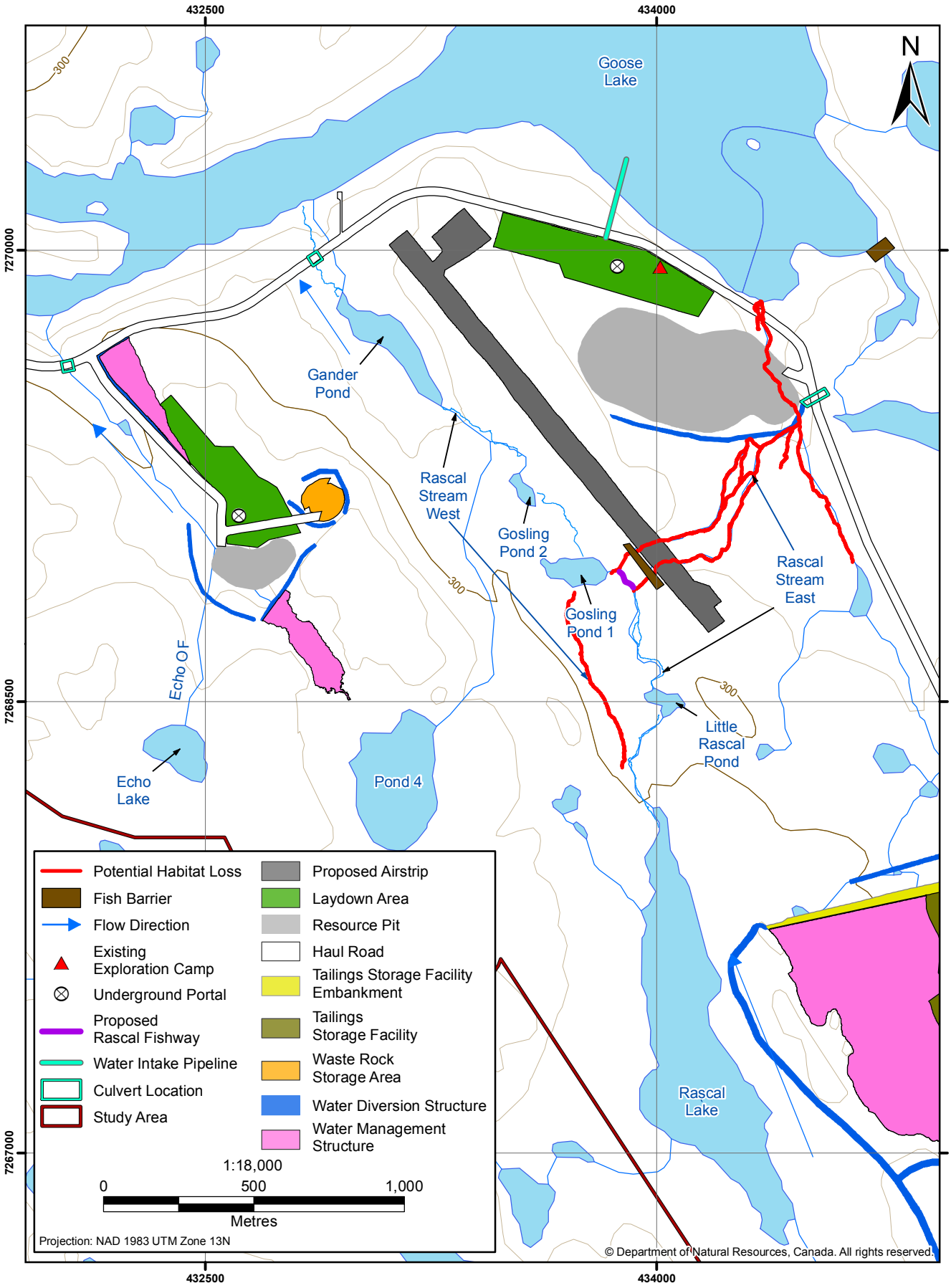


Figure 1.1-1

Back River Project Location

Sabina GOLD & SILVER CORP.

Rescan an ERM company



Sabina GOLD & SILVER CORP

Rascal Stream System and Proposed Rascal Fishway

Figure 1.1-2

Rescan an ERM company

Sabina acknowledged DFO's concern over the migration potential between Goose Lake and spawning and rearing habitat in upper RSE via RSW. In response to Technical Comment No. F-DFO-TC-9, and following DFO's preference to mitigate rather than offset (DFO 2013a), Sabina proposed mitigation by design to ensure adequate fish passage between Goose Lake and upper RSE. The proposed fish passage mitigation included design, construction, and operation of a migratory fishway (i.e., the Rascal Fishway) between Gosling Pond 1 and upper RSE and the engineering/diversion of flow such that stream flow in RSW is sufficient to promote migration through the entire route from Goose Lake to upper RSE (Figure 1.1-2). Based on Sabina's response, the following proposed term and condition was generated by DFO and agreed to by Sabina during the FEIS final hearings:

DFO Proposed Term and Condition #2 (DFO-T-2):

The Proponent commits to engage DFO and other interested parties during the regulatory phase on the design, construction, and operation of adequate fish passage to permit migration of Arctic Grayling from Goose Lake to natural spawning and rearing habitat located in upper Rascal Stream East, south of the planned airstrip. Any additional information required to ensure the design of the fish passage will be completed prior to significant construction activities at the Goose Property.

This memorandum presents preliminary information on the design, construction, and operation of fish passage mitigation (i.e., the Rascal Fishway and subsequent flow diversion through RSW) with the primary objective of ensuring the migration potential of Arctic Grayling from Goose Lake to natural spawning and rearing habitat located in upper RSE via RSW. A monitoring program has also been proposed to determine if the fish passage mitigation, once operating, meets this objective.

1.2 Objectives

The objectives of this memorandum are to:

- Outline the basic design and construction considerations (including the alignment of the Rascal Fishway) and conceptual feasibility of fish passage mitigation in ensuring adequate fish migration potential between Goose Lake and natural spawning and rearing habitat in upper RSE;
- Describe the baseline study area of the fish passage mitigation;
- Characterize anticipated effects on fisheries, including access to spawning, rearing, and migratory habitats by Arctic Grayling, following construction of fish passage mitigation; and
- Outline a proposed monitoring program to ensure fish passage mitigation is functioning as intended.

2. ENVIRONMENTAL SETTING

2.1 Study Area

The study area described in this memorandum encompasses upstream and downstream fish habitat potentially affected by the construction of the Goose Main Open Pit, the TSF and associated infrastructure at the Goose Property (Figure 2.1-1), resulting in the requirement for fish passage mitigation. The proposed mitigation is located in the Wolf Watershed (Figure 2.1-1) with streams emptying into Goose Lake. The Wolf Lake Watershed is large with numerous lakes and ponds discharging first into Wolf Lake and subsequently into Rascal Lake.

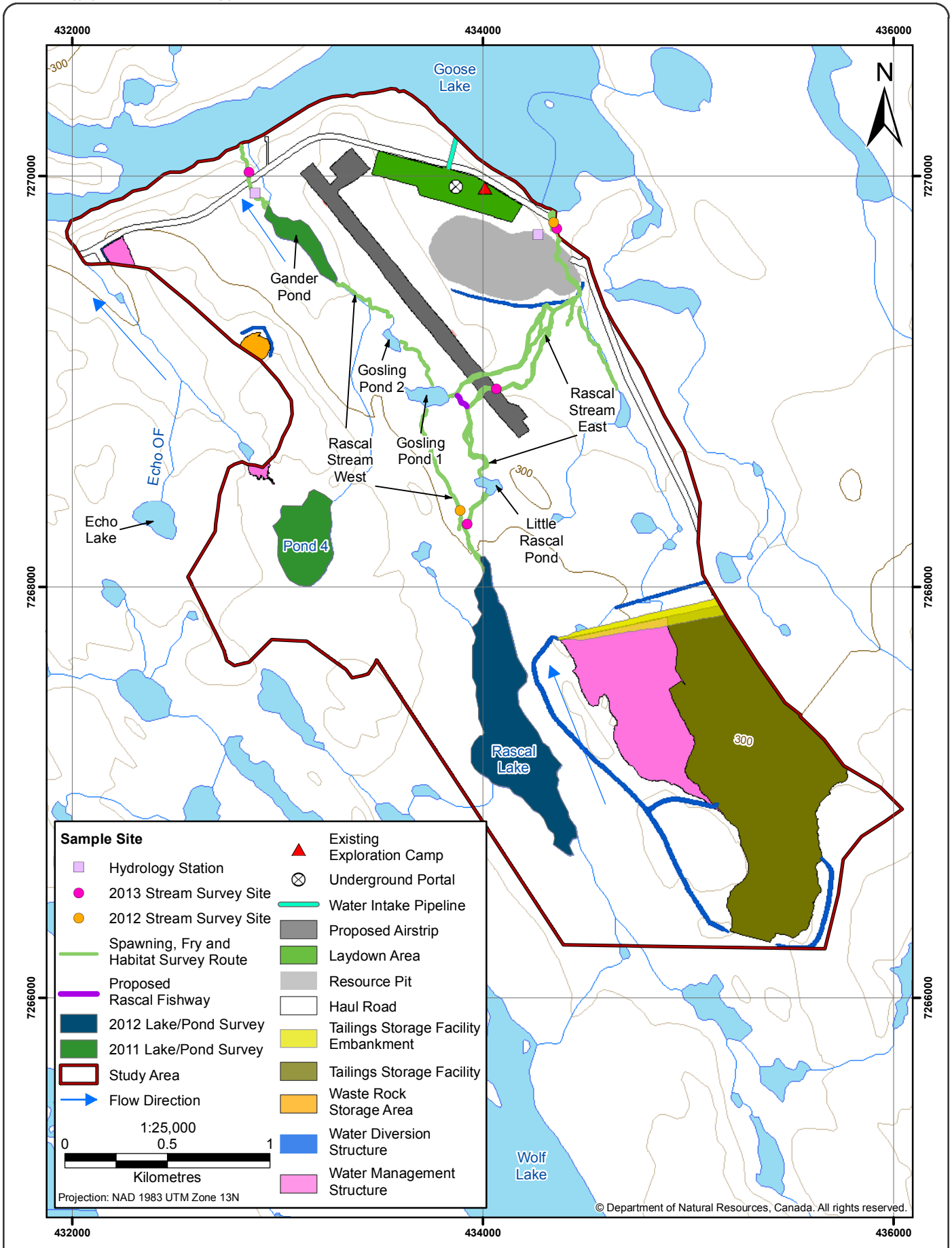
Approximately 250 m downstream of Rascal Lake, its outflow separates into two streams: RSE and RSW. RSE flows northeast towards Goose Lake, through the location of the proposed airstrip and the Goose Main Open Pit. RSW flows to the northwest initially passing through Gosling Ponds 1 and 2 and eventually through Gander Pond prior to reaching Goose Lake (Figure 2.1-1). A small outflow from Gosling Pond 1 also flows east into RSE. Baseline hydrological studies found that approximately 70% of water flowing out of Rascal Lake Outflow passes through RSE before entering Goose Lake during spring freshet; the remaining 30% flows northwards through RSW (Rescan 2012a, 2012b, 2014b). Discharge appears low in both streams during the later summer months and zero discharge was measured (i.e., 0 m^3/s) in RSW for periods of one to five weeks in three years of hydrometric monitoring (Station GL-H3; FEIS Volume 6, Chapter 1).

The conceptual design of fish passage mitigation in RSW and the characterization of potential effects on fisheries were described based on baseline data describing the study area collected from several sources. The primary data sources were baseline studies conducted by Rescan between 2011 and 2013 (Rescan 2012a, 2012b, 2012c, 2012d, 2012e, 2014a, 2014b). Figure 2.1-1 presents a summary of sites sampled.

2.2 Fisheries

Arctic Grayling are a relatively long lived (30+ years) iteroparous species that spawn early in the spring in small streams over a variety of substrates ranging from mud to boulders, although gravel is preferred (Scott and Crossman 1973; Hubert et al. 1985; Stewart et al. 2007). Juveniles tend to rear in these streams for most of the summer, while adults rear in lakes, to which they return after spawning (Table 2.2-1; Hubert et al. 1985). Both adults and juveniles overwinter in larger rivers and lakes upstream and downstream of spawning areas (Stewart et al. 2007). The preferred stream habitat characteristics for each life stage of Arctic Grayling are summarized in Table 2.2-2. In general, all life stages prefer shallow, moving water with gravel and cobble substrates. Adults prefer water velocities up to 119 cm/s and juveniles between 0 and 25 cm/s.

Baseline data were collected from RSE, RSW, Rascal Lake, Gander Pond, and Gosling Ponds to characterize fisheries resources in the waterbodies prior to construction of the airstrip at the Goose Property and subsequent fish passage mitigation activities (Figure 2.1-1). The following section summarizes the fisheries resources in each of these waterbodies.



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Sample Site Locations and Study Area

Figure 2.1-1

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Table 2.2-1. Life History Periodicity Table for Arctic Grayling

Species/Life Stage	Habitat	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arctic Grayling													
Spawning	Streams/Rivers												
Hatching	Streams/Rivers												
Fry rearing/migration	Streams/Rivers												
Rearing/overwintering	Rivers/Lakes												
Adult migration	Streams/Rivers												

Note: Information compiled from Scott and Crossman (1973) and from field observations.

Table 2.2-2. Preferred Habitat Characteristics for Each Life History Stage of Arctic Grayling

Habitat Features	Life Stage			
	Spawning Adults/eggs	Foraging Adults	Rearing and Foraging Fry	Rearing and Foraging Juveniles
Habitat Type	Clear, fast-flowing streams	Middle and upper reaches of small, clear tributaries in riffles, slow-moving shallows, and pools	Shallow pools and side channels of clear streams, in close proximity to where they hatched	Middle and lower reaches of small, clear tributaries in riffles, slow-moving shallows, and pools
Depth Range (m)	A few cm to 1 m	0.2 - 2.8 m; preference 0.5 - 1.34 m	0.05 - 0.85 m; preference 0.08 - 0.45 m; larger fish tend to move to deeper waters but not necessarily faster velocities	0.2 - 1.16 m; preference for 0.2 - 0.8 m
Velocity Range (cm/s)	<150 cm/s, optimal velocities 34 - 119 cm/s	<150 cm/s; optimal velocities 25 – 90 cm/s	<80 cm/s; optimal velocities 0 - 15 cm/s	<50 cm/s; optimal velocities 0 - 25 cm/s
Substrate Size	Clean substrates; unemdedded gravel (including pea-sized), sand, rubble	Gravel, large boulder and cobble	Silt to boulder, with a preference for sand and fine gravel (depends on presence of other species)	Silt to boulder, with a preference for sand and fine gravel with cobble
Cover	Preferred cover is sometimes under ice; eggs in interstices or gravel substrate to a depth of 5 cm	Preferred abundance of cover > 25 cm in size, deep pools	Preferred cover is in substrates (gravel to boulder), overhead vegetation also used	Preferred cover is rocks, cut banks or overhanging/instream vegetation

Note: Data obtained from Stewart et al. (2007), Hubert et al. (1985) and Larocque et al. (2014)

2.2.1 Rascal Stream East (RSE)

RSE is the main migratory corridor for Arctic Grayling moving between the Goose and Wolf watersheds throughout the open-water season and likely provides a critical pathway for fish migrating between summer and winter rearing habitat. Rascal Lake has a maximum depth of 3.7 m and, along with Goose Lake, likely provides overwintering habitat to fish that rear in both West and East Rascal streams.

Electrofishing, fry and spawner surveys show that Arctic Grayling utilize the full length of RSE for spawning and rearing. In addition, fry, spawner, and habitat surveys completed on inflows and outflows to Goose Lake suggest that RSE has the most abundant and highest quality Arctic Grayling spawning habitat available to the overwintering population in Goose Lake. Populations overwintering upstream in Rascal Lake and downstream in Goose Lake may use the stream as a migration corridor when moving between summer and winter habitat.

The flow and substrate composition within RSE indicate that it provides good quality spawning and rearing habitat to Arctic Grayling, Slimy Sculpin, and Ninespine Stickleback (Rescan 2014a). RSE was found to have the highest juvenile fry densities (1,122 fry) in the Goose Property area (Figure 2.2-1). Electrofishing was completed at three sites in RSE in 2013 (Figure 2.1-1; Table 2.2-3). At two sites, located under the proposed airstrip in RSE (Site 1101 and 1004, both approximately 100 m in length), a total of 15 Arctic Grayling and 11 Slimy Sculpin were captured during 525 s of electrofishing on August 11, 2013 (Rescan 2014a).

Extensive high flow (i.e., during freshet) fish habitat assessment surveys were completed for RSE in June 2013 using SHIM (Rescan 2014a). These surveys identified seven reaches between Goose and Rascal lakes (Figure 2.2-2). Overall, the upstream reaches of RSE near Rascal Lake are a mixture of braided channels intermixed with run and riffle sections with gravel, cobble and boulder substrates rated as important for Arctic Grayling spawning, rearing and foraging (Rescan 2014a).

Table 2.2-3. Fish Species Captured in Study Area Waterbodies at the Goose Property Area, 1997 to 2013

Waterbodies Sampled	Species						
	Lake Trout (*Salvelinus namaycush*)	Round Whitefish (*Prosopium cylindraceum*)	Lake Whitefish (*Coregonus clupeaformis*)	Arctic Grayling (*Thymallus arcticus*)	Burbot (*Lota lota*)	Slimy Sculpin (*Cottus cognatus*)	Ninespine Stickleback (*Pungitius pungitius*)
Rascal Lake	X	X	-	X	-	-	-
Goose Lake	X	X	X	X	X	X	X
RSE	-	-	-	X	-	X	X
RSW	-	-	-	X	X	X	X
Gander Pond	-	-	-	X	-	X	X

2.2.2 *Rascal Stream West (RSW)*

RSW flows from Rascal Lake through Gander Pond and into Goose Lake. Arctic Grayling, Burbot, Slimy Sculpin, and Ninespine Stickleback have been caught in Gander Pond and RSW (Table 2.2-2; Rescan 2014a). A fry survey of RSW in 2013 found that Arctic Grayling do utilize this stream, but in far lower densities than in RSE (99 individuals, Figure 2.2-3).

RSW has three reaches between its divergence from RSE and Goose Lake (Figure 2.2-4). The reach between Gander Pond and Goose Lake (Reach 1) has abundant instream cover, heterogeneous habitat types (riffle, pool, run, and cascade), and good rearing habitat. There are also some patches of gravel and cobble substrate that may provide spawning habitat.

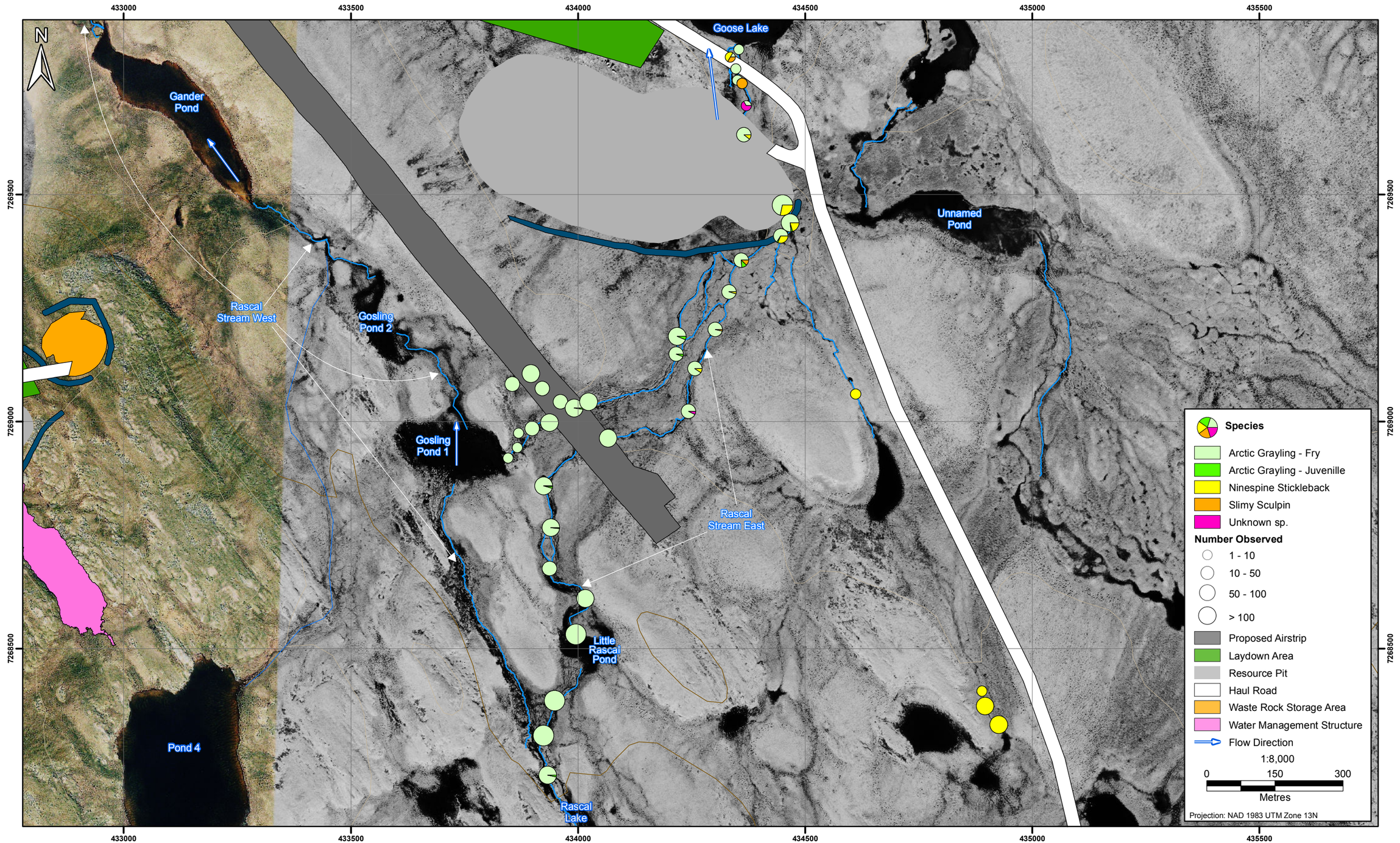

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Figure 2.2-1

Rascal Stream East
Fry Survey Observations, 2013

PROJECT #0333261-0004 GIS # BAC-06-281b October 31 2016

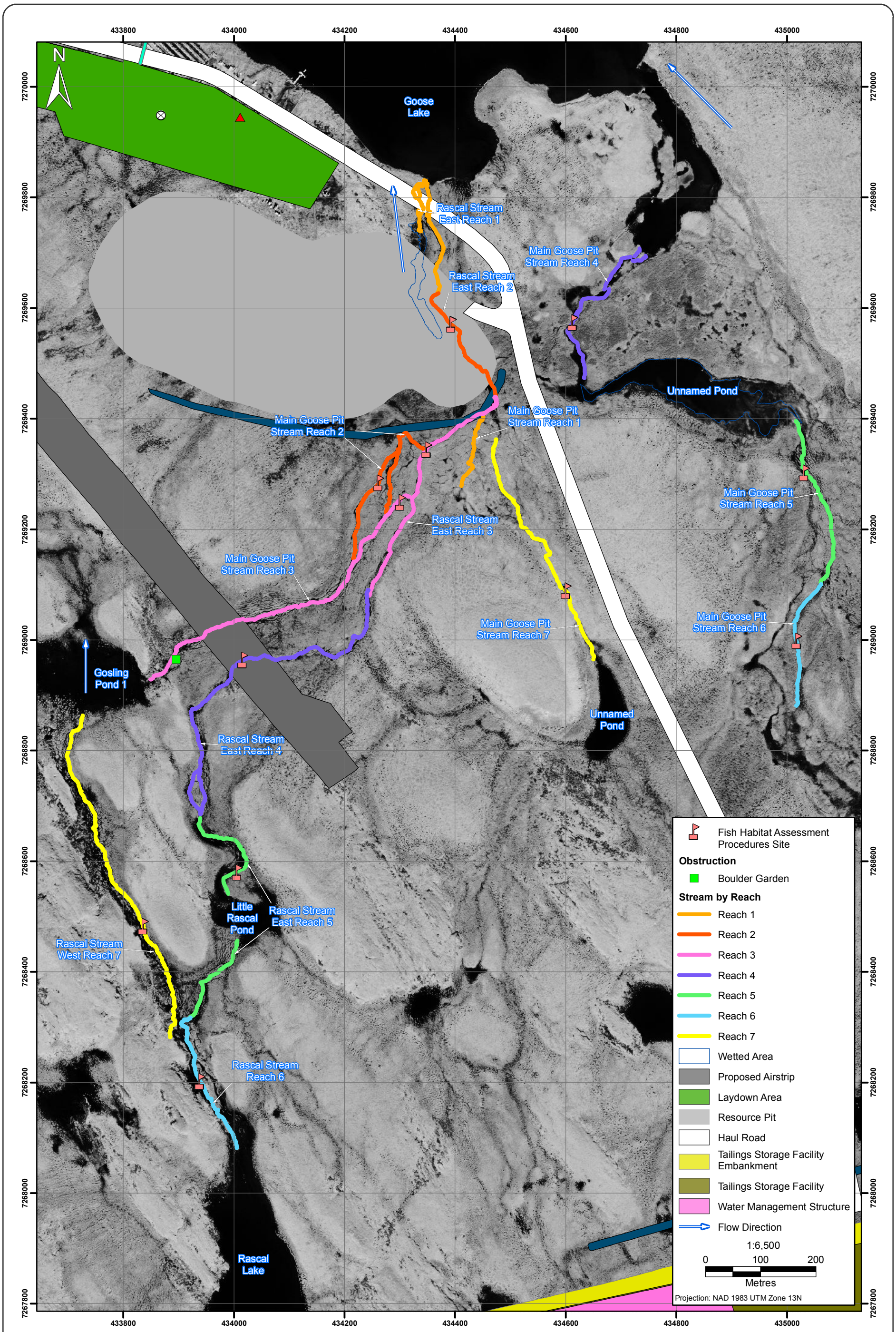

Figure 2.2-2

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Rascal Stream East and Main Goose Pit Stream Reaches and Survey Sites, 2013

Figure 2.2-2

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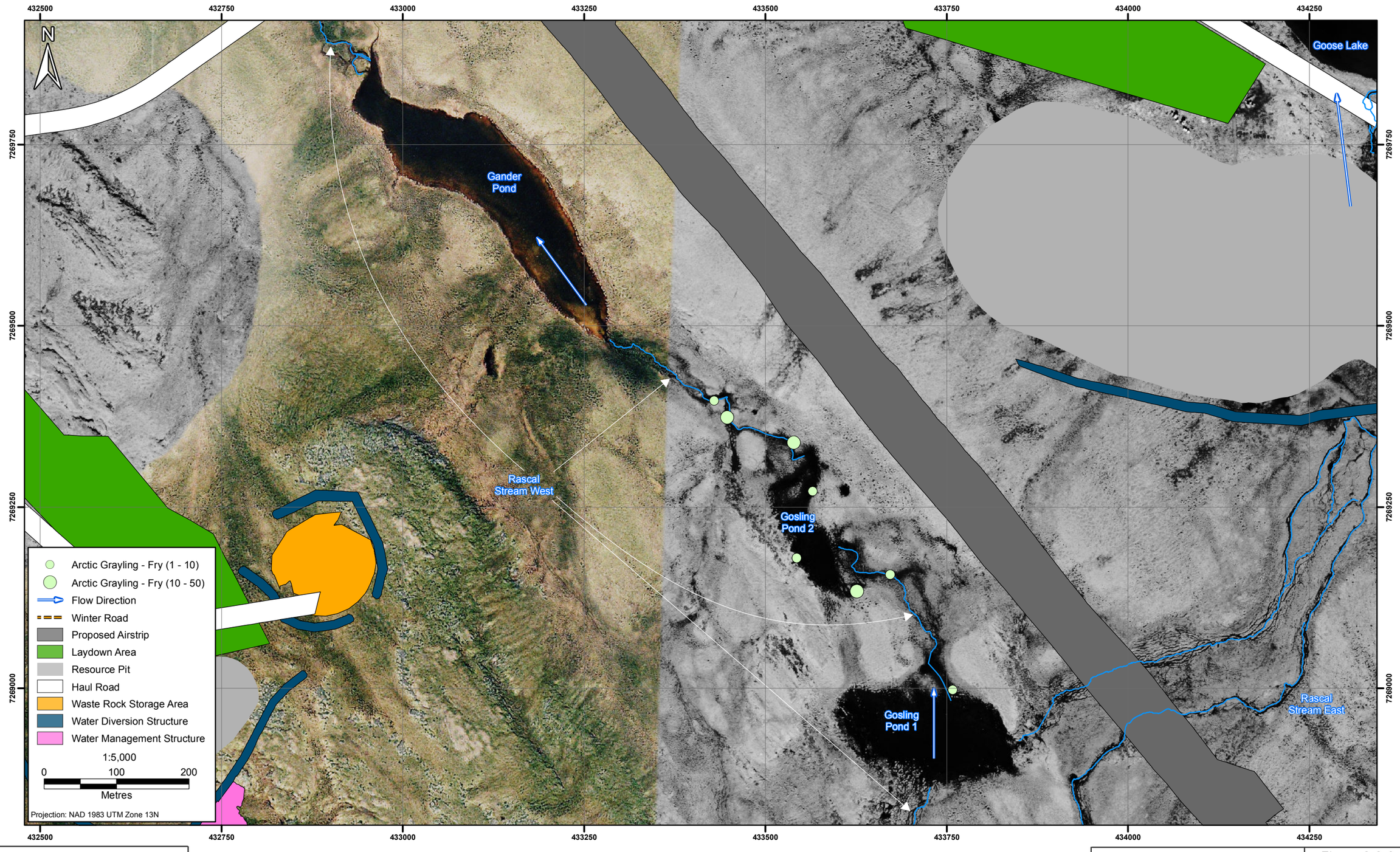

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Figure 2.2-3

Rascal Stream West
Fry Survey Observations, 2013

*PROJECT #*0333261-0004 *GIS #* BAC-06-282 *October 31 2016*

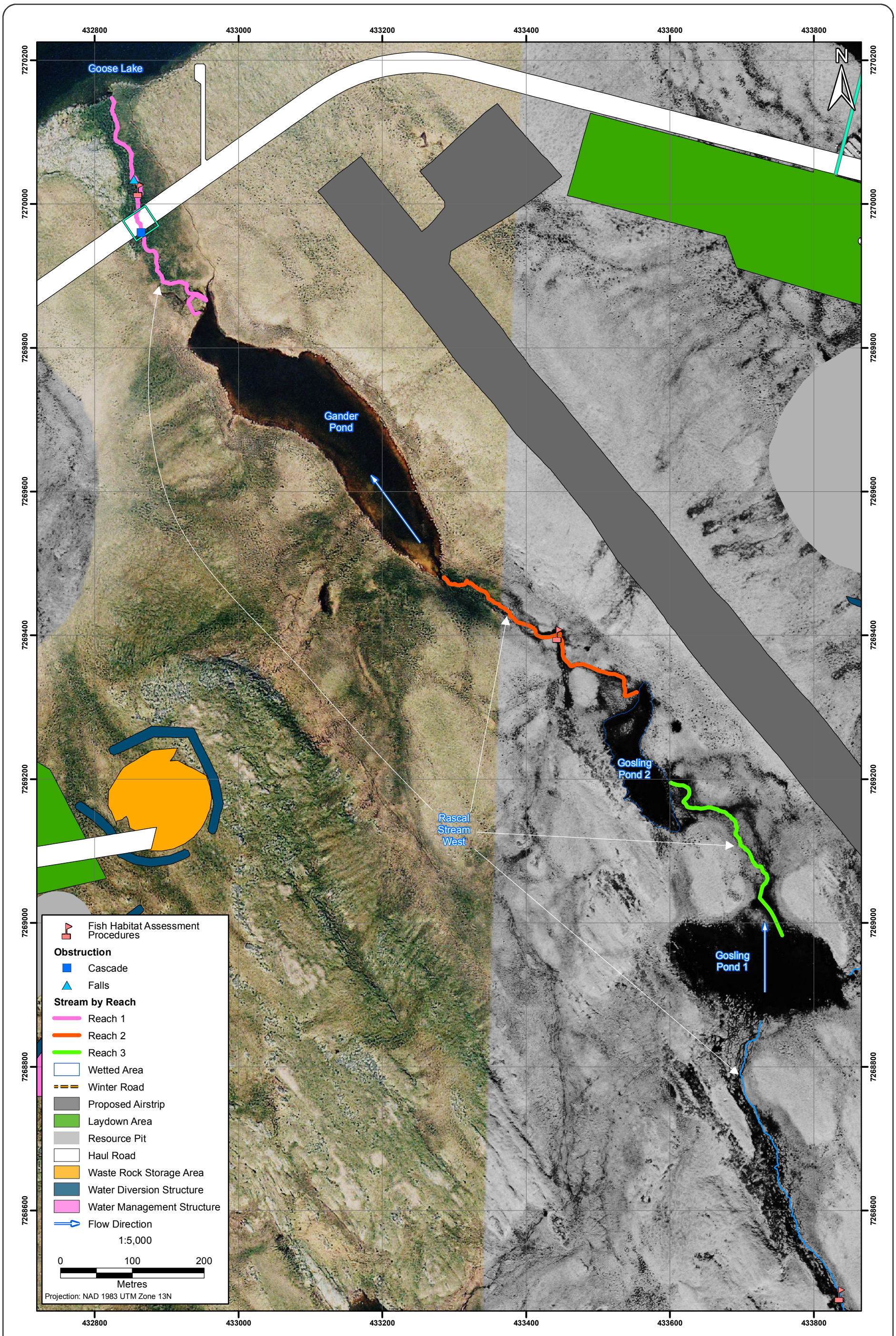

Figure 2.2-4

Sabina GOLD & SILVER CORP.

Rascal Stream West Stream Reaches and Survey Sites, 2013

Figure 2.2-4

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A small cascade located mid-reach may form a barrier to fish migration during periods of low flow, but does not form a barrier during high flow periods (Figure 2.2-4). A second cascade further downstream does not form an impassable barrier to fish but may prevent very small fish from moving upstream at low flows (Figure 2.2-4). If during the course of monitoring stream flow and fish passage (section 5) through this reach reveals that a partial barrier exists at this location, a plan will be developed to modify the channel to facilitate fish access to RSW.

The remaining two reaches (between Gander Pond and Gosling Ponds 1 and 2) are of marginal fisheries value (Rescan 2014a). Channelization is intermittent at Reach 2 (between Gander Pond and Gosling Pond 2), the Gander Pond inflow with low bankfull depth (0.15 m) indicating this reach is shallow at normal flows. The substrate is primarily fine substrate with some embedded boulder and cobbles. The quality of the habitat for rearing is fair, although the intermittent channelization and shallow depths make it unsuitable for larger stream fish. Spawning habitat is poor due to the high proportion of fine sediments. Reach 2 has marginal fish habitat overall from the intermittent channelization.

2.2.3 Gosling Ponds and Gander Pond along Rascal Stream West (RSW)

Gosling Ponds 1 and 2 are shallow waterbodies that are located between Rascal Lake (upstream) and Gander Pond (downstream) on RSW (Figure 2.2-1). Both ponds are likely shallow (< 1 m depth) with predominately fine substrates. In August 2013, the inflows and outflows of Gosling Pond 1 and 2 contained isolated pools; there was no flow in the channel at that time (Rescan 2014a). Arctic Grayling fry were observed in both ponds at relatively low numbers: likely the result of ephemeral flow conditions in the inflows and outflows, and poor connectivity to overwintering habitat (Figure 2.2-3).

Gander Pond is located downstream of Gosling Ponds 1 and 2 and it drains north into Goose Lake (Figure 2.2-4). The shoreline of Gander Pond is composed almost entirely of fine sediment (Figure 2.2-5). One permanent inflow and two ephemeral inflows were present during habitat surveys in July 2011, and the pond has one outflow to Goose Lake (Rescan 2012c). Gander Pond has a maximum depth of approximately 1.5 m. Habitat quality of Gander Pond is poor due to its shallow nature and due to the near total absence of cover available to fish.

3. PROPOSED ACTIVITIES

3.1 Fish Passage Mitigation Activities

The proposed fish passage mitigation will include the construction of the Rascal Fishway and the subsequent diversion of flow through the Rascal Fishway and downstream through RSW (Figure 1.1-2). The proposed timing for the construction of the Rascal Fishway is in Year -3 (Table 3.1-1).

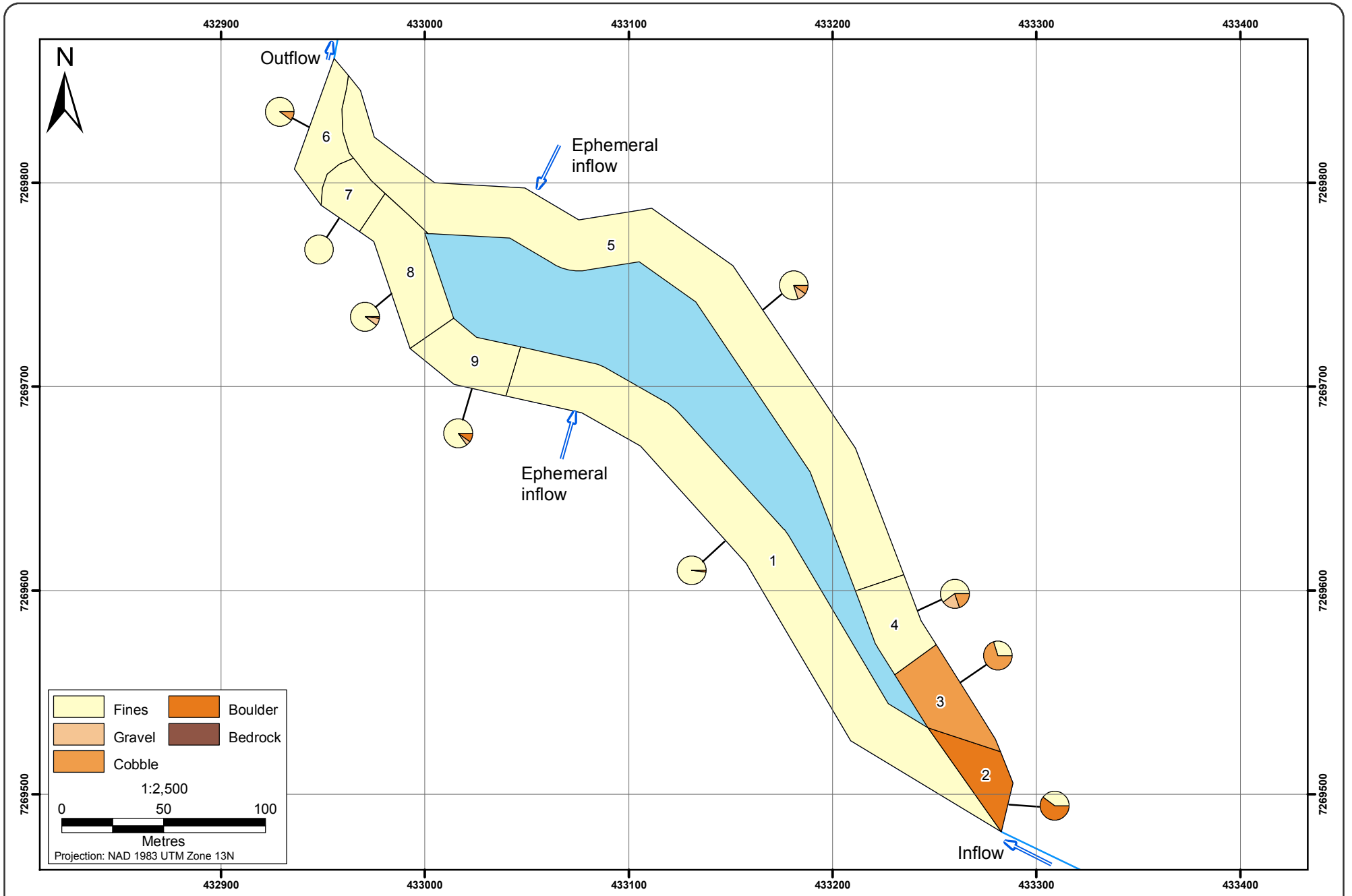

Figure 2.2-5

Sabina GOLD & SILVER CORP.

Shoreline Substrate of Gander Pond

Figure 2.2-5

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Table 3.1-1. Timing of Proposed Fish Passage Mitigation Activities

Activity	Year 1	Year 2	Year 3 to 6
Fisheries Losses	RSW (Reach 7; potential loss due to water diversion)		
Construction	Installation of berms and/or excavation, lining, and armouring of alignment during Rascal Fishway construction and flow diversion. Installation of culverts during airstrip expansion and road construction.		
Mitigation	Placement of sediment curtains to minimize sediment/erosion potential downstream into Goose Lake.		Sediment/erosion control measures.
Monitoring	Hydrological and fisheries assessments during high (freshet) and low (summer) flows.	Hydrological and fisheries assessments during high (freshet) and low (summer) flows.	Hydrological and fisheries assessments during high (freshet) and low (summer) flows in Years 3, 5 and 6.
	Arctic Grayling and Fish Habitat Monitoring.	Arctic Grayling and Fish Habitat Monitoring.	Arctic Grayling and Fish Habitat Monitoring in Years 3, 5 and 6.

The proposed alignment of the Rascal Fishway (Figure 1.1-2) was mapped using local 25 cm Lidar imagery. The alignment, located between upper RSE and the south-eastern edge of Gosling Pond 1, attempts to follow the most likely natural flow path, minimizing any rises in elevation that could result in misdirected flow, and potentially require excavation during construction. Depending on the final alignment selected for the fishway, construction may entail diverting flow using rock berms to follow a natural over-land flow path between upper RSE and Gosling Pond 1 and/or excavation, lining with a geotextile membrane, and armouring with rock over some or all of the alignment to achieve the desired flow path between upper RSE and Gosling Pond 1.

The Rascal Fishway will be designed with the objective of creating a migratory corridor between Gosling Pond 1 and upper RSE; however, the stream habitat created along the length of the fishway alignment may also serve as spawning or rearing habitat for fish. The final design and construction of the Rascal Fishway will consider depth and velocity constraints for migration of all life stages of Arctic Grayling (Table 2.2-2), though the design criteria are primarily focused at allowing passage for spawning adult Arctic Grayling to access the spawning habitat in upper RSE near Rascal Lake. As such, the water velocity range through the fishway should range between 5 to 120 cm/s, with higher velocities at freshet of up to 150 cm/s to correspond with the timing and preference of adult spawners (Table. 2.2-2). Preferred substrates lining the fishway stream bed will be cobble and unembedded gravel, which will provide spawning substrates in addition to rearing and foraging habitat for fry and juveniles as water velocities decline naturally through the summer. Adults, juveniles and fry appear to have a relatively wide range of preferred water depth, from a few centimeters to one meter. The ideal depth of the fishway will be no more than 1 m during freshet.

Operation of the Rascal Fishway may entail the diversion of flow away from the upper-most section of RSW (Rascal Stream West Reach 7 in Figure 2.2-2; identified as potential habitat loss in Figure 1.1-2) to flow through upper RSE. Then, a portion of the water will be diverted through the new Rascal Fishway connecting upper RSE to Gosling Pond 1. The remainder of the water will be directed through culverts under the airstrip towards the southern portion of Goose Lake, as previously planned and assessed in the FEIS (Sabina 2015). The diversion of flow from upper RSE into Gosling Pond 1 will be engineered such that flow is sufficient to allow for upstream and downstream migration of all life stages of Arctic Grayling through the entire route from the Gosling ponds through Gander Pond and ultimately to Goose Lake. This strategy will ensure that the upper 1.1 km section of RSE will continue to provide good quality spawning and rearing habitat to Arctic Grayling from Goose Lake, now accessed through RSW. Natural or constructed fish barriers will be used to keep fish from moving north, through the airstrip culverts, to the east side of the airstrip. A monitoring program will be implemented following mitigation activities (Section 5). If, during monitoring, barriers or seasonal restrictions to fish movement are identified in RSW, the Rascal Fishway, or upper RSE those locations may need to be adaptively managed to improve egress.

Creation of a stream channel between upper RSE and Gosling Pond 1, and the diversion of flow from upper RSE toward RSW have been previously considered and determined conceptually feasible (Rescan 2014c). In this document, the methods outlining flow modeling used to verify that adequate stream flow for Arctic Grayling migration can be conceptually attained through diversion of flow from upper RSE through RSW can be found in detail. A channel with a flow path similar to the proposed alignment of the Rascal Fishway was designed through the use of two rock berms placed just north of Gosling Pond 1. These berms were designed to divert 100% of the flow from upper RSE toward Gosling Pond 1, and subsequently downstream through RSW. Flow modelling of this diversion scenario resulted in modelled stream flows that were generally <1.0 m/s in June and <0.8 m/s in the fall over the length of RSW (including Gosling Ponds 1 and 2, and Gander Pond; Rescan 2014c). Modelled fall flows in stream habitats along the channel (excluding Gosling Ponds 1 and 2, and Gander Pond), were between approximately 0.2 and 0.7 m/s (Rescan 2014c). These modelled flows indicated acceptable velocities to allow for Arctic Grayling migration throughout RSW during the open water season (Rescan 2014c).

The final design of the fish passage mitigation will rely upon new flow modelling. This is needed to determine the amount of water from upper RSE that may be diverted through the Rascal Fishway into Gosling Pond 1 to ensure adequate depth and velocity for Arctic Grayling migration through RSW over the open water season. The proportion of diverted flow required from upper RSE is anticipated to be less than 100%.

3.2 Culvert Installation

To facilitate fish passage across the proposed all-weather road, culverts will be installed approximately 109 metres upstream of the inflow of RSW to Goose Lake (Figure 1.1-2). Culverts will be sized based on the post-mitigation flow diversion scenario described in Section 4.1. All rock used as construction material will be sourced from locally developed, geochemically suitable rock quarries already permitted or under application. The proposed time for installation is during the spring of Year 1 (Table 3.1-1), prior to snow melt and fish access to the streams.

4. CHARACTERIZATION OF EFFECTS AND MITIGATION

4.1 Characterization of Effects on Fisheries

4.1.1 Habitat Losses in RSW and RSE

An approximately 740 m section of upper RSW (Rascal Stream West Reach 7 in Figure 2.2-2; identified as potential habitat loss in Figure 1.1-2) may be lost through the operation of the Rascal Fishway. Operation may entail the diversion of flow away from this upper-most section of RSW to flow through upper RSE. This section of stream was characterized as a boulder garden during baseline studies (labeled Reach 7 of the Rascal Goose Stream; Table 3.3-2 in Rescan 2014a) and is deemed as poor to fair spawning habitat. This reach may become seasonally impassable to fish during low flow periods due to the abundance of large, closely packed boulders, and may restrict movement between RSW and RSE under natural flow conditions (Rescan 2012d). Sabina will incorporate the 740 m section of RSW into the next revision of the Conceptual Fish Offsetting Plan (FEIS Addendum Volume 10, Chapter 21).

Potential habitat losses in RSE downstream of the airstrip culverts (Figure 1.1-2) were assessed in the FEIS and offsetting was incorporated into the Conceptual Fish Offsetting Plan.

4.1.2 Access to Habitats in RSE, the Rascal Fishway, and RSW

Construction of the Rascal Fishway and diversion of flow from upper RSE through RSW will mitigate the effects of potential habitat losses in lower RSE for fish from Goose Lake, particularly Arctic Grayling that use high quality habitats in upper RSE, by ensuring fish passage during migration. The upstream reaches of RSE near Rascal Lake that will be accessible to fish from Goose Lake comprise a mixture of braided channels intermixed with run and riffle sections with gravel, cobble, and boulder substrates rated as important for Arctic Grayling spawning, rearing, and foraging (Rescan 2014a).

Although the Rascal Fishway will be specifically designed as migratory habitat to allow spawning Arctic Grayling passage between Gosling Pond 1 and spawning habitat in the upper RSE, resulting habitat conditions along the Rascal Fishway alignment may also be appropriate for use as spawning and/or rearing and foraging habitat by Arctic Grayling and other fish species such as Ninespine Stickleback, Slimy Sculpin, and Burbot. These species are already found to inhabit RSW in low densities (Table 2.2-3), despite fair to marginal baseline conditions in RSW between Gosling Pond 1 and 2. Thus, increasing access to good rearing and spawning habitat located in upper RSE through the fishway may also increase fish productivity overall species present.

4.1.3 Sedimentation and Erosion in RSW

Increased sedimentation and erosion may occur as a result of construction near and within the stream channel and through increased flow in the re-aligned stream. The construction of berms and culverts will occur during winter, when stream habitat is frozen and absent of fish, and where particulate matter suspension is avoided. Increased flow resulting from the stream re-alignment has the potential to increase the erosive potential and the amount of suspended material, particularly during freshet and in the year immediately following construction. The suspension of fine particulate matter could

result indirectly in decreased Arctic Grayling production because of behavioural avoidance of turbid sections of stream, or directly by smothering eggs laid within the channel. This could result in fewer migrants between Rascal and Goose lakes, leading to decreased spawning production.

4.2 Identification of Mitigation and Management Measures

4.2.1 Habitat Mitigation

During the regulatory phase, Sabina will update the Conceptual Fish Offsetting Plan (FEIS Addendum Volume 10, Chapter 21) to include an approximately 740 m section of upper RSW as habitat lost. This section of potential habitat loss is identified as Rascal Stream West Reach 7 in Figure 2.2-2.

4.2.2 Mitigation for Erosion and Sedimentation

Experience with other arctic diversion channels has shown that sediment can be mobilized from a new stream channel and/or from disturbed areas through thermal degradation, and transported downstream immediately after freshet flows begin in late May/early June.

During freshet of Year 1, releases in sediment are expected to occur following the winter construction of berms and culverts, potential excavation and construction of the Rascal Fishway alignment, and increased channel flows over the length of RSW due to flow diversion. Increased suspended sediment will be mitigated naturally in the three ponds (Gander, Gosling 1 and 2) where low velocities (Rescan 2014c) should result in deposition of a large portion of suspended solids. The result will be a natural lowering of concentrations of suspended solids in the water between pond reaches, and most importantly, in the most downstream reach located just upstream of Goose Lake where Arctic Grayling could enter the re-aligned stream to spawn and migrate. Moreover, the relatively flat topography over the length of the enhanced RSW should allow for additional settling onto the tundra should flows overtop existing banks.

In the event that particulates do not adequately settle prior to leaving Gander Pond, sediment curtains will be installed in Goose Lake at the mouth of RSW, to mitigate for the potential of sediments entering Goose Lake. Sediment curtains will be placed in an overlapping configuration, such that the majority of suspended particulates are captured, but also such that fish may pass between curtains and migrate between stream and lake habitats.

4.2.3 Construction Schedule and Environmental Mitigation Measures

4.2.3.1 Construction Period

The schedule for construction is presented in Table 3.1-1. Any rock berm construction, excavation, and channel lining and armoring will take place in or prior to April of Year 1 when the ground is still frozen. During the first winter season, heavy machinery can move freely around the site with limited damage to the tundra. Substrates used for construction of berms or channel armoring will be composed of clean rock (i.e., non-potentially acid generating rock). Any increase in sediment loading resulting from construction will be managed according to mitigation set out in section 4.2.2.

Detailed hydrological and fish habitat assessments will be conducted in Year 1 (see Proposed Monitoring Program, Section 6) at both high (freshet) and low flows. These surveys will allow for the identification of any adaptive management required to establish or maintain fish passage. Any additional in-water work/structures required will be designed and adapted to conditions observed and will be implemented the following winter (i.e., Year 2).

4.2.3.2 Sources of Substrate

Sources of substrate for construction of fish passage mitigation may include natural boulder and cobble substrates dug up during construction or substrates remaining in lost habitat in upper RSW (Rascal Stream West Reach 7 in Figure 2.2-2) following flow diversion. If required, these substrates will be separated from unwanted materials and retained. These substrates may be used in armouring the Rascal Fishway or for subsequent adaptive management required along the length of RSW downstream of the Rascal Fishway. Larger substrates (i.e., boulders) will be retained for potential placement in culverts. Substrate materials larger than sand will be washed (whenever feasible) prior to use to reduce the amount of small particles. Only clean (i.e., non-potentially acid generating substrates) will be used.

4.2.3.3 Culvert Placement

Placement of box culverts (sea cans) or circular culverts located at meter 96 between Goose Lake and Gander Pond will occur during the winter to minimize/eliminate damage to the tundra. Culverts will be installed following best practices (BC MFLNRO 2012, DFO 2013b). Sizing of culverts to be placed will be determined such that they do not present a velocity barrier to migrating fish present in RSW (Table 2.2-3).

Regular culvert maintenance will be performed on an ongoing basis in order to prevent culvert blockage and will generally follow the DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013b). Specifically, culverts will be blocked prior to winter to prevent snow from accumulating inside the culvert and blocking flows during freshet, which would have the potential of overflooding the area, possibly leading to sedimentation and erosion.

5. PROPOSED MONITORING PROGRAM

5.1 Overview

A monitoring program will be implemented to determine if the proposed Rascal Fishway is functioning effectively as migratory habitat for Arctic Grayling. This proposed Monitoring Program will commence during Year 1, synchronous with the expansion of the airstrip, construction of the all-weather road and implementation of fish passage mitigation activities. In order to monitor the potential for fish passage and the effectiveness of flow diversion under variable annual flow conditions, monitoring will occur annually during Years 1, 2, and 3, then again in Years 5 and 6 after the new habitat has had time to settle/stabilize and mature, and following the removal of the all-weather road culverts. If the all-weather road culverts are removed at a later date, then the Monitoring Program will be modified to include monitoring during and after the culvert removal.

The main objective of the Monitoring Program is to evaluate the effectiveness of the Rascal Fishway and flow diversion through RSW in ensuring adequate passage of Arctic Grayling between Goose Lake and upper RSE. Because the pre-mitigation RSW supports fisheries under baseline conditions, a further objective of the Monitoring Program is to ensure that no serious harm to fish results from migration mitigation activities. "Serious harm" is defined in the *Fisheries Act* (1985) as the death of fish or any permanent alteration to, or destruction (PAD) of fish habitat.

5.2 Monitoring Program Schedule and Design

Table 5.2-1 presents the proposed schedule for the Monitoring Program. The Monitoring Program will assess Arctic Grayling, fish community, fish habitat, stream flow, and water quality for the first 3 years following installation of the Rascal Fishway and initiation of flow diversion, then again in years 5 and 6.

Table 5.2-1. Monitoring Program Schedule and Design Summary

Monitoring Program Design Year	Year 1 Construction Year	Post-Mitigation Monitoring			
		Year 2	Year 3	Year 5	Year 6
Monitoring Component					
Stream flow	X	X	X	X	X
Water quality[1]	X	X	X	X	X
Fish habitat[1]	X	X	X	X	X
Number of Arctic Grayling spawners[1]	X	X	X	X	X
Visual counts of Arctic Grayling fry[1]	X	X	X	X	X
Fish Community Surveys	X	X	X	X	X
Number of outmigrant Arctic Grayling/other fish	X	X	X	X	X
Fish culvert passage assessment	-	X	-	-	-

Notes:
Monitoring of project construction is not included, but required during Rascal Fishway and water diversion berm construction and culvert installation.
[1] Pre-mitigation data collected in 2013 for RSE and RSW (Rescan 2014a).

5.3 Detailed Monitoring Methods

5.3.1 Stream Flow

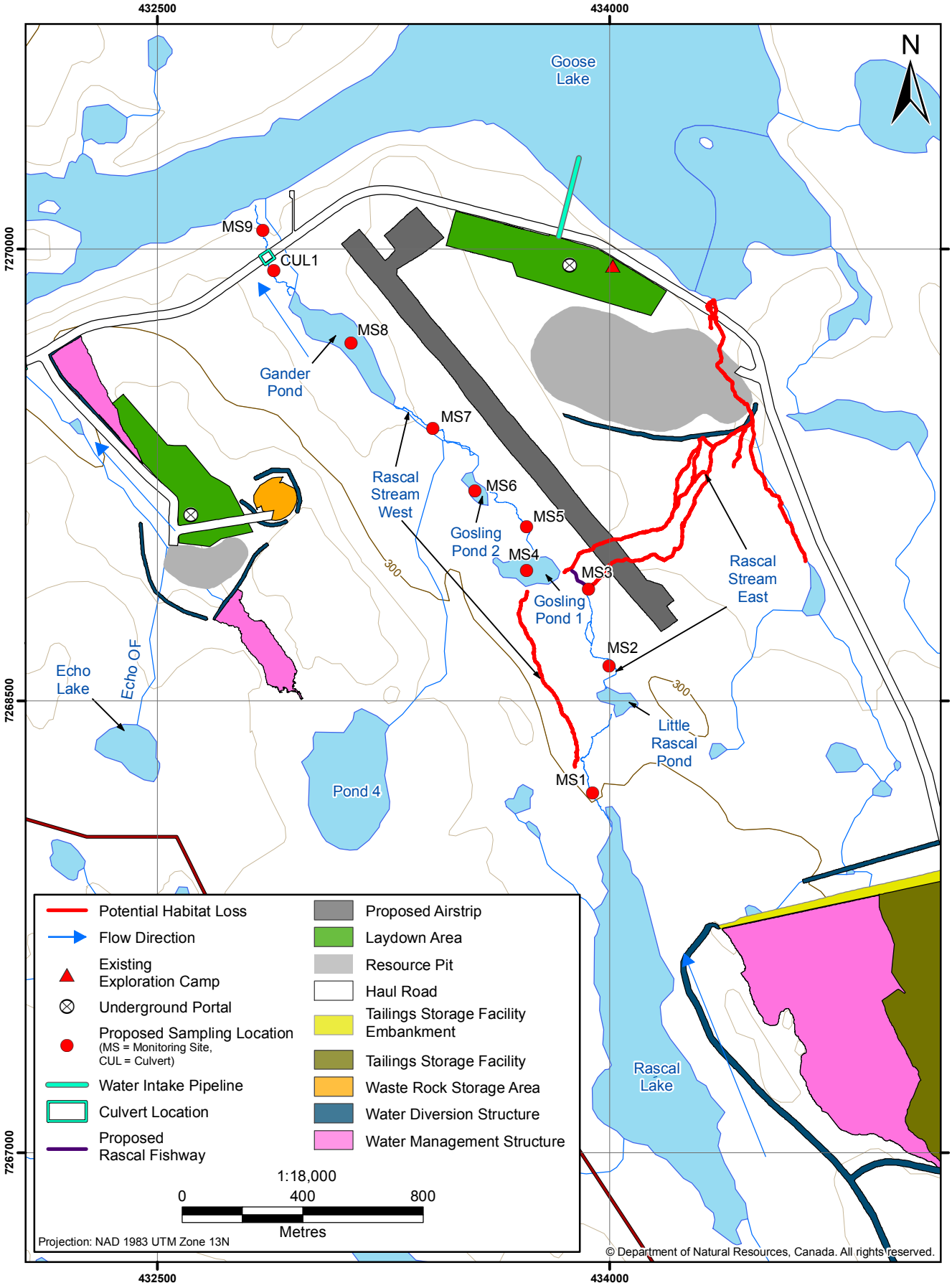
Detailed hydrological assessments including stream velocity and channel profiles will be required to confirm predicted flows following construction of the Rascal Fishway and diversion of flow through RSW. Hydrological assessments will be taken monthly during the open-water season at five transects along each reach of RSW and RSE (i.e., five reaches; between ponds), as well as at five transects in the Rascal Fishway. Hydrological assessments will provide depth and velocity data to determine if flow conditions are within the range of values to support the Arctic Grayling life cycle. In addition, velocity measurements will be taken at the upstream and downstream ends of each culvert (and within each culvert) to ensure Arctic Grayling migration is not restricted by culvert velocities.

5.3.2 Water Quality

Construction activities and erosion resulting from increased flows in stream channels have the potential to result in increased suspended sediments in RSW. To ensure that water quality remains within Canadian Council of Ministers of the Environment (CCME) guidelines for aquatic life or at natural background concentrations, water quality will be monitored at nine locations within the study area (Figure 5.3-1; Table 5.3-1). Water temperatures will be monitored with stationary data loggers installed at each water quality sampling station. Manual measurements will also be taken each time data are collected.

5.3.3 Fish Habitat

Following construction of the Rascal Fishway, initiation of diversion of flow through RSW, and culvert installation, fish habitat surveys will be conducted along the length of RSW, the Rascal Fishway, and upper RSE using SHIM twice per year, once during high and once during low flows. Fish habitat assessments will be used to ensure the mitigation meets migration habitat requirements for all life stages of Arctic Grayling and to identify any impediments to Arctic Grayling migration that may arise as the channel stabilizes/settles following construction and initial flow diversion. Fish habitat assessments will also allow for assessment of the continued suitability of the mitigation habitat for use by other fish species present in RSW (i.e., Ninespine Stickleback, Burbot, and Slimy Sculpin)



Sabina GOLD & SILVER CORP.

Proposed Monitoring Program Sampling Locations

Figure 5.3-1

Rescan an ERM company

Table 5.3-1. Proposed Sampling Sites between Rascal and Goose Lakes

Location	Site	Approximate UTM Coordinates (Zone 13N)		Adult Fish Migration	Culvert Passage	Fry Outmigration	Fish Community	Water Quality
		Easting	Northing					
RSE (downstream of Rascal Lake)	MS1	433964	7268146	X	-	X	X	X
RSE (downstream of Little Rascal Pond)	MS2	433999	7268616	-	-	-	X	X
RSE (upstream of Rascal Fishway)	MS3	433930	7268871	X	-	X	X	X
Gosling Pond 1	MS4	433724	7268933	-	-	-	X	X
RSW (between Gosling ponds 1 and 2)	MS5	433741	7269108	-	-	-	X	X
Gosling Pond 2	MS6	433554	7269199	-	-	-	X	X
RSW (upstream of Gander Pond)	MS7	433390	7269367	X	-	X	X	X
Gander Pond	MS8	433143	7269688	-	-	-	X	X
Upstream of Culvert	CUL1	432886	7269929	-	X	-	-	-
RSW (upstream of Goose Lake)	MS9	432844	7270030	X	X	X	X	X

Notes:
RSW = Rascal Stream West, RSE = Rascal Stream East, MS = Monitoring Site.
Each site will encompass a 100 m section of stream.
The upstream and downstream limits of each site will be determined during Year 1 of the monitoring program.

5.3.4 Arctic Grayling Spawner and Adult Spring Migrant Monitoring

Along with visual spawner counts conducted at the onset of spring melt, Arctic Grayling spawners and migrants will be enumerated as they move between Rascal and Goose lakes via RSW, the Rascal Fishway, and upper RSE using fish boxes according to the schedule set out in Table 5.2-1. Four fish boxes will be installed in the spring to track migrations as soon as water begins to flow and boxes will be removed when spawner numbers decline to zero, typically occurring at the end of June. One fish box will be located at the outlet of Rascal Lake (Site MS1), and another box will be located at the inflow to Goose Lake (Site MS9; Table 5.3-1) to determine the origin of Arctic Grayling spawners accessing the stream. Two additional fish boxes will be located between Goose and Rascal lakes, one directly upstream of the Rascal Fishway (Site MS3), and one downstream of Gosling Pond 2 (Site MS7; Table 5.3-1). These boxes will provide information on access to and use of the Rascal Fishway and downstream reaches of RSW affected by flow diversion by Arctic Grayling spawners. The ratio of visual-survey-fish-counts to box-trap-counts will also be calculated to examine for potential visual underestimation during the spring spawner surveys.

The fish boxes will be serviced once each day during peak spawning migration and once every two days after peak migration. During each visit, all fish will be counted, identified to species, sub-sampled for length and weight, and released in the direction they were swimming. All Arctic

Grayling ≥ 170 mm long will be tagged with a unique T-bar Floy Tag attached below the dorsal fin. Tagging of Arctic grayling will allow for evaluation of fish movement patterns and stream residence times, in addition to fish passage through the stream, the Rascal Fishway, and installed culverts, and it will also indicate what proportion of the population spawning in the Rascal Stream system overwinters in Rascal Lake or Goose Lake.

If barriers or seasonal restrictions to fish movement are identified in RSW, the Rascal Fishway, or upper RSE during adult migrant monitoring, those locations may need to be adaptively managed to improve access.

5.3.5 Summer Fish Community Surveys

Summer fish community surveys will be conducted according to the schedule set out in Table 5.2-1. Newly-emerged Arctic Grayling fry will be enumerated in early to mid-July to help determine if RSW, the Rascal Fishway, and upper RSE are being accessed successfully for spawning. Fry will be counted using timed walking surveys of the entire length of stream habitat located between Rascal and Goose lakes, including RSW, the Rascal Fishway, and upper RSE.

Electrofishing surveys will also be conducted to determine which fish species have access to/utilize habitats in RSW, the Rascal Fishway, and upper RSE following fish passage mitigation. These electrofishing surveys will take place in mid-August at the locations listed in Table 5.3-1. Fish length and weight measurements will be taken during the electrofishing surveys.

5.3.6 Fry Outmigration

Juvenile fish movement through RSW, the Rascal Fishway, and upper RSE prior to winter freeze-up will be monitored using bi-directional fyke nets. Four nets will be installed from early- to mid-July until freeze-up (~early October) at the same locations as the fish boxes (Figure 5.3-1; Table 5.3-1). Each fyke net will be serviced once a day during peak outmigration, and once every two days after peak migration. During each visit, all fish will be counted, identified to species, sub-sampled for length and weight, and released in the direction they were swimming. Fyke nets will allow for the determination of movement patterns and evaluation of fish passage by Arctic Grayling fry and juvenile fish, as well as their stream residence time and total growth of fry during their stream residence. It will also provide information as to lake preferences for overwintering habitat.

5.3.7 Culvert Passage Assessment

An assessment of upstream passage through the culvert will be completed to ensure that the culvert does not restrict access for fish. A box trap will be installed immediately upstream of the culvert in Year 2 to assess fish movement. Catch at this trap will be compared to the catch at the fish box net located at the inflow to Goose Lake (Site MS9; Section 5.3.6), downstream of the culvert.

5.3.8 Evaluating Success of the Fish Passage Mitigation

Data collected during the monitoring program will be used to evaluate the success of the fish passage mitigation.

The fish passage mitigation will be considered successful if: 1) Flow data consistently demonstrate appropriate habitat conditions for migration of all life stages of Arctic Grayling, 2) Adult fish migration and fry outmigration surveys confirm suitable fish passage through the Rascal Fishway and post-mitigation RSW, and 3) Fish habitat and community surveys confirm continued suitability/use of post-mitigation RSW and upper RSE by fish species and life stages observed during baseline studies.

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ADDENDUM APPENDIX V6-6G: WINTER ICE ROAD FISH HABITAT MEMO (NEW)

Memorandum

Date: February 10, 2017

To: Merle Keefe, Sabina Gold & Silver Corp.

From: Kerry Marchinko, ERM (PhD, R.P. Bio.)

Cc: Deborah Muggli, ERM (PhD, R.P. Bio.)

Subject: **Winter Ice Road Water Withdrawal Supplemental Information**

1. INTRODUCTION

In response to the terms and conditions set out for the Back River Project, Sabina has committed to supplying DFO with information required to satisfy DFO-3:

> *The Proponent will provide Fisheries and Oceans Canada (DFO) with the bathymetry, depth and location of proposed water withdrawal sites, volumes to be extracted, anticipated water level decreases, and fish habitat features within each waterbody proposed to be used for winter water withdrawal in support of the construction of the winter ice roads. This will be provided primarily during the regulatory phase however in certain cases waterbodies may be added in the future. If additional waterbodies are required the Proponent commits to provide all required information on the additional proposed lakes, to DFO for review prior to use of these waterbodies.*

Sabina's strategy is to provide the following detail for lakes serving as potential water withdrawal sources for the Winter Road:

- Generate bathymetric maps of all potential water withdrawal source lakes along the Winter Road Alignment using methods based on satellite imagery;
- DFO's protocol for winter water withdrawal will be applied, where no more than 10% of the under ice volume for lakes deeper than 3.5 m will be extracted;
- Provide locations of proposed water withdrawal sites, calculate the depth, volume, maximum withdrawal limits and maximum reduction in depth for each lake;
- Identify any potential for changes in overwintering capacity for fish; and
- Identify any potential for changes to spawning shoal habitat for fall spawning fish species.

1.1 Bathymetry

Bathymetric maps will be generated for all potential water withdrawal source lakes along the winter ice road alignment using stereophotogrammetry of satellite imagery. Satellite imagery has been used to generate highly detailed bathymetric maps in northern regions using DigitalGlobe's Worldview-2 satellite with the Coastal Blue, Blue and Green colour bands (Legleiter et al. 2014; Dörnhöfer and Oppelt 2016; Appendix A). These colour bands allow the identification of detailed lake bottom topography to a depth of 30 m and will provide more precise identification of

bottom features than traditional bathymetry collected using one longitudinal and two (minimum) perpendicular transects, as indicated in Fisheries and Oceans Canada's (DFO) operational statement for winter water withdrawal (DFO 2010). The Coastal Blue colour, along with Blue and Green colour bands enable maximum water penetration, and the collection of large amounts of high-resolution stereo imagery at the ideal angle for water penetration. The advantage of this approach is that multiple images can be registered using tie points that are visible on land and in the water, and the resulting stereo composite can be used to calculate water depth. This level of topographic detail will be useful for identifying fish habitat features, such as shoals, and assessing fish habitat for fall spawning species (Lake Trout, Arctic Char, whitefish and ciscoes) during the application for a *Fisheries Act* (1985) Authorization, if required.

Briefly, the method proposed will use stereophotogrammetry interpretation methods to collect a three dimensional Digital Elevation Model (DEM) of each lake bottom. Source materials include newly acquired stereo satellite imagery (from DigitalGlobe's Worldview-2) and ephemeris (geographic position) data to establish image orientations. Trained photogrammetrists from an Aeroquest Mapcon (external to ERM) will use the surrounding terrain characteristics to interpret slopes entering into the lake at the shorelines. These slopes will be extrapolated out into the water body to connect with the lake bottom topography visualized through the Coastal Blue, Blue and Green bands. Photogrammetrists commonly use similar techniques, and available visual cues, to interpret ground underneath dense tree canopy where the ground is obscured. Any additional information about a lake, such as known depths, will be taken into account if available. A shoreline break line will also be captured and used to generate an estimated lake volume, when used in combination with the collected bathymetry elevation data. Recent studies (Ehses and Rooney 2015; Mohamed et al. 2016) indicate that an accuracy of approximately 0.2 m can be achieved using high quality satellite imagery (e.g., LiDAR) and similar sterophotogrammetry interpretation methods.

Upon acquiring the imagery data, it is anticipated that data analysis could take up to approximately 4 weeks. ERM will then conduct quality assurance/quality control (QA/QC) test of the data analysis of up to 2 weeks in duration. This QA/QC will involve comparing satellite generated bathymetric contours with the existing bathymetry previously assessed along the winter road alignment using Ground Penetrating Radar and hydroacoustic methods.

1.2 Lake Parameters

Once bathymetric maps have been modeled, the maximum depth and total storage volume of the lake will be calculated from the generated contours. Maximum withdrawal limits will be derived by assuming that 10% of the volume of water available under ice will be withdrawn. For lakes above the treeline, the maximum ice thickness is assumed to be 2 m (DFO 2010). The maximum reduction in water depth (in meters under ice) will also be calculated assuming 10% of the water volume will be extracted.

1.3 Overwintering Capacity

The overwintering capacity of each lake will be assessed as a measurement of area (m^2) using bathymetric contours. Overwintering habitat will be classified into two categories: Fair Overwintering Habitat (between 2.5 m and 4 m depth) and Good Overwintering Habitat (> 4 m depth). In general, lake morphometry (i.e., lake size, depth, and shape) and productivity are

important determinants of the overall oxygen inventory in a lake (Lampert and Sommer 2007). Shallow lakes that have a large sediment surface area to water volume ratio tend to lose much of their DO budget to sediment decomposition processes (Lampert and Sommer 2007). In Arctic lakes, DO inputs to a lake can be very low during the ice-covered season (lasting eight or nine months of the year) because ice and snow form a barrier to atmospheric exchange and light penetration needed for photosynthetic oxygen production. The DO inventory of a lake at the onset of ice formation will be depleted over the course of the ice-covered season, as respiratory rates exceed rates of DO replenishment (White et al. 2008). In shallow lakes that have a relatively small DO budget at the start of winter and a high sediment oxygen demand relative to the lake volume, winter DO depletion is of particular concern (White et al. 2008). Published data pertaining to overwintering Lake Trout dissolved oxygen requirements in Arctic lakes are currently unavailable.

Calculations of the area within each habitat class will be completed for baseline conditions (i.e. no water withdrawal) and post-withdrawal (i.e. after 10% of the under ice water volume is withdrawn). The maximum difference between baseline and post-withdrawal will be reported as an area and also as a percentage of baseline habitat for each lake. In addition, the overall reduction in overwintering habitat across all potential water withdrawal lakes along the length of the road alignment will be reported as a percentage of baseline habitat.

1.4 Spawning Shoal Habitat

Fall-spawning fish in the Arctic (Lake Trout, Arctic Char, whitefish and ciscoes) spawn prior to, or during the early stages of ice formation, but they must spawn below the maximum depth where ice and natural drawdown penetrate at a later date to guarantee that their eggs do not freeze or desiccate. Water withdrawal associated with winter ice road construction that causes under-ice drawdowns to stay within the lake's natural range are unlikely to affect spawning beds as these local populations of fish would be adapted to avoid these high-risk areas. However, drawdown that exceeds the natural range could be detrimental to egg survival, particularly if fish spawn immediately below where lake ice commonly extends.

Spawning habitat for fall spawning species will be examined using a risk level framework, conducted after collection of bathymetric data on each potential water withdrawal lake along the winter ice road alignment. Prior to determining the risk level, data from the bathymetric survey will be used to calculate the change in under ice water level due to water withdrawal during winter ice road construction. First, the elevation of under ice water level will be calculated for baseline conditions (i.e. no water withdrawal) assuming 2.0 m ice thickness. Second, post-withdrawal under ice water elevation will be calculated assuming that a maximum of 10% of the under ice water volume is withdrawn. The maximum difference between baseline and post-withdrawal under ice water elevation will be reported in meters for each lake. Once the change in under ice water level has been calculated, the risk level framework will be applied to examine the potential for alteration of spawning habitat availability.

Risk level framework: The risk of loss to spawning habitat and incubating eggs occurs when under ice water levels drop below that normally experienced by fall spawning species. Baseline data collected at eight sites within the Back River Project area over the years 2011, 2012, and 2013 indicate that average difference in ice thickness within a lake over the sampling period averaged

0.21 m (1 standard deviation [SD] = 0.19 m). The maximum difference was up to 0.65 m at Reference Lake B. Thus, fall spawning species would normally experience a 0.21 m change in ice thickness and any reduction of water level due to ice road construction less than 0.21 m would be considered of negligible risk to incubating eggs and represent no potential loss in spawning habitat. A drop beyond 0.21 m in would present progressively greater risk to incubating eggs and spawning habitat loss (Table 1).

Table 1. Risk Level Framework for Fall Spawning Habitat

Risk of Spawning Habitat Loss	Change in Water Elevation under Ice (m)	Reasoning
Negligible	< 0.21	The reduction in water level lies within the average change in ice thickness (i. e. within normal variation).
Low	0.22 - 0.41	The reduction in water level remains within 1 SD of the average
Medium	0.42 - 0.8	The reduction in water level remains between 1 and 2 SD of the average
High	> 0.8	The reduction in water level is beyond 2 SD of average and there is less than a 5% chance for this occurring naturally.

After each potential water withdrawal lake has been assessed within this framework, the list of potential lakes can be refined in order to avoid, mitigate or offset any potential harm to incubating eggs and spawning habitat. This refinement process, along with the location of each lake and a full assessment of the potential effects of water withdrawal due to winter road construction on fish habitat, will be made during the application for an authorization under Paragraph 35(2)(b) of the *Fisheries Act* (1985).

2. SUMMARY

Sabina commits to providing DFO with the information collected along the winter ice road alignment to satisfy term and commitment # DFO-3. Specifically, Sabina will submit the bathymetric maps, estimates of volume, depth and the maximum limits to their reduction, and estimates of potential losses to overwintering and spawning habitat for fish. Although it is not anticipated that winter ice road construction will require an authorization under the *Fisheries Act* (1985), the description of potential effects and the appropriate avoidance and mitigation measures will be included in the application for a *Fisheries Act* Authorization for the Project.

Prepared by:

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Principal Consultant, ERM

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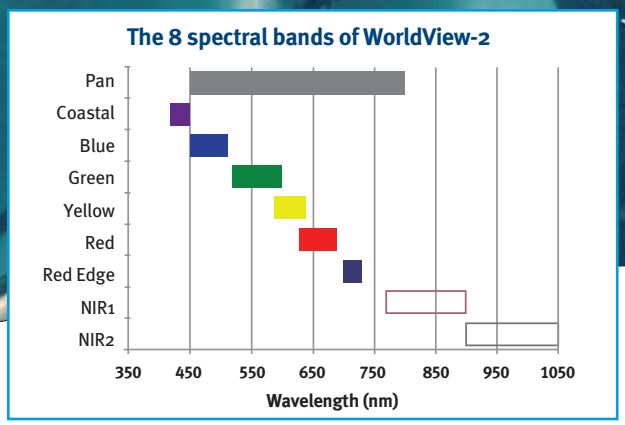
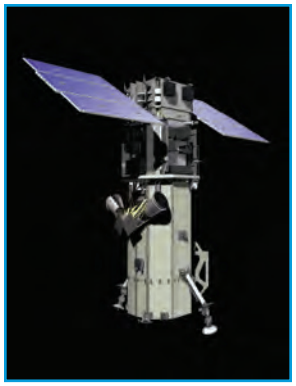
— Appendix A —

DigitalGlobe Bathymetry Datasheet



Bathymetry

Launching in Sept/Oct 2009, WorldView-2 will be the first high resolution satellite to provide half-meter panchromatic resolution and 1.8 meter multispectral resolution across 8 spectral bands. With unprecedented agility and a collection capacity of 975,000 km² per day, WorldView-2 will double the DigitalGlobe collection capacity and provide worldwide intra-day revisit capabilities.



WorldView-2 is the first high-resolution multispectral satellite to provide a Coastal Blue detector (400-450nm) enabling it to see further into the water and support bathymetric studies around the globe. With unsurpassed accuracy, agility and collection capacity, WorldView-2 is delivering comprehensive new solutions for the marine community.

Remote sensing of the shallow ocean floor will now become much clearer, thanks to the addition of the Coastal Blue band. Analysts will be able to discriminate features more accurately and increase the scope of remote sensing applications. And, thanks to WorldView-2's ability to collect large volumes of stereo imagery, new photogrammetric techniques for calculating ocean depth are finally possible. Current, accurate depth measurements will provide increased navigational security, and support detailed mapping and modeling applications.

Applications

Updating navigational hazards

Current and accurate nautical charts are critical to the safety of marine navigation. With global coverage and continuous collections, the opportunity to create and update charts rapidly is a dramatic improvement over current capabilities.

Coastal modeling

Predicting the effects of storm surge and tsunamis requires a detailed understanding of the near-shore environment. With photogrammetric techniques, the entire coastline can be mapped simultaneously above and below the water, providing unprecedented continuity and critical insights.

Marine habitat monitoring

Government agencies monitor coastal areas to document changes to protected habitats. The ability to map large under water areas, and classify marine habitats with great detail enables more efficient responses and a better understanding of the environment.

Benefits

- Provide navigational charts for remote places that do not have accurate surveys
- Frequently update dynamic areas, such as river deltas and barrier islands
- Locate debris deposited by storms, to efficiently direct cleanup operations

- Map properties and infrastructure that are at risk due to coastal inundation
- Model the effects of storm surge to create better emergency response plans
- Rapidly conduct change analyses, in order to test and refine existing models

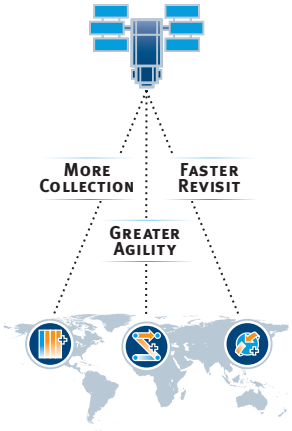
- Rapidly identify changes that can indicate the early effects of pollution
- Develop accurate models of reef recovery with bathymetric studies after catastrophic events
- Monitor the impact from coastal development such as offshore wind farms and shallow water oil platforms

We expect to see WorldView-2 derived bathymetric measurements to propagate quickly around the globe, improving the safety of marine navigation, and providing much needed insight into the ever-changing marine environment.

Bathymetry

Design and Specifications

Launch Information	Date: Anticipated Sep/Oct 2009 Launch Vehicle: Delta 7920 (9 strap-ons) Launch Site: Vandenberg Air Force Base
Orbit	Altitude: 770 kilometers Type: Sun synchronous, 10:30 am descending node Period: 100 minutes
Mission Life	7.25 years, including all consumables and degradables (e.g. propellant)
Spacecraft Size, Mass and Power	4.3 meters (14 feet) tall x 2.5 meters (8 feet) across 7.1 meters (23 feet) across the deployed solar arrays 2800 kilograms (6200 pounds) 3.2 kW solar array, 100 Ahr battery
Sensor Bands	Panchromatic + 8 Multispectral: 4 standard colors: red, blue, green, near-IR 4 new colors: red edge, coastal, yellow and near-IR2
Sensor Resolution	Panchromatic: 0.46 meters GSD at nadir, 0.52 meters GSD at 20° off-nadir Multispectral: 1.84 meters GSD at nadir, 2.08 meters GSD at 20° off-nadir
Dynamic Range	11-bits per pixel
Swath Width	16.4 kilometers at nadir
Attitude Determination and Control	3-axis Stabilized Actuators: Control Moment Gyros (CMGs) Sensors: Star trackers, solid state IRU, GPS
Pointing Accuracy and Knowledge	Accuracy: <500 meters at image start and stop Knowledge: Supports geolocation accuracy below
Retargeting Agility	Acceleration: 1.5 deg/s/s Rate: 3.5 deg/s Time to Slew 300 kilometers: 9 seconds
Onboard Storage	2199 gigabits solid state with EDAC
Communications	Image and Ancillary Data: 800 Mbps X-band Housekeeping: 4, 16 or 32 kbps real-time, 524 kbps stored, X-band Command: 2 or 64 kbps S-band
Max Viewing Angle / Accessible Ground Swath	Nominally +/-45° off-nadir = 1355 km wide swath Higher angles selectively available
Per Orbit Collection	524 gigabits
Max Contiguous Area Collected in a Single Pass	96 x 110 km mono 48 x 110 km stereo
Revisit Frequency	1.1 days at 1 meter GSD or less 3.7 days at 20° off-nadir or less (0.52 meter GSD)
Geolocation Accuracy (CE90%)	Specification of 6.5m CE90, with predicted performance in the range of 4.6 to 10.7 meters (15 to 35 feet) CE90, excluding terrain and off-nadir effects With registration to GCPs in image: 2.0 meters (6.6 feet)



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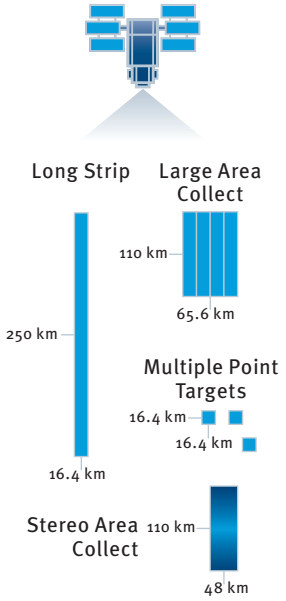

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ADDENDUM APPENDIX V6-6H: BERNARD HARBOUR REPORT AND BASELINE (NEW)

February 2017

BERNARD HARBOUR PROJECT

Arctic Char Run Baseline Report - 2016 Results

Submitted to:
Sabina Gold & Silver Corp.

Suite 375, Two Bentall Centre
555 Burrard Street
Box 220
Vancouver, BC V7X 1M7

Report Number: Doc 010 1545534.4000

REPORT

Golder Associates

Table of Contents

ACKNOWLEDGMENTS **1**

1.0 INTRODUCTION **1**

1.1 Introduction 1

1.2 Study Area 2

2.0 METHODS **4**

2.1 Water Temperature and Velocity Measurements 4

2.2 Fish Capture and Sampling 5

2.2.1 Fyke Trap 5

2.2.2 Individual Fish Measurements 6

2.3 Fish Movements 6

2.3.1 Statistical Analyses 8

2.4 Habitat Assessments 9

2.4.1 Nulahugyuk Creek 9

3.0 RESULTS AND DISCUSSION **11**

3.1 Environmental Variables 11

3.2 Fish Capture and Sampling 14

3.3 Fish Movements 16

3.3.1 Migration Success 18

3.3.2 Migration Retreat 21

3.4 Habitat Assessments 22

3.4.1 2012 Low-Flow Channel Integrity 23

4.0 SUMMARY **28**

5.0 REFERENCES **31**

TABLES

Table 2-1: Field Personnel Involved in the 2016 Bernard Harbour Study 4

Table 2-2: Water Temperature and Velocity Measurement Locations, Nulahugyuk Creek 5

Table 2-3: Locations of the Fyke Trap and Antennae Arrays, Nulahugyuk Creek 7

Table 2-4: Habitat Assessment Sections in Nulahugyuk Creek 9

Table 3-1: Lengths and Weights for Arctic Char Captured in Nulahugyuk Creek, 6 July to 25 July 2016 16

Table 3-2: Travel Time and Mean Speed of PIT-Tagged Char Migrating Upstream, 2016 18

Table 3-3: Parameter Metrics for Binary Logistic Regression of Migratory Success 19

Table 3-4: Parameter Metrics for Binary Logistic Regression of Retreat 21

Table 3-5: Summary of Potential Locations for Fish Passage Enhancement Projects 23

Table 3-6: Summary of Low-Flow Channel Data 24

Table 3-7: Comparison of 2016, 2014, and 2012 Low-Flow Channel Mean Depth Data 24

FIGURES

Figure 1-1: Bernard Harbour Offsetting Option, July 2016 3

Figure 3-1: Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from 8 July to 24 July 2016. Maximum and Minimum Daily Values Indicated by Upper and Lower Dotted Lines Respectively. Warm Water Temperatures (>21°C) Delineated by the Dashed Line 11

Figure 3-2: Monthly mean (maximum daily) temperatures reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut 12

Figure 3-3: Daily Stream Discharge (m^3/s) Calculated for Nulahugyuk Creek Between 7 July and 25 July 2016 13

Figure 3-4: Monthly precipitation totals reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut 13

Figure 3-5: Length-Frequency Distribution of Arctic Char Captured in the Fyke Trap 16

Figure 3-6: Daily Captures of Migratory Char in Nulahugyuk Creek, 2014 (A) and 2016 (B). D/S = downstream travelling fish and U/S = upstream travelling fish 17

Figure 3-7: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Stream Discharge (x), Holding Char Body Weight Constant at 3.90 kg 20

Figure 3-8: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Char Body Weight (y) Holding Mean Stream Discharge Constant at 0.408 m^3/s 20

Figure 3-9: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2014 22

Figure 3-10: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2016 22

PHOTOGRAPHS

Photo 2-1: Two-Way Fyke Net Trap at Mouth of Nulahugyuk Creek, July 2016 6

Photo 2-2: Antennae-Array Location (LDSA); Photograph Facing the Right Downstream Bank of Creek, July 2016 8

Photo 3-1: Adult Arctic Char Captured During Their Upstream Migration on 21 July 2016 14

Photo 3-2: Juvenile Arctic Char Captured During Their Downstream Migration on 12 July 2016 15

Photo 3-3: 2012 Project 1, Facing Downstream, 8 July 2016 25

Photo 3-4: 2012 Project 2, Facing Downstream, 8 July 2016 25

Photo 3-5: 2012 Project 3 (Upper Section), Facing Upstream, 8 July 2016. 26

Photo 3-6: 2012 Project 4, Facing Downstream, 8 July 2016 26

Photo 3-7: 2012 Project 5 (Top Section), Facing Downstream, 8 July 2016 27

Photo 3-8: 2012 Project 5, Showing Failed Directional Weir Near Right Downstream Bank, 15 July 2016 27

Photo 3-9: 2012 Project 5, Showing Repaired Directional Weir Near Right Downstream Bank, 15 July 2016 28

APPENDICES

APPENDIX A
Project Photos

APPENDIX B
Fish Catch Data for Lower Nulahugyuk Creek, 6 to 25 July 2016

APPENDIX C
Remediation Plan

ACKNOWLEDGMENTS

Funding for this study was provided by Sabina Gold & Silver Corp. (Sabina) and the successful execution of the study is credited to the community of Kugluktuk and the staff at the Kugluktuk HTO. Their hard work in the creek and on-going support of the objectives for this project are acknowledged as critical components to its successful completion. This project was also successful because of the logistical support provided by Johnny Nivingalok (HTO Manager), Larry Adjun (HTO chairperson), and John Kaiyogana (Sabina).

1.0 INTRODUCTION

1.1 Introduction

Bernard Harbour was (and continues to be) an important land use area for a number of Inuit families in the Kitikmeot region of Nunavut (Prno and Kaiyogana 2015). Based on Traditional Knowledge collected in the area (Prno and Kaiyogana 2015), recent environmental changes have had negative implications on the local Arctic Char (*Salvelinus Alpinus*) fishery (Golder 2013). This highlights the potential benefit stream restoration activities may have on the Arctic Char fishery and the Inuit that rely on the fishery for subsistence and cultural values.

In preparation of a detailed offsetting plan to be submitted with a *Fisheries Act* Authorization application for the Back River Project, Golder was contracted by Sabina Gold & Silver Corp. (Sabina) to continue baseline studies at Bernard Harbour (specifically Nulahugyuk Creek) (Figure 1-1). The 2016 scope of work provides a numerical estimate on the Arctic Char run in Nulahugyuk Creek, which will be combined with data collected in 2014 and available Traditional Knowledge (Prno and Kaiyogana 2015) to describe a reference condition for future quantification of the benefits of creek remediation efforts (Golder 2015a). The 2016 scope of work also provides baseline data on habitat conditions for directing remediation efforts on Nulahugyuk Creek (the creek).

The 2016 field program addressed five general baseline objectives at Nulahugyuk Creek (see below). All of which were conducted within the known migration window for Arctic Char (char) at Nulahugyuk Creek, and timed to overlap during low-flow conditions in early to mid-summer when fish passage barriers (e.g., boulders) are prevalent (Golder 2013, 2015a). The work objectives were as follows:

1) Monitor the adult char (lake-bound) migration using a two-way fyke net trap (fyke trap) during low-flow conditions; results from this objective are intended to confirm that suitable conditions for fish passage are not present during the upstream migration period;

2) Monitor the juvenile char (seaward) migration using a fyke trap during the peak period of outmigration early to mid-summer (Golder 2013, 2015a); results from this work objective are intended to help understand spawning and migration successes associated with the run that produced the offspring observed during the outmigration (which are assumed to be 4 to 5 year-old fish; Golder 2013);

3) Monitor rates of movement and successful upstream passage of adult char using Passive Integrated Transponder (PIT) tags (e.g., Puffer et al. 2015); the movement data provide a direct measurement of the effects of migrations conditions (e.g., low-flows) on char in the creek for the study year under examination and are anticipated to provide a baseline condition (when combined with 2014 data) as a measurement indicator for evaluating the benefits of future remediation efforts;

4) Survey creek habitat to identify and describe problem locations where low-flow channels and/or directional weirs could be constructed to effectively increase fish passage success and hence production; and

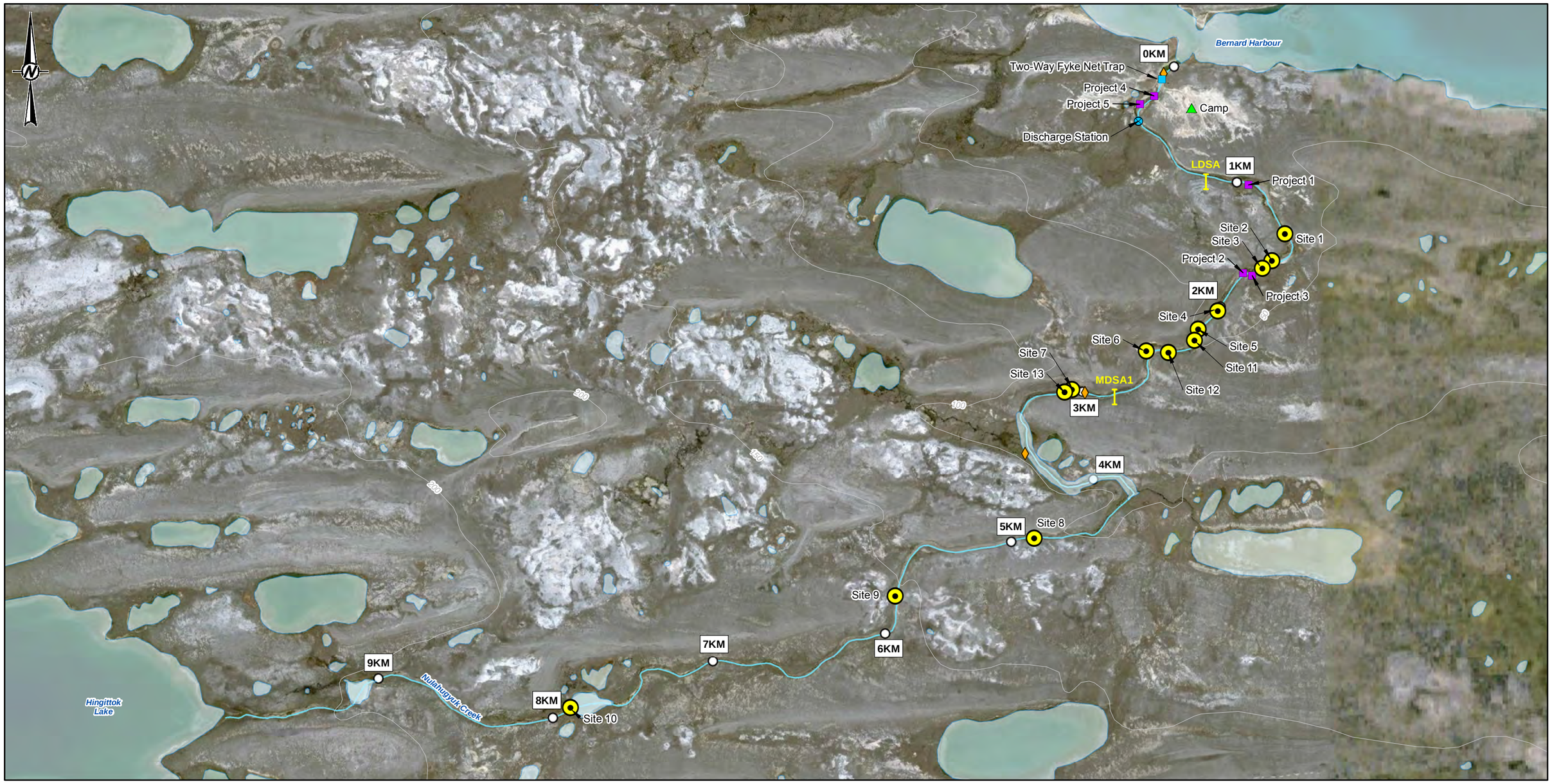
5) Evaluate the structural integrity and performance of previously constructed (2012) low-flow channels as part of a feasibility assessment of using low-flow channels to improve upstream passage for fish; this work objective is a direct follow-up from work initiated in 2012 (Golder 2013), and related to monitoring work completed in 2014 (Golder 2015a) and 2015 (Golder 2015b).

In addition to the objectives outlined above, the 2016 field program integrated conservation and community-capacity objectives of the Kugluktuk Hunters' and Trappers' Organization (HTO). This was achieved by incorporating local students and community members, and by designing a study that fosters education, stewardship, and community involvement in conservation initiatives. Past studies (e.g., Stern et al. 2008) have demonstrated a lasting positive change in environmental attitude, awareness, action, and knowledge following environmental education programs, such as the program being implemented at Bernard Harbour (Golder 2013, 2015a, 2015b). Local residents are supportive of the stream restoration work being proposed by the Kugluktuk HTO and Sabina, and wish to see the Bernard Harbour Arctic Char fishery returned to its previous status (Prno and Kaiyogana 2015).

1.2 Study Area

The Hingittok Lake-Nulahugyuk Creek drainage is located approximately 100 kilometres (km) directly north from the hamlet of Kugluktuk, Nunavut (the community), along the south coast of Dolphin and Union Strait (Figure 1-1). The Project site is about 4.5 hours (h) travel time by boat from Kugluktuk. Nulahugyuk Creek, the outflow from Hingittok Lake (882 hectares [ha] in area), flows north for approximately 10 km before entering the Dolphin and Union Strait at 68°44'52"N, 114°45'27"W, approximately 5 km southeast from an abandoned DEW-Line site (site PIN-C) (Appendix A; Photo A-1).

The contributing basin area at the mouth of the creek is approximately 125 square kilometres (km^2) and may be characterized by limited groundwater derived flows punctuated by precipitation-driven peak flows. It is expected that most of the precipitation falls as rain during the open water season. Based on Canadian climate normal station data for Kugluktuk (1981 to 2010), mean total precipitation is approximately 247 millimetres (mm), of which 144 mm falls during June, July, August, and September (see http://climate.weather.gc.ca). Daily maximum temperatures, on average, are above 0 degrees Celsius (°C) for June through September, peaking in July at 15.6°C, and below 0°C for the remainder of the year.



LEGEND

- CAMP
- DISCHARGE STATION
- FYKE NET
- KILOMETRE MARKER
- LOW-FLOW CHANNEL PROJECT 2012
- PIT TAG ARRAY
- REMEDIATION SITE 2016
- WATER TEMPERATURE LOGGER
- ELEVATION CONTOUR
- WATERCOURSE
- WATERBODY

LDSA - LOWER DOWNSTREAM ARRAY
MDSA1 - MIDDLE DOWNSTREAM ARRAY 1

KEY MAP

0 400 800
1:20,000 METRES

REFERENCE(S)
1. GOOGLE EARTH IMAGERY: © 2014 DIGITAL GLOBE
2. CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
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REVIEWED	RP
APPROVED	CS

PROJECT
BACK RIVER PROJECT
NUNAVUT, CANADA

TITLE
BERNARD HARBOUR OFFSETTING OPTION, JULY 2016

PROJECT NO.	PHASE	REV.	FIGURE
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2.0 METHODS

The field program at Bernard Harbour occurred from 5 to 25 July 2016 during the later stages of the char migration when creek conditions were anticipated to be unsuitable for fish passage. Methods followed those previously used during 2012 and 2014 visits to Bernard Harbour (Golder 2013, 2015a). The field crew comprised fisheries biologists from Golder and camp monitors, assistants, and students from the Kugluktuk HTO (Table 2-1).

Table 2-1: Field Personnel Involved in the 2016 Bernard Harbour Study

Name	Role
Paul Vecsei	Golder Aquatic Biologist
Cam Davis	Golder Aquatic Biologist
Eztiaan Groenewald	Golder Aquatic Biologist
Corby Shurgot	Golder Aquatic Biologist
Johnny Nivingalok	Logistical Support
Adrian Kudlak	HTO Bear Monitor
Perry Klengenberg	HTO Bear Monitor
Cathy Anablak	HTO Field Assistant
Andrew J Atatahak	HTO Field Assistant
Evan Nivingalok	HTO Student
Antoin Nivingalok	HTO Student
Kaelan Panioyak	HTO Student
Keegen Taptuna	HTO Student
Amber Adjun	HTO Student
David Enogaloak	Camp Supervisor
Margo Nivingalok	Camp Cook/Attendant
Shirly Hatogina	Camp Cook/Attendant
Jack Himiak	Boat Captain
Shaun Klengenberg	Boat Mate
Richard Akana	Boat Captain
OJ Bernhardt	Boat Mate
Jonathan Niptanatiak	Boat Captain

2.1 Water Temperature and Velocity Measurements

A water discharge station and staff gauge was established upstream from the mouth of Nulahugyuk Creek (Figure 1-1; Table 2-2; Appendix A, Photo A-6). Water velocities were measured between the creek banks at 0.75 m intervals along a transect set up perpendicular to the flow of water. Each point velocity was measured at 0.6 times the measured depth which is representative of the mean velocity at that vertical profile. Velocity was measured using a direct read-out Swoffer™ Model 2100 velocity meter and top-setting wading rod. Velocity and water levels were measured on eight days between 7 July and 14 July 2016. Discharge was calculated based on the point measurements of velocity, depth, and creek width at the discharge station.

Water temperature was measured for the duration of the field program at 0.25 h intervals at three locations (TWFN, BH3, and BH4) in Nulahugyuk Creek using Onset® HOBO Water Temperature Pro V2 Data Loggers (Figure 1-1; Table 2-2).

Table 2-2: Water Temperature and Velocity Measurement Locations, Nulahugyuk Creek

Site	Location (UTM, Zone 11W)		Distance to Nulahugyuk Creek Mouth (km)[b]	Year Logger Installed	
	Easting	Northing		2014	2016
TWFN[a]	590644	7627855	0.06		√
Staff gauge	590551	7627716	0.24	√	
Discharge station	590514	7627609	0.37	√	
BH2	590627	7627754	0.19	√	
BH4	590234	7626192	2.99	√	√
BH3 (Pond 1)	589922	7625874	3.58	√	√
BH5	589029	7624910	6.16	√	
BH7 (Pond 2)	587558	7624550	7.89	√	
BH8 (Hingittok Lake)	585681	7624524	9.96	√	

[a] Fyke trap positioned approximately 50 m downstream of the location used in 2014

[b] Distances were based on a revised shapefile of the creek resulting in minor differences with measurements made as part of previous baseline studies

UTM=Universal Transverse Mercator; km=kilometre; BH=Bernard Harbour

2.2 Fish Capture and Sampling

2.2.1 Fyke Trap

Fish were captured in Nulahugyuk Creek using a fyke trap installed immediately upstream from the mouth of the creek. The fyke trap was installed on 6 July 2016 and operated continuously until 25 July 2016 (Photo 2-1; Appendix A Photo A-2 to A-4). The fyke trap was installed within a shallow run area and the wings of the fyke trap spanned the creek such that fish moving upstream or downstream would be directed into the 1.8 m by 1.9 m openings. Once fish had entered the trap they were directed through a series of five funnels with openings ranging between 0.85 m by 0.85 m and 0.19 m by 0.29 m. Captured fish were directed for a total distance of approximately 6.4 m prior to entering a holding basket at the base of the net. The trap was checked several times daily and fish were removed and processed according to the methods approved under the DFO Licence to Fish For Scientific Purposes (licence #S-16/17-1015-NU) and the DFO Animal Use Protocol application (protocol #FWI-ACC-2016-015). The frequency of checks increased when water temperatures and/or capture success was high to reduce crowding and potential stress to captured fish.

Photo 2-1: Fyke Trap at Mouth of Nulahugyuk Creek, July 2016

2.2.2 Individual Fish Measurements

Fish captured at the fyke trap were enumerated, identified to species, and released on the side of the trap that corresponded with their direction of travel. Most fish were weighed (grams [g]) and measured (fork length [FL] [mm]), and a small number of representative individuals were photographed. To minimize stress during periods of warm water temperatures (greater than 17°C), some fish were enumerated but not processed at the fyke trap (i.e., were allowed to pass without measurement). Char smaller than 300 mm were classified as 'juveniles', fish between 300 and 550 mm were classified as 'immature' (or sub-adults), and fish larger than 550 mm were classified as adults (Golder 2013). Body measurement data were then combined with 2014 data to update length-weight (L-W) equations for understanding population structure and patterns in growth (Guy and Brown 2007).

Field crew members visually surveyed the creek for dead char and when located, carcass information was documented using a hand-held global positioning system (GPS), photographs (photos), and field notes. Carcasses were scanned for PIT tags with a hand-held reader, visually assessed for the presence of an external (e.g., Floy) tag, and otoliths were removed for ageing.

2.3 Fish Movements

Upstream movements of char were monitored using implanted PIT tags and Radio Frequency Identification (RFID) antenna-reader arrays (the antenna arrays), consistent with other research on salmonid migrations (e.g., Puffer et al. 2015) and the previous Bernard Harbour field programs (Golder 2013, 2015a).

Upon capture, adult char were transferred by dip net from the fyke net to an immersed soft mesh net panel in shallow water. High water temperatures (greater than 17°C) in early July required constant ventilation of gills in

fast flowing water to minimize unnecessary stress. While immersed in the creek, char were placed ventral side facing up and a PIT tag needle was used to implant a uniquely coded half duplex (HDX) PIT tag (23 mm length, 3.7 mm diameter, 0.6 g weight) in the char's abdomen. The needle penetrated the fish's ventrum between the posterior tip of the pectoral fin and the anterior point of the pelvic girdle, 1 to 2 mm lateral from the mid-ventral line. The bevel of the needle was oriented toward the ventral surface at a 20 degrees angle to minimize the chance of contact with internal organs. PIT tag injectors were disinfected between implantations using ethyl alcohol (ethanol) diluted with water to a final concentration of 70% to 80% ethanol. Once the PIT tag was implanted, char were immediately released upstream from the fyke trap in a natural side pool that served as a recovery area. Char were then observed until swimming upstream on their own.

Antenna arrays were installed at two locations on the creek (Table 2-3; Photo 2-2; Figure 1-1; Appendix A Photo A-5), both of which were used as antenna array locations in 2014 (Lower Downstream Array [LDSA] and Middle Downstream Array 1 [MUSA1]). The LDSA location represents the assumed location at which upstream migrating char have acclimatized to warmer, freshwater conditions. Based on previews habitat assessments, the area between the two antenna arrays was expected to include the most challenging areas with respect to fish movements (Golder 2013, 2015a).

Table 2-3: Locations of the Fyke Trap and Antennae Arrays, Nulahugyuk Creek

Array	Location (UTM, Zone 11 W)		Distance from Nulahugyuk Creek Mouth (km)[a]	Year Installed	
	Easting	Northing		2014	2016
Two Way Fyke Net (TWFN)[b]	590644	7627855	0.10	√	√
Lower Downstream Array (LDSA)	590865	7627313	0.84	√	√
Lower Upstream Array 1 (LUSA1)	591178	7627164	1.23	√	
Lower Upstream Array 2 (LUSA2)	591192	7627151	1.25	√	
Middle Downstream Array 1 (MDSA1)	590387	7626190	2.83	√	√
Middle Downstream Array 2 (MDSA2)	590372	7626185	2.84	√	
Middle Upstream Array (MUSA)	589992	7626191	3.22	√	
Upper Lake Outlet Array (ULOA)	586065	7624520	9.56	√	

[a] Distances upstream were measured from the mouth of Nulahugyuk Creek using collected GPS data and a revised creek shapefile in GIS, resulting in minor differences with measurements made as part of previous baseline studies

[b] Fyke trap positioned approximately 50 m downstream from the location used in 2014

UTM=Universal Transverse Mercator; km=kilometre

Photo 2-2: Antenna Array Location (LDSA) with a Rock Weir Built to Direct Fish Through the Antenna Array; Photo Facing the Right Downstream Bank of the Creek, July 2016

Rock weirs were constructed to prevent fish from moving around the arrays and to direct fish through the antenna arrays (Photo 2-2). The antenna loops of the antenna arrays were oriented vertically to increase PIT tag reception range. The bottom of the antenna loop was embedded in the creek substrate and the top of the loop was suspended approximately 5 centimetres (cm) above the water surface. This configuration ensured that char passed through the loop perpendicular to the antenna field. Antenna loops were connected to individual tuner boxes and HDX-PIT tag reader boxes located on the bank. The arrays were powered by deep-cycle 130 ampere marine batteries which were continually charged using solar panels.

2.3.1 Statistical Analyses

The migratory success of char traveling upstream from the fyke trap to the upstream array (labelled MDSA1 in 2014) was assessed by comparing data collected in 2014 (Golder 2015a) with 2016 data under similar discharge conditions (less than 0.5 cubic metres per second [m^3/s]) using a binary logistic regression. Because no significant differences were observed in migratory success between 2014 and 2016 ($p = 0.452$), migratory data were pooled to develop a single baseline model describing biological and environmental factors affecting migratory success of char through the lowest 2.8 km of the creek.

Binary logistic regressions were used to explore relationships between upstream migration success (fish detected [1], or not detected [0] at the upstream array) and environmental and biological factors such as migration date, stream discharge, water temperature, length, weight, and condition factor. Various models were compared based on their Akaike Information Criterion (AIC) score, with lower values identifying models better representing the data

analyzed, and on their Receiver Operating Characteristic (ROC), with higher values indicating greater sensitivity and specificity of the model.

A complementary investigation on the effects of environmental factors on the probability of char retreating from Nulahugyuk Creek was completed after initial review of the 2016 dataset. The warmer water temperatures in early July (compared to the 2012 and 2014 field programs [Golder 2013, 2015a]) and the location of the fyke net trap, which was 50 m downstream from the 2014 location and nearer to the interface of fresh and brackish water, provided an opportunity to examine the ability of char to acclimatize as they entered the creek from the ocean. This interface may be an area for acclimatization as char attempt to enter the creek from the ocean, occasionally retreating back towards the ocean until physiologically adapted for their upstream migration. Thus, a migration retreat model was developed (as done for migration success) to identify parameters affecting the probability of char retreating from Nulahugyuk Creek and exiting the system after commencing the upstream migration (fish retreated [1], or did not retreat [0] from Nulahugyuk Creek) with respect to year (as a surrogate of trap position), migration date, stream discharge, water temperature, length, weight, and condition factor.

2.4 Habitat Assessments

2.4.1 Nulahugyuk Creek

Approximately 10 km of Nulahugyuk Creek habitat was assessed from 8 to 13 July 2016. The creek assessments were divided into four main sections bounded by Hingittok Lake (upstream) and the Dolphin and Union Strait (downstream) and included three ponds (Pond 1, Pond 2, and Pond 3) (Table 2-4; Figure 1-1). Dominant habitat types within the sections were described using Hawkins et al. (1993).

Table 2-4: Habitat Assessment Sections in Nulahugyuk Creek

Section	Start (km)	Length (km)	Upstream Bound (UTM)	Downstream Bound (UTM)
Stream Section 1 (Mouth of creek to Pond 1 outlet)	0	3.37	589901 E 7626102 N	590739 E 7627908 N
Pond 1	3.37	0.93	590309 E 7625468 N	589901 E 7626102 N
Stream Section 2 (Pond 1 inlet to Pond 2 outlet)	4.30	3.38	587763 E 7624574 N	590309 E 7625468 N
Pond 2	7.68	0.21	587548 E 7624547 N	587763 E 7624574 N
Stream Section 3 (Pond 2 inlet to Pond 3 outlet)	7.89	1.14	586459 E 7624644 N	587548 E 7624547 N
Pond 3	9.03	0.17	586399 E 7624568 N	586459 E 7624644 N
Stream Section 4 (Pond 3 inlet to Hingittok Lake outlet)	9.20	0.70	585742 E 7624519 N	586399 E 7624568 N

UTM=Universal Transverse Mercator; km=kilometres

Potential char migration barriers (problem locations) along the entire length of the creek were identified, photographed, and described during low flow conditions (i.e., less than 0.8 m^3/s). Aerial photos of selected problem locations in the lower section of Nulahugyuk Creek were taken using a drone.

To prepare for future remedial works, GPS coordinates were obtained for each problem location, and each problem location was qualitatively rated according to the perceived level impassibility for adult char moving upstream during the later stages of migration. The most impassible locations (rank '3' locations) were those where fish stranding has been previously observed and where flows are dispersed flows and boulder fields often occur at the reach-level, impeding upstream movements and exposing fish to terrestrial predators. Highest risk locations were obvious barriers to fish passage during the later stages of the upstream migration (e.g., early July), and may also

present a risk to fish earlier in the migration period. Rank 2 locations were those characterized by a high potential for stranding and a partial migration barrier during the later stages of migration when water levels decline. Rank 1 locations were those that may be passable during average flow conditions, but present the potential for stranding and stressful conditions during below-average flow conditions during the later stages of migration.

A detailed remediation plan was then finalized in the field, capturing the spatial extent and locations of remediation sites and included spatial (track) files of proposed low-flow channels and directional weirs (using the Esri Collector Application). The integrity of previously completed low-flow channels was also visually assessed and photographed during low flow conditions. Width, velocity, and depth measurements within the thalweg were collected every 2 m for the length of each 2012 low-flow project and any displaced substrates were identified and photographed.

3.0 RESULTS AND DISCUSSION

3.1 Environmental Variables

Daily mean water temperatures in Nulahugyuk Creek ranged from a high of 19.8°C on 12 July 2016 to a low of 7.0°C on 22 July 2016 (Figure 3-1). The warmest recorded temperatures occurred during the first half of the study period and exceeded 21°C (thermal stress barrier for salmonids [McCullough 1999]) for a combined total of 40 hours as measured at the fyke trap. Water temperatures during the 2016 sampling period were warmer than those measured in 2014 (Golder 2015a) when the highest daily mean water temperature was 7.5°C lower (i.e., only 12.3°C), and the maximum recorded water temperature remained below 21°C for the duration of the 2014 monitoring period. As observed in 2014, diurnal variation in water temperature was evident during the sampling period in 2016. The mean difference between daily minimum and maximum values during the 2016 monitoring period was 7.4°C.

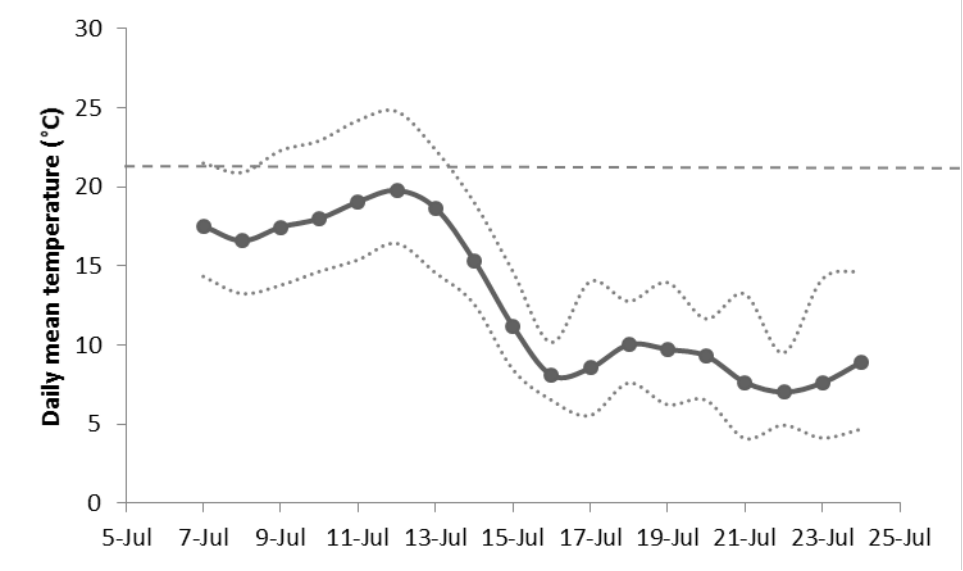


Figure 3-1: Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from 8 July to 24 July 2016. Maximum and Minimum Daily Values Indicated by Upper and Lower Dotted Lines Respectively. Warm Water Temperatures (>21°C) Delineated by the Dashed Line

Mean maximum daily air temperatures for the 2016 study year were above the 30-year normal for the months of June (by 1.8°C), July (by 1.2°C), and August (by 1.5°C) (Figure 3-2) (weather data obtained from http://climate.weather.gc.ca). For comparison, monthly mean maximum daily temperatures for the 2014 study year were below normal for the months of June (by 1.2°C) and August (by 1.2°C), but were above normal for July (by 0.2°C).

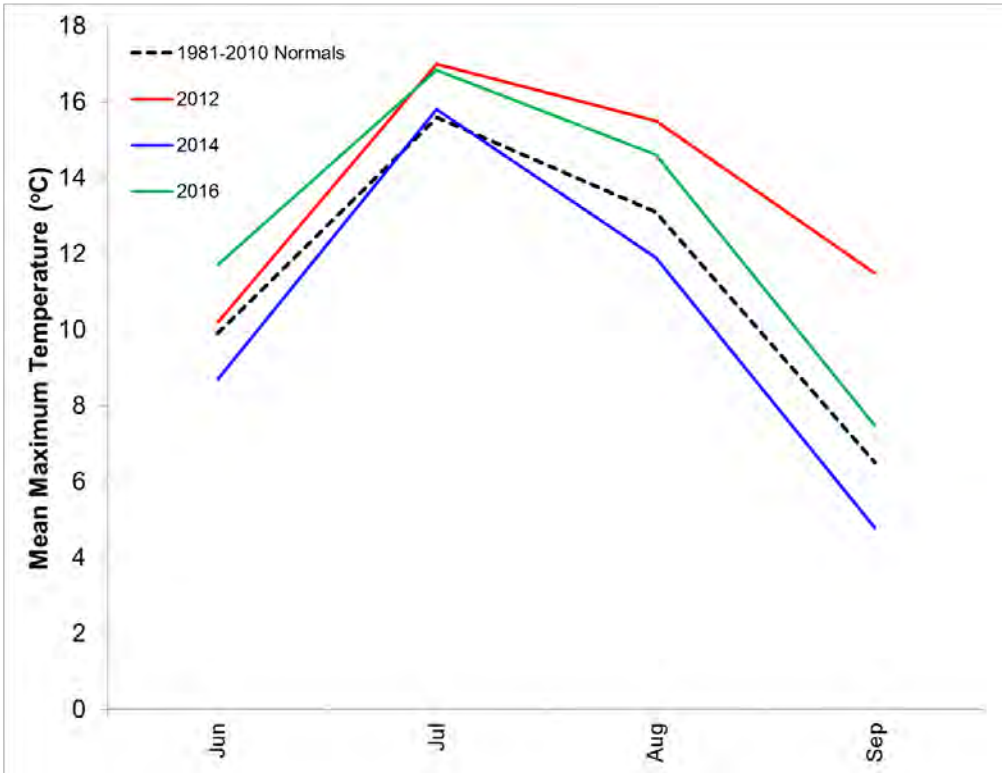
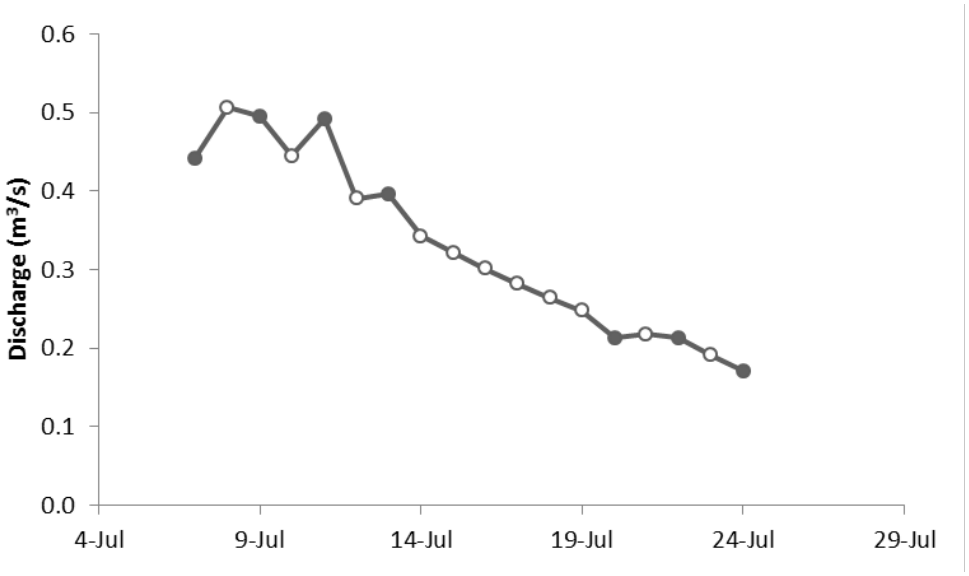


Figure 3-2: Monthly mean (maximum daily) temperatures reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut

Discharge declined over the study period ranging from a high of 0.5 m^3/s on 8 July 2016 to a low of 0.2 m^3/s on 25 July 2016 (Figure 3-3). For comparison, discharge during the 2014 study period started at a high of 6.0 m^3/s on 15 June 2014 to a low of 0.4 m^3/s on 17 July 2014 (Golder 2015a). During the 2015 field visit, creek discharge ranged from 0.4 to 0.3 m^3/s from 22 July to 24 July (Golder 2015b).

Monthly precipitation totals for the 2016 study year were above the 30-year normal for the months of May (10.2 mm above normal), and June (21.1 mm above normal), but were below the 30-year normal for the month of July (6.5 mm below normal) (Figure 3-4) (weather data obtained from http://climate.weather.gc.ca). For comparison, monthly precipitation totals for the 2014 study year were above normal for the months of May (0.6 mm above normal), June (9 mm above normal), and July (1.7 mm above normal).



Note: Calculated values are indicated by open circles derived from regression formula $y=0.5768e^{-0.065x}$

Figure 3-3: Daily Stream Discharge (m^3/s) Calculated for Nulahugyuk Creek Between 7 July and 25 July 2016

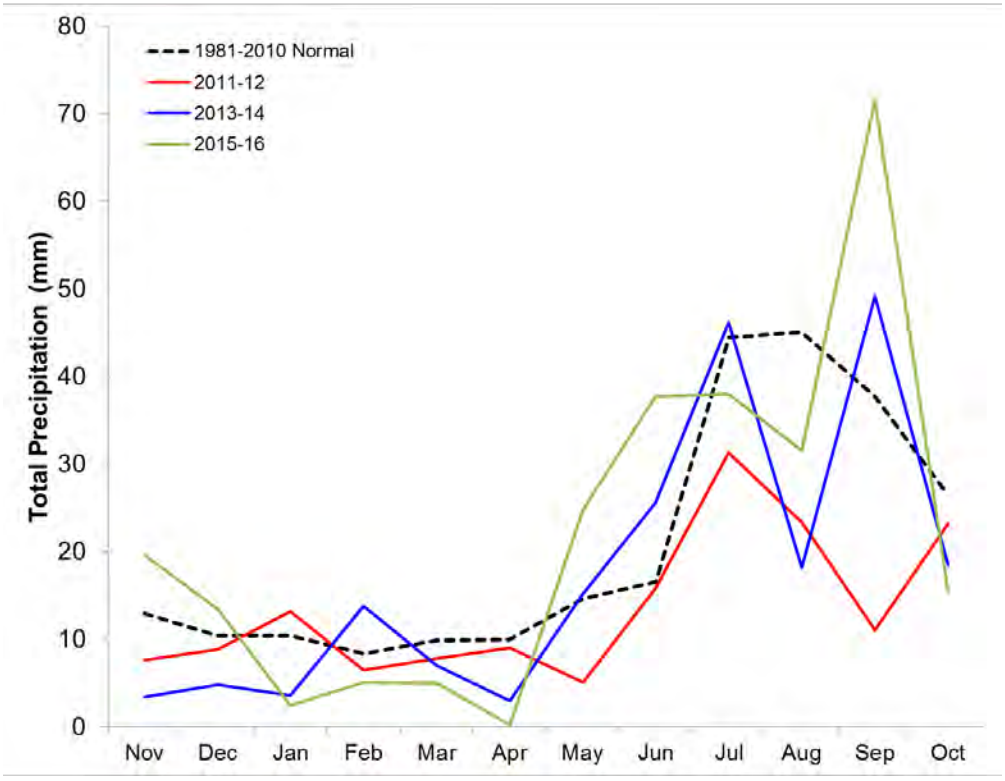


Figure 3-4: Monthly precipitation totals reported for 2011-12, 2013-14, and 2015-16 by the Environment Canada climate station at Kugluktuk, Nunavut

3.2 Fish Capture and Sampling

The fyke trap was in place for a total of 19 days, 21 hours and 40 minutes beginning the afternoon of 6 July 2016 (14:10) and ending 25 July 2016 (11:50). Five species were captured: Arctic Char, Arctic Cisco (*Coregonus autumnalis*), Arctic Cod (*Arctogadus glacialis*), Lake Trout (*Salvelinus namaycush*), and Spoonhead Sculpin (*Cottus ricei*) (non-char species shown in Appendix A, Photos A-15 through A-17). Total catch-per-unit-effort (CPUE) for the downstream opening portion of the fyke trap was 0.32 upstream migrating fish/h, while CPUE for the upstream opening portion of the fyke trap was 3.56 downstream migrating fish/h.

CPUE for char in the downstream opening portion of the fyke trap (Photo 3-1) was 0.12 fish/h, while CPUE for char in the upstream opening portion of the fyke trap (Photo 3-2) was 3.24 fish/h. Maximum daily catch of adult char in the upstream opening portion of the fyke trap was 10 fish on 9 July 2016; and maximum daily catch of juvenile char in the downstream opening portion of the fyke trap was 189 on 7 July 2016.

Photo 3-1: Adult Arctic Char Captured During Upstream Migration, 21 July 2016

Photo 3-2: Juvenile Arctic Char Captured During Downstream Migration, 12 July 2016

Most (86%) of the captured fish were char (1,467 juvenile captures and 55 adult captures), followed by Spoonhead Sculpin (228), Arctic Cod (10), Arctic Cisco (1), and Lake Trout (1). A portion of the catch were recaptured fish that were moving within the lower section of the creek where the fyke trap was installed. For example, the 55 captures of adult char represented 33 individual fish (60% of the catch) based on PIT tag identification. These char were lake-bound fish (Photo 3-1), first recorded in the downstream opening portion of the fyke trap as they started their upstream migration to Hingittok Lake from the ocean. Of the 1,467 captures of juvenile char, 1,452 were assumed to be of individual fish (99% of the catch) (Table 3-1). These fish were seaward bound (Photo 3-2), captured in the upstream opening portion of the fyke trap during their downstream migration to the ocean. For additional information on catch data, see Appendix B.

Char length and weight measurements are described in Table 3-1 and Figure 3-5 (not every individual was measured). The largest char was 879 mm in length with a weight of 7,350 g. Length and weight measurements for adult char were combined with those made in 2014 to provide the following length-weight relationship:

$$\log_{10} Weight\ (g) = -4.6039 + 2.8733 \times \log_{10} Length\ (mm) (R^2 = 0.87)$$

Table 3-1: Lengths and Weights for Arctic Char Captured in Nulahugyuk Creek, 6 July to 25 July 2016

Migratory Group	Number of Char	Length Range (mm)	Mean Length (mm) ± SD	Weight Range (g)	Mean Weight (g) ± SD	Mean Condition Factor ± SD
Juveniles moving downstream	1,452	104 to 228	157 ± 16	-	-	-
Adults moving upstream	33	560 to 879	709 ± 85	2,250 to 7,350	3,935	1.07

- =no data; the length-weight equation for 2014 juvenile fish was calculated as: $\log_{10}$ Weight (g) = -4.9282 + 2.9275 x $\log_{10}$ Length (mm) (R^2 = 0.91); n=number of fish; mm=millimetres; ± = plus or minus; SD=standard deviation; g=grams

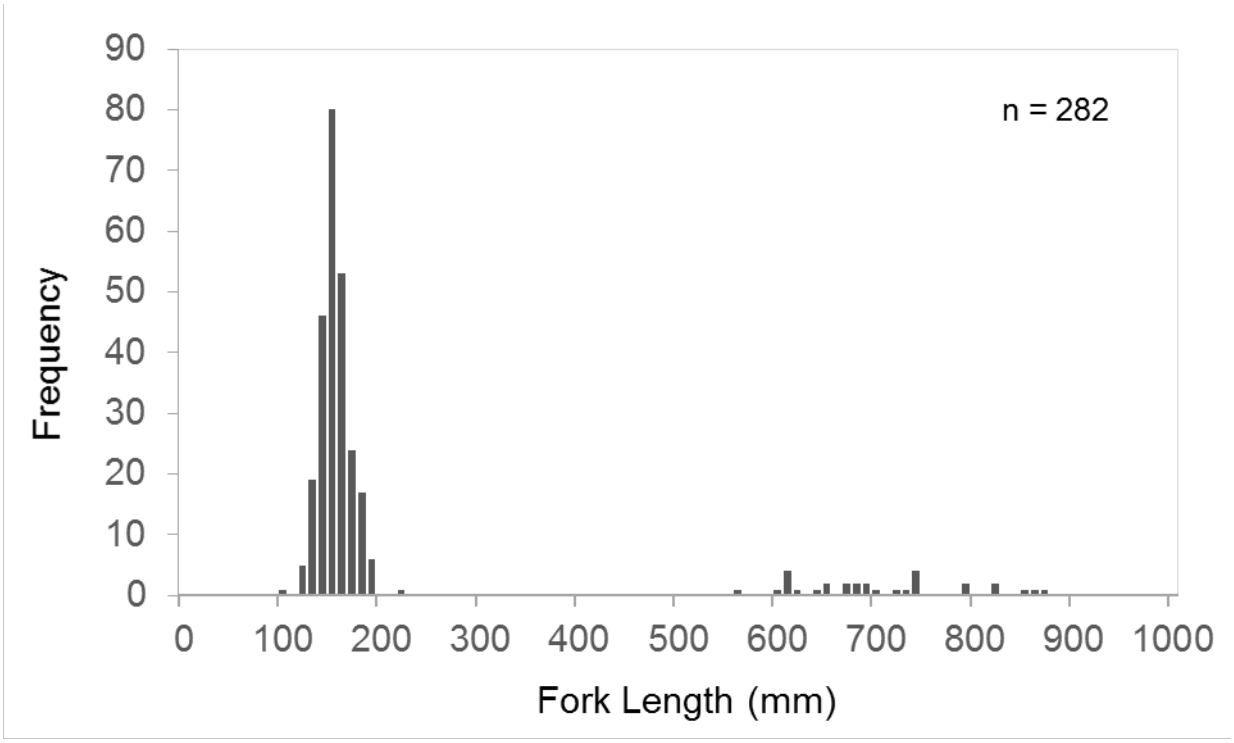


Figure 3-5: Length-Frequency Distribution of Arctic Char Captured in the Fyke Trap

3.3 Fish Movements

Two distinct groups of migratory char were identified in July 2016, which included adults moving upstream (n = 33) to overwinter in Hingittok Lake, potentially spawning first, and juveniles moving downstream from Hingittok Lake to the ocean for foraging (n = 1,452) (Figure 3-6). Adult char migrating downstream from Hingittok Lake to the ocean were not observed in 2016. Based on the timing of migrations observed in 2014, it is expected that the downstream migration by adult char was completed 1 to 2 weeks prior to the installation of the fyke trap in 2016. The trapping period in 2016 is assumed to have captured the majority of the downstream migrating juvenile char, and any movements associated with the later stages of the upstream migration of adult char. Migration successes were quantified for adult char migrating upstream from the ocean to Hingittok Lake (see below – Migration Success).

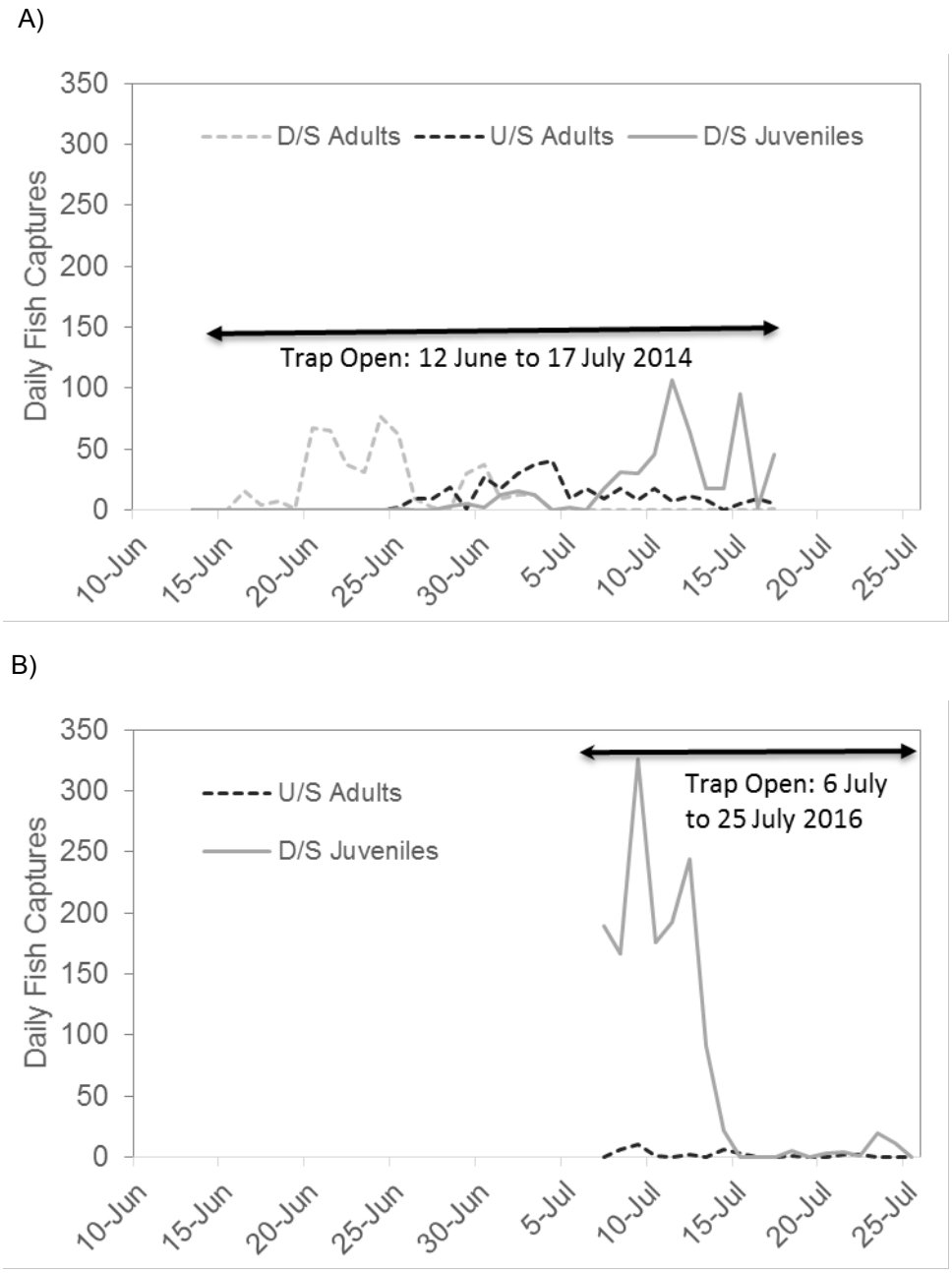


Figure 3-6: Daily Captures of Migratory Char in Nulahugyuk Creek, 2014 (A) and 2016 (B). D/S = downstream travelling fish and U/S = upstream travelling fish

3.3.1 Migration Success

In 2016, field data collection occurred from 8 to 24 July with discharge declining from 0.5 to 0.2 m^3/s over that period. In 2014, field data collection occurred from 12 June to 17 July with discharge declining from 6.0 to an estimated 0.4 m^3/s over that period (Golder 2015a). Differences in the timing of the data collection resulted in lower catch numbers in 2016 compared with 2014, however migration success results were similar when comparing sampling periods with comparable discharge (less than 0.5 m^3/s) (Golder 2015a).

Of the 33 adult char captured while migrating upstream in 2016, 24 were new captures and implanted with PIT tags, 5 were recaptures previously tagged in 2014, and 4 were new captures but not tagged due to their poor health condition. The average length of upstream migrating adult char was 706 ± 16 mm, ranging from 560 to 879 mm in length and had an average mass of 3,897 ± 254 g ranging from 1,700 to 7,350 g. Of these, 14 adult char were detected at the downstream antenna array (LDSA) and three were detected at the upstream antenna array (MDSA). On average, it took char 7.7 h traveling 96 m/h (mean rate of travel) to reach LDSA, and another 24.9 h traveling 80 m/h to reach MDSA. Generally, char either moved relatively quickly to LDSA arriving at the array in less than 6.5 h, or progressed slowly taking over 11 h to complete the same journey. Travel times and speeds of individual char are presented in Table 3-2.

Table 3-2: Travel Time and Mean Speed of PIT-Tagged Char Migrating Upstream, 2016

PIT ID Number	Travel Time (h)			Mean Travel Speed (m/h)		
	TWFN-LDSA	LDSA-MDSA	TWFN-MDSA	TWFN-LDSA	LDSA-MDSA	TWFN-MDSA
228000152702	13.2			56		
228000152707	11.0			67		
228000152708	3.1	30.2	33.3	239	66	82
228000152709	3.5	19.6	23.1	211	102	118
228000152710	19.6			38		
228000152711	2.5			296		
228000152712	13.6			54		
228000152746	3.6			206		
228000152751	nd		25.1			109
228000152752	4.7			157		
228000152755	2.8			264		
228000152757	14.7			50		
228000152772	6.1			121		
228000152779	3.4			218		
228000152783	6.4			116		
Average	7.7	24.9	27.2	96	80	100

Note: 15 tagged char did not reach the LDSA and were not included in this table.
nd=not detected

Using a binary logistic regression, the primary factors influencing migratory success to MDSA in 2014 and 2016 were determined to be discharge and char weight. This relationship was expressed using the formula:

$$P = \frac{e^{-5.475+13.709x-4.282x^2-0.628y}}{1+e^{-5.475+13.709x-4.282x^2-0.628y}}$$

where P was the probability of success, *x* was discharge (m^3/s), and *y* was the char mass in kilograms (kg). Model fit was significant ($p < 0.001$) with an ROC value of 0.87. Parameter estimates are presented in Table 3-3. There was no significant difference in the number of char reaching the upstream array between 2014 and 2016 under similar discharge conditions (less than 0.5 m^3/s; $p = 0.452$).

With respect to discharge, the probability of successfully reaching the upstream array ranged from a high of 95% at 1.6 m^3/s or greater, declining to a low of 0% at 0.2 m^3/s, when char mass was held constant using the mean char mass of 4.20 kg. The P_{50} was 0.79 m^3/s. With respect to char mass, the probability of successfully reaching the upstream antenna array ranged from a high of 96% for char that had a maximum mass of 2.0 kg to a low of 38% for 7.55 kg (the maximum char mass measured), when discharge was held constant using the weighted mean discharge of 1.06 m^3/s. The P_{50} was calculated as 6.75 kg.

For the data collection period in 2016, the probability of char successfully reaching the upstream array ranged from a high of 11% at a maximum discharge of 0.5 m^3/s, declining to a low of 0% at 0.2 m^3/s, when char mass was held constant using the 2016 mean char mass of 3.90 kg (Figure 3-7). Regarding char mass, the probability of char successfully reaching the upstream antenna array ranged from a high of 14% for fish that had a mass of 2.0 kg to a low of 1% in fish that had a mass of 5.75 kg, when discharge was held constant using the 2016 weighted mean discharge of 0.41 m^3/s (Figure 3-8).

Table 3-3: Parameter Metrics for Binary Logistic Regression of Migratory Success

Parameter	Estimate	Standard Error	Z	p-Value	95% Confidence Interval	
					Lower	Upper
Constant	-5.475	1.11	-4.9325	<0.001	-7.6506	-3.2995
Discharge (x)	13.709	1.8335	7.4766	<0.001	10.1149	17.3022
Discharge^2 (x^2)	-4.282	0.67	-6.3914	<0.001	-5.595	-2.9688
Weight (kg) (y)	-0.628	0.156	-4.0293	<0.001	-0.9341	-0.3227

z=z score; p-Value=probability value; % =percent; < =less than; kg=kilograms

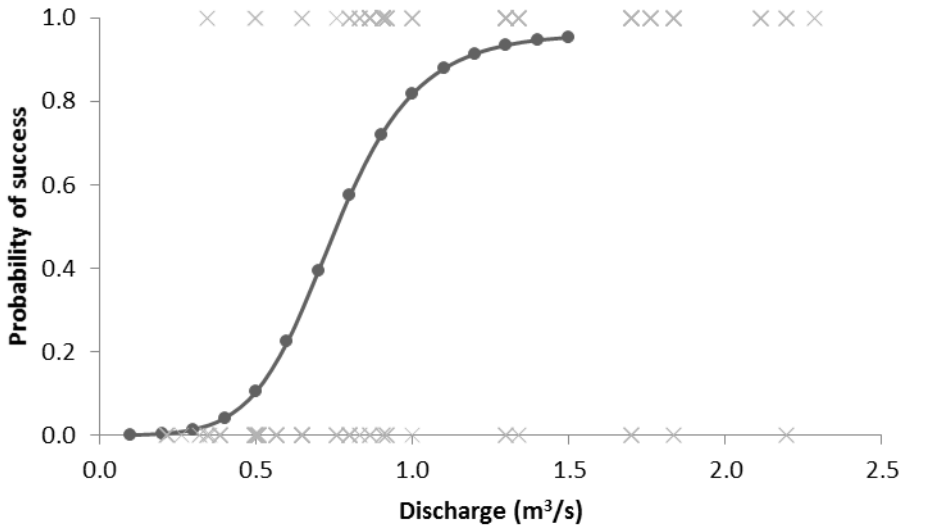


Figure 3-7: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Stream Discharge (x), Holding Char Body Weight Constant at 3.90 kg

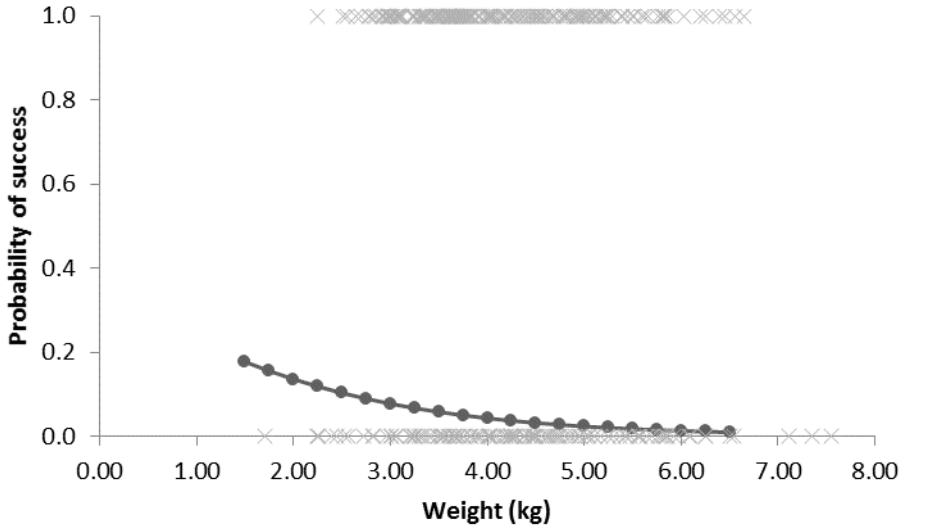


Figure 3-8: Results of Binary Logistic Regression Plotting the Probability of Migration Success against Char Body Weight (y) Holding Mean Stream Discharge Constant at 0.408 m^3/s

3.3.2 Migration Retreat

Between 2014 and 2016, 31 tagged fish were detected retreating from Nulahugyuk Creek after initiating an upstream migration, including 18 char in 2014 (6% of tagged fish) and 13 char in 2016 (45% of tagged fish). The proportion of char retreating in 2014 under discharge conditions similar to that observed in 2016 was only 1 of 30 fish (3.3%). The unusually warm water temperatures in early July that exceeded a known thermal stress barrier for salmonids (21ºC; McCullough 1999), and the new location of the fyke trap near the interface of fresh and brackish water (during high tides only) in 2016 provided an opportunity to examine the ability of char to acclimatize as they entered the creek from the ocean. Some of the char (5 of 13) in 2016 re-attempted the migration 3 to 14 days after exiting the creek on their first attempt.

Using a binary logistic regression, the primary factor influencing retreat in 2014 and 2016 was determined to be maximum daily water temperature with a significant difference observed between years (Table 3-4). There was no interaction between temperature and year (p = 0.509). The relationship was expressed using the formula:

$$P = \frac{e^{-5.190+0.265x_1-1.719x_2}}{1+e^{-5.190+0.265x_1-1.719x_2}}$$

where *P* was the probability of success, x_1 was maximum daily temperature (°C), and x_2 was year (2016 = 0 and 2014 = 1). Model fit was significant (p <0.001) with an ROC value of 0.77. Parameter estimates are presented in Table 3-4. The output of the formula is presented graphically in Figures 3-9 and 3-10.

In 2014 the probability of retreat ranged from 17% at 20.2°C (July 15, 2014) to 2% at 11.0°C (27 June 27 2014). The P_{50} was calculated as 26.1°C. In 2016 the probability of retreat was determined to range from 67% at 22.3°C (9 July 2016) to 6% at 9.5°C (22 July 2016). The P_{50} was calculated as 19.6°C. The effect of year (i.e., as a surrogate of trap position) suggests that adult char acclimation occurs near the mouth of the creek and that char are more committed to their migration the further upstream they swim.

Table 3-4: Parameter Metrics for Binary Logistic Regression of Retreat

Parameter	Estimate	Standard Error	Z	p-Value	95% Confidence Interval	
					Lower	Upper
Constant	-5.1902	1.8072	-2.8719	0.0041	-8.7323	-1.648
Year	-1.7191	0.5854	-2.9364	0.0033	-2.8665	-0.5716
Maximum Daily Temperature	0.2645	0.0885	2.9877	0.0028	0.091	0.4381

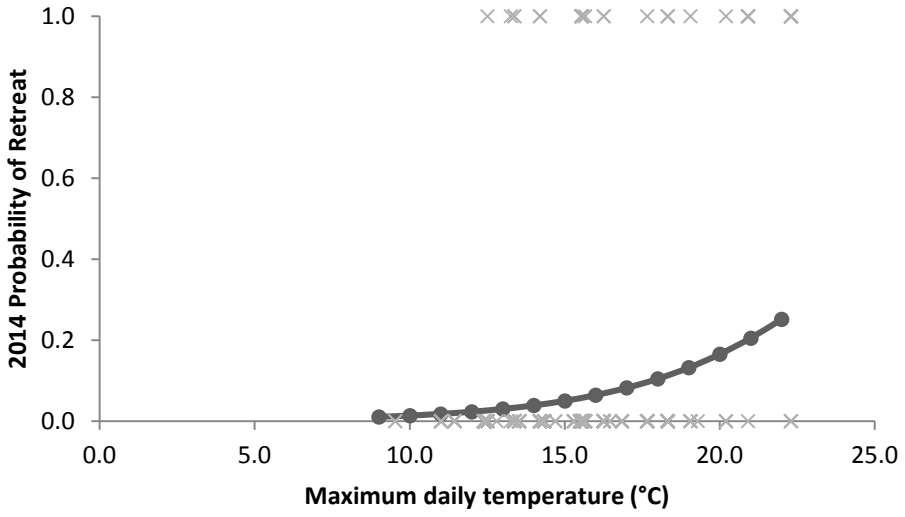


Figure 3-9: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2014

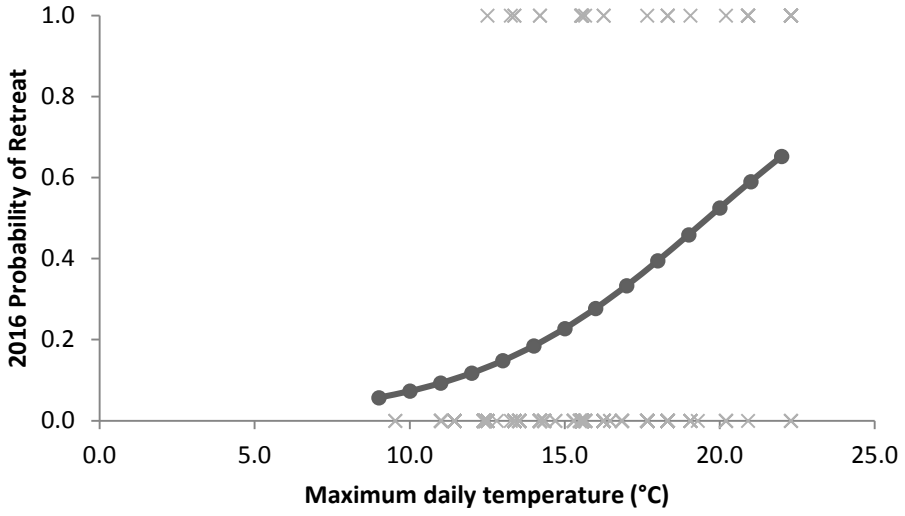


Figure 3-10: Results of Binary Logistic Regression Plotting the Probability of Retreat against Maximum Daily Temperature in 2016

3.4 Habitat Assessments

Habitat conditions were similar to that described in July 2014 (Golder 2015a). Flow characteristics of the creek (not including the pools) at the time of sampling included mean water depths = 0.23 m, mean water velocities = 0.28 m/s, and mean wetted widths = 27.8 m (n = 45 transects). The most prevalent habitat type was riffle habitat (35%) defined by a broken water surface due to effects of exposed bed materials, and by relatively shallow water during moderate to low-flow periods (typically less than 0.25 m). Riffle habitat was common in the lower 3.4 km of Nulahugyuk Creek. Shallow run habitat, defined by moderate to high current velocity relative to pool habitats, a water surface that is largely unbroken, and water depths averaging less than 0.50 m, was the second most

common (25%) habitat type. Rapids comprised 23% of the creek length, occurring only in creek Section 2 (between 4.2 to 6.0 km upstream from the creek mouth), and riffle/boulder garden habitat comprised 17% of the creek length. Overall substrate composition was 37% boulder, 28% cobble, 25% gravel, 7% fines, and 3% bedrock. The habitat survey indicated little cover for adult char (14% of creek area), where any cover was provided by intermittent (or discontinuous) undercut banks and large boulders; however, it is expected that the abundance of small and large boulders in the creek provides suitable cover for juvenile char (79% of creek area).

Thirteen problem locations were identified or re-evaluated during the habitat assessment and are described in detail in Appendix C. These locations are where fishery productivity, characterized by char production (i.e., available biomass for harvesting), may benefit from enhancement projects (Table 3-5).

Table 3-5: Summary of Potential Locations for Fish Passage Enhancement Projects

Site Identification	Stream Section	Approximate Distance Upstream from Creek Outlet (km)	Expected Risk of Mortality and/or Blockage Rank (Higher Ranking = Higher Risk)	Minimum Required Low-Flow Channel Length to Improve Passage (m)
Site 1[a]	Section 1	1.40	Rank 3	41
Site 2	Section 1	1.63	Rank 2	42[b]
Site 3	Section 1	1.69	Rank 2	34[c]
Site 4	Section 1	2.03	Rank 2	30
Site 5	Section 1	2.15	Rank 3	22
Site 6	Section 1	2.50	Rank 3	45
Site 7	Section 1	3.05	Rank 2	14
Site 8	Section 2	4.87	Rank 1	20
Site 9	Section 2	5.76	Rank 1	40
Site 10	Section 3	7.89	Rank 1	15
Site 11[d]	Section 1	2.22	Rank 1	38
Site 12[d]	Section 1	2.40	Rank 1	19
Site 13[d]	Section 1	3.10	Rank 1	15

Note: extended rock weirs are recommended for most sites, for example, to direct char migrating upstream through the low-flow channels

[a] The site was initially described as two separate problem locations in 2014 but was later characterized in 2015 as one problem location requiring an extended low-flow channel (versus two separate consecutive channels)

[b] Two parallel low-flow channels recommended (length represents combined length of parallel channels)

[c] Problem location requires further evaluation; a directional weir may be a viable alternative for this location

[d] Problem sites identified in 2015

km=kilometres; m=metre

3.4.1 2012 Low-Flow Channel Integrity

Photographs of previously constructed low-flow channels (Golder 2013) are provided in Photos 3-3 to 3-7. Supporting information on channel width, velocity, and depth for each project are summarized in Table 3-6 and Table 3-7. Mean depths of the 2012 projects have remained at approximately 0.2 m depths under low-flow conditions, which is adequate depth for adult char to successfully migrate upstream.

Table 3-6: Summary of Low-Flow Channel Data

Project	Wetted Width (m)		Centre Depth (m)		Velocity (m/s)	
	Mean	± SD	Mean	± SD	Mean	± SD
Project 1	1.08	0.15	0.14	0.03	0.44	0.32
Project 2	2.47	0.20	0.24	0.06	0.48	0.24
Project 3	2.67	0.55	0.17	0.06	0.36	0.19
Project 4	3.30	2.14	0.21	0.06	0.53	0.18
Project 5	2.20	0.64	0.24	0.14	0.57	0.23

± =plus or minus; SD=standard deviation; m=metre; m/s=metres per second

Table 3-7: Comparison of 2016, 2014, and 2012 Low-Flow Channel Mean Depth Data

Project	Low-Flow Channel Conditions					
	2012[a] Depth (m)	± SD	2014[b] Depth (m)	± SD	2016[c] Depth (m)	± SD
Project 1	0.17	0.03	0.13	0.03	0.14	0.03
Project 2	0.24	0.04	0.17	0.04	0.24	0.06
Project 3	NA	NA	0.22	0.03	0.17	0.06
Project 4	0.20	0.04	0.17	0.06	0.21	0.06
Project 5	0.19	0.05	0.19	0.10	0.24	0.14
Mean	*0.20*		*0.18*		*0.20*	

[a] Discharge at time of measurement approximately 0.36 m^3/s

[b] Discharge at time of measurement approximately 0.38 m^3/s

[c] Discharge at time of measurement approximately 0.51 m^3/s

± =plus or minus; SD=standard deviation; m=metre; NA=not available

As concluded from the assessments performed in July 2014 and 2015 (Golder 2015a, 2015b), the low-flow channels constructed in 2012 were deemed structurally intact in 2016, and provided char with suitable depths and velocities to create an enhanced path for upstream migration. The only low-flow channel project that required minor repair was project 5 where boulders within a directional weir on the right downstream bank were displaced. The boulders were repositioned at the weir location by one field technician with less than one hour of effort (Photos 3-8 and 3-9).

Photo 3-3: 2012 Project 1, Facing Downstream, 8 July 2016

Photo 3-4: 2012 Project 2, Facing Downstream, 8 July 2016

Photo 3-5: 2012 Project 3, Facing Upstream, 8 July 2016

Photo 3-6: 2012 Project 4, Facing Downstream, 8 July 2016

Photo 3-7: 2012 Project 5, Facing Downstream, 8 July 2016

Photo 3-8: 2012 Project 5, Showing Failed Directional Weir Near Right Downstream Bank, 15 July 2016

Photo 3-9: 2012 Project 5, Showing Repaired Directional Weir Near Right Downstream Bank, 15 July 2016

4.0 SUMMARY

The 2016 field program provided data contributing to a better understanding of the Bernard Harbour Arctic Char migration, and a rigorous dataset for evaluating future changes in the local stock. The baseline data collection period coincided with a short period of above average water temperatures in early July that exceeded a known thermal stress barrier for salmonids. Although monitoring may have occurred during above average flow conditions at the start of the sampling period in early July based on climate data normals for the region, creek discharge at the start of the field program was below the previously identified flow threshold at which adult char can successfully migrate to Hingittok Lake (Golder 2015a).

Even under the low-flow conditions, 33 adult char were captured in the fyke trap moving upstream from the ocean to spawn in Hingittok Lake. Only three char (10.3% of tagged char) were detected at the upstream antenna array, and using 2014 and 2016 data combined, the estimated discharge at which there is a 50% probability of an adult Arctic Char reaching the upstream antenna array was 0.8 m^3/s. It is unlikely that any of these char were successful in reaching Hingittok Lake, in part, because of the stress incurred while navigating shallow water in the lower sections of Nulahugyuk Creek.

The fyke trap also captured 1,467 juvenile char. Although the start of the juvenile char downstream migration was not monitored in 2016, the number of juvenile captures exceeded that recorded during the extended monitoring period in 2014 when only 522 juvenile char were captured. Assuming that the age of a juvenile char migrating downstream is 4 years old, the number of captured juvenile char may reflect, in part, the number of adult Arctic Char run that successfully reached Hingittok Lake in 2012 (estimated to be 116 char; see Golder 2013).

Observations of creek habitat and the physical dimensions of previously constructed low-flow channels were similar to those made in 2014. The low-flow channels constructed in 2012 (Golder 2013) were deemed structurally intact, providing char with suitable depths, velocities, and an unobstructed path for migration to upstream locations. Thirteen remaining problem locations were confirmed in 2016 where low-flow channels are recommended to improve upstream passage of fish. Remediation of these problem locations are expected to benefit the production of Arctic Char stock at Bernard Harbour (i.e., increase available biomass for harvesting through increased survival, access, and recruitment).

Report Signature Page

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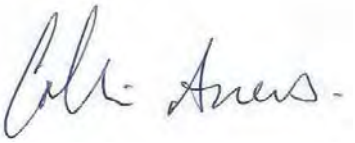

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APPENDIX A

Project Photos

Photo A-1: Arrival at abandoned DEW-Line site 5 km southeast from Bernard Harbour, 6 July 2016.

Photo A-2: Downstream fyke-net trap used to capture out-migrating juvenile Arctic Char, 12 July 2016.

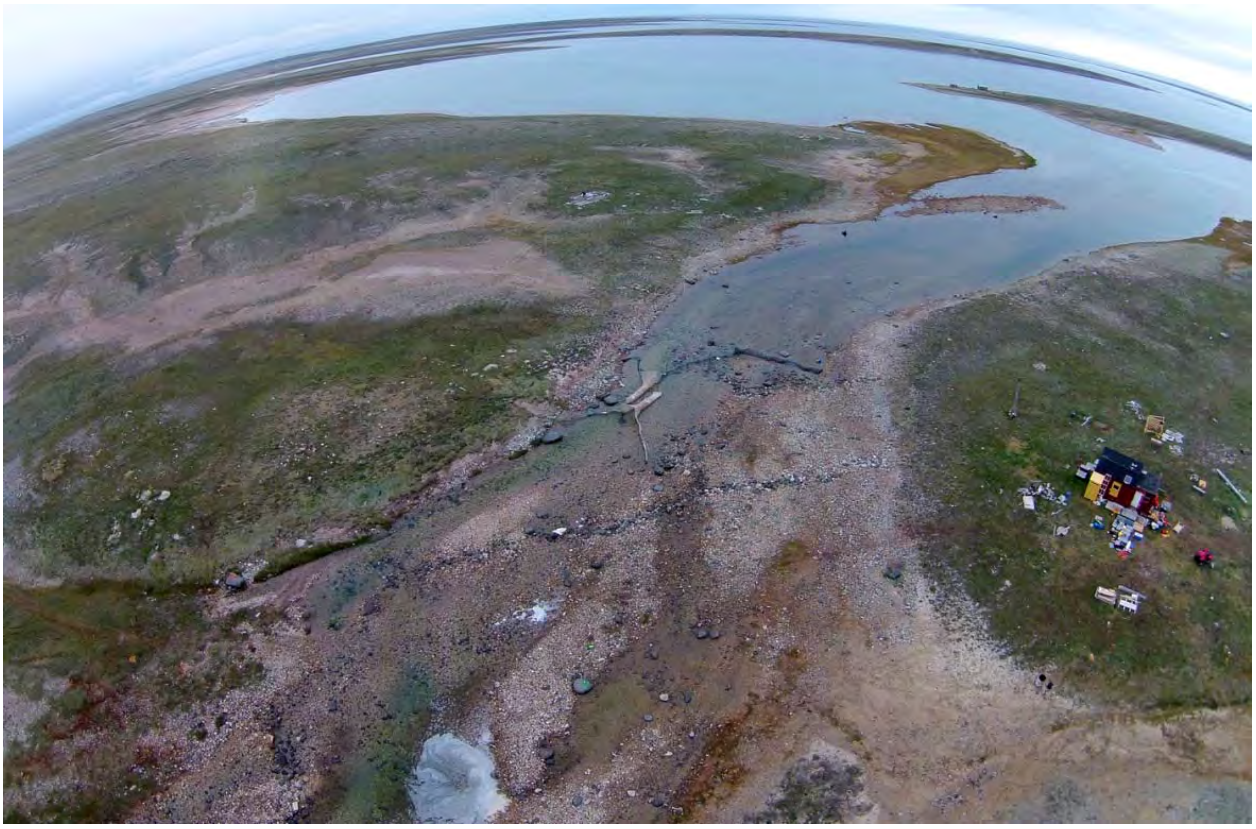


Photo A-3: Aerial view of base camp/HTO cabin and fyke trap layout at stream/estuary interface, 10 July 2016.

Photo A-4: Base camp/HTO cabin on lower Nulahugyuk Creek, Bernard Harbour, 24 July 2016.

Photo A-5: Antenna array tuner and reader box, setup on the bank Nulahugyuk Creek, 10 July 2016.

Photo A-6: Aerial upstream view of Nulahugyuk Creek 0.75 km upstream from the outlet. Discharge station was at narrow bottleneck immediately upstream from the bend in the creek, 10 July 2016.

Photo A-7: Large male Arctic Char pit tagged and being released upstream from the fyke trap, 12 July 2016.

Photo A-8: Pair of Arctic Char in lower Nulahugyuk Creek, 12 July 2016.

Photo A-9: Migrating Arctic Char resting in shallows during warm water conditions, 8 July 2016

Photo A-10: Large pool (refugia) at km 2 on Nulahugyuk Creek, 11 July 2016.

Photo A-11: Wide, shallow section of Nulahugyuk Creek at km 4.3, 13 July 2014.

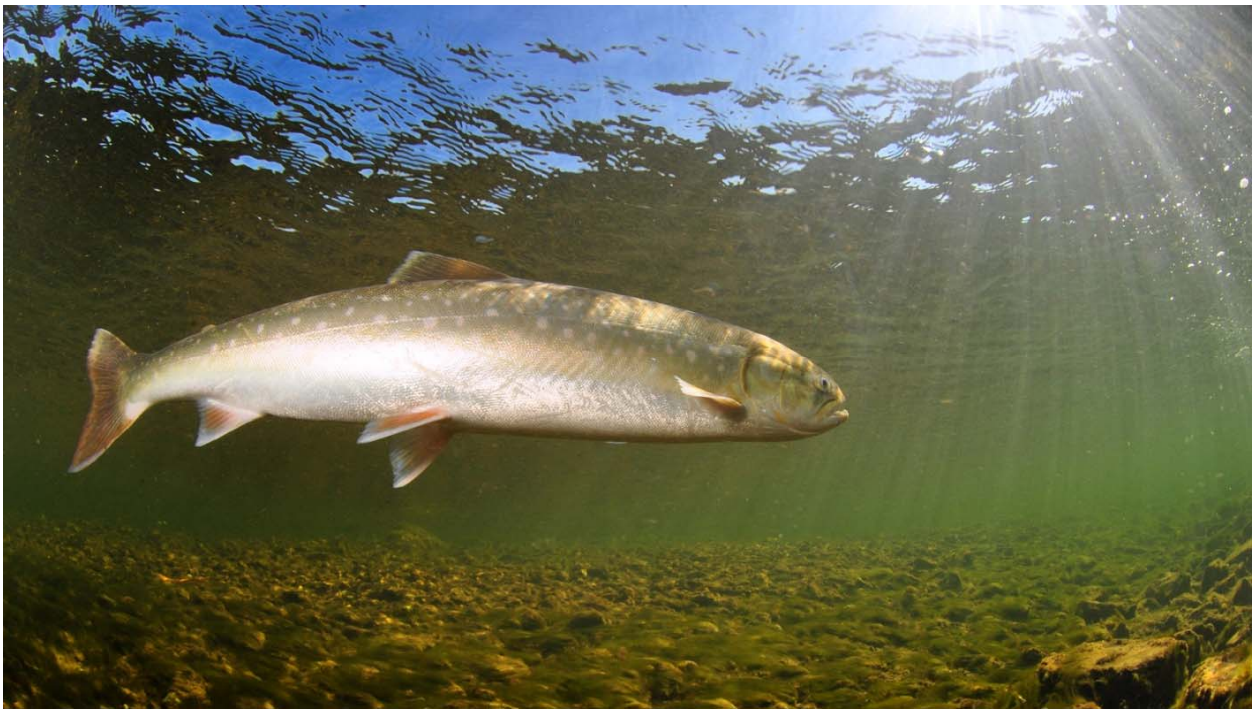


Photo A-12: Arctic Char entering freshwater interface in estuary of Nulahugyuk Creek, 12 July 2016.

Photo A-13: Upstream migrating Arctic Char in Project 4 area at km 0.5, 12 July 2016

Photo A-14: View of Golder Fish Biologist snorkeling to observe char following release after processing, 18 July 2016.

Photo A-15: Spoonhead Sculpin caught and released from the fyke trap, 22 July 2016.

Photo A-16: An Arctic Cisco captured in lower Nulahugyuk Creek, 1o July 2016.

Photo A-17: Arctic Cod in live-well prior to release, 24 July 2016.

Photo A-18: Golder biologist and an HTO student holding an Arctic Char, 24 July 2016.

APPENDIX B

Fish Catch Data for Lower Nulahugyuk Creek, 6 to 25 July 2016

February 2017
Report No. Doc **010 1545534.4000**

Golder Associates

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
1	-	-	N	ARCH	7-Jul-16	9:15	1	D	193	-	-
2	-	-	N	ARCH	7-Jul-16	9:15	1	D	162	-	-
3	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
4	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
5	-	-	N	ARCH	7-Jul-16	9:15	1	D	171	-	-
6	-	-	N	ARCH	7-Jul-16	9:15	1	D	228	-	-
7	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
8	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
9	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
10	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
11	-	-	N	ARCH	7-Jul-16	9:15	1	D	134	-	-
12	-	-	N	ARCH	7-Jul-16	9:15	1	D	159	-	-
13	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
14	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
15	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
16	-	-	N	ARCH	7-Jul-16	9:15	1	D	177	-	-
17	-	-	N	ARCH	7-Jul-16	9:15	1	D	189	-	-
18	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-
19	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
20	-	-	N	ARCH	7-Jul-16	9:15	1	D	183	-	-
21	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
22	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
23	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
24	-	-	N	ARCH	7-Jul-16	9:15	1	D	183	-	-
25	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
26	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
27	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
28	-	-	N	ARCH	7-Jul-16	9:15	1	D	167	-	-
29	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
30	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
31	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
32	-	-	N	ARCH	7-Jul-16	9:15	1	D	193	-	-
33	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
34	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
35	-	-	N	ARCH	7-Jul-16	9:15	1	D	154	-	-
36	-	-	N	ARCH	7-Jul-16	9:15	1	D	147	-	-
37	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
38	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
39	-	-	N	ARCH	7-Jul-16	9:15	1	D	177	-	-
40	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
41	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
42	-	-	N	ARCH	7-Jul-16	9:15	1	D	172	-	-
43	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
44	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
45	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
46	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
47	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
48	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
49	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
50	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
51	-	-	N	ARCH	7-Jul-16	9:15	1	D	121	-	-
52	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
53	-	-	N	ARCH	7-Jul-16	9:15	1	D	147	-	-
54	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
55	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
56	-	-	N	ARCH	7-Jul-16	9:15	1	D	198	-	-
57	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
58	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
59	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
60	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
61	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
62	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
63	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
64	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
65	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
66	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
67	-	-	N	ARCH	7-Jul-16	9:15	1	D	133	-	-
68	-	-	N	ARCH	7-Jul-16	9:15	1	D	175	-	-
69	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
70	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
71	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
72	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
73	-	-	N	ARCH	7-Jul-16	9:15	1	D	132	-	-
74	-	-	N	ARCH	7-Jul-16	9:15	1	D	147	-	-
75	-	-	N	ARCH	7-Jul-16	9:15	1	D	144	-	-
76	-	-	N	ARCH	7-Jul-16	9:15	1	D	163	-	-
77	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
78	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
79	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
80	-	-	N	ARCH	7-Jul-16	9:15	1	D	165	-	-
81	-	-	N	ARCH	7-Jul-16	9:15	1	D	138	-	-
82	-	-	N	ARCH	7-Jul-16	9:15	1	D	159	-	-
83	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
84	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
85	-	-	N	ARCH	7-Jul-16	9:15	1	D	133	-	-
86	-	-	N	ARCH	7-Jul-16	9:15	1	D	138	-	-
87	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
88	-	-	N	ARCH	7-Jul-16	9:15	1	D	128	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
89	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
90	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
91	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
92	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
93	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
94	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
95	-	-	N	ARCH	7-Jul-16	9:15	1	D	136	-	-
96	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
97	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
98	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
99	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
100	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
101	-	-	N	ARCH	7-Jul-16	9:15	1	D	161	-	-
102	-	-	N	ARCH	7-Jul-16	9:15	1	D	122	-	-
103	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
104	-	-	N	ARCH	7-Jul-16	9:15	1	D	128	-	-
105	-	-	N	ARCH	7-Jul-16	9:15	1	D	173	-	-
106	-	-	N	ARCH	7-Jul-16	9:15	1	D	162	-	-
107	-	-	N	ARCH	7-Jul-16	9:15	1	D	142	-	-
108	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-
109	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
110	-	-	N	ARCH	7-Jul-16	9:15	1	D	170	-	-
111	-	-	N	ARCH	7-Jul-16	9:15	1	D	130	-	-
112	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
113	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
114	-	-	N	ARCH	7-Jul-16	9:15	1	D	129	-	-
115	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
116	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
117	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
118	-	-	N	ARCH	7-Jul-16	9:15	1	D	165	-	-
119	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
120	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
121	-	-	N	ARCH	7-Jul-16	9:15	1	D	170	-	-
122	-	-	N	ARCH	7-Jul-16	9:15	1	D	180	-	-
123	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
124	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
125	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
126	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
127	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
128	-	-	N	ARCH	7-Jul-16	9:15	1	D	190	-	-
129	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
130	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
131	-	-	N	ARCH	7-Jul-16	9:15	1	D	143	-	-
132	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
133	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
134	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
135	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
136	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
137	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
138	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
139	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
140	-	-	N	ARCH	7-Jul-16	9:15	1	D	148	-	-
141	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
142	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
143	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
144	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
145	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
146	-	-	N	ARCH	7-Jul-16	9:15	1	D	172	-	-
147	-	-	N	ARCH	7-Jul-16	9:15	1	D	184	-	-
148	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
149	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
150	-	-	N	ARCH	7-Jul-16	9:15	1	D	175	-	-
151	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
152	-	-	N	ARCH	7-Jul-16	9:15	1	D	166	-	-
153	-	-	N	ARCH	7-Jul-16	9:15	1	D	198	-	-
154	-	-	Y	ARCH	7-Jul-16	9:15	1	D	182	-	-
155	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
156	-	-	N	ARCH	7-Jul-16	9:15	1	D	146	-	-
157	-	-	N	ARCH	7-Jul-16	9:15	1	D	169	-	-
158	-	-	N	ARCH	7-Jul-16	9:15	1	D	182	-	-
159	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
160	-	-	N	ARCH	7-Jul-16	9:15	1	D	153	-	-
161	-	-	N	ARCH	7-Jul-16	9:15	1	D	137	-	-
162	-	-	N	ARCH	7-Jul-16	9:15	1	D	151	-	-
163	-	-	N	ARCH	7-Jul-16	9:15	1	D	155	-	-
164	-	-	N	ARCH	7-Jul-16	9:15	1	D	170	-	-
165	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
166	-	-	N	ARCH	7-Jul-16	9:15	1	D	188	-	-
167	-	-	N	ARCH	7-Jul-16	9:15	1	D	180	-	-
168	-	-	N	ARCH	7-Jul-16	9:15	1	D	174	-	-
169	-	-	N	ARCH	7-Jul-16	9:15	1	D	163	-	-
170	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
171	-	-	N	ARCH	7-Jul-16	9:15	1	D	150	-	-
172	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-
173	-	-	N	ARCH	7-Jul-16	9:15	1	D	178	-	-
174	-	-	N	ARCH	7-Jul-16	9:15	1	D	158	-	-
175	-	-	N	ARCH	7-Jul-16	9:15	1	D	180	-	-
176	-	-	N	ARCH	7-Jul-16	9:15	1	D	157	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
177	-	-	N	ARCH	7-Jul-16	9:15	1	D	175	-	-
178	-	-	N	ARCH	7-Jul-16	9:15	1	D	139	-	-
179	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
180	-	-	N	ARCH	7-Jul-16	9:15	1	D	152	-	-
181	-	-	N	ARCH	7-Jul-16	9:15	1	D	140	-	-
182	-	-	N	ARCH	7-Jul-16	9:15	1	D	160	-	-
183	-	-	N	ARCH	7-Jul-16	9:15	1	D	156	-	-
184	-	-	N	ARCH	7-Jul-16	9:15	1	D	149	-	-
185	-	-	N	ARCH	7-Jul-16	9:15	1	D	173	-	-
186	-	-	N	ARCH	7-Jul-16	9:15	1	D	168	-	-
187	-	-	N	ARCH	7-Jul-16	9:15	1	D	141	-	-
-[a]	-	-	N	ARCH	7-Jul-16	9:15	3	D	-	-	-
188	52780	0465	Y	ARCH	8-Jul-16	9:00	1	U	823	-	-
189	52701	0468	Y	ARCH	8-Jul-16	9:20	1	U	745	5,250	1.270
190	52757	-	N	ARCH	8-Jul-16	9:40	1	U	730	4,250	1.092
191	52756	-	N	ARCH	8-Jul-16	10:00	1	U	605	2,250	1.016
192	52181	-	Y	ARCH	8-Jul-16	10:30	1	U	745	4,250	1.028
193	52755	-	N	ARCH	8-Jul-16	10:50	1	U	615	3,250	1.397
-[a]	-	-	N	ARCH	8-Jul-16	11:30	167	D	-	-	-
194	52779	0453	Y	ARCH	9-Jul-16	8:05	1	U	795	4,250	0.846
195	52777		N	ARCH	9-Jul-16	8:15	1	U	791	4,200	0.849
196	52778		N	ARCH	9-Jul-16	8:35	1	U	618	3,750	1.589
197	52754		N	ARCH	9-Jul-16	8:45	1	U	612	2,450	1.069
198	52753		N	ARCH	9-Jul-16	8:50	1	U	649	2,400	0.878
199	52752		N	ARCH	9-Jul-16	9:05	1	U	650	3,400	1.238
200	52751		N	ARCH	9-Jul-16	9:10	1	U	655	2,700	0.961
201	52749		N	ARCH	9-Jul-16	9:15	1	U	855	5,700	0.912
202	52748		N	ARCH	9-Jul-16	9:25	1	U	620	2,250	0.944
203	52185		Y	ARCH	9-Jul-16	9:30	1	U	691	3,250	0.985
204	-	-	N	ARCH	9-Jul-16	10:30	1	D	178	-	-
205	-	-	N	ARCH	9-Jul-16	10:30	1	D	163	-	-
206	-	-	N	ARCH	9-Jul-16	10:30	1	D	172	-	-
207	-	-	N	ARCH	9-Jul-16	10:30	1	D	155	-	-
208	-	-	N	ARCH	9-Jul-16	10:30	1	D	147	-	-
209	-	-	N	ARCH	9-Jul-16	10:30	1	D	198	-	-
210	-	-	N	ARCH	9-Jul-16	10:30	1	D	163	-	-
211	-	-	N	ARCH	9-Jul-16	10:30	1	D	166	-	-
212	-	-	N	ARCH	9-Jul-16	10:30	1	D	166	-	-
213	-	-	N	ARCH	9-Jul-16	10:30	1	D	181	-	-
214	-	-	N	ARCH	9-Jul-16	10:30	1	D	142	-	-
215	-	-	N	ARCH	9-Jul-16	10:30	1	D	149	-	-
216	-	-	N	ARCH	9-Jul-16	10:30	1	D	156	-	-
217	-	-	N	SPSC	9-Jul-16	10:30	1	D	66	-	-
218	-	-	N	ARCH	9-Jul-16	10:30	1	D	170	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
219	-	-	N	ARCH	9-Jul-16	10:30	1	D	154	-	-
220	-	-	N	ARCH	9-Jul-16	10:30	1	D	136	-	-
221	-	-	N	ARCH	9-Jul-16	10:30	1	D	153	-	-
222	-	-	N	ARCH	9-Jul-16	10:30	1	D	165	-	-
223	-	-	N	ARCH	9-Jul-16	10:30	1	D	154	-	-
224	-	-	N	ARCH	9-Jul-16	10:30	1	D	163	-	-
225	-	-	N	ARCH	9-Jul-16	10:30	1	D	157	-	-
226	-	-	N	ARCH	9-Jul-16	10:30	1	D	160	-	-
227	-	-	N	ARCH	9-Jul-16	10:30	1	D	154	-	-
228	-	-	N	ARCH	9-Jul-16	10:30	1	D	148	-	-
229	-	-	N	ARCH	9-Jul-16	10:30	1	D	167	-	-
230	-	-	N	ARCH	9-Jul-16	10:30	1	D	180	-	-
231	-	-	N	ARCH	9-Jul-16	10:30	1	D	150	-	-
232	-	-	N	ARCH	9-Jul-16	10:30	1	D	144	-	-
233	-	-	N	ARCH	9-Jul-16	10:30	1	D	153	-	-
-[a]	-	-	N	ARCH	9-Jul-16	15:00	125	D	-	-	-
234		0549	Y	ARCH	10-Jul-16	8:00	1	U	-[c]	-	-
-[a]	-	-	N	ARCH	10-Jul-16	10:30	141	D	-	-	-
-[a]	-	-	N	ARCH	10-Jul-16	16:00	35	D	-	-	-
-[a]	-	-	N	ARCH	11-Jul-16	8:30	77	D	-	-	-
-[a]	-	-	N	ARCH	11-Jul-16	14:30	67	D	-	-	-
-[a]	-	-	N	ARCH	11-Jul-16	16:45	49	D	-	-	-
235	-	-	N	ARCH	11-Jul-16	8:00	1	U	-[c]	-	-
236	-	-	N	ARCH	11-Jul-16	8:00	1	U	-[c]	-	-
237	-	-	N	ARCH	11-Jul-16	16:00	1	D	-[c]	-	-
-[a]	-	-	N	ARCH	12-Jul-16	8:00	190	D	-	-	-
-[a]	-	-	N	ARCH	12-Jul-16	16:00	54	D	-	-	-
-[a]	-	-	N	ARCH	13-Jul-16	8:00	91	D	-	-	-
238	52710		N	ARCH	14-Jul-16	6:30	1	U	826	6,250	1.109
239	52707		N	ARCH	14-Jul-16	6:45	1	U	725	4,300	1.128
240	52709		N	ARCH	14-Jul-16	6:55	1	U	615	2,550	1.096
241	52708		N	ARCH	14-Jul-16	7:10	1	U	677	3,300	1.064
242	52712		N	ARCH	14-Jul-16	7:15	1	U	679	3,000	0.958
243	52711		N	ARCH	14-Jul-16	7:30	1	U	686	3,250	1.007
-[a]	-	-	N	ARCH	14-Jul-16	7:45	22	D	-	-	-
244	52747		N	ARCH	15-Jul-16	8:30	1	U	879	7,350	1.082
245	52779	0481	Y	ARCH	15-Jul-16	8:45	1	U	749	4,250	1.011
246	52746		N	ARCH	15-Jul-16	9:00	1	U	748	4,250	1.016
247	52772		N	ARCH	18-Jul-16	17:15	1	U	690	4,250	1.294
-[a]	-	-	N	ARCH	18-Jul-16	17:15	4	U	-	-	-
248	-	-	N	ARCH	18-Jul-16	17:15	1	U	-	-	-
-[a]	-	-	N	ARCH	18-Jul-16	17:30	5	D	-	-	-
-[a]	-	-	N	SPSC	18-Jul-16	17:30	3	D	-	-	-
249	-	-	N	ARCH	19-Jul-16	17:50	1	U	157	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
250	-	-	N	SPSC	19-Jul-16	17:50	1	U	65	-	-
251	-	-	N	SPSC	19-Jul-16	17:50	1	U	75	-	-
252	-	-	N	SPSC	19-Jul-16	17:50	1	U	71	-	-
253	-	-	N	SPSC	19-Jul-16	17:50	1	U	71	-	-
254	-	-	N	SPSC	19-Jul-16	17:50	1	U	67	-	-
255	-	-	N	SPSC	19-Jul-16	17:50	1	D	79	-	-
256	-	-	N	SPSC	20-Jul-16	7:35	1	D	68	-	-
257	-	-	N	SPSC	20-Jul-16	7:35	1	D	115	-	-
258	-	-	N	SPSC	20-Jul-16	7:35	1	D	110	-	-
259	-	-	N	SPSC	20-Jul-16	7:35	1	D	69	-	-
260	-	-	N	SPSC	20-Jul-16	7:35	1	D	81	-	-
261	-	-	N	SPSC	20-Jul-16	7:35	1	D	71	-	-
262	-	-	N	SPSC	20-Jul-16	7:35	1	D	62	-	-
263	-	-	N	SPSC	20-Jul-16	7:35	1	D	59	-	-
264	-	-	N	SPSC	20-Jul-16	7:35	1	D	64	-	-
265	-	-	N	SPSC	20-Jul-16	7:35	1	D	76	-	-
266	-	-	N	SPSC	20-Jul-16	7:35	1	D	73	-	-
267	-	-	N	SPSC	20-Jul-16	7:35	1	D	71	-	-
268	-	-	N	SPSC	20-Jul-16	7:35	1	D	72	-	-
269	-	-	N	SPSC	20-Jul-16	7:35	1	D	64	-	-
270	-	-	N	SPSC	20-Jul-16	7:35	1	D	71	-	-
271	-	-	N	ARCH	20-Jul-16	7:35	1	D	197	-	-
272	-	-	N	ARCO	20-Jul-16	7:35	1	D	82	-	-
273	-	-	N	SPSC	20-Jul-16	7:50	1	U	62	-	-
274	-	-	N	SPSC	20-Jul-16	7:50	1	U	73	-	-
275	-	-	N	SPSC	20-Jul-16	7:50	1	U	68	-	-
276	-	-	N	SPSC	20-Jul-16	7:50	1	U	70	-	-
277	-	-	N	SPSC	20-Jul-16	7:50	1	U	115	-	-
278	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
279	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
280	-	-	N	SPSC	20-Jul-16	7:50	1	U	74	-	-
281	-	-	N	SPSC	20-Jul-16	7:50	1	U	67	-	-
282	-	-	N	SPSC	20-Jul-16	7:50	1	U	82	-	-
283	-	-	N	SPSC	20-Jul-16	7:50	1	U	75	-	-
284	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-
285	-	-	N	SPSC	20-Jul-16	7:50	1	U	68	-	-
286	-	-	N	SPSC	20-Jul-16	7:50	1	U	60	-	-
287	-	-	N	SPSC	20-Jul-16	7:50	1	U	64	-	-
288	-	-	N	SPSC	20-Jul-16	7:50	1	U	60	-	-
289	-	-	N	SPSC	20-Jul-16	7:50	1	U	56	-	-
290	-	-	N	SPSC	20-Jul-16	7:50	1	U	67	-	-
291	-	-	N	SPSC	20-Jul-16	7:50	1	U	64	-	-
292	-	-	N	SPSC	20-Jul-16	7:50	1	U	69	-	-
293	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
294	-	-	N	SPSC	20-Jul-16	7:50	1	U	73	-	-
295	-	-	N	SPSC	20-Jul-16	7:50	1	U	60	-	-
296	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
297	-	-	N	SPSC	20-Jul-16	7:50	1	U	66	-	-
298	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-
299	-	-	N	SPSC	20-Jul-16	7:50	1	U	71	-	-
300	-	-	N	SPSC	20-Jul-16	7:50	1	U	54	-	-
301	-	-	N	SPSC	20-Jul-16	7:50	1	U	55	-	-
302	-	-	N	SPSC	20-Jul-16	7:50	1	U	59	-	-
303	-	-	N	SPSC	20-Jul-16	7:50	1	U	65	-	-
304	-	-	N	ARCO	20-Jul-16	7:50	1	U	65	-	-
305	-	-	N	ARCO	20-Jul-16	7:50	1	U	71	-	-
306	-	-	N	ARCO	20-Jul-16	7:50	1	U	82	-	-
307	-	-	N	ARCH	20-Jul-16	18:10	1	D	155	-	-
308	-	-	N	ARCH	20-Jul-16	18:10	1	D	154	-	-
309	-	-	N	SPSC	20-Jul-16	18:10	1	D	113	-	-
310	-	-	N	SPSC	20-Jul-16	18:10	1	D	76	-	-
311	-	-	N	SPSC	20-Jul-16	18:10	1	D	78	-	-
312	-	-	N	SPSC	20-Jul-16	18:10	1	D	62	-	-
313	-	-	N	SPSC	20-Jul-16	18:10	1	D	65	-	-
314	-	-	N	SPSC	20-Jul-16	18:10	1	D	68	-	-
315	-	-	N	SPSC	20-Jul-16	18:10	1	D	69	-	-
316	-	-	N	SPSC	20-Jul-16	18:10	1	D	59	-	-
317	-	-	N	SPSC	20-Jul-16	18:10	1	D	76	-	-
318	-	-	N	SPSC	20-Jul-16	18:10	1	D	77	-	-
319	-	-	N	SPSC	20-Jul-16	18:10	1	D	78	-	-
320	-	-	N	SPSC	20-Jul-16	18:10	1	D	69	-	-
321	-	-	N	SPSC	20-Jul-16	18:10	1	D	62	-	-
322	-	-	N	SPSC	20-Jul-16	18:10	1	D	83	-	-
323	-	-	N	SPSC	20-Jul-16	18:10	1	D	70	-	-
324	-	-	N	SPSC	20-Jul-16	18:10	1	D	61	-	-
325	-	-	N	SPSC	20-Jul-16	18:10	1	D	70	-	-
326	-	-	N	SPSC	20-Jul-16	18:10	1	D	63	-	-
327	-	-	N	ARCH	20-Jul-16	18:20	1	U	166	-	-
328	-	-	N	ARCH	20-Jul-16	18:20	1	U	152	-	-
329	-	-	N	ARCH	20-Jul-16	18:20	1	U	134	-	-
330	-	-	N	ARCH	20-Jul-16	18:20	1	U	148	-	-
331	-	-	N	ARCH	20-Jul-16	18:20	1	U	149	-	-
332	-	-	N	SPSC	20-Jul-16	18:20	1	U	68	-	-
333	-	-	N	SPSC	20-Jul-16	18:20	1	U	65	-	-
334	-	-	N	SPSC	20-Jul-16	18:20	1	U	70	-	-
335	-	-	N	SPSC	20-Jul-16	18:20	1	U	78	-	-
336	-	-	N	SPSC	20-Jul-16	18:20	1	U	66	-	-
337	-	-	N	ARCO	20-Jul-16	18:20	1	U	59	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
338	-	-	N	ARCO	20-Jul-16	18:20	1	U	68	-	-
339	52774	-	N	ARCH	21-Jul-16	8:55	1	U	560	-	-
340	52783	-	N	ARCH	21-Jul-16	8:55	1	U	700	-	-
341	-	-	N	LKTR	21-Jul-16	8:55	1	U	105	-	-
342	-	-	N	ARCO	21-Jul-16	8:55	1	U	80	-	-
343	-	-	N	SPSC	21-Jul-16	8:55	1	U	67	-	-
344	-	-	N	SPSC	21-Jul-16	8:55	1	U	68	-	-
345	-	-	N	SPSC	21-Jul-16	8:55	1	U	70	-	-
346	-	-	N	ARCH	21-Jul-16	18:35	1	D	178	-	-
347	-	-	N	ARCH	21-Jul-16	18:35	1	D	148	-	-
348	-	-	N	ARCH	21-Jul-16	18:35	1	D	155	-	-
349	-	-	N	ARCH	21-Jul-16	18:35	1	D	149	-	-
350	-	-	N	SPSC	21-Jul-16	18:35	1	D	65	-	-
351	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
352	-	-	N	SPSC	21-Jul-16	18:35	1	D	81	-	-
353	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
354	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
355	-	-	N	SPSC	21-Jul-16	18:35	1	D	65	-	-
356	-	-	N	SPSC	21-Jul-16	18:35	1	D	72	-	-
357	-	-	N	SPSC	21-Jul-16	18:35	1	D	95	-	-
358	-	-	N	SPSC	21-Jul-16	18:35	1	D	98	-	-
359	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
360	-	-	N	SPSC	21-Jul-16	18:35	1	D	72	-	-
361	-	-	N	SPSC	21-Jul-16	18:35	1	D	72	-	-
362	-	-	N	SPSC	21-Jul-16	18:35	1	D	75	-	-
363	-	-	N	SPSC	21-Jul-16	18:35	1	D	67	-	-
364	-	-	N	SPSC	21-Jul-16	18:35	1	D	75	-	-
365	-	-	N	SPSC	21-Jul-16	18:35	1	D	73	-	-
366	-	-	N	SPSC	21-Jul-16	18:35	1	D	70	-	-
367	-	-	N	SPSC	21-Jul-16	18:35	1	D	73	-	-
368	-	-	N	ARCH	21-Jul-16	18:35	1	D	-	-	-
369	52702	-	N	ARCH	22-Jul-16	9:15	1	U	862	6,250	0.976
370	52744	-	N	ARCH	22-Jul-16	9:15	1	U	681	3,650	1.156
371	-	-	N	ARCH	22-Jul-16	9:15	1	U	143	-	-
372	-	-	N	ARCH	22-Jul-16	9:15	1	U	157	-	-
373	-	-	N	SPSC	22-Jul-16	9:15	1	U	79	-	-
-[a]	-	-	N	SPSC	22-Jul-16	9:15	5	U	-	-	-
374		-	N	ARCH	22-Jul-16	10:00	1	D	156	-	-
-[a]	-	-	N	SPSC	22-Jul-16	10:00	7	D	-	-	-
375	-	-	N	ARCO	22-Jul-16	10:00	1	D	-	-	-
376	-	-	N	ARCH	23-Jul-16	18:30	1	D	183	-	-
377	-	-	N	ARCH	23-Jul-16	18:30	1	D	153	-	-
378	-	-	N	ARCH	23-Jul-16	18:30	1	D	169	-	-
379	-	-	N	ARCH	23-Jul-16	18:30	1	D	166	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
380	-	-	N	ARCH	23-Jul-16	18:30	1	D	155	-	-
381	-	-	N	ARCH	23-Jul-16	18:30	1	D	168	-	-
382	-	-	N	ARCH	23-Jul-16	18:30	1	D	171	-	-
383	-	-	N	ARCH	23-Jul-16	18:30	1	D	168	-	-
384	-	-	N	ARCH	23-Jul-16	18:30	1	D	163	-	-
385	-	-	N	ARCH	23-Jul-16	18:30	1	D	185	-	-
386	-	-	N	ARCH	23-Jul-16	18:30	1	D	165	-	-
387	-	-	N	ARCH	23-Jul-16	18:30	1	D	156	-	-
388	-	-	N	ARCH	23-Jul-16	18:30	1	D	165	-	-
389	-	-	N	ARCH	23-Jul-16	18:30	1	D	164	-	-
390	-	-	N	ARCH	23-Jul-16	18:30	1	D	164	-	-
391	-	-	N	ARCH	23-Jul-16	18:30	1	D	145	-	-
392	-	-	N	ARCH	23-Jul-16	18:30	1	D	133	-	-
393	-	-	N	ARCH	23-Jul-16	18:30	1	D	145	-	-
394	-	-	N	SPSC	23-Jul-16	18:30	1	D	119	-	-
395	-	-	N	SPSC	23-Jul-16	18:30	1	D	111	-	-
396	-	-	N	SPSC	23-Jul-16	18:30	1	D	79	-	-
397	-	-	N	SPSC	23-Jul-16	18:30	1	D	72	-	-
398	-	-	N	SPSC	23-Jul-16	18:30	1	D	81	-	-
399	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
400	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
401	-	-	N	SPSC	23-Jul-16	18:30	1	D	85	-	-
402	-	-	N	SPSC	23-Jul-16	18:30	1	D	79	-	-
403	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
404	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
405	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
406	-	-	N	SPSC	23-Jul-16	18:30	1	D	73	-	-
407	-	-	N	SPSC	23-Jul-16	18:30	1	D	64	-	-
408	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
409	-	-	N	SPSC	23-Jul-16	18:30	1	D	65	-	-
410	-	-	N	SPSC	23-Jul-16	18:30	1	D	76	-	-
411	-	-	N	SPSC	23-Jul-16	18:30	1	D	78	-	-
412	-	-	N	SPSC	23-Jul-16	18:30	1	D	75	-	-
413	-	-	N	SPSC	23-Jul-16	18:30	1	D	72	-	-
-[a]	-	-	N	SPSC	23-Jul-16	18:30	17	D	-	-	-
-[a]	-	-	N	ARCH	23-Jul-16	18:30	2	D	-	-	-
414	-	-	N	ARCH	24-Jul-16	18:35	1	D	104	-	-
415	-	-	N	ARCH	24-Jul-16	18:35	1	D	176	-	-
416	-	-	N	ARCH	24-Jul-16	18:35	1	D	148	-	-
417	-	-	N	ARCH	24-Jul-16	18:35	1	D	166	-	-
418	-	-	N	ARCH	24-Jul-16	18:35	1	D	155	-	-
419	-	-	N	ARCH	24-Jul-16	18:35	1	D	158	-	-
420	-	-	N	ARCH	24-Jul-16	18:35	1	D	161	-	-
421	-	-	N	ARCH	24-Jul-16	18:35	1	D	152	-	-

Table B1: Fish Catch Data from the Fyke Trap on Nulahugyuk Creek, 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	2014 Floy Tag#	2014 Recap.? (Y/N)	Species	Date	Time	No. of Fish	Fish Direction	Length (mm)	Weight (g)	Condition Factor (k)
422	-	-	N	ARCH	24-Jul-16	18:35	1	D	155	-	-
423	-	-	N	ARCH	24-Jul-16	18:35	1	D	162	-	-
424	-	-	N	ARCH	24-Jul-16	18:35	1	D	167	-	-
- [a]	-	-	N	SPSC	24-Jul-16	18:35	27	D	-	-	-
- [a]	-	-	N	ARCO	24-Jul-16	18:35	1	D	-	-	-
- [a]	-	-	N	SPSC	24-Jul-16	18:50	31	U	-	-	-
- [a]	-	-	N	ARCI	25-Jul-16	10:00	1	U	-	-	-
- [a]	-	-	N	SPSC	25-Jul-16	10:00	3	U	-	-	-
- [a]	-	-	N	ARCH	25-Jul-16	10:00	3	U	-	-	-
- [a]	-	-	N	SPSC	25-Jul-16	10:10	17	D	-	-	-

Note: Table excludes a description of efforts or net checks when no fish were captured.

[a] No fish ID number was assigned to fish that were enumerated only (not weighed or measured for length). The number of fish captured is provided in the "Number of Fish" column.

[b] All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.

[c] Fish escaped or fish was not checked for an existing FLOY or PIT tag (re-capture).

ID = identification; # = number; PIT tag = Passive Integrated Transponder tag; - = no data; Recap.? = Has this individual been captured before, where N = No, and Y = Yes, this individuals was captured prior to 2016 (FLOY or PIT tag present); ARCH = Arctic Char, ARCO = Arctic Cod, ARCI = Arctic Cisco, LKTR = Lake Trout, SPSC = Spoonhead Sculpin; D = downstream; U = upstream; mm = millimetres; g = grams; k = condition factor (k = [weight/length3]*100000).

Table B2: Recapture Summary of Tagged Fish – 7 to 25 July 2016

Fish ID#	PIT Tag#[b]	FLOY Tag#	Species	Date	Time	Initial Catch Date	Fish Direction
188	52780	0465[a]	ARCH	8-Jul-16	10:00	8-Jul-16	D
189	52701	0468[a]	ARCH	8-Jul-16	11:20	8-Jul-16	D
189	52701	0468[a]	ARCH	22-Jul-16	9:15	8-Jul-16	U
190	52757	-	ARCH	11-Jul-16	8:30	8-Jul-16	D
191	52756	-	ARCH	8-Jul-16	12:00	8-Jul-16	D
192	52181[a]	-	ARCH	8-Jul-16	12:30	8-Jul-16	D
192	52181	-	ARCH	22-Jul-16	9:15	8-Jul-16	U
194	52779	0453[a]	ARCH	9-Jul-16	16:00	9-Jul-16	D
196	52778	-	ARCH	10-Jul-16	16:00	9-Jul-16	D
197	52754	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
197	52754	-	ARCH	23-Jul-16	8:15	9-Jul-16	U
199	52752	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
199	52752	-	ARCH	17-Jul-16	7:45	9-Jul-16	U
199	52752	-	ARCH	17-Jul-16	12:00	9-Jul-16	D
201	52749	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
202	52748	-	ARCH	10-Jul-16	15:30	9-Jul-16	D
203	52185[a]	-	ARCH	9-Jul-16	16:00	9-Jul-16	D
242	52712	-	ARCH	16-Jul-16	8:00	14-Jul-16	U
242	52712	-	ARCH	19-Jul-16	20:25	14-Jul-16	D
339	52774	-	ARCH	22-Jul-16	10:00	21-Jul-16	D

[a] Fish was also recognized as 2014 re-capture.

[b] All PIT tag identification numbers began with the same 7 digits (2280001), not displayed in this table.

ID = identification; # = number; PIT tag = Passive Integrated Transponder; - = no data; N/A = not applicable; ARCH = Arctic Char; D = downstream; U = upstream.

APPENDIX C

Remediation Plan

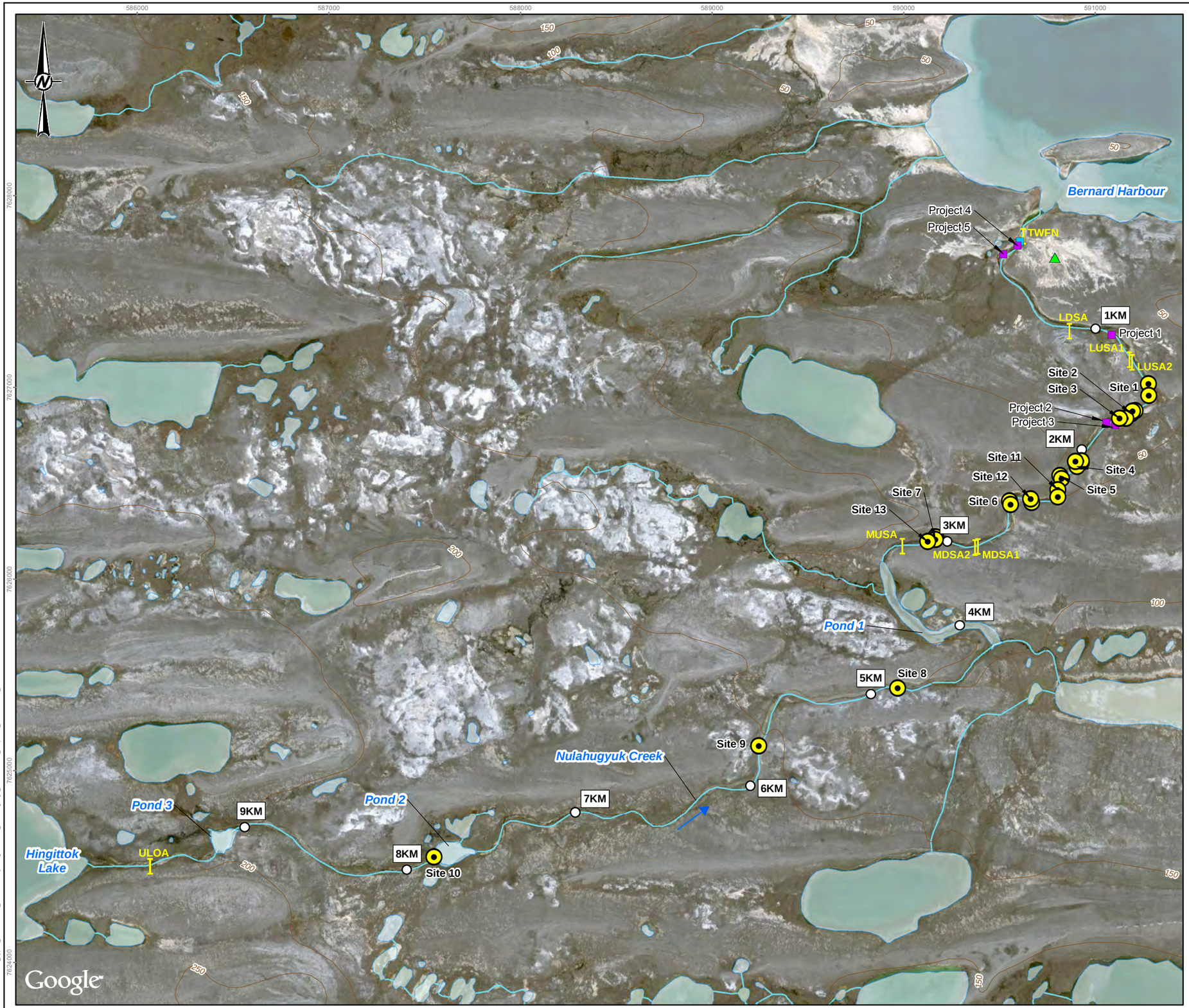
A reconnaissance survey of Nulahugyuk Creek was completed on 16 July 2014 to identify problem locations which have the potential to negatively affect the upstream migration of Arctic Char. Negative effects to Arctic Char migration include impeded access to the spawning lake and physiological stress or mortality from exposure due to stranding; both of which may lead to reductions in fishery productivity. A follow-up survey was completed on 23 to 24 July 2015 to collect additional information on the problem locations and identify where stream enhancement (i.e., remediation) activities could facilitate migration. An objective for the 2016 field program was to conduct habitat surveys of the creek to finalize the remediation plan, including updates to descriptions of problem locations where low-flow channels could be constructed to improve fish passage.

Potential barriers to fish passage were identified at 13 sites or locations on the creek during habitat surveys on 10 to 14 July 2016 (Table 3-5; Figure C1). These locations were characterized as difficult for adult Arctic Char to migrate upstream because of boulder barriers, 'broken' thalwegs and lack of water depth that can result in strandings and mortalities The problem sites are where low-flow-channel projects may improve fish passage and ultimately benefit the production of Arctic Char. Three sites were identified as the highest priority for site remediation, as a rank 3, followed by five rank 2 locations, and five rank 1 locations where remediation efforts are needed. Five of the problem sites were identified within a sharp bend in the lower section of the creek, starting 1.3 km from the mouth of Nulahugyuk Creek and for an upstream distance of approximately 800 m. Many strandings and mortalities were incidentally observed along this section during 2012 and 2014. Furthermore, most of the problem sites where remediation work is proposed (approximately 77%) are within the lower 3 km of the creek, which is consistent with previous habitat assessments of the creek (Golder and ANL 2007).

The remediation program will focus on constructing low-flow channels and directional weirs at the 13 proposed enhancement sites described in detail in the tables below (Tables C1 to C13). The Golder field crew and HTO students will use the information in the tables for the construction of the remediation structures at each site. Although this document provides a description and guideline for constructing the low-flow channel sites, the crew will use their best judgement of the current conditions to determine the most effective design. The final design may differ from what is described in this remediation plan.

Design considerations include the following:

- Where low-flow channels or weirs must be oriented against the natural direction of flows, the largest available boulders should be positioned on the upstream side of the weir to prevent blow-outs at high velocities during the spring freshet.
- When a low-flow channel is constructed in an area where the creek is relatively wide, it is recommended that multiple channels or extended directional weirs be considered to aid upstream navigation.
- Where flows are dispersed and water depths are low, additional weirs should be considered (using large boulders) at the upstream end of the channel to direct flows into the channel to increase water depths.
- Where possible, large boulders should be included as a natural feature in the low-flow channels to provide in-stream cover and enhance the structural integrity of the channels.

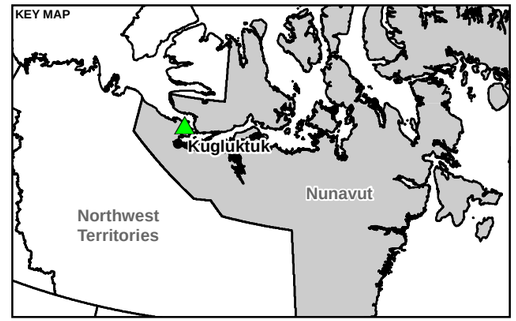


LEGEND

- ELEVATION CONTOUR
- WATERCOURSE
- WATERBODY
- CAMP
- CHANNEL MANIPULATION PROJECT 2012
- FYKE NET
- KILOMETRE MARKER
- PIT TAG ARRAY

LDSA - LOWER DOWNSTREAM ARRAY
MUSA - MIDDLE UPSTREAM ARRAY
ULOA - UPPER LAKE OUTLET ARRAY
LUSA1 - LOWER UPSTREAM ARRAY 1
LUSA2 - LOWER UPSTREAM ARRAY 2
MDSA1 - MIDDLE DOWNSTREAM ARRAY 1
MDSA2 - MIDDLE DOWNSTREAM ARRAY 2
TWFN - TWO WAY FYKE NET (ARRAY)

KEY MAP



DRAFT

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NOTES

1. THE LOW-FLOW CHANNELS (CHANNEL MANIPULATION PROJECTS) WERE CONSTRUCTED IN 2012 (GOLDER 2013)

REFERENCE

GOOGLE EARTH IMAGERY: © 2014 DIGITAL GLOBE
CANVEC BASE DATA: © DEPARTMENT OF NATURAL RESOURCES CANADA, 2012. ALL RIGHTS RESERVED.
NAD 83 UTM ZONE 11N

CLIENT
Sabina GOLD & SILVER CORP.

PROJECT
BACK RIVER PROJECT
NUNAVUT, CANADA

TITLE
LOCATIONS OF PROPOSED ENHANCEMENT SITES ON NULAHUGYUK CREEK

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-06-16
PREPARED	LMR/ANK
DESIGN	KD
REVIEW	-
APPROVED	-

PROJECT No.	PHASE	Rev.	FIGURE
1545534	4000	A	C1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

Path: G:\2015\1545534_Tyze A_WaterLicence_BackRiverProject\Figures\4000_Offsetting\Fig1_1545534-4000_Proposed_Enhancement_Sites.mxd

Table C1: Remediation Planning Notes for Low-Flow Channel Site 1

Priority for Enhancement	High		Notes: ■ Proposed low-flow channel at Site 1 is located at a sharp bend in the creek where the creek widens and flows are dispersed. ■ Fish travelling upstream will become stranded if they continue up the RDB at this location because it is shallow and is dry further upstream. There is no room to turn around. ■ Level of effort for this site may require more than that used for Project 5 in 2012.
Fish Stranding Observed?	Yes (2012 and 2014)		
Approximate Minimum Length	Low-flow channel (41 m), plus two weirs (6 m, and 30 m)		
Approximate Distance From Mouth	1.4 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	**Easting**	**Northing**	
306	591278	7627020	
307	591279	7626958	
Recommendation	■ Construct a 41-m low-flow channel to direct fish diagonally up the center of the creek, towards the LDB where there is deeper flowing water. This low-flow channel would connect the thalwegs and allow for easier fish passage with less likelihood of stranding. ■ Two rock weirs should be constructed on either side of the channel to direct fish into the low-flow channel and block access up the shallow RDB where strandings occur further upstream. Weir 1 (approximately 30 m long) will be constructed towards the RDB, and Weir 2 (approximately 6 m long) will be constructed towards the LDB.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

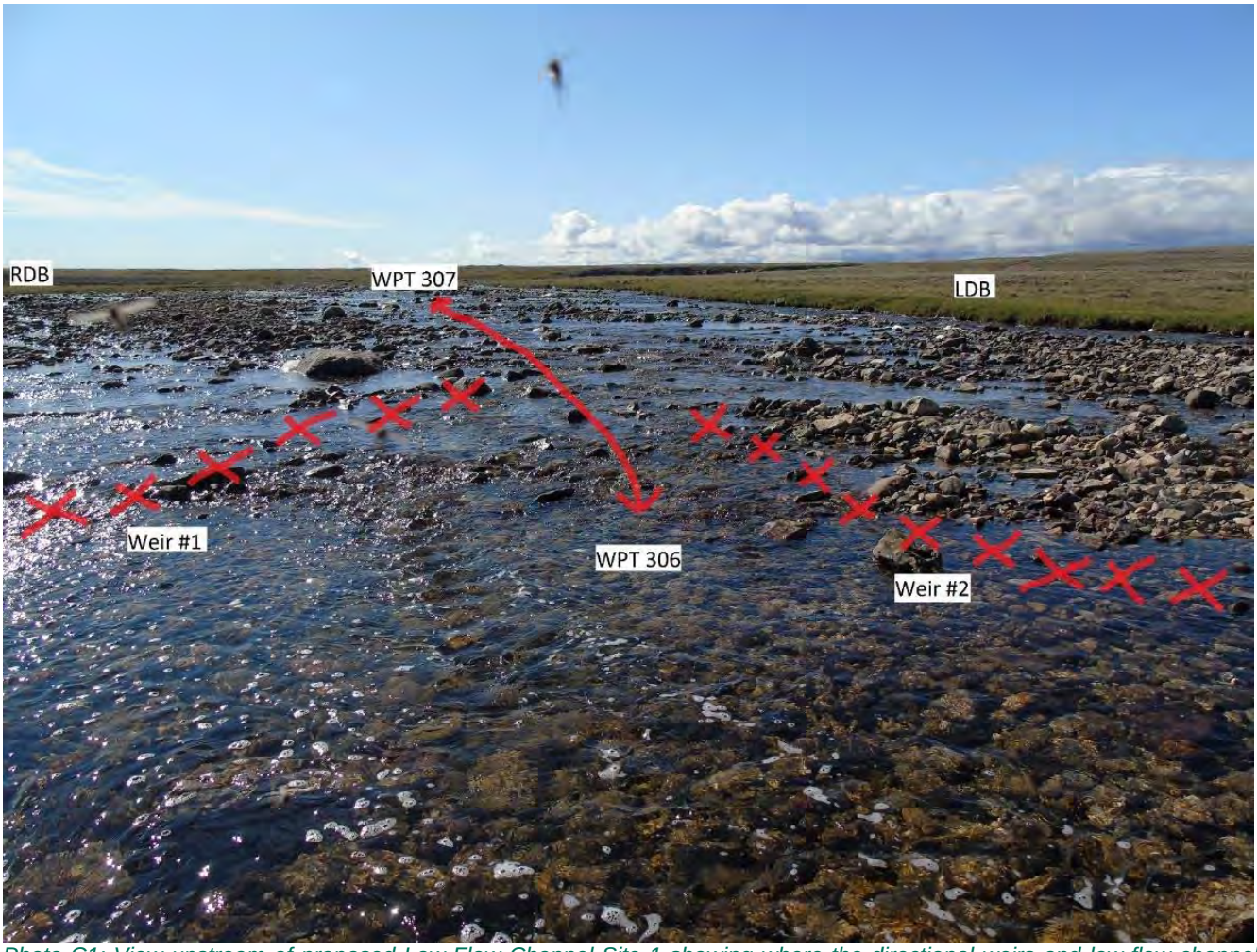

Photo C1: View upstream of proposed Low-Flow Channel Site 1 showing where the directional weirs and low-flow channel should be constructed.

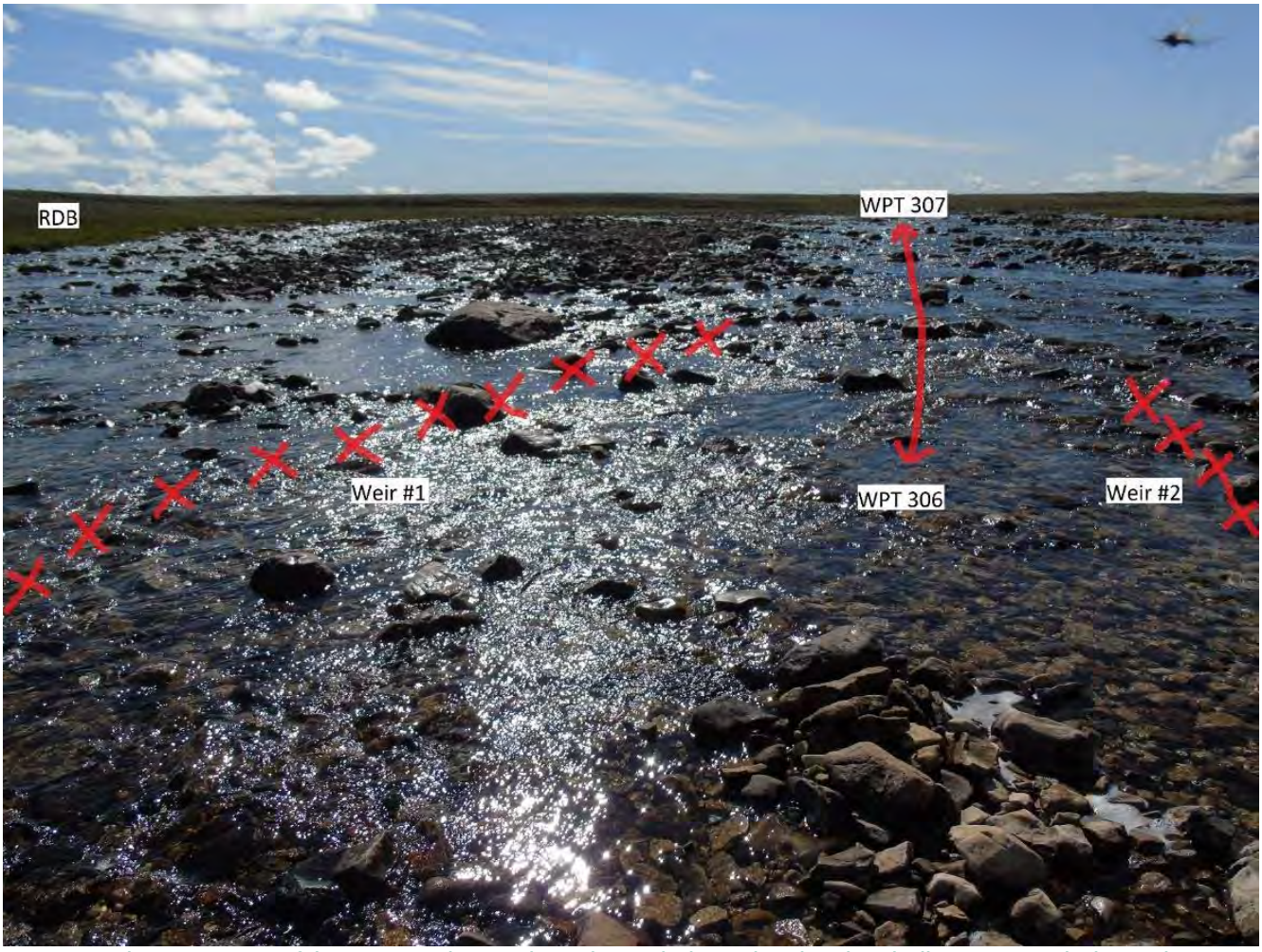

Photo C2: View upstream of the proposed Low-Flow Channel Site 1 showing the shallow RDB and where placement of the weir, and low-flow channel should be constructed.

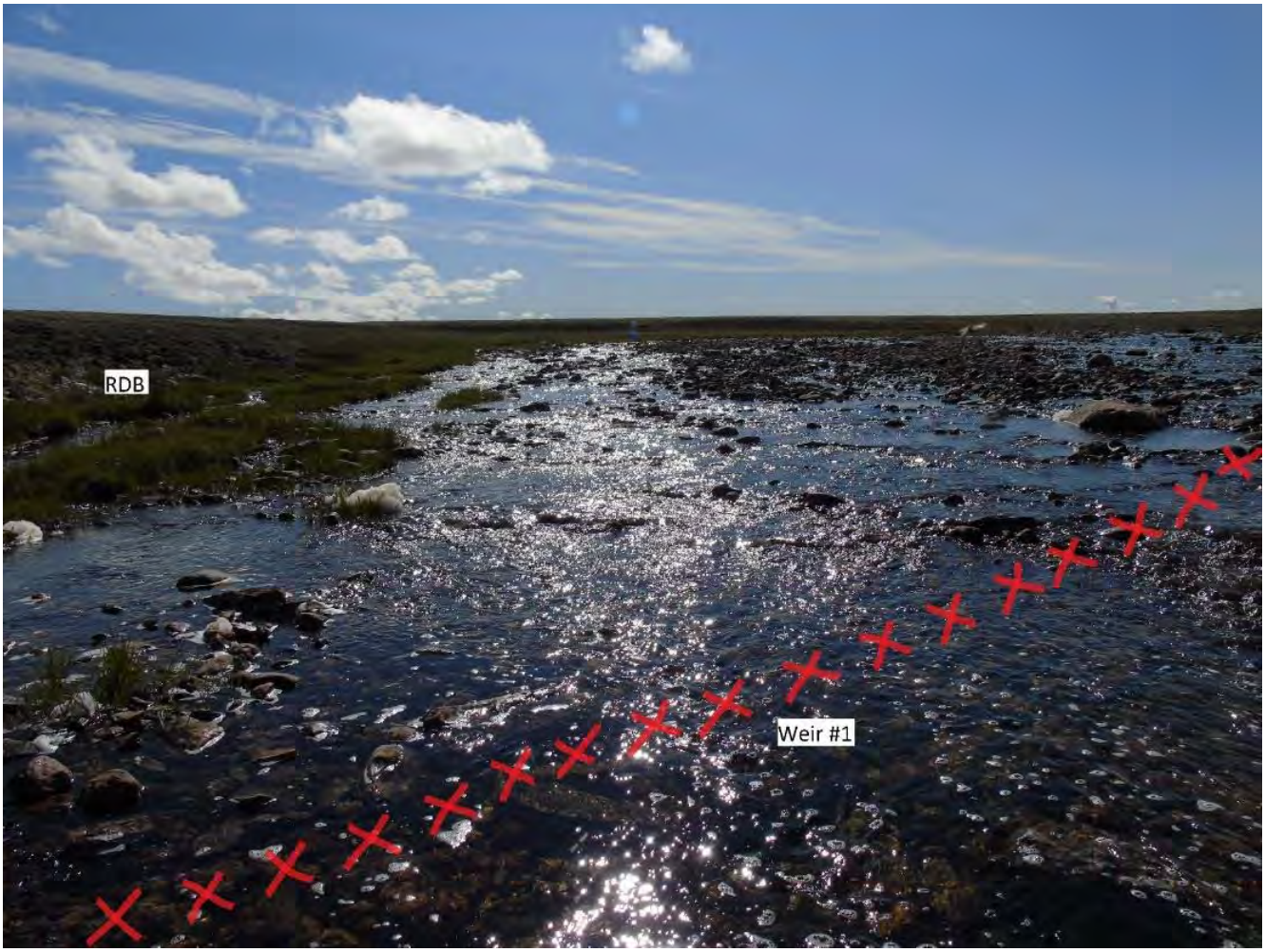

Photo C3: View upstream of the proposed Low-Flow Channel Site 1 showing where weir 1 should be constructed to block access up the shallow RDB

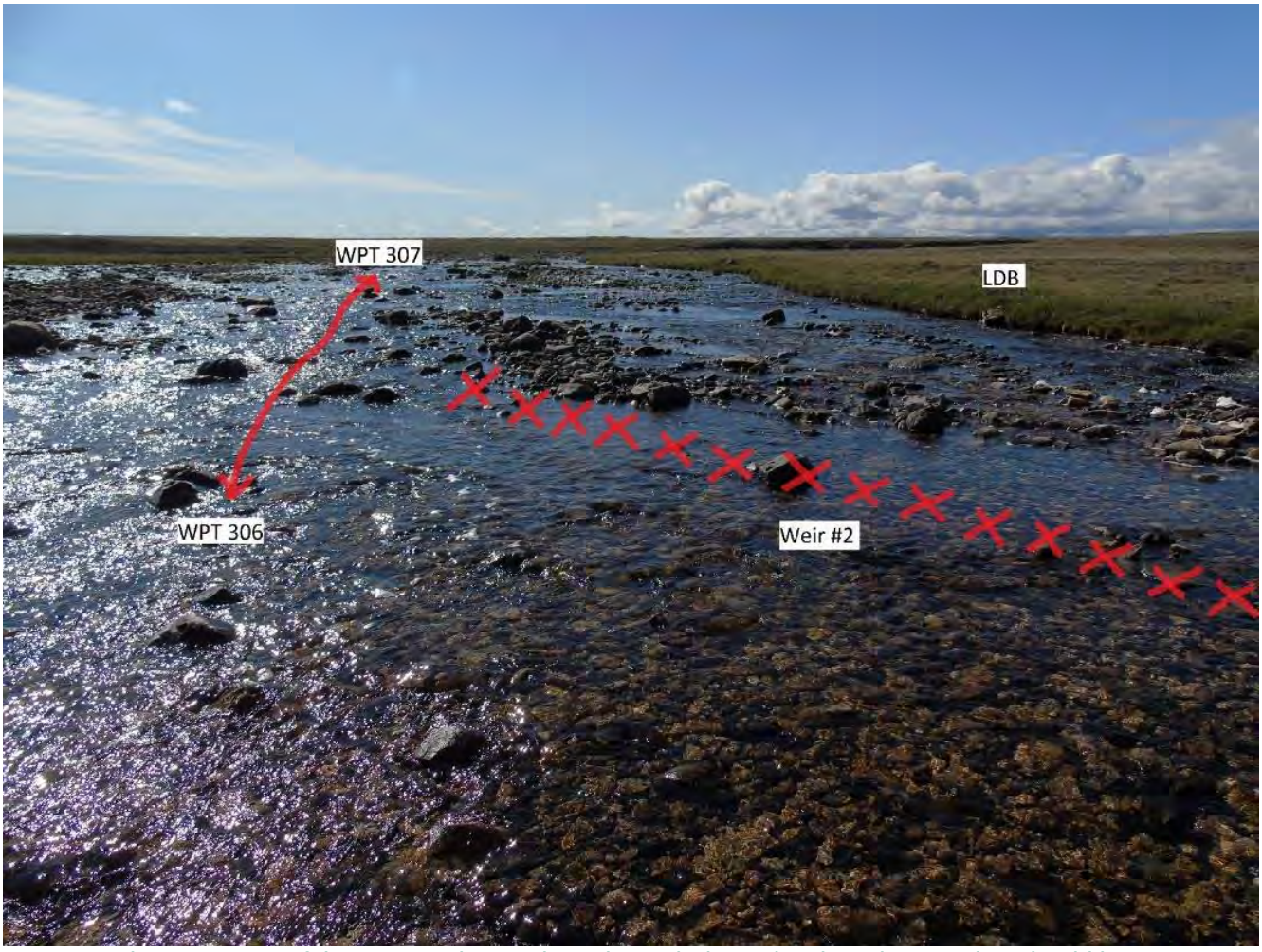

Photo C4: View upstream of the proposed Low-Flow Channel Site 1 showing where Weir 2 should be constructed to direct fish towards the center of the channel

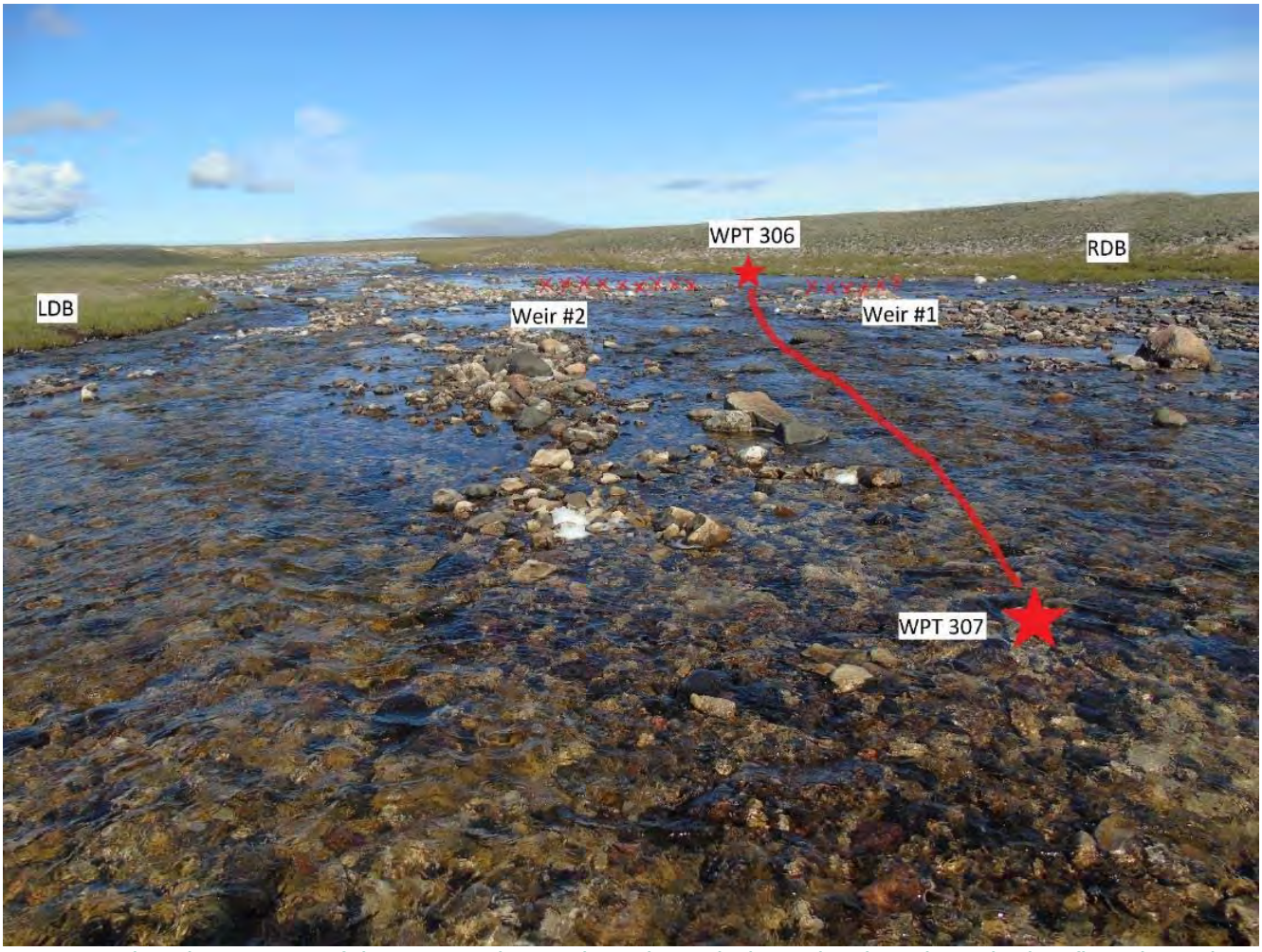

Photo C5: View downstream of the proposed Low-Flow Channel Site 1 showing where the low flow channel and directional weirs should be constructed.

Table C2: Remediation Planning Notes for Low-Flow Channel Site 2

Priority	Medium	Notes: ■ Proposed low-flow channel for Site 2 is located in a sharp bend in the creek where flows are dispersed. ■ Fish migrating upstream in this section will encounter a moderate gradient with moderate velocities but shallow depths that spans most of the creek. If fish follow the LDB they risk stranding further upstream where it becomes shallow and dry in sections at low-flows. ■ Proposed low-flow channels for Site 2 are downstream of existing 2012 Projects 2 and 3.
Fish Stranding Observed?	Yes (2012 and 2014)	
Approximate Minimum Length	Two Channels (26 m, and 16 m) plus a 10-m long weir	
Approximate Distance From Mouth	1.6 km	

Location of Channel Start and End Points (UTM 11W)		
Waypoint	**Easting**	**Northing**
311	591209	7626879
312	591188	7626862
313	591195	7626876

Recommendation	■ Construct two, low-flow channels to connect isolated thalwegs to locations with higher flow. Channel 1 (approximately 26 m long) will direct fish up the center of the channel and away from the LDB where stranding can occur at upstream locations. Channel 2 (approximately 16 m long) would provide another option to direct fish away from the LDB to the centre of the channel. ■ A 10-m diversion or directional weir may be required from the mouth of Channel 2 to the LDB to direct fish into the channel and away from swimming up the LDB where there is a high risk of stranding; this determination will be made by the remediation crew.

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

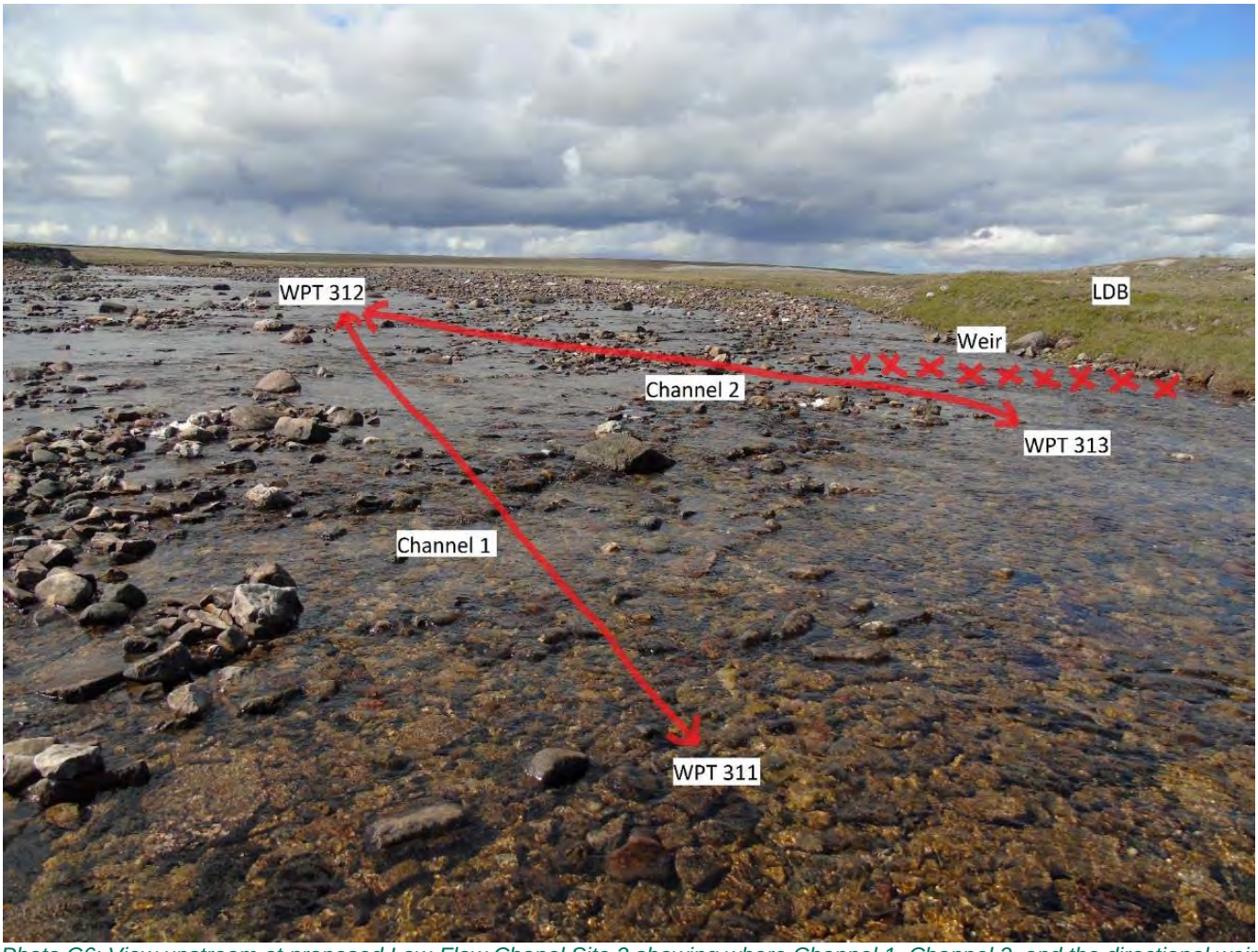

Photo C6: View upstream at proposed Low-Flow Chanel Site 2 showing where Channel 1, Channel 2, and the directional weir should be constructed.

Photo C7: View looking upstream at the LDB where the directional weir should be constructed to prevent fish stranding along the LDB.

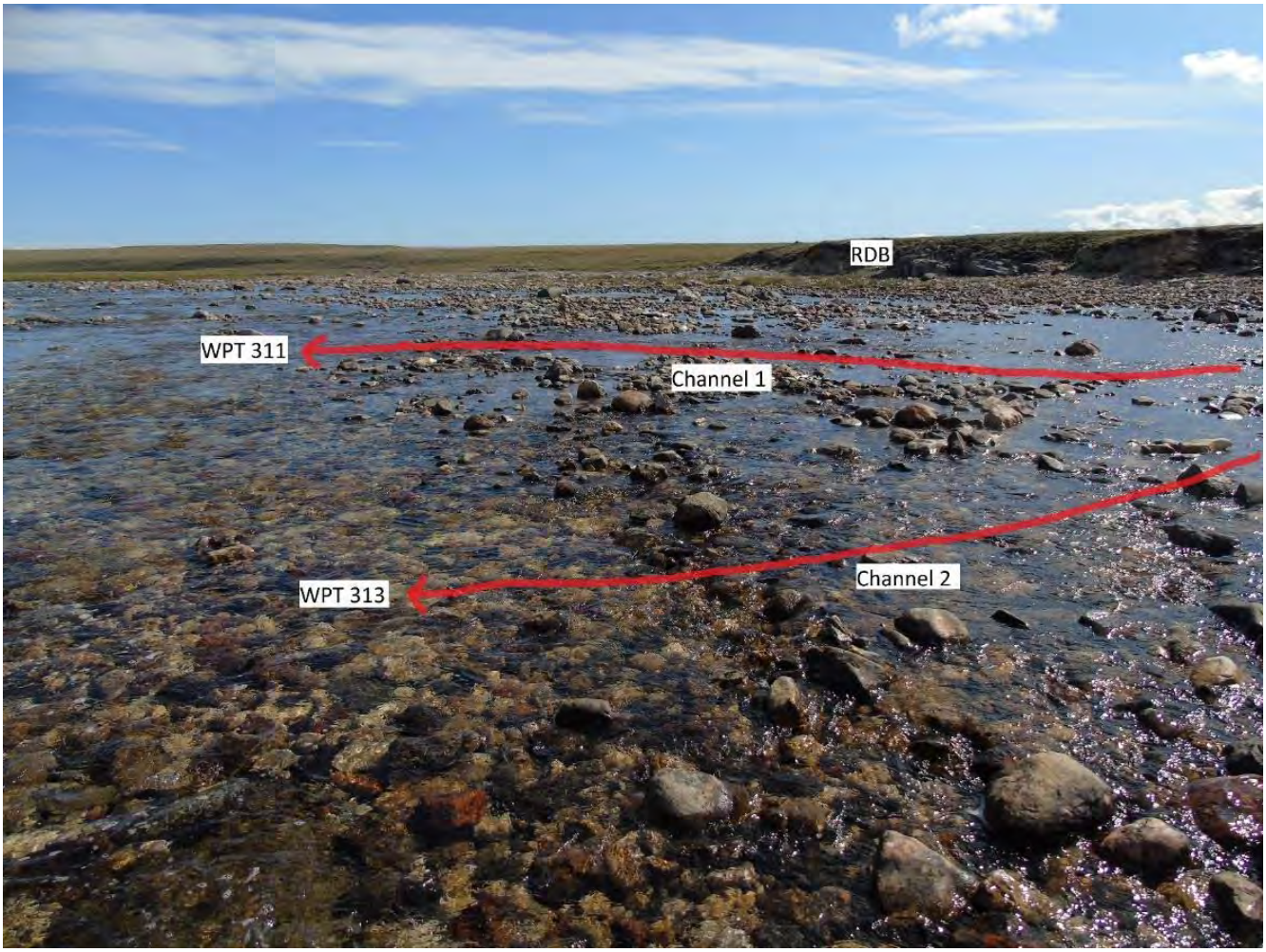

Photo C8: View downstream looking at the RDB showing where Channel 1 and Channel 2 should be constructed. This photo also shows the dry RDB and deeper LDB area where fish will originate when migrating upstream.

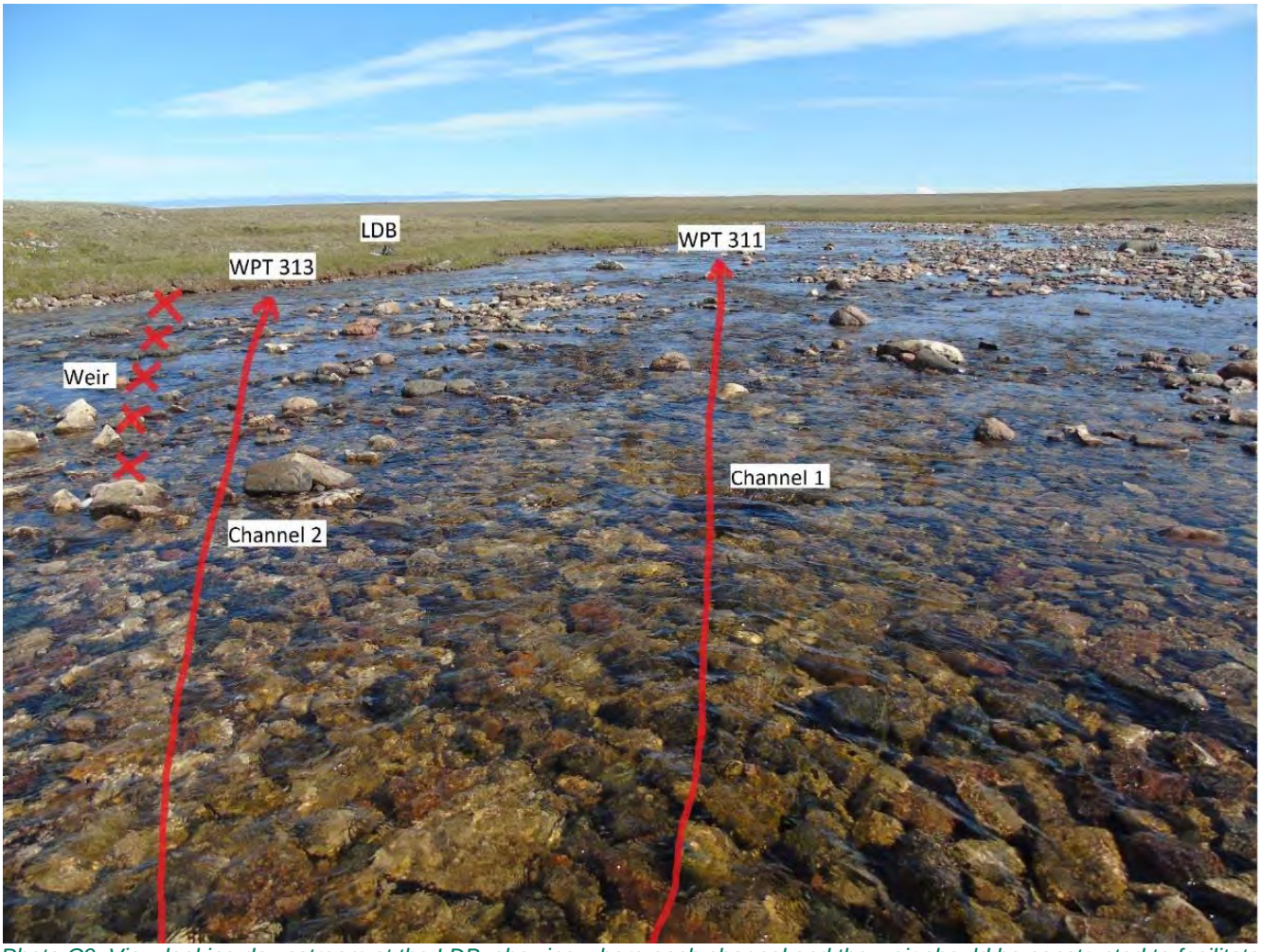

Photo C9: View looking downstream at the LDB, showing where each channel and the weir should be constructed to facilitate fish migration.

Table C3: Remediation Planning Notes for Low-Flow Channel Site 3

Priority	Medium		Notes: ■ In this section of the creek, there is sufficient depth for fish to travel up the RDB. Though more difficult, fish may also travel up the center, and towards the LDB where flow is faster but the water is shallow. ■ An unimpeded migration route is required to connect deep water sections (e.g., thalwegs, small pools) where fish might be holding ■ Site 3 is immediately below 2012 Projects 2 and 3.
Fish Stranding Observed?	Yes (2012 and 2014)		
Approximate Minimum Length	34-m channel or a 16-m weir		
Approximate Distance From Mouth	1.7 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	**Easting**	**Northing**	
316	591160	7626839	
317	591127	7626839	
Recommendation	■ Construct a 34-m channel to provide migrating fish the option of swimming up through the center or LDB of the creek; an alternative design would be a rock weir from the LDB to the centre of the creek, directing fish to the RDB. ■ Final design of the remediation site will be determined in the field by the remediation crew.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

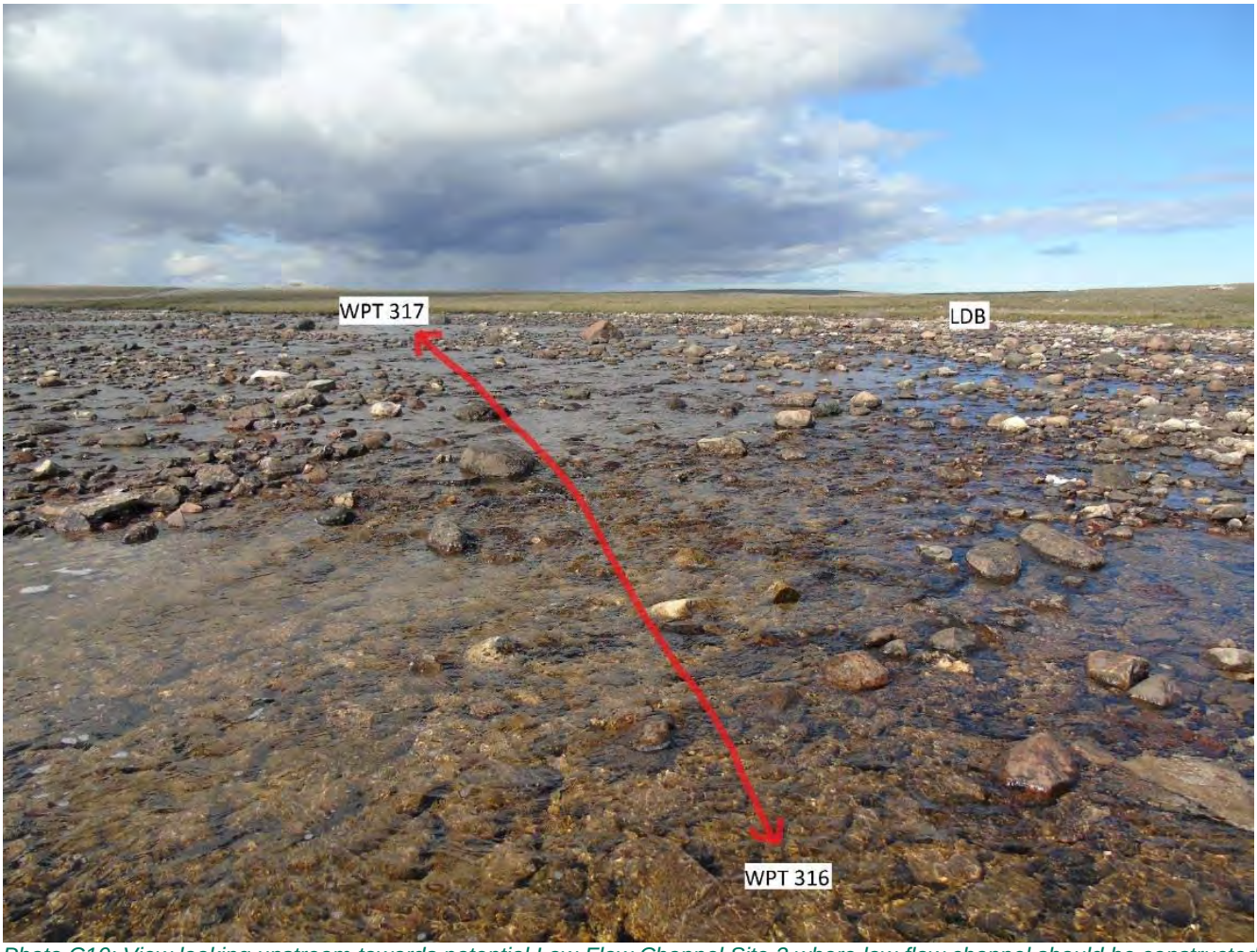

Photo C10: View looking upstream towards potential Low-Flow Channel Site 3 where low-flow channel should be constructed to provide the option for migration up the LDB.

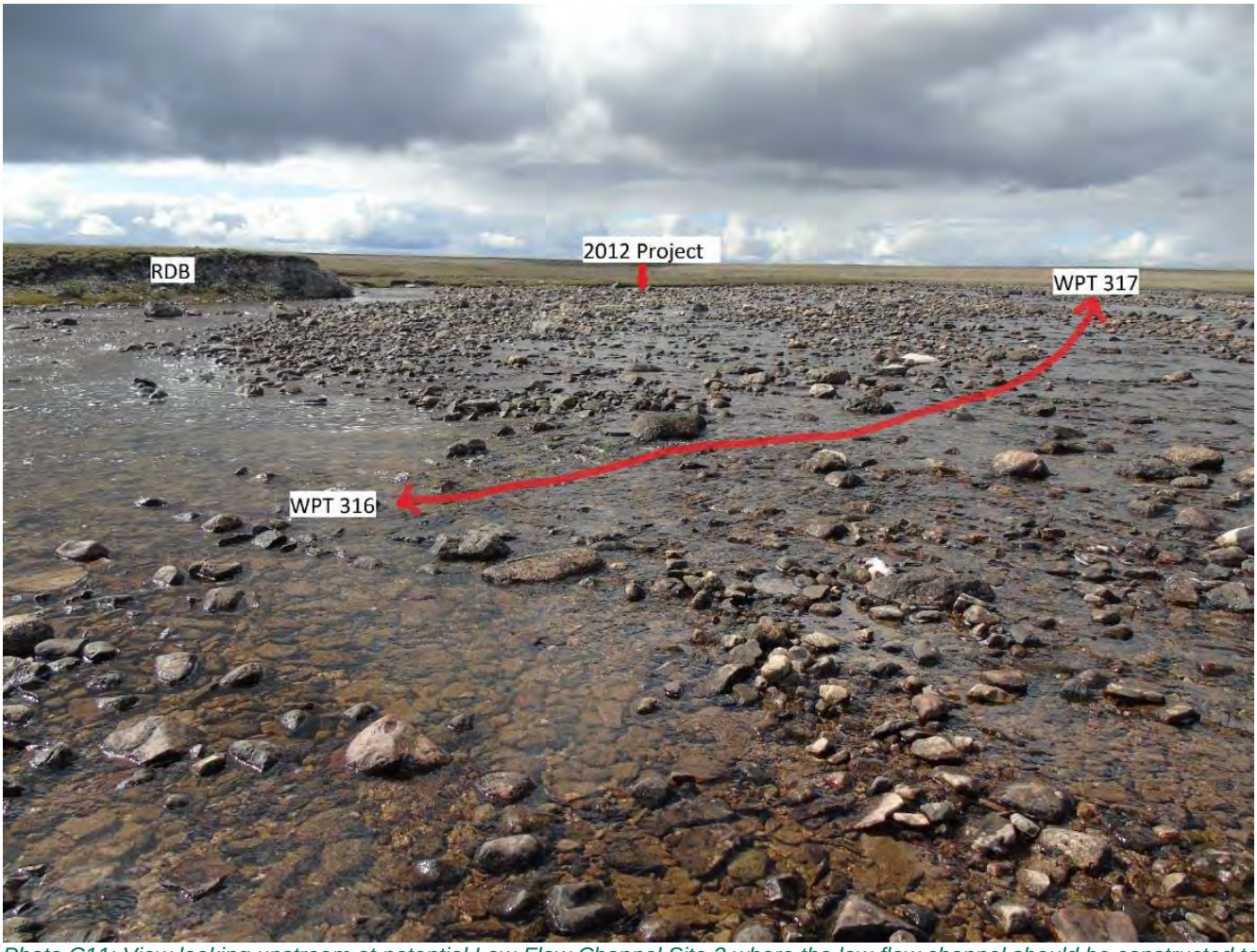

Photo C11: View looking upstream at potential Low-Flow Channel Site 3 where the low-flow channel should be constructed to direct fish towards the LDB. This photo also shows the deeper RDB where fish travel up towards 2012 Project 3.

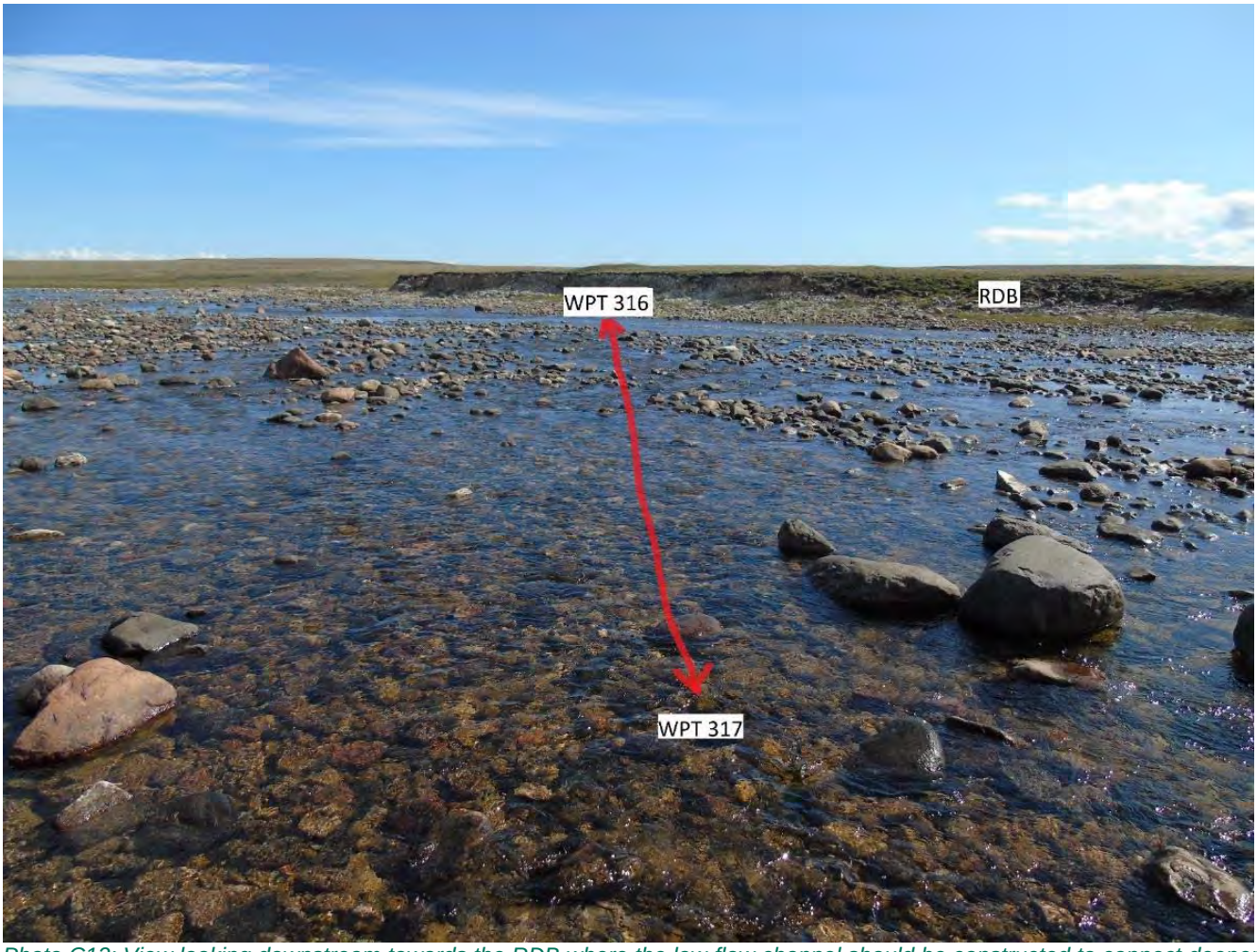

Photo C12: View looking downstream towards the RDB where the low-flow channel should be constructed to connect deeper areas of the creek.

Table C4: Remediation Planning Notes for Low-Flow Channel Site 4

Priority	Medium	Notes: ■ Fish swimming upstream in this section will encounter good flows but shallow depths along the RDB and also through the center of the channel from the LDB. Fish may attempt to travel in either direction following the flow, and therefore, two low-flow channels should be constructed to provide multiple for unimpeded swimming upstream. ■ The design should consider maintaining connectivity with the next upstream remediation site; this will be considered by the remediation field crew in 2016. ■ A second channel at this location would give fish another migration route option and position fish to be in a good location for continued migration through the next upstream remedition site that is proposed (i.e., Site 5).
Fish Stranding Observed?	Yes (2012 and 2014)	
Approximate Minimum Length	30-m channel and an 18 m weir	
Approximate Distance From Mouth	2.0 km	
Location of Channel Start and End Points (UTM 11W)		
Waypoint	**Easting**	**Northing**
318	590927	7626609
319	590906	7626587
320	590927	7626616
321	590897	7626613
Recommendation	■ Construct two, low-flow channels to connect the thalwegs to locations with deeper flows. ■ Channel 1 (approximately 31 m) will direct fish up the RDB where there is sufficient depth further upstream. ■ Channel 2 (approximately 32 m) will direct fish diagonally up the center towards the LDB to connect thalwegs and position fish through the next upstream low-flow channel site that is proposed.	

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

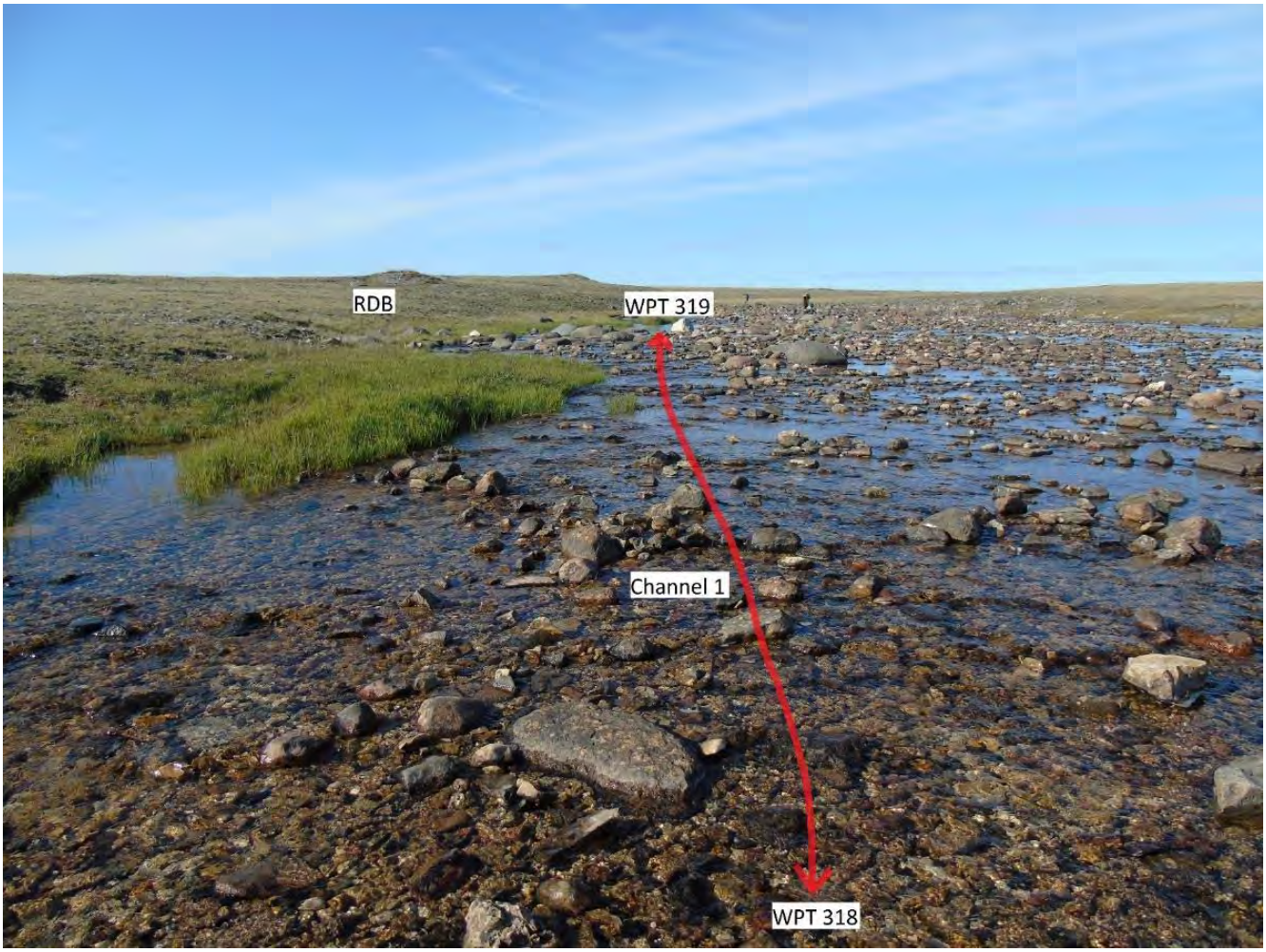

Photo C13: View upstream towards potential Low-Flow Channel Site 4 showing where low-flow Channel 1 should be constructed along the RDB.

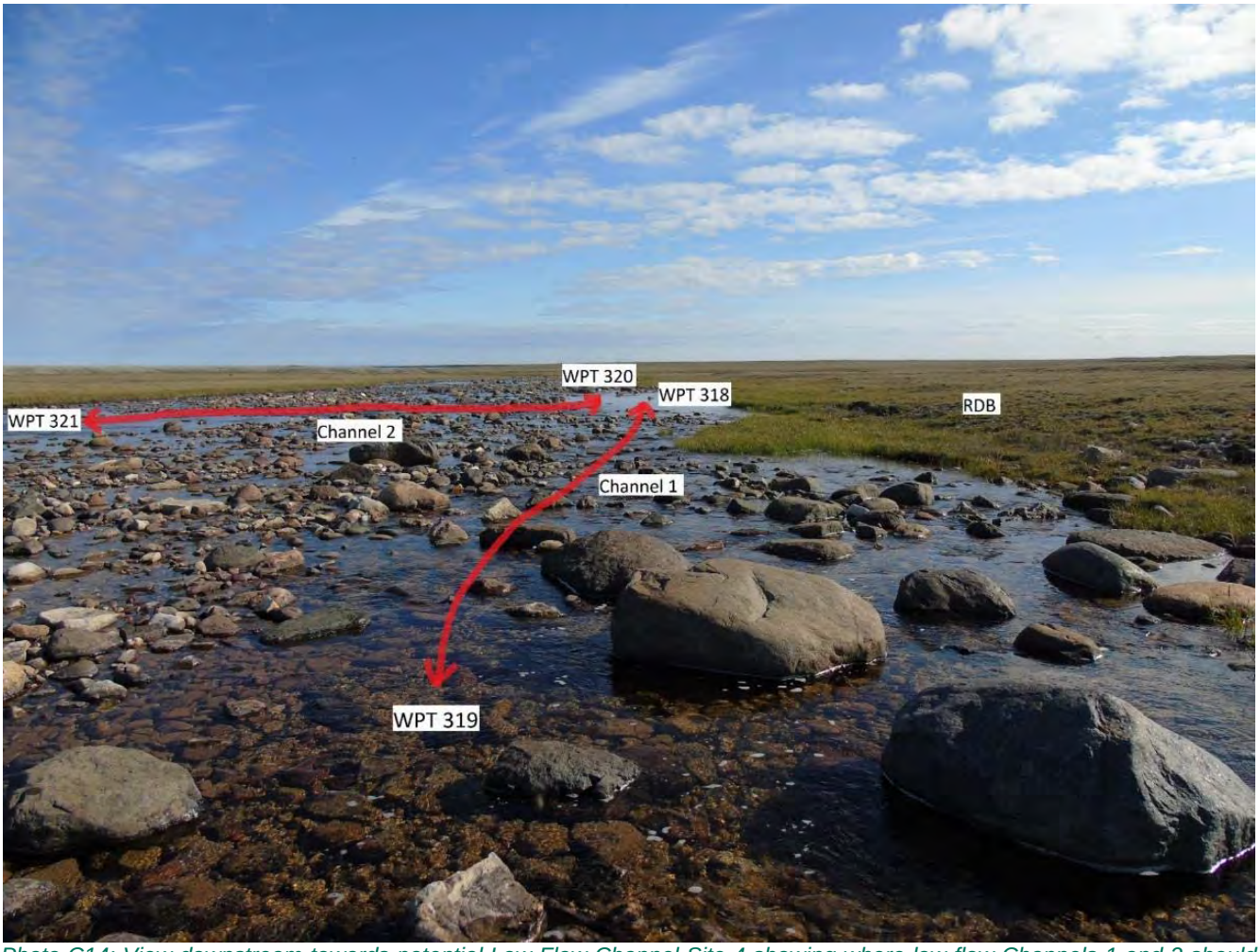

Photo C14: View downstream towards potential Low-Flow Channel Site 4 showing where low-flow Channels 1 and 2 should be constructed to connect the thalwegs and provide options for upstream migration.

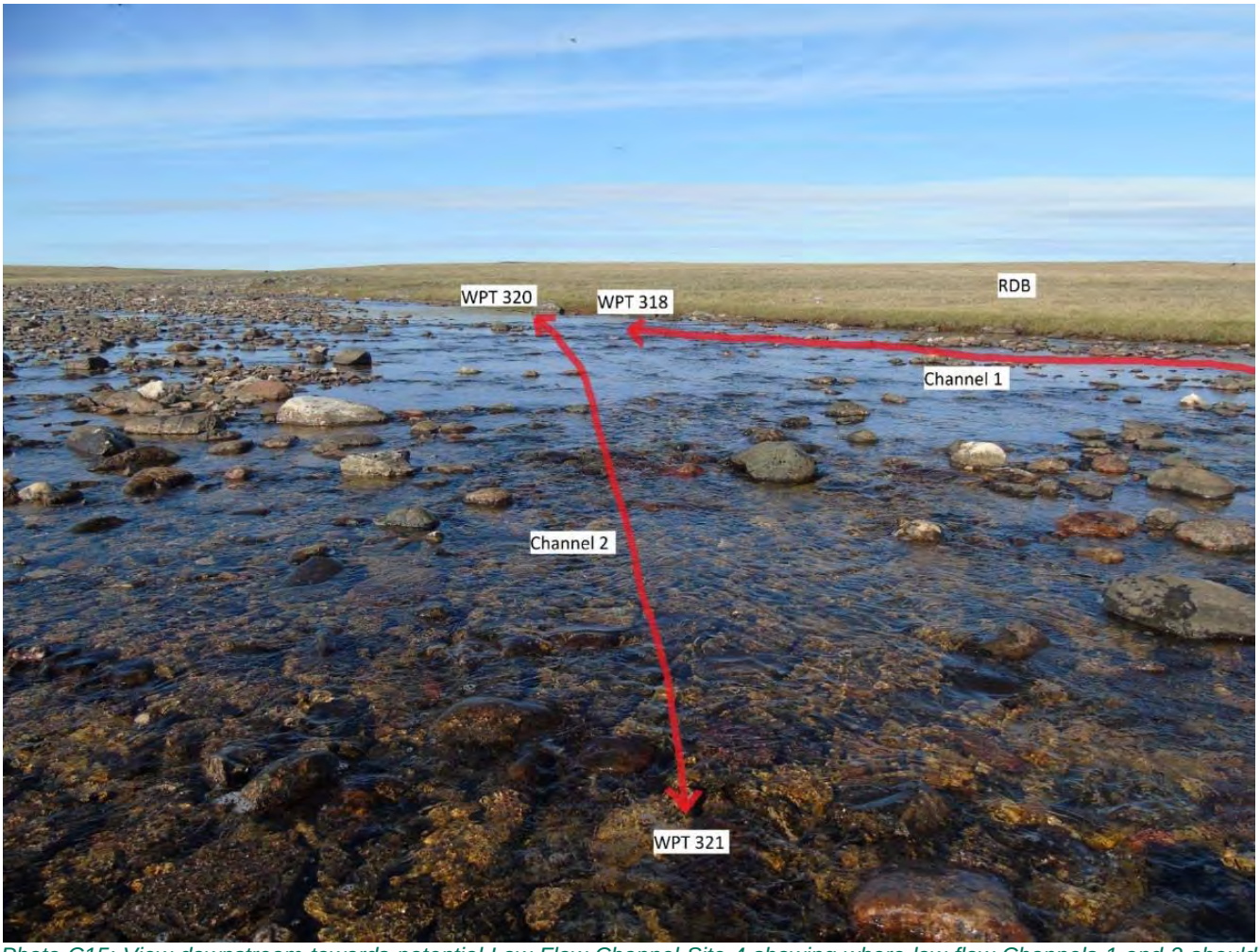

Photo C15: View downstream towards potential Low-Flow Channel Site 4 showing where low-flow Channels 1 and 2 should be constructed to connect the thalwegs and provide options for upstream migration.

Photo C16: View upstream showing where low-flow Channel 2 directs fish, up the LDB towards proposed Site 5.

Table C5: Remediation Planning Notes for Low-Flow Channel Site 5

Priority	High	Notes: ■ In this section of the creek, fish must swim up the LDB due to the RDB being dry and impassable. Fish are also faced with a 30 to 60 cm gradient of shallow flows and boulders that spans the width of the creek, and at low-water levels this is a barrier to fish movement. ■ The LDB is the only obvious route for fish migration, and a low-flow channel should be constructed here. ■ This is the highest priority of all proposed remediation sites for 2016. ■ This site may be similar in design and effort to Project 2 from 2012. ■ Large boulders are present.
Fish Stranding Observed?	Yes (2012 and 2014)	
Approximate Length	22 m channel	
Approximate Distance From Mouth	2.2 km	
Location of Channel Start and End Points (UTM 11W)		

Waypoint	**Easting**	**Northing**
322	590815	7626539
323	590824	7626522

Recommendation	■ Construct a 22 m long, low-flow channel to direct fish from the LDB, up the middle of the creek to a pool on the right downstream bank. ■ Efforts should also restrict access to the shallow LDB by constructing a short weir (approximately 6 m) from the LDB to the mouth of the channel. ■ Where possible, integrate large boulders into the low-flow channel design to provide instream cover and maintain structural integrity of the channel.

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

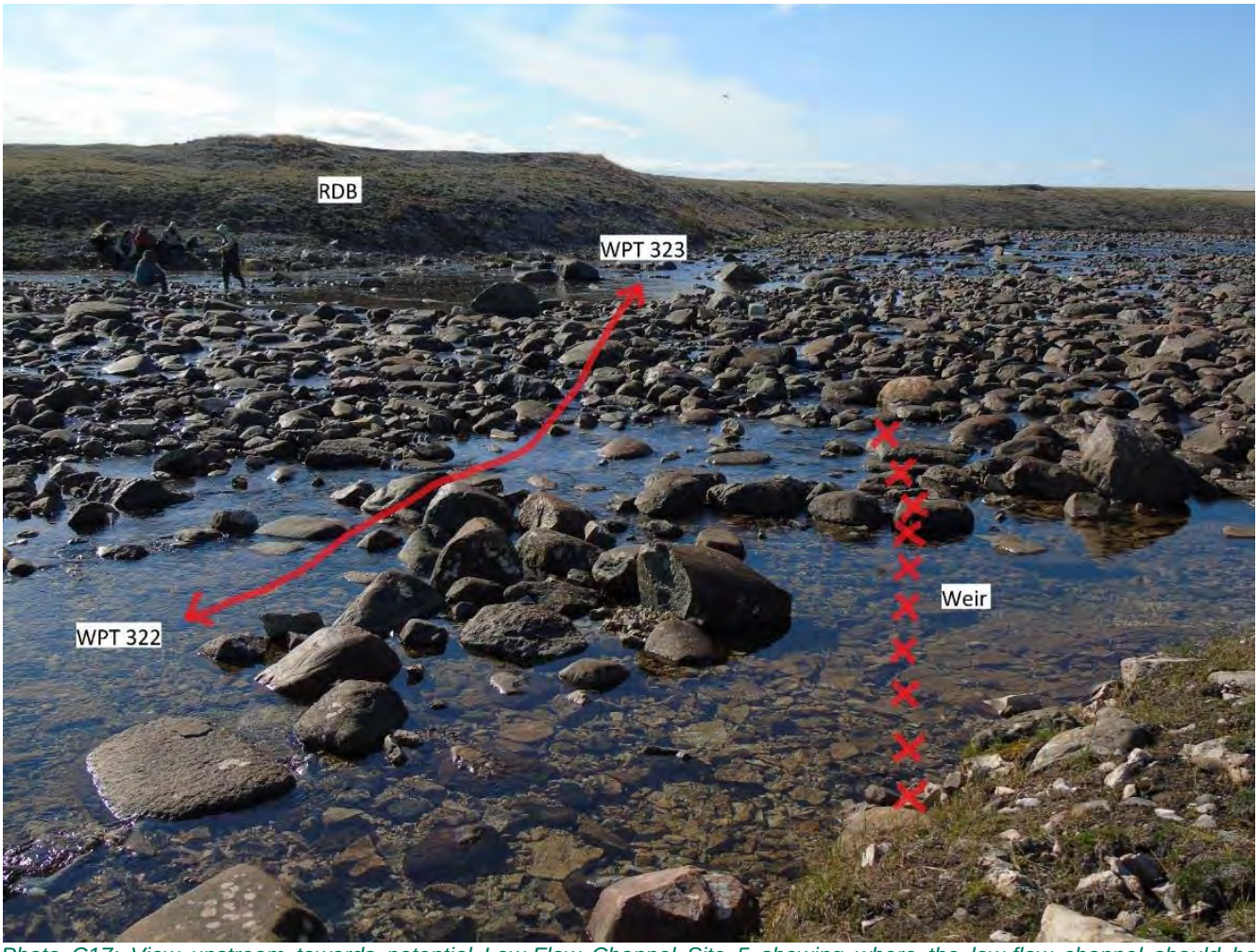

Photo C17: View upstream towards potential Low-Flow Channel Site 5 showing where the low-flow channel should be constructed to allow fish passage from the LDB towards the deeper RDB. A directional weir should also be constructed along the LDB towards the proposed channel, blocking access up the shallow LDB.

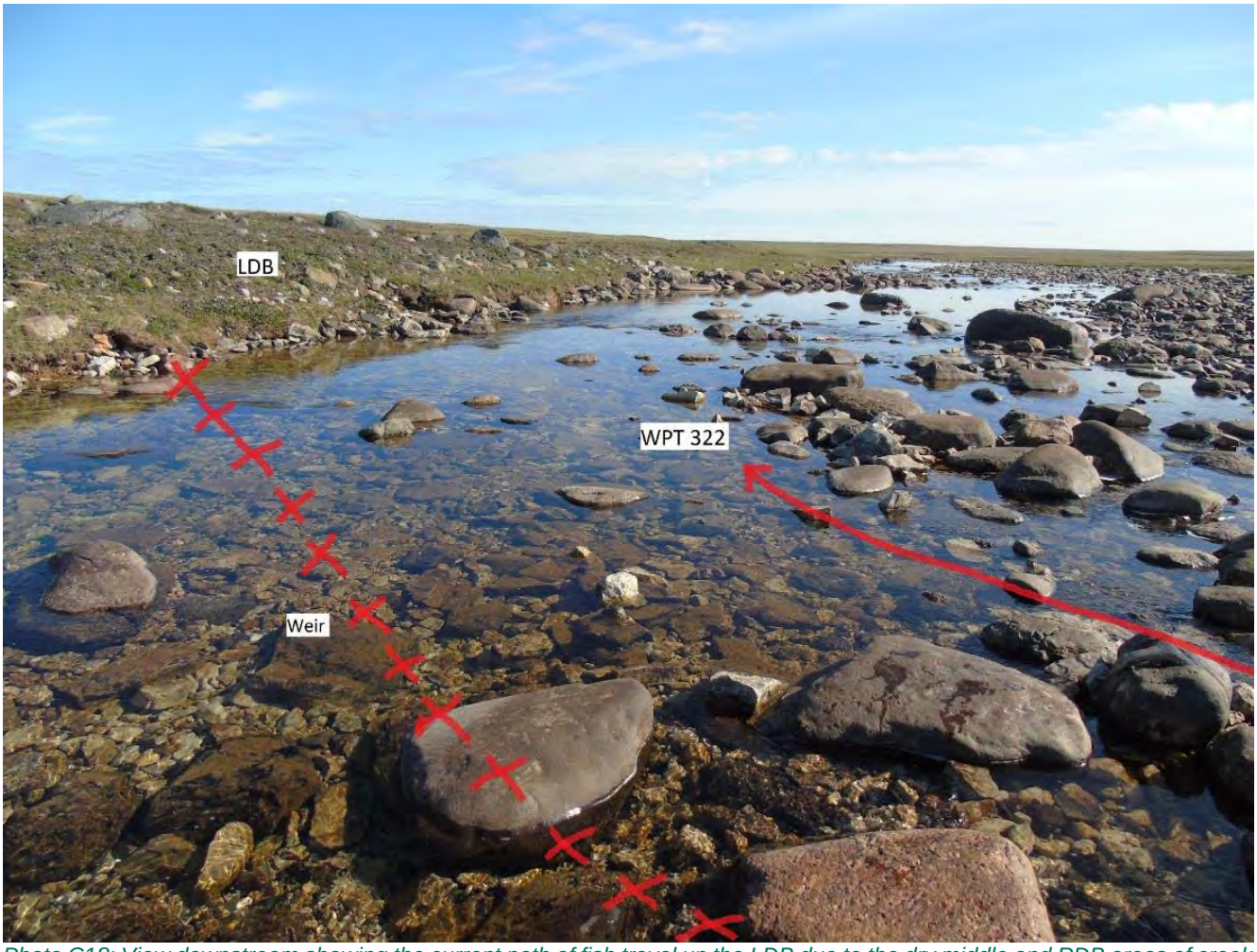

Photo C18: View downstream showing the current path of fish travel up the LDB due to the dry middle and RDB areas of creek. Also shown is the starting location of the proposed low-flow channel and directional weir blocking access up the LDB which becomes dry further upstream.

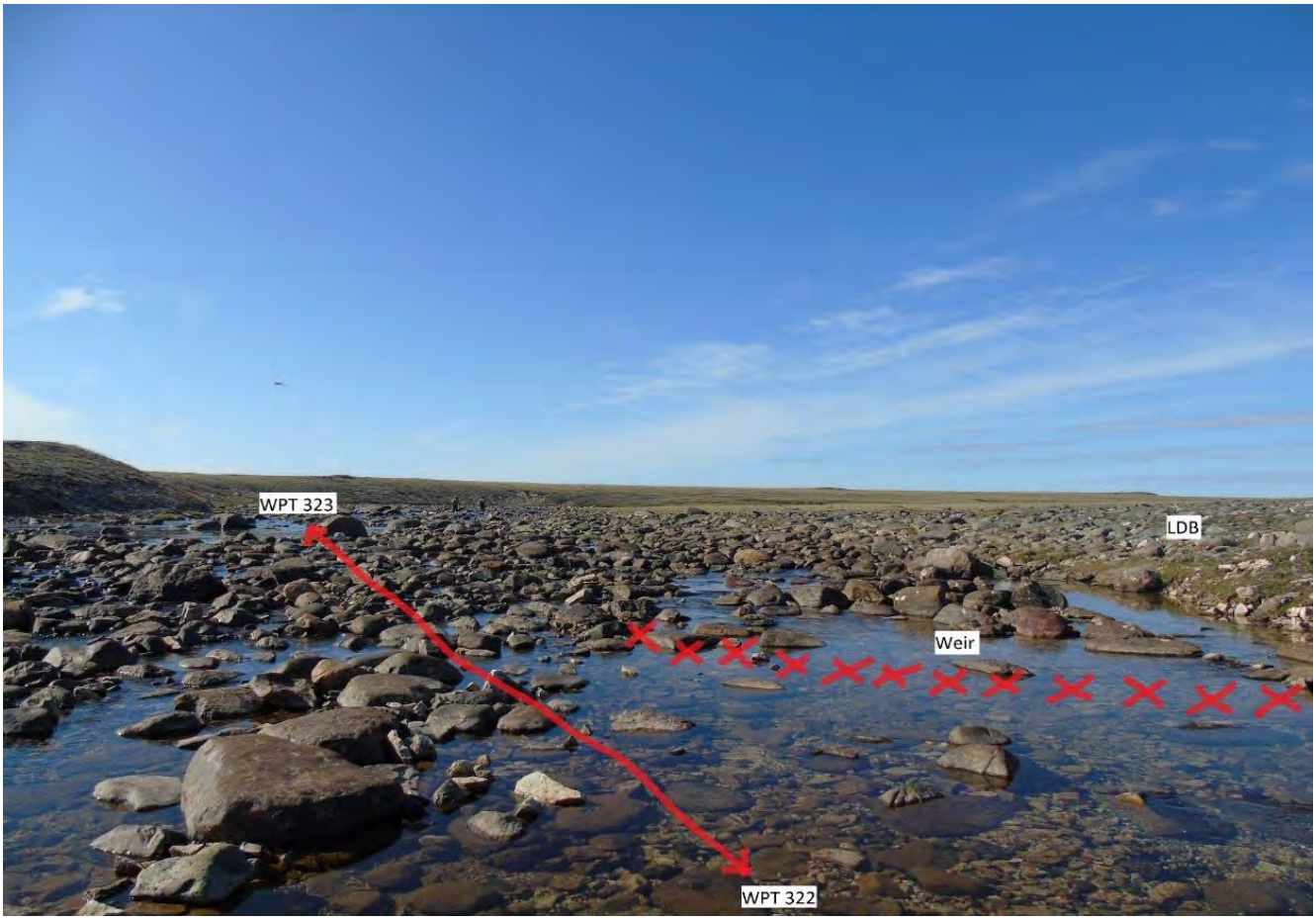

Photo C19: View upstream towards potential Low-Flow Channel Site 5 showing the dry LDB and where the low-flow channel should be constructed to connect the thalweg with the deeper RDB upstream. Also shown is where the directional weir should be constructed along the LDB to direct fish into the low-flow channel.

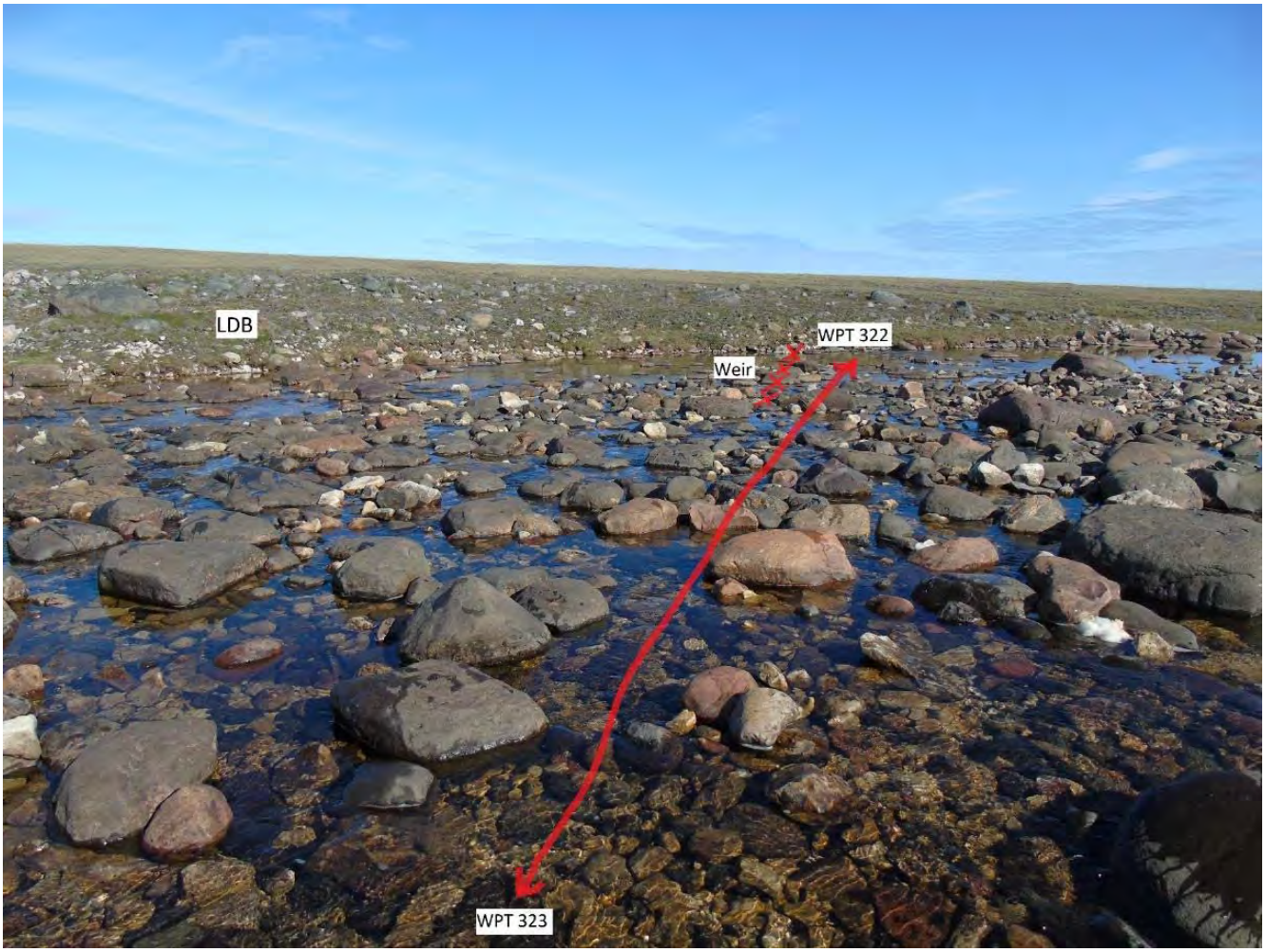

Photo C20: View downstream towards the LDB showing where the low-flow channel should be constructed to connect the deeper LDB and RDB thalwegs.

Table C6: Remediation Planning Notes for Low-Flow Channel Site 6

Priority	High		Notes: ■ In this section of the creek shallow depths in the center and along the RDB result in fish having to migrate up the LDB to a large pool. Upstream of the pool, the only route of travel is along a 30 to 60 cm gradient of shallow flows, boulders and large cobble that spans the width of the creek for a distance of 45 m. It is expected that there is a high risk of stranding through this section. ■ Due to fish holding in a large pool downstream of the proposed channel, it is recommended that the mouth of the constructed channel be wider than usual (approximately 3 m) to make it obvious where the channel is as fish attempt to leave the pool.
Fish Stranding Observed?	Yes (2014)		
Approximate Minimum Length	45 m channel		
Approximate Distance From Mouth	2.5 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	**Easting**	**Northing**	
330	590554	7626407	
331	590559	7626388	
Recommendation	■ Construct a 45 m low-flow channel to connect the deeper pool on the LDB to the thalweg in the center of the channel further upstream. Weirs constructed on either side of the channel may assist in directing fish up the low-flow channel from the pool.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

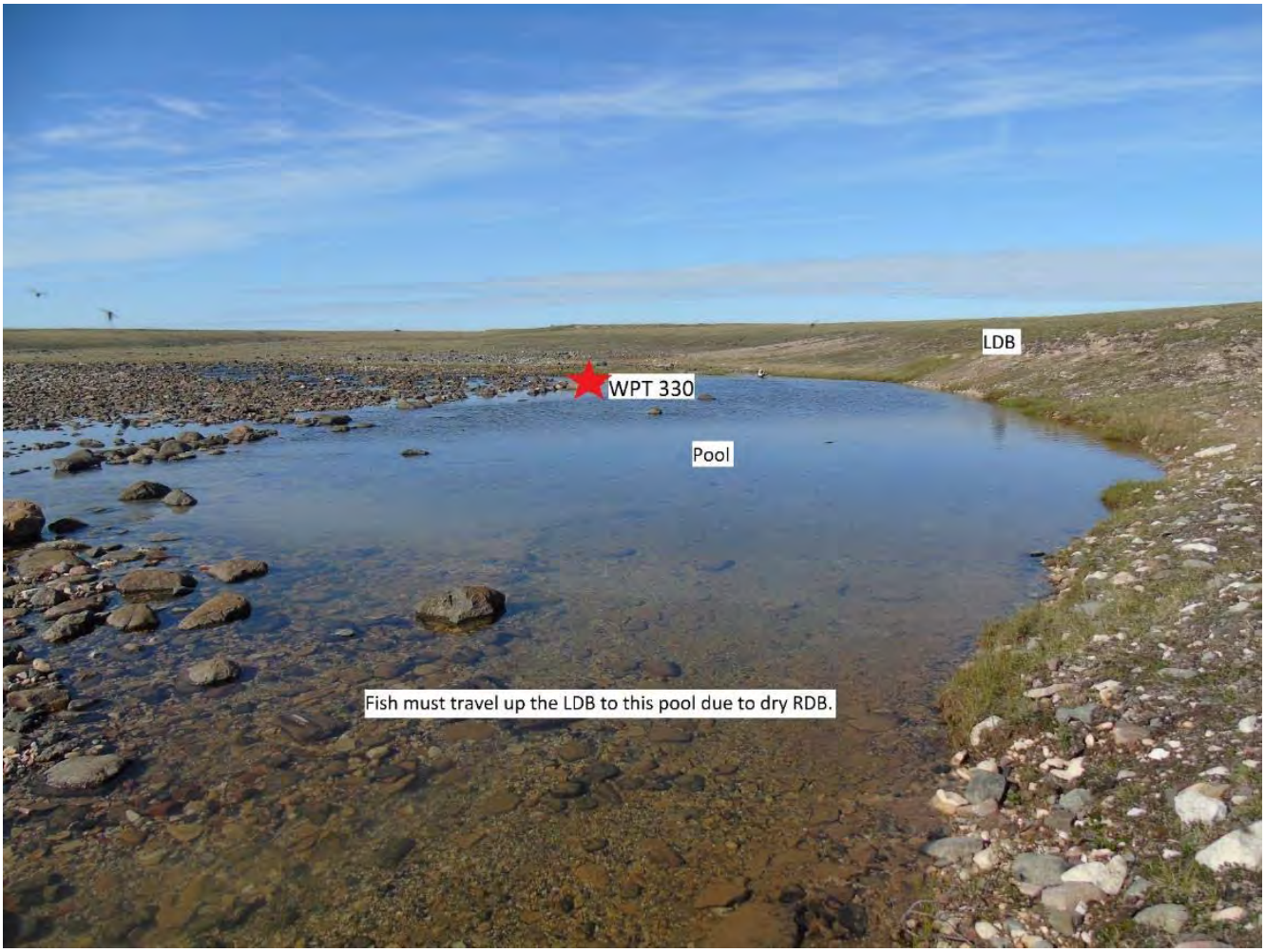

Photo C21: View looking upstream at the pool that fish must reach before travelling upstream to proposed Site 6.

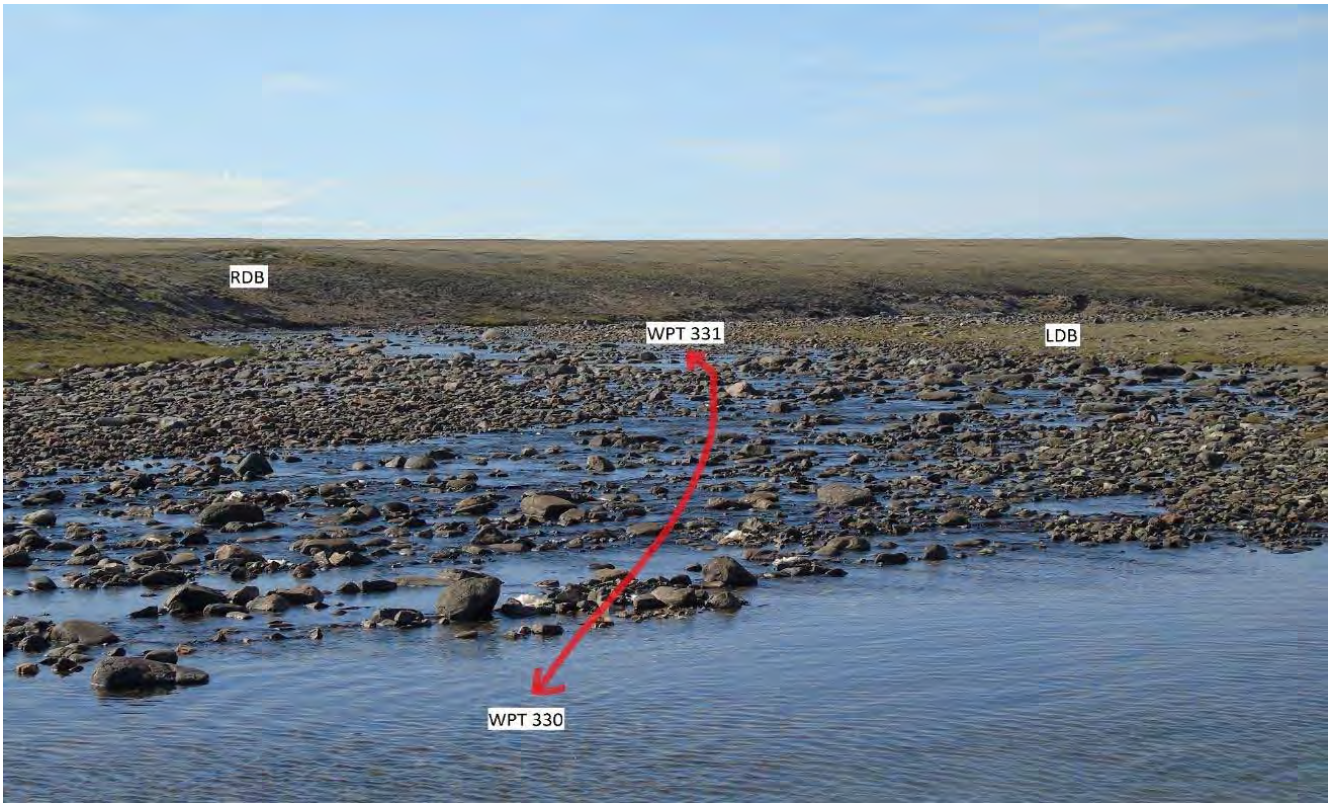

Photo C22: View upstream towards Low-Flow Channel Site 6 showing where the channel should be constructed to facilitate fish passage.

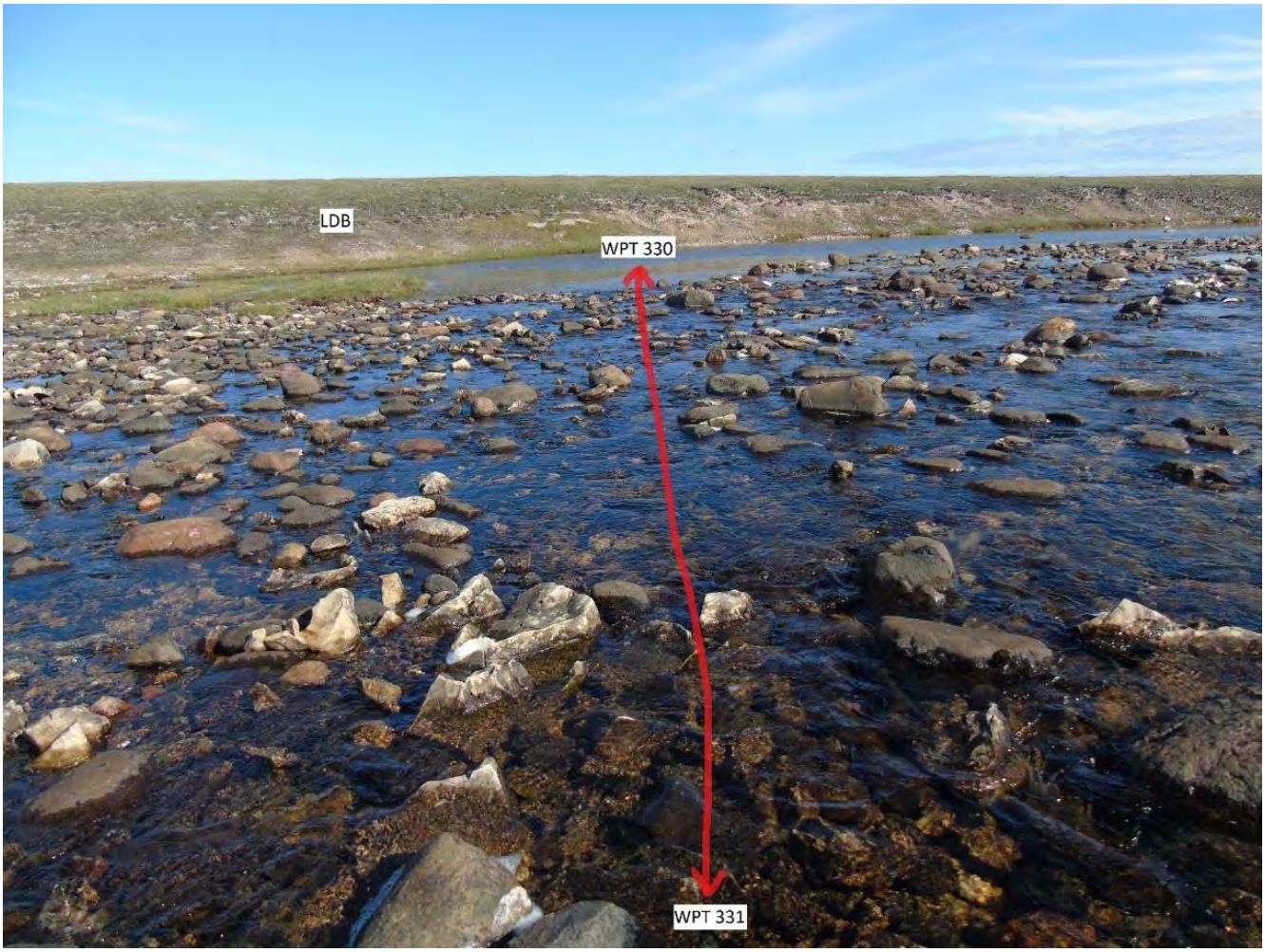

Photo C23: View downstream towards the LDB and pool showing where the low-flow channel should be constructed to connect thalwegs.

Table C7: Remediation Planning Notes for Low-Flow Channel Site 7

Priority	Medium		Notes: ■ In this section of the creek, fish migrating upstream must swim from a pool on the LDB, up a gradient of 30 to 60 cm of large cobble for approximately 14 m before reaching the thalweg in the center of the creek. ■ At the time of the survey the only route of travel during low-flows would be along the LDB. ■ This site is similar to the pre-construction section for 2012 Project 3. ■ Due to the short distance of the proposed channel, it is recommended that a wider than normal channel (approximately 2-3 m) be constructed.
Fish Stranding Observed?	Yes (2012)		
Approximate Minimum Length	14 m channel		
Approximate Distance From Mouth	3.1 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	**Easting**	**Northing**	
332	590167	7626219	
333	590165	7626206	
Recommendation	■ Construct a 14-m low-flow channel from the pool along the LDB towards the center of the creek where the water is deeper. The connection of deep water areas would facilitate fish passage. ■ At higher water levels fish may continue up the LDB where there remains a potential for stranding. Therefore, a rock weir should be constructed to direct fish from the LDB into the low-flow channel, reducing the risk of stranding. ■ Build channel around large boulders (to provide instream cover and stability for the channel) if possible.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

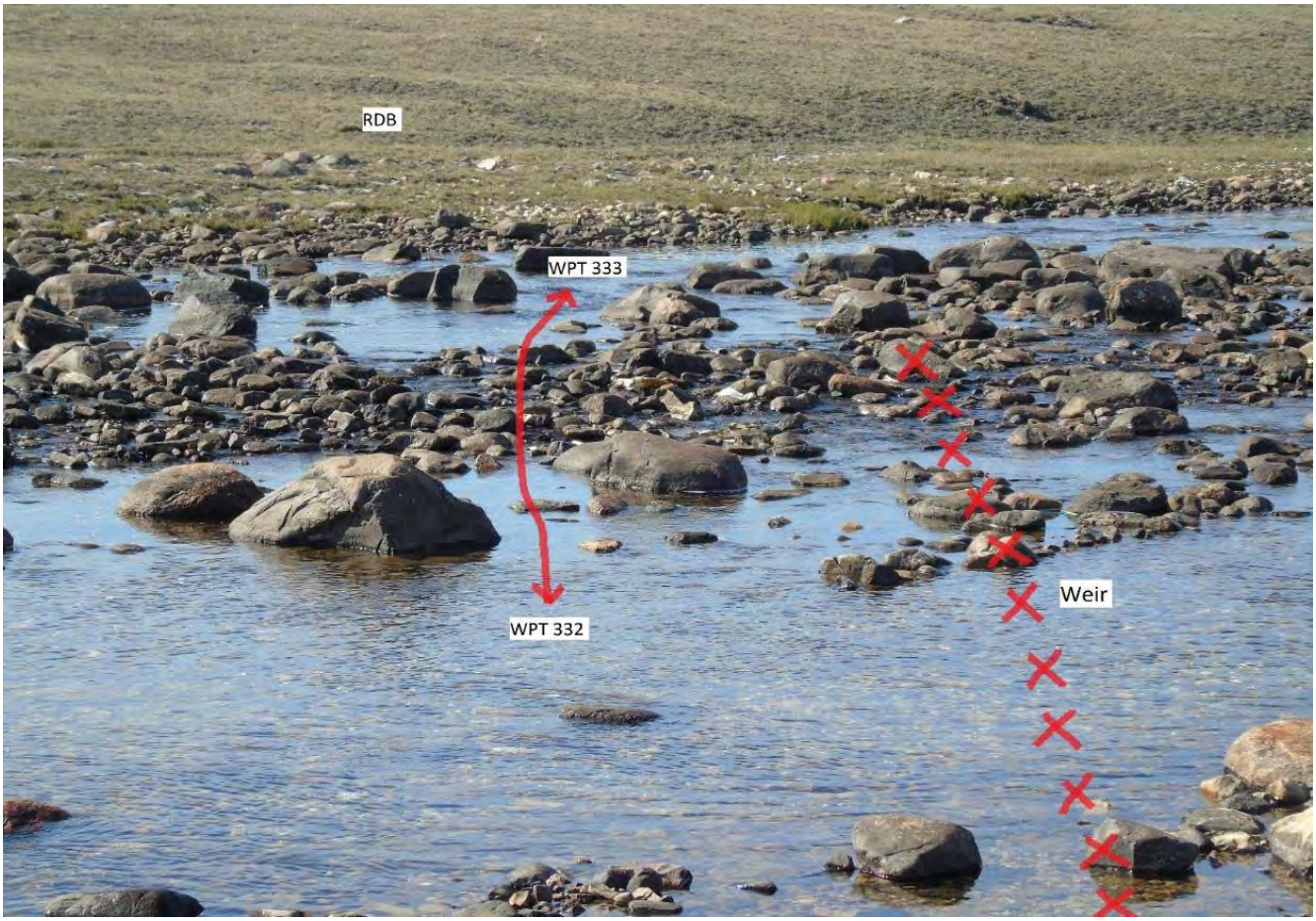

Photo C24: View upstream towards potential Low-Flow Channel Site 7 showing the RDB and where the low-flow channel should be constructed. Also shown is the directional weir that should be constructed to direct fish from the LDB into the channel.

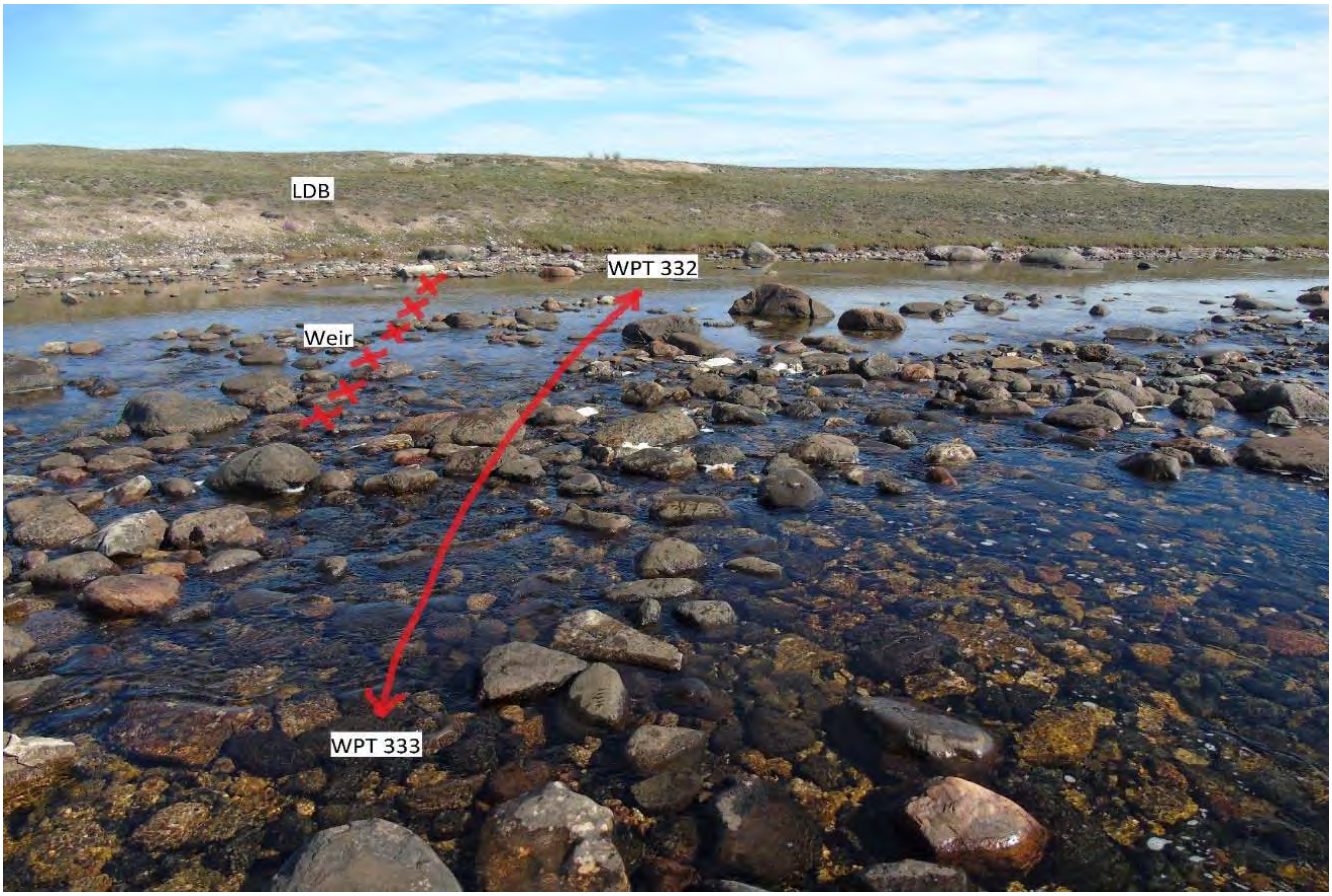

Photo C25: View downstream towards the LDB showing where the low flow channel should be constructed to connect the pool to the thalweg in the center of the channel. Also shown is the location of the directional weir that should be constructed to direct fish into the channel and stop migration up the shallow LDB.

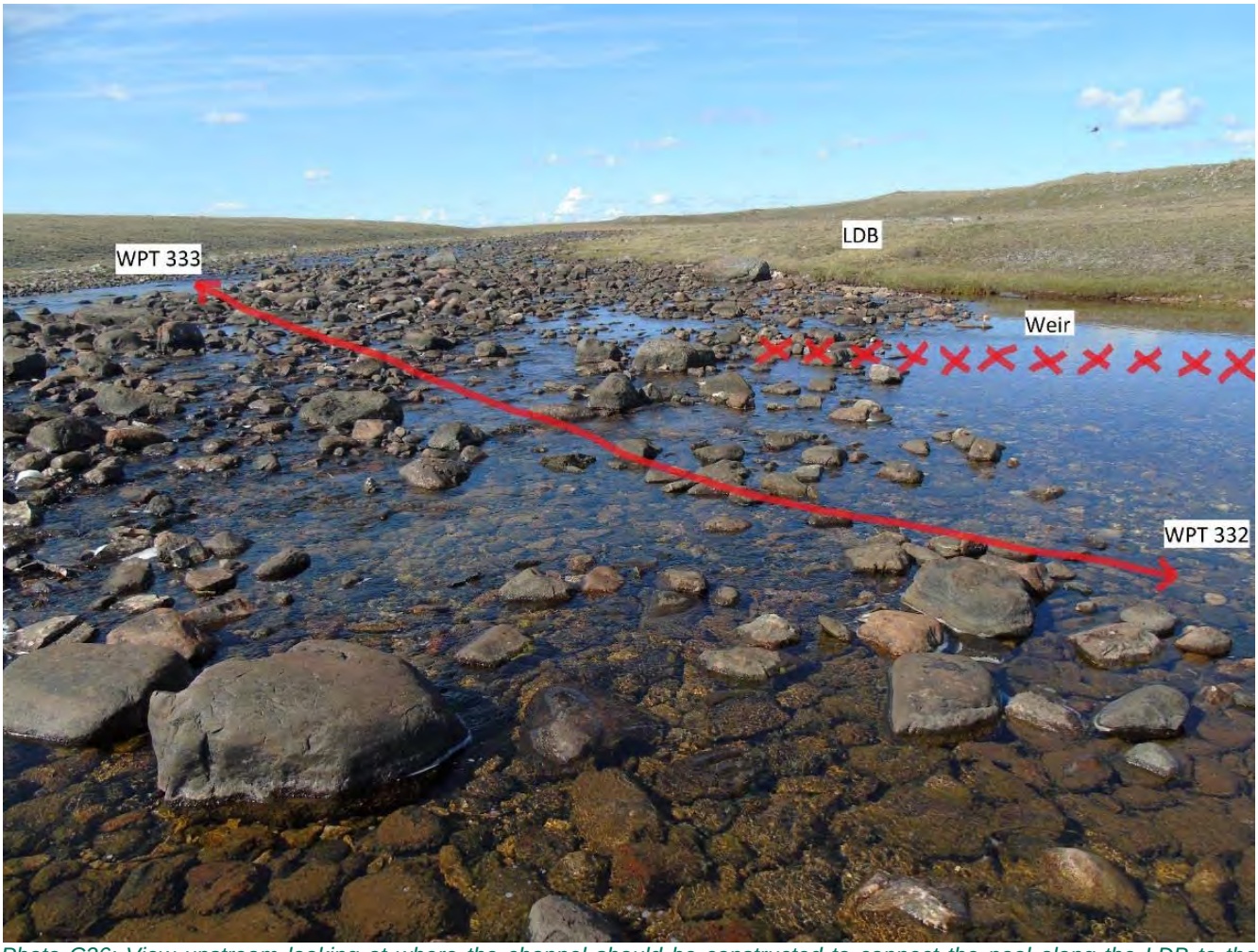

Photo C26: View upstream looking at where the channel should be constructed to connect the pool along the LDB to the thalweg in the center of the channel further upstream.

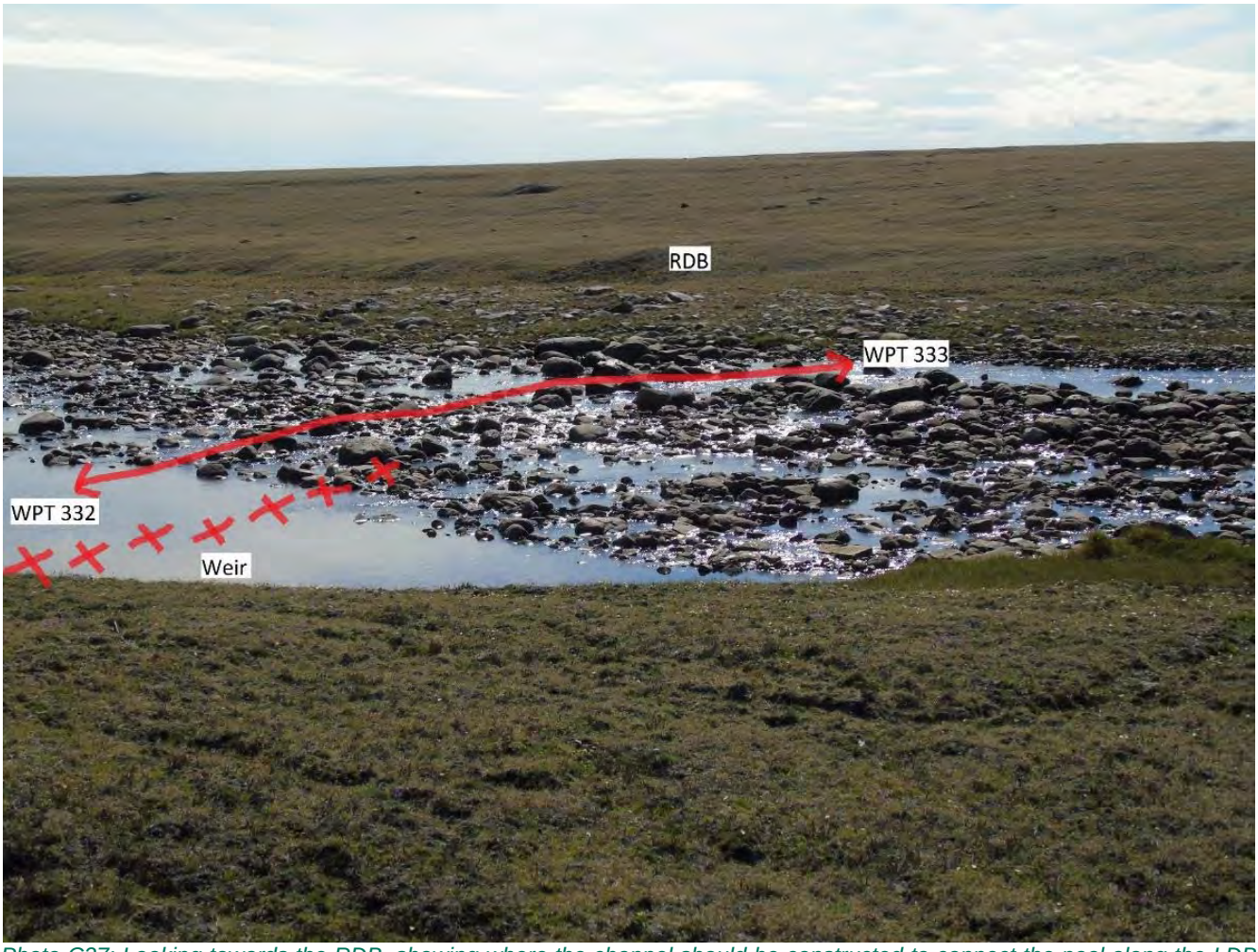

Photo C27: Looking towards the RDB, showing where the channel should be constructed to connect the pool along the LDB to the center of the channel further upstream.

Table C8: Remediation Planning Notes for Low-Flow Channel Site 8

Priority	Low	Notes: ■ At this location there are small holding pools along the RDB, but if fish continue up the RDB there is potential for stranding further upstream at low-water conditions. A low-flow channel should be constructed to direct fish from the RDB, up the center of the channel towards the LDB where there is deeper water for passage. ■ This site is similar to pre-construction conditions at 2012 Project 3. ■ Site is approximately 600 m above the lowermost pond on the creek. ■ Remediation design of this site to be finalized in the field during the 2016 field program.
Fish Stranding Observed?	No data available	
Approximate Minimum Length	35 m channel	
Approximate Distance From Mouth	4.9 km	
Easting	589969	
Northing	7625431	
Recommendation	■ Construct a low-flow channel (approximately 35 m) to connect deeper areas and direct fish from the RDB up the center towards the LDB. ■ A directional weir (approximately 15 m) should be constructed from the RDB to the mouth of the proposed channel to direct fish into the channel and block access up the shallow RDB.	

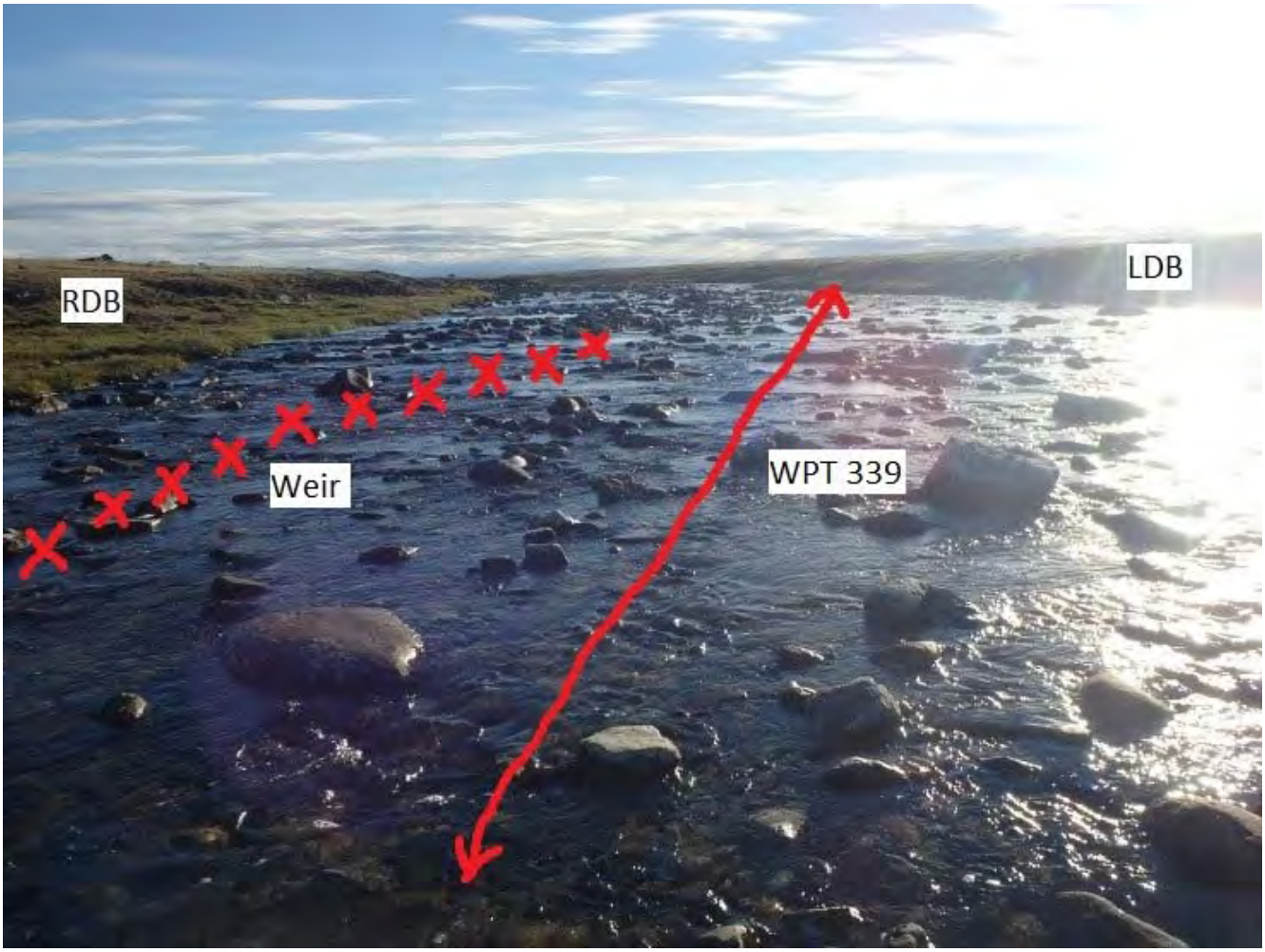

Photo C28: Looking upstream at potential Low-Flow Channel Site 8 where the channel should be constructed to connect RDB and LDB thalwegs. Also shown is where the directional weir should be constructed to direct fish into the channel and block access up the shallow RDB.

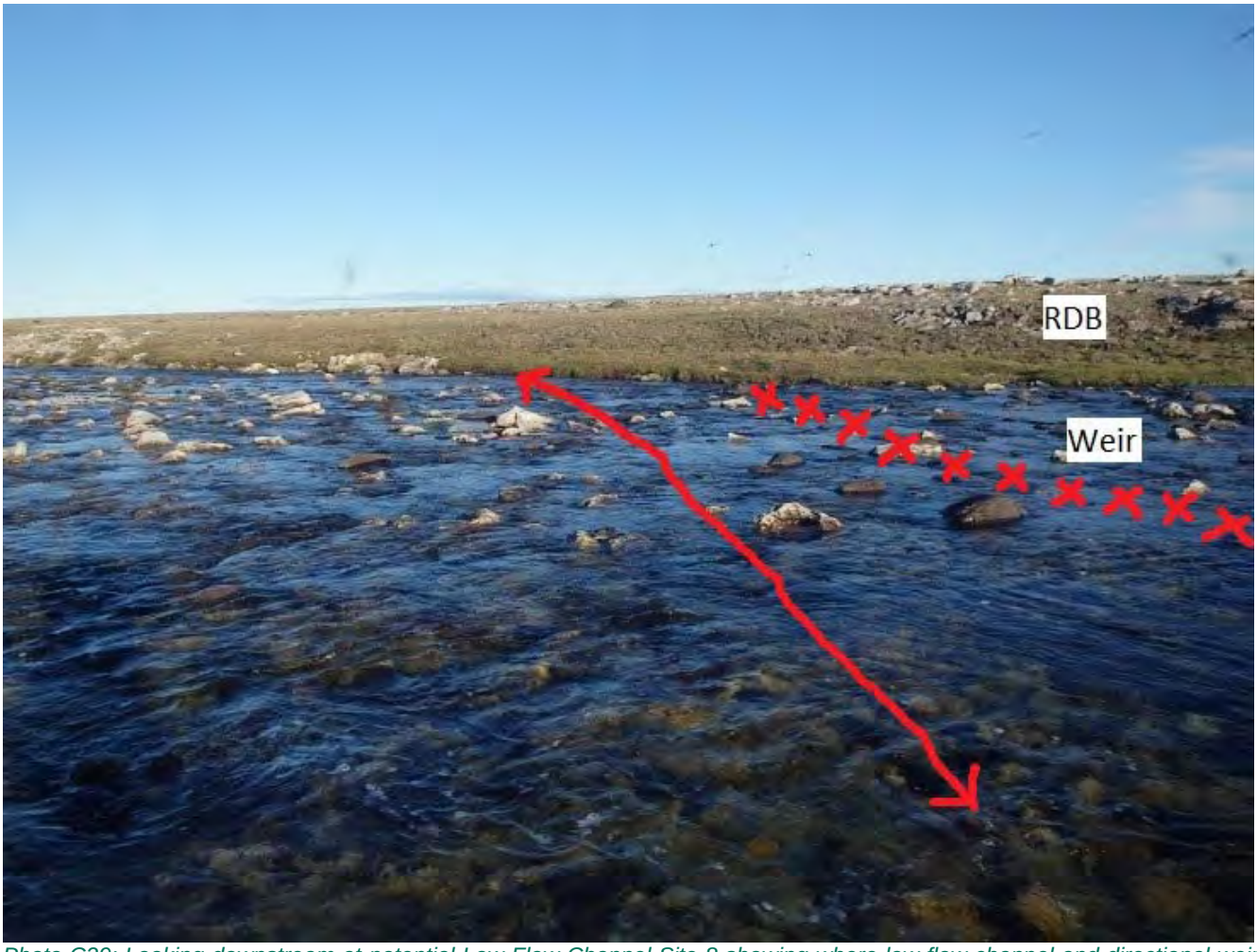

Photo C29: Looking downstream at potential Low-Flow Channel Site 8 showing where low-flow channel and directional weir should be constructed.

Table C9: Remediation Planning Notes for Low-Flow Channel Site 9

Priority	Low	Notes: ■ Fish travelling up the LDB have potential to become stranded. ■ The RDB currently provides a better (i.e., non-obstructed) route for fish passage. A low-flow channel should be constructed to connect thalwegs and direct fish away from the LDB and up the center towards the RDB. ■ Large boulders present at Site 9. ■ Final remediation design of this section to be determined during the 2016 field program.
Fish Stranding Observed?	No data available	
Approximate Minimum Length	40 m channel	
Approximate Distance From Mouth	5.8 km	
Easting	589244	
Northing	7625128	
Recommendation	■ Construct a low-flow channel (approximately 40 m) to connect the LDB thalweg to the RDB thalweg. ■ A rock weir (approximately 10 m) should also be constructed to direct fish to the RDB and block access to shallow locations along the LDB. ■ Design the channel around large boulders (to provide instream cover and stream stability) if possible.	

Photo C30: Looking upstream towards proposed Low-Flow Channel Site 9 showing where channel and directional weir should be constructed.

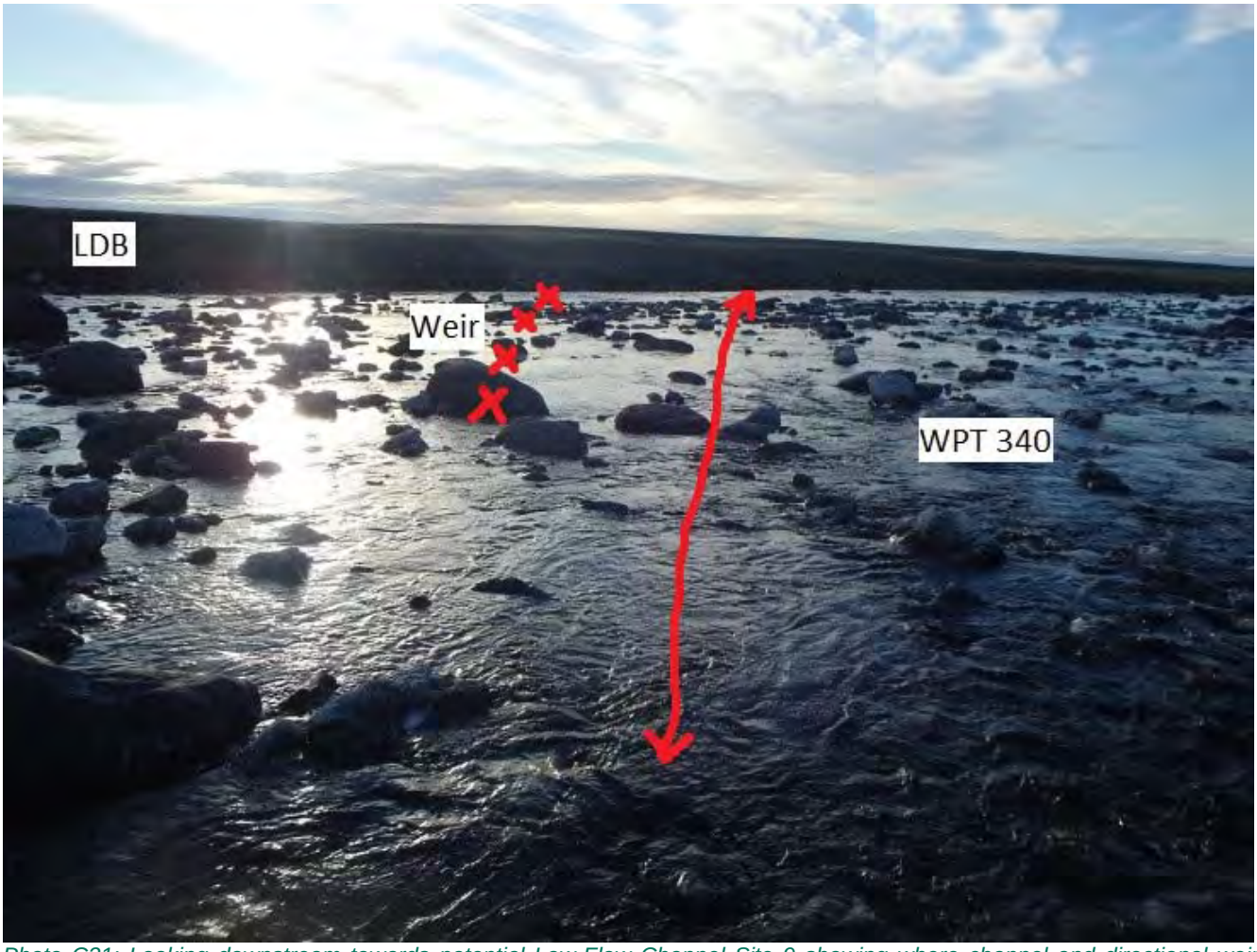

Photo C31: Looking downstream towards potential Low-Flow Channel Site 9 showing where channel and directional weir should be constructed.

Table C10: Remediation Planning Notes for Low-Flow Channel Site 10

Priority	Low	Notes: ■ During low flows fish that swim up the center of the channel may become stranded. Fish may swim more easily up LDB and RDB routes where depths and flows are more suitable for passage. Two directional rock weirs would direct fish away from the center of the channel and towards either banks-side thalweg for migration. ■ Site located approximately 2 km downstream of Hingittok Lake where Nulahugyuk Creek flows into Pond 2. ■ Remediation design of this section to be finalized in the field during the 2016 field program. ■ Travel time to this site from camp should be considered when planning the schedule for the field program; this is the most upstream remediation site under consideration.
Fish Stranding Observed?	No data available	
Approximate Minimum Length	14 m (two adjacent weirs)	
Approximate Distance From Mouth	7.9 km	
Easting	587549	
Northing	7624548	
Recommendation	■ Construct two directional rock weirs located at the inlet of Pond 2 (i.e., second pond from mouth) to direct fish towards either thalweg on the LDB or RDB and away from the shallow center of the channel. ■ Weir 1 (approximately 12 m) should be constructed from the center of the channel towards the RDB (but not connected to the RDB) directing fish towards the RDB thalweg. Weir 2 (approximately 14 m) should be constructed from the center of the channel towards the LDB (but not connected to the LDB) directing fish towards the LDB thalweg.	

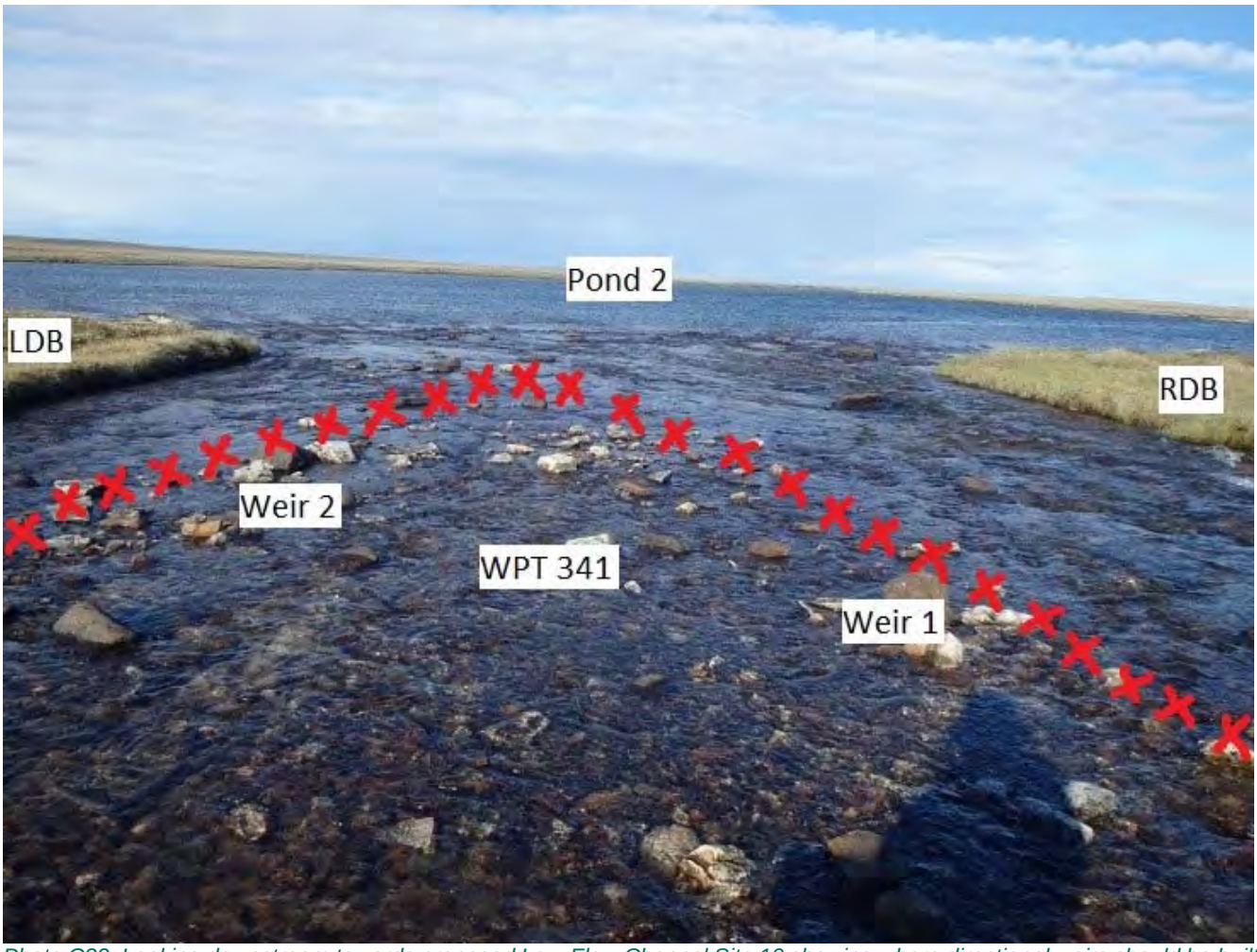

Photo C32: Looking downstream towards proposed Low-Flow Channel Site 10 showing where directional weirs should be built to direct fish towards the deeper LDB and RDB.

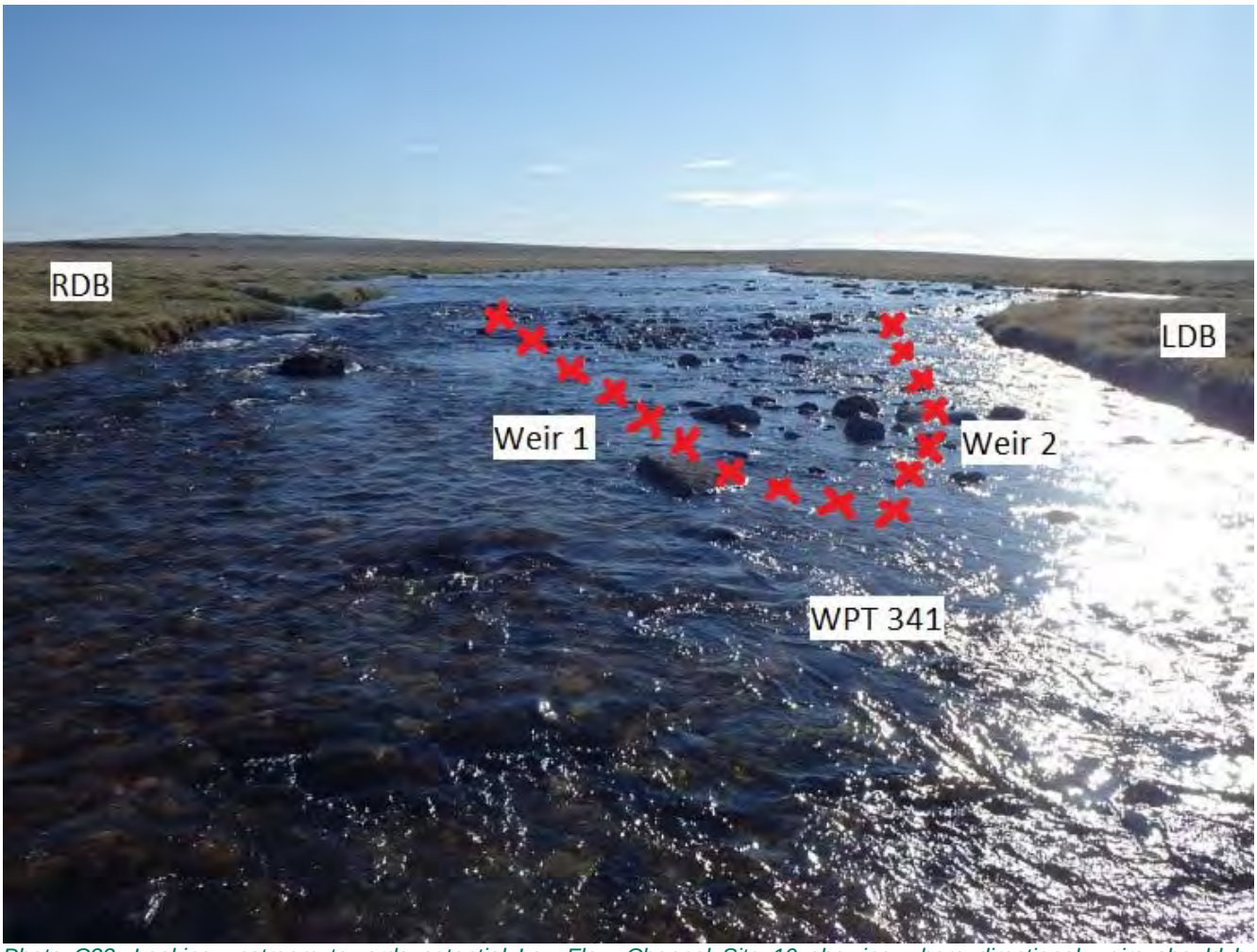

Photo C33: Looking upstream towards potential Low-Flow Channel Site 10 showing where directional weirs should be constructed to direct fish towards the deeper LDB and RDB.

Table C11: Remediation Planning Notes for Low-Flow Channel Site 11

Priority	Low		Notes: ■ In this section of the creek water is dispersed over a wide, shallow area with no obvious thalweg. Fish can travel upstream with some effort; however, a low-flow channel would facilitate fish migration between proposed Site 5 and Site 12. ■ Enhancement of this section of the creek is a low priority, but will assess in maintaining in connectivity between Site 5 and Site 12. ■ Wide section of the creek; final design of the channel may include extended weirs to direct fish into the channel, as needed.
Fish Stranding Observed?	No		
Approximate Minimum Length	38 m channel		
Approximate Distance From Mouth	2.2 km		
Location of Channel Start and End Points (UTM 11W)			
Waypoint	**Easting**	**Northing**	
325	590806	7626464	
326	590806	7626428	
Recommendation	■ Construct a 38 m low-flow channel, providing an unobstructed route to the deeper areas further upstream.		

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

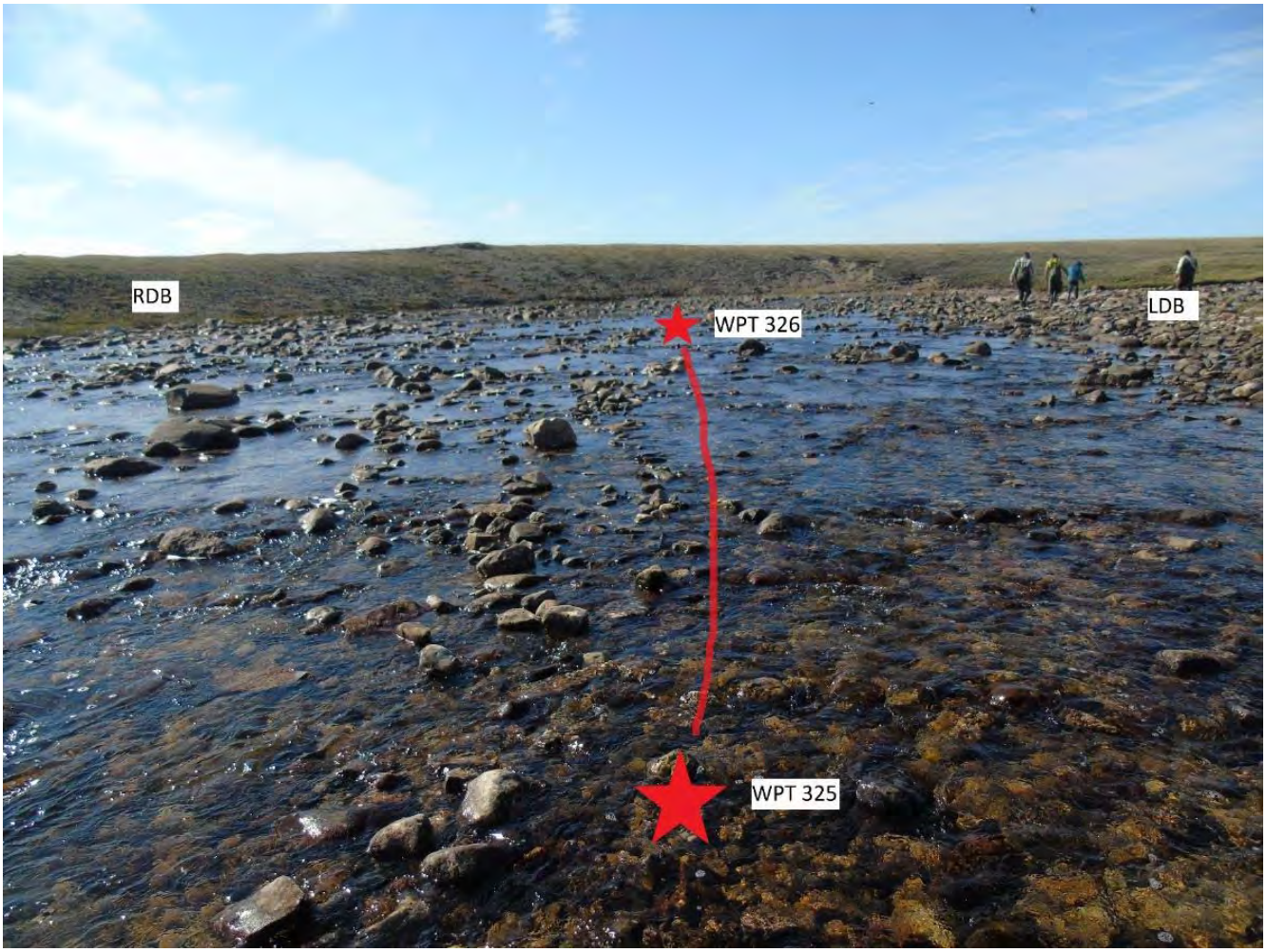

Photo C34: View upstream showing where the low-flow channel should be constructed to create a more functional thalweg.

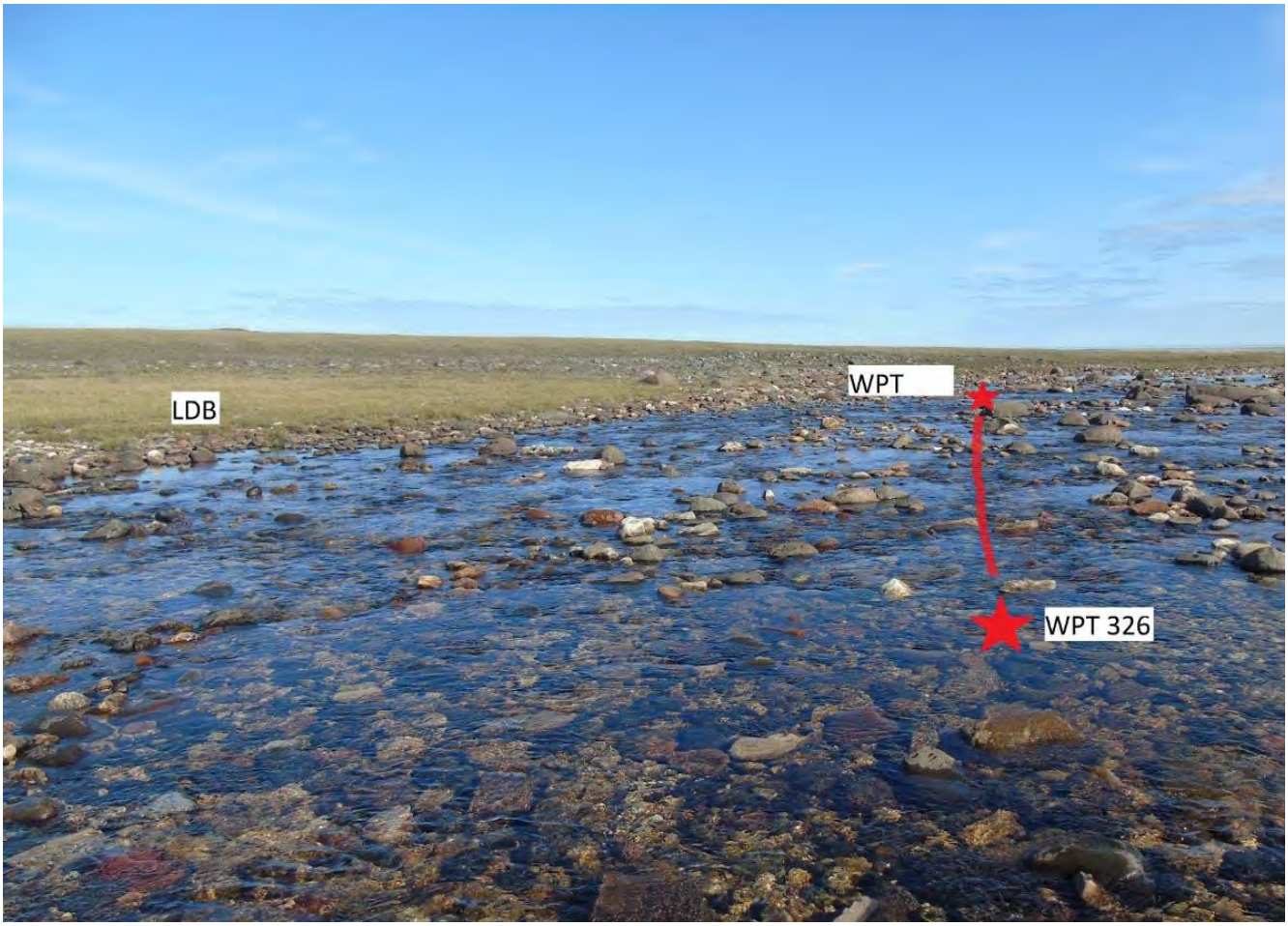

Photo C35: View downstream showing where the low-flow channel should be constructed to create a more functional thalweg and connect it with the deeper water section upstream.

Table C12: Remediation Planning Notes for Low-Flow Channel Site 12

Priority	Medium	Notes: ■ Fish can swim through a deeper route along the RDB; however, the RDB becomes dry and impassable further upstream. Another option is needed for the upstream migration of char. ■ Fish should be directed diagonally upstream towards the LDB where deep water continues; access to the RDB route should be blocked.
Fish Stranding Observed?	No	
Approximate Minimum Length	19-m channel plus weir	
Approximate Distance From Mouth	2.4 km	
Location of Channel Start and End Points (UTM 11W)		

Waypoint	**Easting**	**Northing**
328	590669	7626399
329	590663	7626417

Recommendation	■ Construct a 19-m low-flow channel to connect the deeper thalweg of the RDB, diagonally upstream to the thalweg of the LDB. ■ Two rock weirs are to be considered to direct fish into the channel. Weir 1 should be constructed from the RDB to the channel mouth to direct fish into the channel and block access to the shallow RDB. ■ A second weir on the other side of the channel may be required to direct fish into the channel. ■ The final length and orientation of the weirs are to be determined in the field during summer 2016.

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

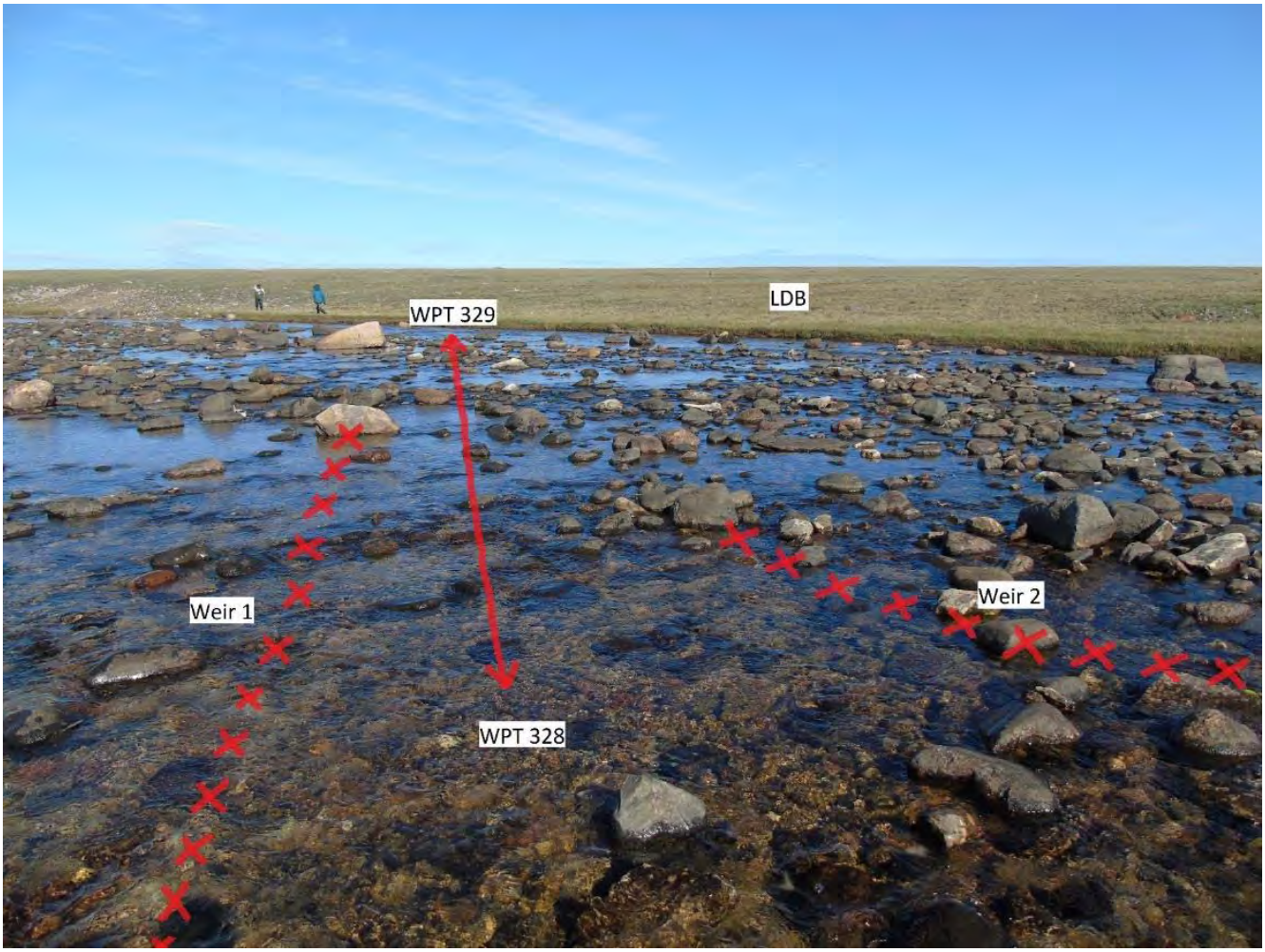

Photo C36: View upstream showing where the low-flow channel should be constructed to connect the RDB and LDB thalwegs. Also shown are the directional weirs which should be built to direct fish into the channel and block access up the shallow RDB.

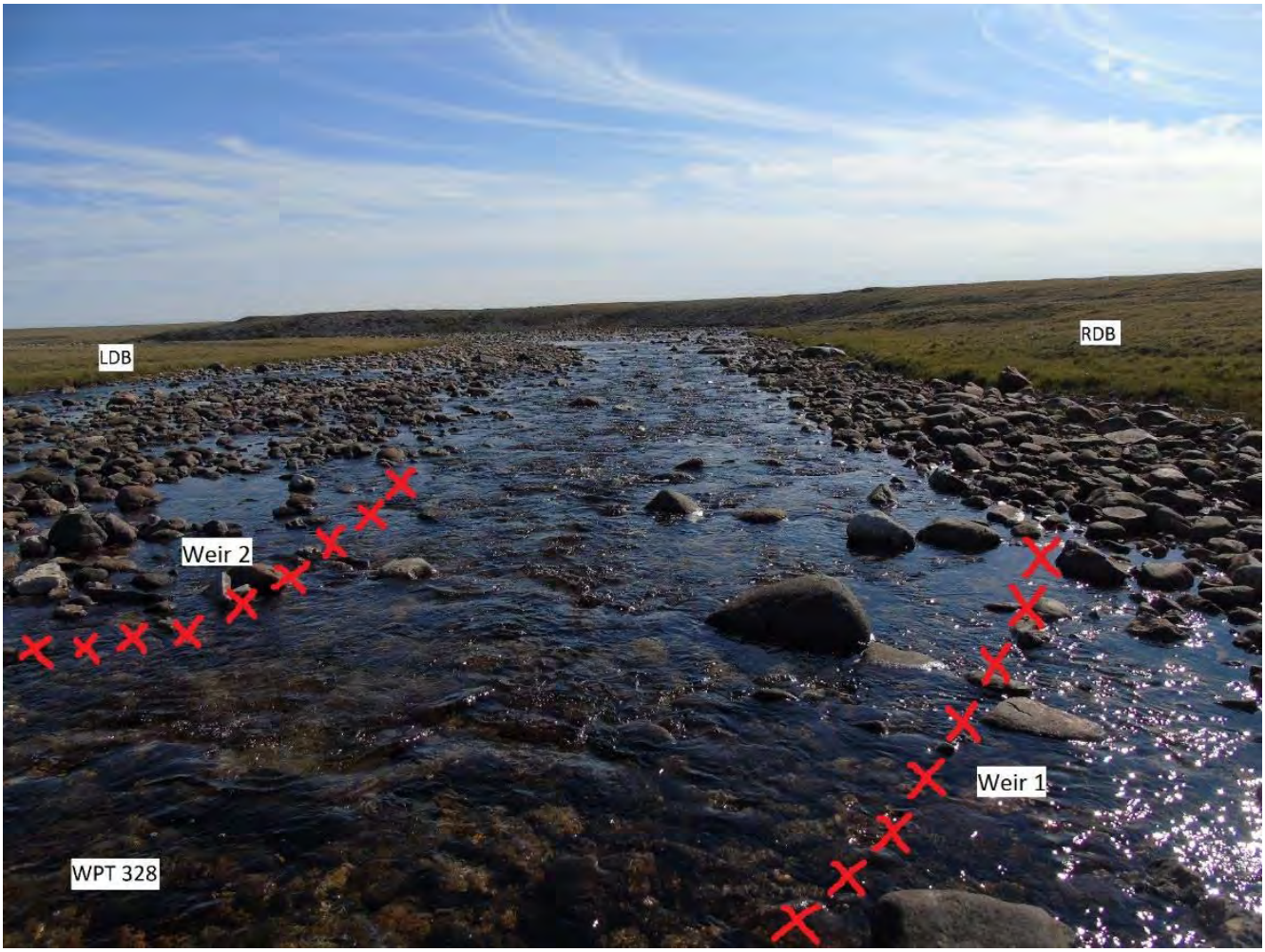

Photo C37: View downstream from WPT 328 showing where the fish will travel from along the center / RDB of the creek, leading fish to proposed Site 12.

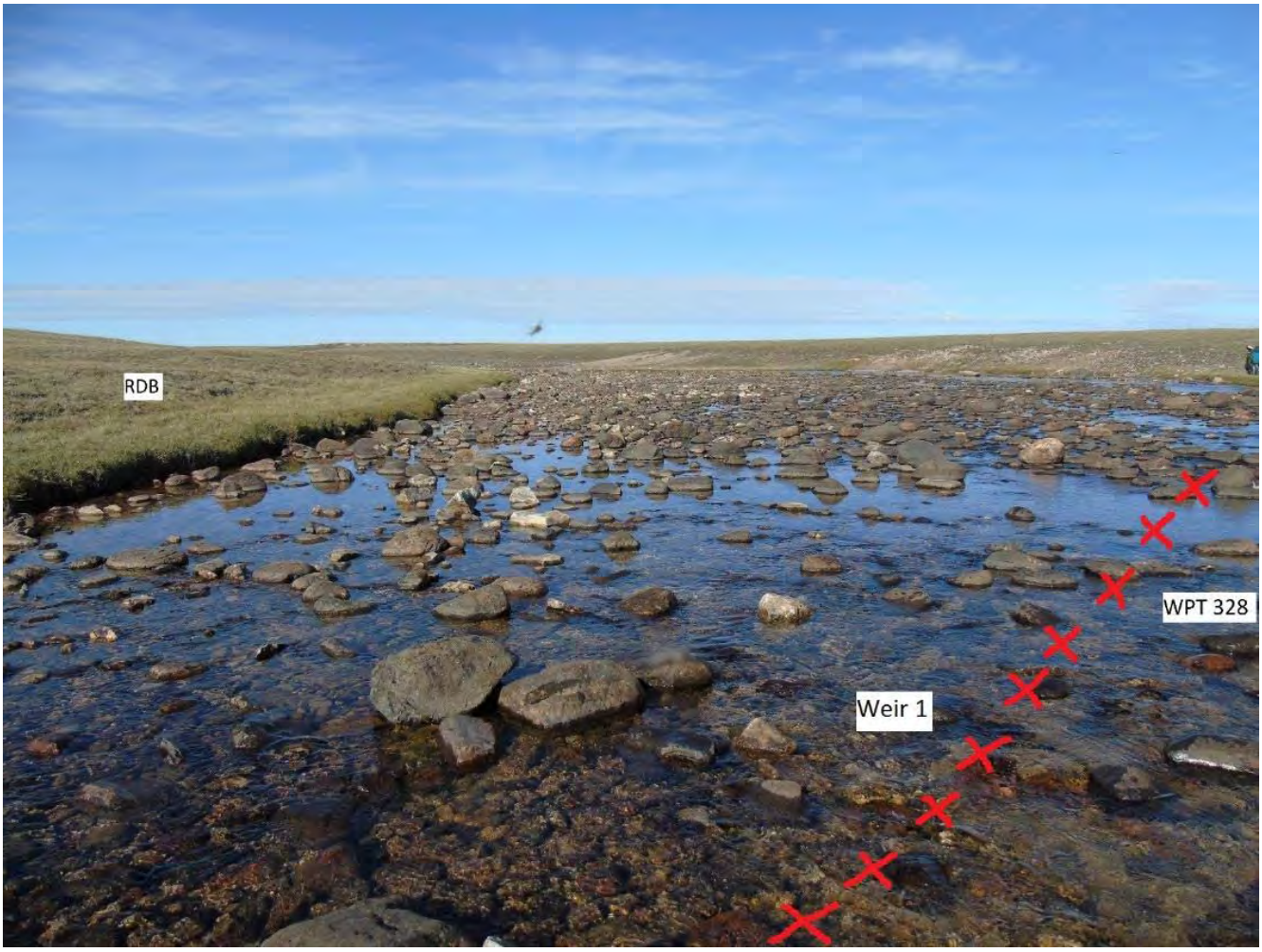

Photo C38: View upstream showing the impassable RDB with high potential for stranding fish at higher water levels and where Weir 1 should be constructed to block access up the RDB.

Photo C39: View upstream showing the dry RDB and where the channel should be constructed to divert fish from the RDB to the deeper LDB.

Tale C13: Remediation Planning Notes for Low-Flow Channel Site 13

Priority	Low	Notes: ■ Fish swimming through this location will encounter a one-meter wide section of boulders across the creek. The problem area is not a complete barrier at low-flows, but does create a minor blockage across some of the channel width. ■ This is the lowest priority of all proposed sites and will require minimal effort to complete. ■ This site is immediately above Site 7.
Fish Stranding Observed?	No	
Approximate Minimum Length	10 m (boulder removal)	
Approximate Distance From Mouth	3.1 km	
Easting	590127	
Northing	7626194	
Recommendation	■ Reposition the boulders so that they are more staggered, instead of straight across the channel, facilitating fish passage. ■ Small and medium-sized boulders should be moved to allow fish to pass between larger boulders (i.e., retain large boulders so they continue to provide in-stream cover along the migration path).	

m = metres; km = kilometres; HTO = Kugluktuk Hunters and Trappers Organization ; LDB = left downstream bank; RDB = right downstream bank.

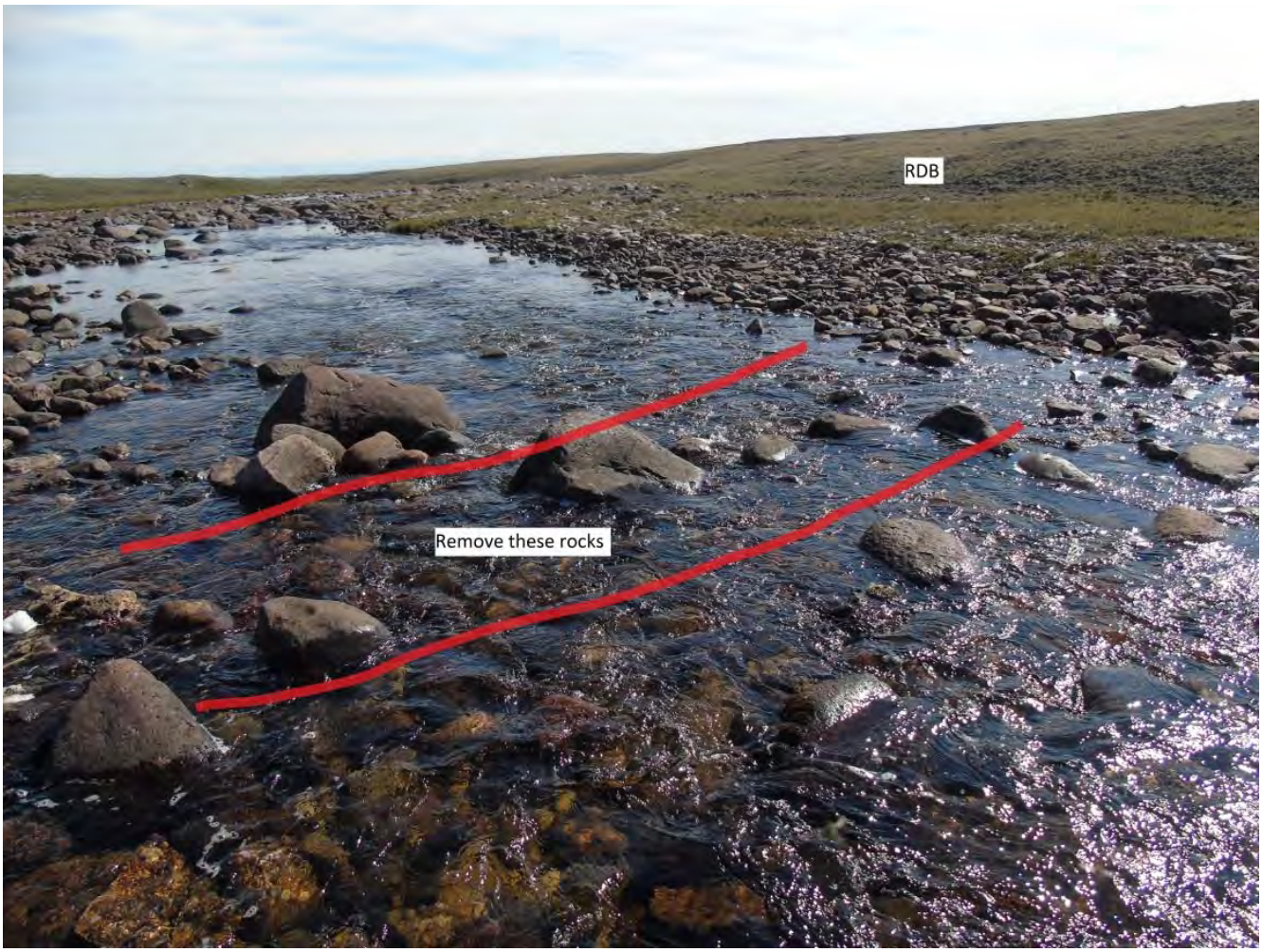

Photo C40: View downstream showing boulders in channel that should be repositioned to allow for easier fish passage.

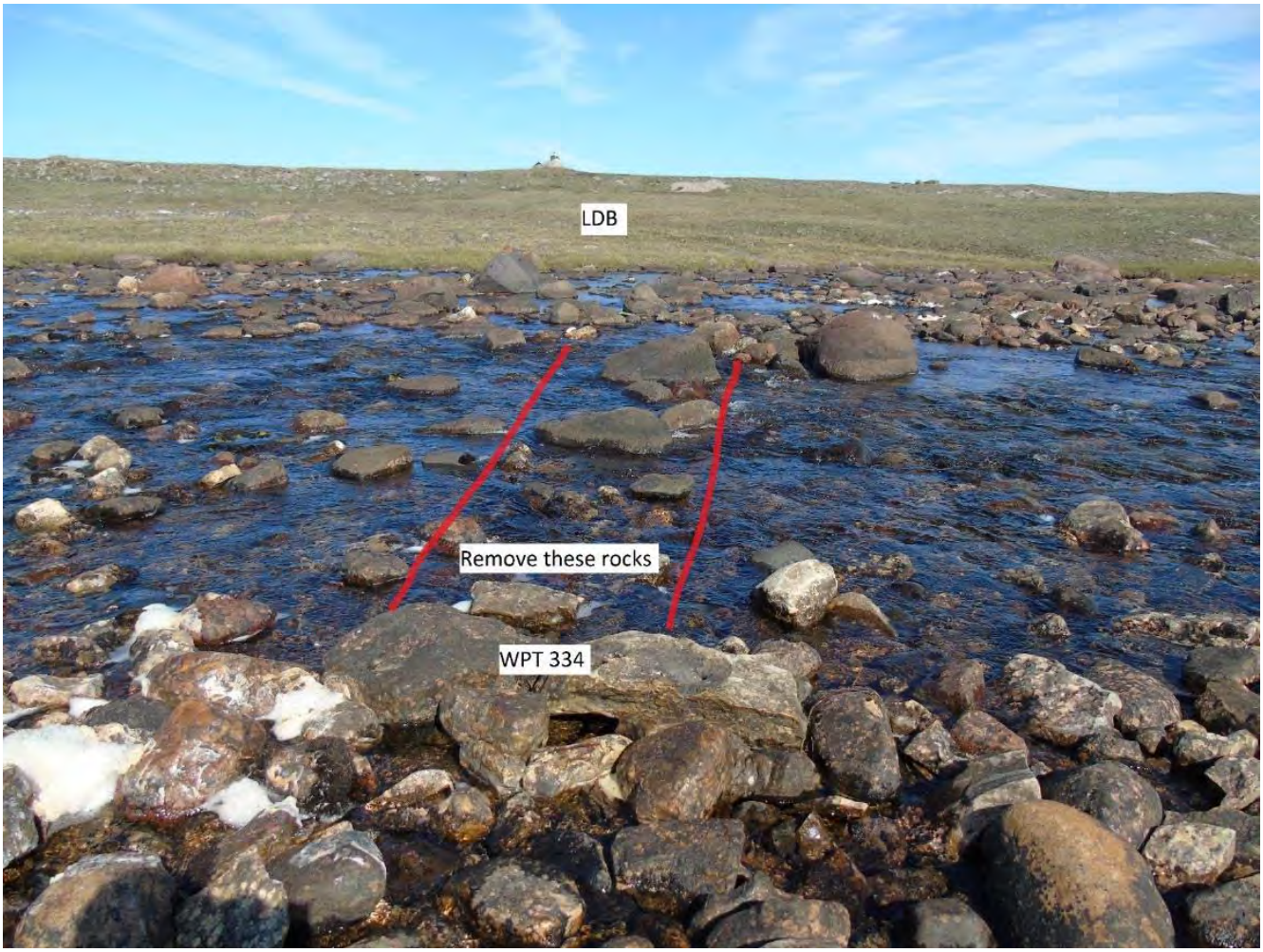

Photo C41: View looking towards the LDB showing how boulders line up in the creek to make fish passage difficult.

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7. Volume 7 Addenda: Marine Environment

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of the Marine Environment, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

During development of the FEIS, the following marine components were selected as VECs: marine water quality, marine sediment quality, marine fish/aquatic habitat, marine fish communities, seabirds/seaducks, and ringed seals. Marine physical processes were considered Subjects of Note and all required information noted in the EIS guidelines is included in Volume 7. Additional information on the commercial shipping route, key migratory bird nesting areas, and marine mammals is included in the seabird/seaducks and ringed seals (marine mammals) chapters. A marine diesel fuel spill model was also developed for the Project and can be found in Volume 9 of the FEIS.

Potential effects on VECs were evaluated spatially within a Local Study Area (LSA) and a larger Regional Study Area (RSA). The marine LSA covered 32 km^2 and included the water portion of the Potential Development Area (PDA) for the Marine Laydown Area (MLA), as well as the over-water portion of the winter road across Bathurst Inlet (~14 km) to the Nunavut mainland. The marine RSA covered 3,000 km^2 and included the marine LSA plus all of Bathurst Inlet as far north as Omingmaktok. All potential Project effects were assessed during the Construction, Operations, Reclamation and Closure, and Post-closure Project phases. Specific legislation that was considered during the assessment included the *Fisheries Act*, the *Species at Risk Act* (SARA), the *Migratory Birds Convention Act*, and the *Nunavut Wildlife Act*. Canadian Council of Ministers of the Environment (CCME) water and sediment quality guidelines for the protection of marine and estuarine life were used in the water and sediment quality assessments.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 8.1.13) in respect of the new information provided on the topic of the Marine Environment, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

MARINE PHYSICAL PROCESSES (FEIS VOLUME 7, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

MARINE WATER QUALITY (FEIS VOLUME 7, CHAPTER 2)

In the Final Hearing Report, the NIRB concluded that there is uncertainty in relation to the effects predicted for the proposed saline water discharge at the MLA. Sabina has prepared new or updated information to address Section 4.13 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.13 under FHR-NIRB-4.13(A) - Saline Water Discharge from Desalination Plant at the MLA. More specifically, Sabina has provided additional clarity within the Environmental Management Plan - Marine Monitoring Program Supplemental Information (FEIS Addendum Appendix V7-2B).

The updated information provides details on our proposed monitoring within the marine environment including a map of marine sampling location, type of sample, purpose, and frequency. The information was originally presented within the Aquatic Effects Monitoring Plan (AEMP) (FEIS Volume 10, Chapter 19) but was subsequently removed from the AEMP, updated, and will be added to the Environmental Management Plan (FEIS Volume 10, Chapter 2) in the next revision of that Plan. This information adds to FEIS Volume 7, Section 2.9 to replace any reference to the AEMP.

The NIRB identified concerns with the adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment. Sabina has provided additional clarity to address Section 4.13 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.13 under FHR-NIRB-4.13(A).

None of the additional information presented in the FEIS Addendum affects the conclusions presented in the FEIS Marine Environment Volume including existing environment and baseline information, spatial and temporal boundaries, Project related effect assessments, cumulative effects, transboundary, and mitigation and adaptive management.

MARINE SEDIMENT QUALITY (FEIS VOLUME 7, CHAPTER 3)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

MARINE FISH/AQUATIC HABITAT (FEIS VOLUME 7, CHAPTER 4)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

MARINE FISH COMMUNITY (FEIS VOLUME 7, CHAPTER 5)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

SEABIRDS/SEADUCKS (FEIS VOLUME 7, CHAPTER 6)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

RINGED SEALS (FEIS VOLUME 7, CHAPTER 7)

Sabina agrees with the NIRB that the Project's potential effects to marine wildlife can be appropriately managed through the commitments provided and application of key mitigation measures. Sabina has prepared new or updated information to further clarify Section 4.14 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.14 – Marine Wildlife. More specifically, Sabina has further clarified our monitoring and mitigation measures associated with ringed seals.

None of the additional information presented in the FEIS Addendum affects the conclusions presented in the FEIS Marine Environment Volume including existing environment and baseline information, spatial

and temporal boundaries, Project related effect assessments, cumulative effects, transboundary, and mitigation and adaptive management.

OTHER TOPIC-RELEVANT INFORMATION IN FEIS ADDENDUM

The NIRB identified concerns with the adequacy of emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet for the Project. Sabina has prepared new or updated information to address Section 4.13 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.13 under FHR-NIRB-4.13(B) - Adequacy of Emergency Preparedness, Shipping Response Capacity. More specifically, Sabina has provided a response to this concern in response FHR-NIRB-6.2 – Accidents and Malfunctions Assessment.

APPENDICES (FEIS VOLUME 7)

FEIS Appendix	Title	Summary of Change
Appendix V7-1A	Back River Project: 2012 Marine Baseline Report	No changes
Appendix V7-2A	Back River Project: 2013 Marine Baseline Report	No changes
Addendum Appendix V7-2B	Marine Monitoring Supplemental Information	New
Appendix V7-4A	Back River Project: 2012 Marine Fish and Fish Habitat Baseline Report	No changes
Appendix V7-4B	Back River Project: 2013 Marine Fish and Fish Habitat Baseline Report	No changes
Appendix V7-6A	Shipping Sensitivity Report	No changes

7.4 MARINE FISH/AQUATIC HABITAT (ADDENDA)

NIRB Section:	Section 4.13 – Marine Environment	Ref No.:	FHR-NIRB-4.13

Reference to NIRB Report:
Section 4.13 – Marine Environment

Conclusions and Recommendations of the Board (Section 4.13.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that there is considerable uncertainty in relation to the effects predicted for the proposed saline water discharge at the Marine Laydown Area **[FHR-NIRB-4.13(A)]** and the adequacy of emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet for the Project **[FHR-NIRB-4.13(B)]**. Given the Board's need to ensure adequate protection of the pristine marine environment in Bathurst Inlet, the Board has outstanding concerns for the adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment **[FHR-NIRB-4.13(A, B)]**.

Issues Highlighted within the Ministers' Referral Letter:

On the issue of the marine environment, the Board's conclusion was that it saw "considerable uncertainty" in the effects predicted for the proposed saline water discharge and emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet. Having reviewed the Board's recitation of the evidence, and the Board's views and conclusions, it is not clear why this uncertainty remains.

While we would have expected that the information before the Board on effects predictions and emergency preparedness would meet the appropriate standard for impact assessment, the Board appears to have concluded otherwise. However, at this stage, we do not have enough of an understanding of the Board's concern to come to our own conclusions.

This issue thus requires further review to make sure the Board's concerns are well understood by the parties and that, most importantly, they are given the opportunity to try to address them. By this approach, it seems reasonable to believe that the remaining uncertainty could be resolvable, and this process may bring with it the ability to make refined impact predictions and to develop additional mitigations if necessary.

Sabina Response:

The Board has stated that they have uncertainty in relation to the effects predicted, and the adequacy of proposed mitigation, management, and regulatory oversight for the proposed saline water discharge at the Marine Laydown Area (MLA).

For the NIRB's consideration, Sabina has provided additional clarity with regards to the proposed saline water discharge at the MLA, and is providing supplemental information marine monitoring for the Project (FEIS Addendum Appendix V7-2B). Sabina also confirmed that the four federal departments who have interaction with or oversight of the facility and marine discharge (INAC, ECCC, DFO, and TC) have no concerns with the potential for effects on the marine environment.

The NIRB identified concerns regarding emergency preparedness, fuel shipping response capacity into Bathurst Inlet, and regulatory oversight for proposed Project marine activities, Sabina has provided a response to this concern in FEIS Addendum Volume 9, Section 6.2 (FHR-NIRB-6.2 (A)).

The Board also remains concerned that efforts would be necessary to ensure shipping operations do not, and are not seen to adversely affect the marine environment or marine wildlife through the life of the Project. In recognition of NIRB's concern, Sabina has provided supplemental information regarding

marine wildlife and its marine mammal observation program in FEIS Addendum Volume 5, Section 4.14 (FHR-NIRB-4.14(A)).

For the NIRB's convenience, a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by ECCC and agreed to by Sabina that are relevant to the topic of saline water discharge in the marine environment are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	ECCC-T-1	The Proponent shall design and implement a marine monitoring program at the Marine Laydown Area to identify potential impacts of the project on the marine environment and inform adaptive management actions. *Commentary: The monitoring program shall be in line with the proposed monitoring in the Aquatic Effects Monitoring Plan presented in the FEIS Vol. 10 Chapter 19.*	ECCC, INAC

FHR-NIRB-4.13(A) – MLA Saline Water Discharge and Regulatory Oversight

The Board has stated that they have uncertainty in relation to the effects predicted, and the adequacy of proposed mitigation, management, and regulatory oversight for the proposed saline water discharge at the MLA.

Sabina would like to provide additional clarity with regards to the proposed saline water discharge at the MLA. The desalination plant will pull seawater from Bathurst Inlet, and will produce a concentrated seawater discharge as a by-product of producing potable water. None of the concentrated seawater discharge will come into contact with any mining facilities and the discharge will remain isolated. No additives are used in this process. The concentrated sea water will be mixed with sea water to ensure the saline water remains within 10% of the natural variation of salinity. The only change to the seawater before it is returned to the ocean is that it will have a slightly higher concentration of salt.

Sabina would like to highlight that this discharge is of a very different nature than what was recently permitted at TMAC's Doris North Project, which will direct compliant discharge to Robert's Bay from the Tailings Impoundment Area and saline groundwater from mining. The discharge volume at the Back River Project is much lower than the anticipated volume at the Doris North Project. Sabina would like to reiterate that, as stated in the FEIS, there will be no direct discharge of treated sewage effluent, contact water or camp greywater to the marine environment (FEIS Volume 2, Chapter 4, Section 4.3.6.1).

Sabina provided detailed information on the planned desalination plant discharge and the related potential effects assessment on the marine environment. As stated in FEIS Volume 7, Chapter 2, Section 2.5.3.6, no residual effects are anticipated:

> Discharge of brine water from the desalination plant will meet the CCME salinity guideline for the protection of marine life and will not cause the salinity of the receiving environment to fluctuate by more than 10% of the natural expected salinity (CCME 2015).
>
> The desalination plant is designed with an intake flow rate of 33 m^3/h and a discharge rate of 30 m^3/h. Assuming the fresh water plant product has a salinity of 0, the discharge from the plant is predicted to be 10% more saline, and therefore within the CCME salinity guideline at the point of discharge. The discharged effluent is expected to mix in the receiving environment, and is not expected to be detectable beyond the outfall. Hence no effects from the concentration of

> naturally present metals in the seawater influent are expected. Baseline metal concentrations are generally low but some seasonal variation has been observed in the baseline monitoring program (FEIS Volume 7, Chapter 2, Section 2.1.5.5). A 10% increase in natural metal concentrations in the desalination effluent is not expected to be detectable in the marine receiving environment once natural variation and mixing are considered. No treatment or process chemicals, such will be added at alto the effluent stream returning to the marine environment, and therefore no effects from those chemicals are predicted.
>
> It is anticipated there will be no residual effects from the desalination and greywater discharges on the VEC marine water quality due to the application of the mitigation by Project design and management measures.

During the FEIS Final Hearing, Sabina and ECCC jointly submitted the following term and condition (ECCC-T-1):

> The Proponent shall design and implement a marine monitoring program at the Marine Laydown Area to identify potential impacts of the project on the marine environment and inform adaptive management actions.

For the NIRB's consideration, Sabina is proposing the monitoring of intake water, discharge effluent, and the receiving environment for the Project during Construction, Operations, and Closure in MLA; this information is provided in the attached Marine Monitoring Supplemental Information (FEIS Addendum Appendix V7-2B), which will be incorporated into the next version of the Environmental Management Plan (FEIS Volume 10, Chapter 1). Sabina would like to emphasize that if the proposed monitoring results are materially different than anticipated, adaptive management will be implemented (e.g., storage of water, treatment of water).

During the FEIS Final Hearing, it was confirmed that four federal departments have interaction or oversight with marine discharge: INAC, ECCC, DFO, and TC.

- INAC administers the *Arctic Waters Pollution Prevention Act* and its regulations as well as the *Territorial Lands Act* and its regulations, which both include significant enforcement provisions. The *Arctic Waters Pollution Prevention Regulations* prohibit the deposit of "waste" into Arctic waters unless otherwise authorized under the *Territorial Lands Act*. Sabina is required under the *Territorial Lands Act* and its regulations to obtain an instrument before constructing the MLA, and INAC confirmed during the FEIS Final Hearing that it will include marine discharge criteria within its instrument, developed as follows:

  > *"Yesterday, during the Fisheries and Oceans presentation, the Nunavut Impact Review Board enquired about the regulation of the outfall from the desalination plant at the marine laydown area. At this time, I would like to advise the Board that the deposition of material into Arctic waters will be addressed through an authorization issued by the department under the same instrument that allows the installation of the outfall. We will work with experts at Environment and Climate Change Canada to determine appropriate water quality parameters that will be appropriated into the authorization."* [26]

- ECCC administers section 36 of the *Fisheries Act* which prohibits the deposit of deleterious substances into fisheries waters, as well as the *Metal Mining Effluent Regulations*. There are numerous enforcement provisions in the *Fisheries Act,* which (among other items) provide for fines of up to $500,000 per day (during periods where discharges are ongoing). As confirmed during the

[26] K. Costello, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 554, Lines 18 to 26; Pg. 555, Lines 1 to 3

FEIS Final Hearing and acknowledged in the FEIS Final Hearing Report, ECCC has no concerns with respect to the assessment work completed by Sabina, the proposed discharge plan, or potential impact of the discharge on fish[27]. ECCC also provided the Canadian Council of Ministers of the Environment (CCME) salinity guidelines to the Board for review during the FEIS Final Hearing, which details the scientific basis of the salinity guideline and supports the assessment that the effluent from the proposed MLA desalination plant is not expected to have effects on fish and other aquatic life in Bathurst Inlet.

- Sabina will also be required by DFO to comply with the *Fisheries Act* requirements respecting protection of fish habitat in regards to construction and operation of the outfall.

- Sabina will also be required to comply with the *Navigation Protection Act* in respect of the marine outfall, which is administered by Transport Canada. This will ensure the outfall will not interfere with marine navigation.

The regulatory authorities with oversight over the facility and discharge have all confirmed that they have no concerns with the potential for effects on the marine environment.

The NIRB stated that it was uncertain in relation to the effects predicted for the proposed saline water discharge at the MLA. For the NIRB's consideration, Sabina has provided additional clarity with regards to the proposed saline water discharge at the MLA, and is providing marine monitoring supplemental information for the Project (FEIS Addendum Appendix V7-2B).

Attachment:

FEIS Addendum Appendix V7-2B. Marine Monitoring Supplemental Information.

FHR-NIRB-4.13(B) – Emergency Preparedness, Spill Response Capacity and Regulatory Oversight

The NIRB identified concerns with the adequacy of emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet for the Project. The NIRB has also expressed concerns with regards to adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment.

In recognition of NIRB's above concerns, Sabina has provided a response to this concern in FEIS Addendum Volume 9, Section 6.2 (FHR-NIRB-6.2 (A)).

Attachment:

Not applicable

[27] A. Wilson, ECCC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 497, Lines 4 to 20

7.5 MARINE FISH COMMUNITY (ADDENDA)

NIRB Section:	Section 4.14 – Marine Wildlife	Ref No.:	FHR-NIRB-4.14

Reference to NIRB Report:
Section 4.14 – Marine Wildlife

Conclusions and Recommendations of the Board (Section 4.14.4):

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 marine wildlife could be appropriately managed through the commitments provided by the Proponent and application of key mitigation measures associated with monitoring prior to construction of the winter ice road and airstrip on Bathurst Inlet, and ensuring that shipping companies employ sufficient ship-based wildlife monitoring during annual resupply.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

Sabina agrees with the NIRB that the Project's potential effects to marine wildlife could be appropriately managed through the commitments provided and application of key mitigation measures associated with monitoring prior to construction of the winter ice road and airstrip on Bathurst Inlet, and ensuring that shipping companies employ sufficient ship-based wildlife monitoring during annual resupply.

For the NIRB's convenience a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by the DFO and agreed to by Sabina that are relevant to the topic of marine wildlife are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	DFO-T-5	The Proponent commits to developing and implementing a pre-construction monitoring plan for seal lairs to ensure potential lair locations are not impacted by the ice road or airstrip construction. If construction is scheduled during the seal pupping period, then the identified potential lair locations – such as ice ridges or large snow drifts, will be avoided and monitoring for ringed seal presence will be triggered prior to construction. The Proponent will update the text in the WMMP Plan (Section 7.2.8.3) to include working with Fisheries and Oceans Canada and interested parties to determine the most appropriate methodology should construction be proposed during the seal pupping period and structures that may support lairs (ice ridges and snow banks) be unavoidable. Prior to construction of the project, a detailed Standard Operating Procedure (SOP) will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.	DFO

(continued

)

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	DFO-T-6	The Proponent commits to produce a simplified SOP and ensure that Marine mammal surveys are conducted following the basic methods provided in the protocol outlined in Recommended Seabird and Marine Mammal Observational Protocols for Atlantic Canada (Moulton & Mactavish 2004). The Proponent has also committed to avoiding any groups of marine mammals observed on the ocean surface except where the safety of the ship is in concern (FEIS Volume 10, Chapter 20, Section 6.11.3). The Proponent also commits to continue to work with Fisheries and Oceans Canada and interested parties in the development of the ship based marine mammal monitoring program that utilizes bridge crew. The Proponent will update the text in the WMMP Plan (FEIS Volume 10, Chapter 20, Section 7.2.8.5) to this effect.	DFO, KIA

Since the FEIS Final Hearing, Sabina has updated the text of the Pre-Construction Survey for Seal Lairs Section (14.2.1) of the WMMP Plan:

> Sabina will work with relevant parties, including Fisheries and Oceans Canada (DFO) to determine the most effective methodology should construction be proposed during the seal pupping period and structures that may support lairs (ice ridges and snow banks) be unavoidable. Prior to construction of the Project, a detailed SOP will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Sabina has also updated the text of the Marine Mammal Monitoring during Project Shipping Section (14.2.2) of the WMMP Plan:

> Sabina will work with Fisheries and Oceans Canada and interested parties in the development of the ship based marine mammal monitoring program that utilizes bridge crew. Sabina will produce a simplified SOP and ensure that Marine mammal surveys are conducted following the basic methods provided in the protocol outlined in Recommended Seabird and Marine Mammal Observational Protocols for Atlantic Canada (Moulton & Mactavish 2004).

Since the FEIS Final Hearing, Sabina has worked to progress the WMMP Plan and held a WMMP 2-day workshop with the KIA and the GN on October 25–26, 2016. Specific to marine wildlife, the KIA requested that the following text be included in the WMMP Plan; this text has been added to Section 14.1.4:

> If a ringed seal is found on land in the MLA infrastructure area, the KIA will be contacted prior to any action being carried out.

All WMMP Plan monitoring programs, and the Project phases in which they occur, were reviewed and increased as a result of the 2-day workshop; these updates can be found in Tables 6.2-1 and 6.2-2 of the WMMP Plan. Specific to marine mammals, the WWMP Plan text was updated to read:

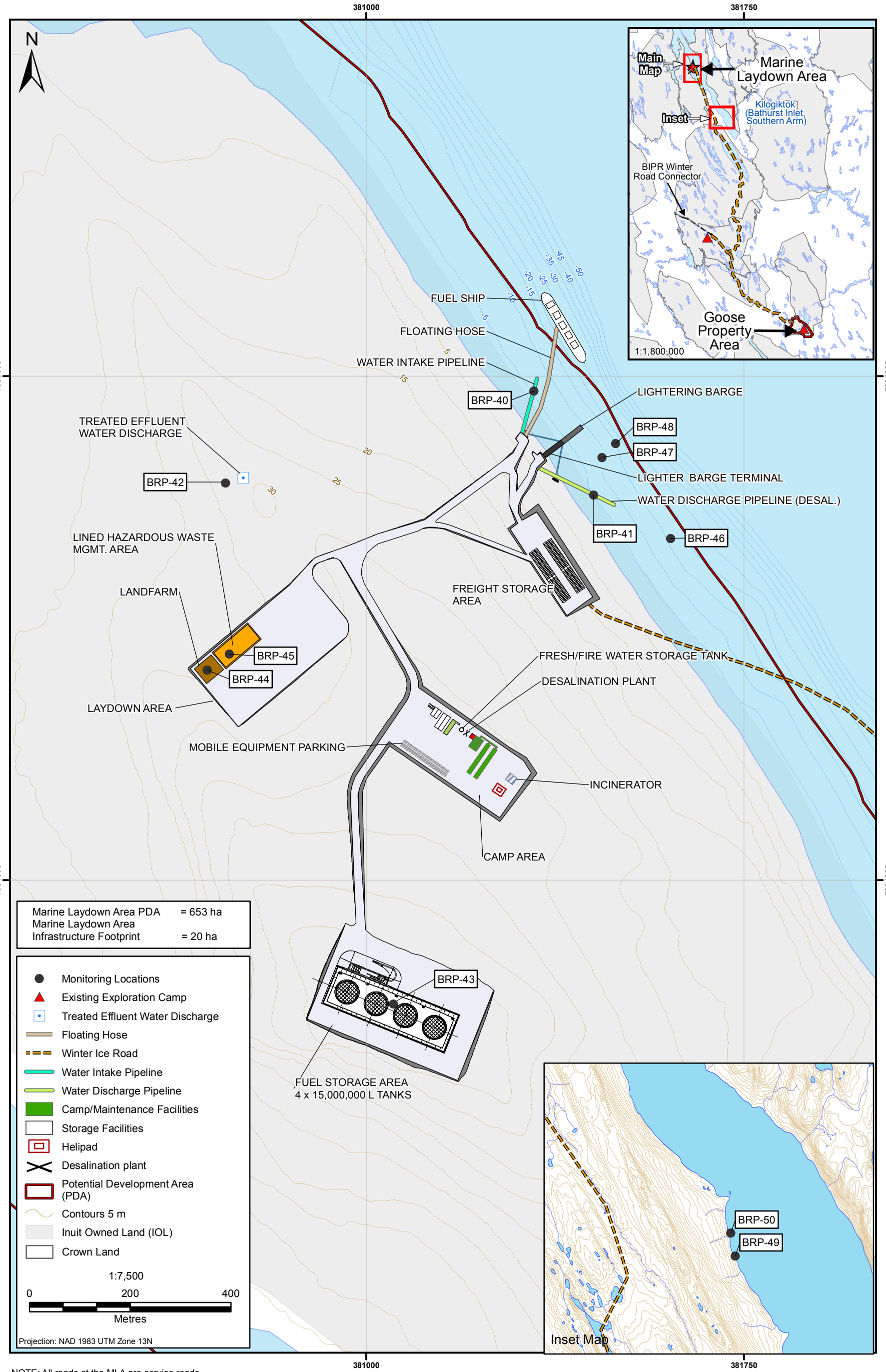
> Pre-construction surveys will be conducted for seal lairs if on-ice construction is planned during the seal pupping season, February 15–April 15, during Construction, Operations, Care and Maintenance, and Reclamation/Closure.

For the NIRB's convenience, the updated WMMP Plan can be found in FEIS Addendum Volume 10, Chapter 20.

Attachment:

FEIS Addendum Volume 10, Chapter 20. Wildlife Mitigation and Monitoring Program Plan

ADDENDUM APPENDIX V7-2B: MARINE MONITORING SUPPLEMENTAL INFORMATION (NEW)



NOTE: All roads at the MLA are service roads

Sabina GOLD & SILVER CORP.

Figure 9.3-2

Proposed Regulated, General and Verification Monitoring Locations in Marine Laydown Area, Back River Project

Table 1. Proposed Water Quality Monitoring for the Project during Construction, Operations, and Closure in Marine Laydown Area

Monitoring Location Number	Monitoring Type	Description	Purpose	Mine Phase	Parameter Group Code(a)	Frequency
BRP-40	General Monitoring	Bathurst Inlet Intake (pretreatment)	Source intake water quality for potable and industrial use	Construction to Closure	A, D	(b)
					B	(b)
BRP-41	General Monitoring	Bathurst Inlet Discharge (post treatment)	Test quality at final point of control	Construction to Closure	D	(b)
BRP-42	General Monitoring	MLA Treated Effluent Discharge Location to land (greywater)	Confirm quality of greywater before release	Construction to Closure	E	Prior to discharge or transfer of water
BRP-43	Regulated & General Monitoring	MLA Fuel Tank Farm	Test quality of runoff water in the Fuel Tank Farm containment area	Construction to closure	E	Prior to discharge or transfer of water
BRP-44	Regulated & General Monitoring	MLA Landfarm	Test quality of runoff water in the Landfarm containment area	Construction to closure	E	Prior to discharge or transfer of water
BRP-45	General Monitoring	MLA Hazardous Waste Mgmt Area	Test quality of runoff water in the Hazardous Waste Management containment area	Construction to closure	E	Prior to discharge or transfer of water
BRP-46	General Monitoring	MLA mid-shore by the water discharge pipeline	Monitor marine area near the treated water discharge; AEMP station also sampled for sediment, benthics, and shellfish	Construction to closure	A, I	Twice per year when there is active discharge to the marine environment
BRP-47	General Monitoring	MLA near-shore by the barge	Monitor marine area in the barge area, near-shore environment; AEMP station also sampled for sediment and benthics	Construction to closure	A, I	Twice per year when there is barge activity
BRP-48	General Monitoring	MLA mid-shore by the barge	Monitor marine area in the barge area, mid-shore environment; AEMP station also sampled for sediment, benthics, and shellfish	Construction to closure	A, I	Twice per year when there is barge activity
BRP-49	General Monitoring	MLA reference near-shore	Reference for comparison to exposure near-shore sites; AEMP station, water only	Construction to closure	A, I	Twice per year in coordination with sampling in the water discharge and barge sampling areas
BRP-50	General Monitoring	MLA reference mid-shore	Reference for comparison to exposure mid-shore sites; AEMP station also sampled for sediment, benthics, and shellfish	Construction to closure	A, I	Twice per year in coordination with sampling in the water discharge and barge sampling areas

Notes BRP = Back River Project; MLA = Marine Laydown Area

a See Table 10.3-3 ("Table-Monitoring Parameters-v2") for parameters in each monitoring group

b Monitoring parameters and frequency at the discretion of Sabina as results from the verification stations are used for operational and management purposes

Table 2. List of Constituents in Each Parameter Group

Parameter Group	Parameter Group Code	Specific parameters
Field Chemistry	A	pH, specific conductivity, dissolved oxygen, and temperature.
Flow	B	Flow datalogger, calculated volume
Surface runoff	C	Total Suspended Solids (TSS)
General Chemistry on site	D	Conventional: turbidity, hardness, alkalinity, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, total dissolved solids (TDS), TSS, total cyanide, free cyanide, and weak acid dissociable (WAD) cyanide. Nutrients: ammonia, nitrate, nitrite, total phosphorus (TP), and total dissolved phosphorus (TDP). Total metals: aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, and zinc Other: radium-226 when required
Secondary Containment	E	TSS, ammonia, total arsenic, total copper, total lead, total nickel, total zinc, benzene, toluene, ethylbenzene, xylene, and total petroleum hydrocarbons (TPH), plus nitrate and ammonia when necessary
MMER deleterious substances	F	TSS, total cyanide, total arsenic, total copper, total lead, total nickel, total zinc, and radium-226
MMER toxicity	G	Acute toxicity (Rainbow Trout and Daphnia magna)
MMER sublethal toxicity	H	Sublethal toxicity (Fathead Minnow or Rainbow Trout, Ceriodaphnia dubia, Lemna minor, Pseudokirchneriella subcapitata)
Receiving Environment	I	Conventional: turbidity, hardness, alkalinity, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, TDS, TSS, and total cyanide. Nutrients: ammonia, total Kjeldahl nitrogen, nitrate, nitrite, ortho-phosphate, TP, TDP, total organic carbon, dissolved organic carbon, and reactive silica. Total and dissolved metals: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc. Other: radium-226 when required

Note: Detection limits for site monitoring may be higher than detection limits for downstream receiving environment monitoring

8. Volume 8 Addenda: Human Environment

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of the Human Environment, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

During development of the FEIS, the following human environment components were selected as VSECs: archaeological sites, economic development, business opportunities, employment, education and training, health and community well-being, non-traditional land and resource use, subsistence economy and land use, and country foods. Paleontological sites, human health risk assessment, and environmental risk assessment were considered Subjects of Note and all required information noted in the EIS guidelines was considered.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 8.2, 8.3 and 8.4) in respect of the new information provided on the topic of the Human Environment, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

ARCHAEOLOGY (FEIS VOLUME 8, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

PALEONTOLOGY (FEIS VOLUME 8, CHAPTER 2)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

SOCIO-ECONOMICS (FEIS VOLUME 8, CHAPTER 3)

In the Final Hearing Report, the NIRB stated that they have uncertainty in relation to the effects of potential temporary mine closures on the well-being of businesses in the Kitikmeot Region. Sabina has prepared new or updated information to address Section 5.4 of the Final Hearing Report. This information can be found in response FHR-NIRB-5.4 under FHR-NIRB-5.4(A) – Potential Effects on Economic Well-Being of Kitikmeot Businesses.

In the Final Hearing Report, the NIRB concluded that there is uncertainty in relation to the effects predicted of scheduling on the health and well-being of employees and their families. Sabina has provided

additional clarity to address Section 5.9 of the Final Hearing Report. This information can be found in response FHR-NIRB-5.9 under FHR-NIRB-5.9(A) – Health and Wellbeing of Employees and their Families.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Socio-Economic assessment (FEIS Volume 8, Chapter 3).

LAND USE (FEIS VOLUME 8, CHAPTER 4)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

COUNTRY FOODS (FEIS VOLUME 8, CHAPTER 5)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT (FEIS VOLUME 8, CHAPTER 6)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

OTHER TOPIC-RELEVANT INFORMATION IN FEIS ADDENDUM

In the Final Hearing Report, the NIRB concluded that there is uncertainty in relation to the effects predicted on human health and safety. Sabina has prepared new or updated information to address Section 5.11 of the Final Hearing Report. This information can be found in response FHR-NIRB-5.11 under FHR-NIRB-5.11(A) – Potential Effects of the Project on Human Health and Safety.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in the Human Environment (FEIS Volume 8).

APPENDICES (FEIS VOLUME 8)

FEIS Appendix	Title	Summary of Change
Appendix V8-1A	Archaeological Sites within the LSA and TCWR Winter Road Connector Assessment Area	No changes
Appendix V8-1B	Back River Project: Cumulative Heritage Baseline Report 2013	No changes
Appendix V8-1C	Archaeological Site Type and Artifact Tables	No changes
Appendix V8-3A	Back River Project: 2012 Socio-economic and Land Use Baseline Report	No changes
Appendix V8-3B	Back River Project: 2015 Economic Impact Model Report	No changes
Addendum Appendix V8-3C	Communities and Diamonds: 2015 Annual Report	New
Addendum Appendix V8-3D	Measuring Success 2014: NWT Diamond Mines Continue to Create Benefits	New
Appendix V8-5A	Back River Project: Country Foods Baseline Screening Level Risk Assessment	No changes
Appendix V8-5B	Addendum to the Back River Project Country Foods Baseline Screening Level Risk Assessment	No changes
Appendix V8-6A	Ecological Risk Assessment Chemicals of Potential Concern Screening for the Project	No changes
Appendix V8-6B	Risk Assessment Model Appendix	No changes
Appendix V8-6C	Risk Assessment Model Appendix: Worked Example for Predicted Future Media Concentrations	No changes

8.3 SOCIO-ECONOMICS (ADDENDA)

NIRB Section:	Section 5.4 – Contracting and Business Opportunities	Ref No.:	FHR-NIRB-5.4

Reference to NIRB Report:
Section 5.4 – Contracting and Business Opportunities

Conclusions and Recommendations of the Board (Section 5.4.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board is not confident that mitigation measures have yet been designed to adequately address the potential for temporary mine closures to adversely affect the economic well-being of businesses of the Kitikmeot region **[FHR-NIRB-5.4(A)]**.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

FHR-NIRB-5.4(A) – Potential Effects on Economic Well-Being of Kitikmeot Businesses

The Board has stated that they have uncertainty in relation to the effects of potential temporary mine closures on the well-being of businesses in the Kitikmeot Region.

The Board also acknowledges Sabina's commitment to further engage with the residents of the Northwest Territories with regards to potential employment, business, and contracting opportunities.

Sabina has been operating in the Kitikmeot Region for over a decade, and in that time Sabina has built strong relationships with many contractors in both Nunavut and the Northwest Territories. In 2013 alone, we spent nearly $10M with Nunavut Agreement beneficiary companies.

Over the years we have built strong relationships with our primary suppliers including the following northern companies:

- Nuna Logistics
- First Air/Sakku Aviation
- Canadian North Inc./Northerra
- Det'on Cho Logistics/QDC Logistics
- 5136 Nunavut Ltd. (1984 Catering)
- Discovery Mining Services/Nunavut Expediting

These companies, along with dozens of other smaller local northern firms, have formed the core of our business in Nunavut.

Support from these firms in meeting northern employment targets and working closely with community stakeholders has been essential to Sabina and our northern projects' success over many years. This can be attested to by 1984 Nunavut, and Great Slave Helicopters, respectively:

> *"This dedication from Sabina Gold and Silver Corp. to the communities in which they operate encourages our Inuit owned company, 1984 Nunavut to grow and allowed our company to retain a 65% Inuit hire base…The relationship that 1984 Nunavut has built with Sabina Gold and Silver*

> *Corp. is based on our companies' mutual respect for the environment, the Inuit people, Inuit culture and the future economic development available to the Kitikmeot region."*[28]
>
> *"Since the early 2000's GSH has worked closely with Sabina along with our local Indigenous partners Kitikmeot Helicopters. We have worked closely with community stakeholders to ensure the program was a success while exceeding the regulatory requirements."*[29]

Sabina has also worked closely with many businesses in the Northwest Territories. Det'on Cho Logistics out of Yellowknife (a wholly owned subsidiary of Det'on Cho Corporation, the economic development arm of the Yellowknives Dene First Nation) alone has done in excess of $1.2M in business with Sabina since 2013.

Building and maintaining strong relationships with our contractors and local businesses will remain a core part of Sabina and the Project's success over the life of the Project. In the Business Development Plan (FEIS Volume 10, Chapter 24), Sabina commits to providing contracting and procurement opportunities within Nunavut and specifically within the Kitikmeot Region. These commitments will be further defined in the IIBA currently being negotiated with the KIA.

Also in the Business Development Plan, Sabina discusses the importance of Adaptive Management in establishing contracting opportunities for Inuit firms with the Project. This management approach extends further to helping to build capacity of local businesses and entrepreneurs to support not only the Project but other mining projects and opportunities in the region and beyond. This development support will focus on the following areas:

- Business management.
- Financial management.
- Performance assurance (e.g., health and safety).
- Contracts and procurement.
- Human resources management.

Building this capacity will assist businesses in case of temporary mine closure, but will also allow them to continue to be viable and successful well beyond the life of the Project. Sabina will have discussions with companies during the procurement process to ensure clear contractual obligations are established and understood.

There are a multitude of examples of the benefits mining can bring to a region, for additional information on the benefits of mining in the Canadian Arctic please reference the following reports by the Government of the Northwest Territories, Communities and Diamonds: 2015 Annual Report of the Government of the Northwest Territories under the Ekati, Diavik and Snap Lake Socio-economic Agreements (FEIS Addendum Appendix V8-3C) and by the NWT & Nunavut Chamber of Mines, Measuring Success 2014: NWT Diamond Mines Continue to Create Benefits (FEIS Addendum Appendix V8-3D).

The Board has stated that they have uncertainty in relation to the potential effects of potential temporary mine closures on the well-being of businesses in the Kitikmeot Region. Sabina acknowledges the NIRB's outstanding concern and remains willing and able to discuss any issues related to local contracting and business opportunities. Sabina wishes to reiterate our commitment to engaging local northern contractors and businesses focusing primarily on the Kitikmeot but also including those from the whole of Nunavut and the Northwest Territories. Further, our commitment to continuing to building capacity with these businesses will support their success well beyond the life of the Project. Sabina has operated successfully in the Kitikmeot Region for over a decade, and takes pride in the business

[28] 160831-12MN036-1984 Group of Companies Ltr NIRB Re Support-IOCE
[29] 160908-12MN036-GSH Ltr Minister Re Support-IOCE

relationships we have built in the North. We look forward to continuing to build on these efforts throughout the life of the Project.

Attachment:

FEIS Addendum Appendix V8-3C. Communities and Diamonds: 2015 Annual Report
FEIS Addendum Appendix V8-3D. Measuring Success 2014: NWT Diamond Mines Continue to Create Benefits

NIRB Section:	Section 5.9 – Health and Well-Being	Ref No.:	FHR-NIRB-5.9

Reference to NIRB Report:
Section 5.9 – Health and Well-Being

Conclusions and Recommendations of the Board (Section 5.9.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that there is considerable uncertainty related to the potential effects of scheduling on the health and well-being of employees and their families, as well as for potential effectiveness of the proposed mitigation measures owing to the limited amount of information made available for the areas noted in the preceding section **[FHR-NIRB-5.9(A)]**.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

FHR-NIRB-5.9(A) – Health and Well-Being of Employees and Their Families

The Board has stated that they have uncertainty related to the potential effects of scheduling on the health and well-being of employees and their families, as well as for potential effectiveness of the proposed mitigation measures.

For the Boards convenience a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by the GN and agreed to by Sabina that are relevant to the topic of human health and well-being are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested Text from Final Hearing	Anticipated Party Involvement
Commitment	GN-C-1	Provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association, The Proponent commits to include project-specific data concerning employee community or residence and number of employees that relocated from the year prior (where available, to and from, for Cambridge Bay, Kugluktuk, Taloyoak, Gjoa Haven, and Kugaaruk) in their Socio-Economic Monitoring Program and subsequent annual reports. The details of this process will be captured in the terms of reference for the project specific Back River Socio-economic Monitoring Committee.	GN
Commitment	GN-C-6	Sabina will be offering annual influenza vaccinations to all employees and providing education on proper personal hygiene to limit the spread of influenza. All medical incidents or occurrences, including those tied to a rabid animal, will be addressed through the company HS&E policy, where a qualified on-site Nurse/Medic will assess the situation and where necessary consult with our Medical Doctor. All regulatory reporting will be adhered to for compliance.	GN

(continued)

Type	Identifier	Suggested Text from Final Hearing	Anticipated Party Involvement
Commitment	GN-C-7	In the event the pre-employment medicals are required, Sabina will commit to a service fee payable to the Community Health services based on a negotiated fee schedule. Sabina will develop any pre-employment medical screening program in discussion with Nunavut Health Services.	GN
Commitment	GN-C-8	The Proponent commits to integrate information and data relating to employee support programs and training through the Back River Socio-Economic Monitoring Program Annual Report, provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association.	GN
Commitment	GN-C-11	Provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association, the Proponent commits to integrate information and data relating to employee support programs and training through the Back River Socio-Economic Monitoring Program Annual Report.	GN

Sabina acknowledges the Board's concerns about potential impacts to public housing in the Kitikmeot Region, however, Sabina reiterates that it does not expect families to move or take up additional public housing as a result of the Project. Sabina presented an analysis in the FEIS that indicates the Project will likely act to stimulate increased housing investments by local residents and decrease the number of individuals receiving income support (FEIS Volume 8). This stimulus is expected to occur primarily through increases in local wealth generated by Project-related employment and other economic opportunities. While the manner in which Project employees spend their incomes will ultimately be a personal choice, it is important to note that most individuals share a basic desire to maintain a healthy standard of living wherever possible. Access to adequate housing, including private ownership, is often a major component of this, and incomes generated by the Project will help individuals accomplish this goal should they wish.

Additionally, the analysis presented in Volume 8 of the FEIS demonstrated the low likelihood of significant Project-related in-migration to the Kitikmeot Region. This is largely due to points-of-hire being established for the Project in all Kitikmeot communities (thus allowing Inuit to reside in their home communities and not be required to relocate) and in the south (thus encouraging non-Inuit to reside in their southern home communities and not be required to relocate to the north). Sabina also concluded in the FEIS that most spin-off Project employment within the Kitikmeot communities is likely to be taken up by existing local residents, making any additional effect on housing demand negligible. Additional strains on public housing in the Kitikmeot Region as a result of Project-related in-migration are thus not expected to occur in any significant manner.

Sabina agrees with the Board that supply and maintenance of housing in Nunavut is primarily a government responsibility. In recognition, Sabina and the GN jointly submitted the following term and condition at the FEIS Final Hearing to enhance employee access to a range of housing options, including homeownership (GN-T-6):

> Provided the sharing of such information is consistent with the terms and conditions of any applicable Inuit Impact Benefits Agreement with the Kitikmeot Inuit Association, the Proponent is strongly encouraged to communicate and collaborate with the GN and Nunavut Housing Corporation (NHC) on potential housing initiatives with a view to enhancing employee access to a range of housing options, including homeownership. Initiatives may include, but are not limited to, the provision of financial literacy, financial planning, and personal budgeting training.

The Nunavut Housing Corporation's (NHC) efforts to establish new housing units and update allocation methodologies in recent years are expected to lead to improved housing circumstances for some families.

The NHC has also recently implemented changes to the Public Housing Rent Scale (PHRS) which will now assess only the incomes of the two primary tenants within a unit. Rather than an immediate loss of housing subsidy for those who obtain relatively high income employment, the NHC has adjusted the PHRS to limit rent increases by 25% of the newly assessed amount annually, until the maximum is reached. And, if public housing tenants obtain employment or receive a pay raise, their rent will not increase until September 1 of the following year.

Sabina acknowledges the transition to paid employment and personnel financial management is a known challenge. Sabina has committed to providing access to financial planning and information for employees and family members. NHC's new approach to rental assessment for public housing substantially reduces the previous disincentive to employment, where the increased cost of rent offset an individual's earnings. Limiting the rent increase enables individuals to transition into their new financial position and responsibilities gradually, while accumulating wealth and increasing the likelihood that the new circumstances will be sustainable. Overall, the new, longer-term approach provides incentive for individuals receiving the housing subsidy to obtain employment and gradually increase the amount of rent paid until they're able to transition out of public housing. Finally, the income of individuals in public housing will continue to be exempt from rental assessment by NHC for full-time students, as well as individuals attending pre-trades and trades courses.

The potential for increased in- and out-migration in the Kitikmeot Region as a result of Project activities have been assessed in the FEIS in Volume 8, where it was demonstrated that no significant negative effects are expected to arise. This is primarily due to Sabina's commitment to provide preferential employment to residents of all Kitikmeot communities and cover the costs of travel to/from those communities to the Project site (thus encouraging Inuit employees to continue residing in their home communities and not relocate), and the close ties Inuit continue to maintain with their families and communities (which acts as a further incentive for Inuit employees to remain in their home communities and not relocate).

For these reasons combined, additional strains on public housing in the Kitikmeot Region are not envisioned to result from the Project in any significant manner.

> *"Sabina respectfully notes that, at the FEIS Final Hearing and in the FEIS, Sabina did not indicate that housing would be arranged for Kitikmeot residents who relocated to a direct point of hire. Rather, Sabina indicated during the FEIS Final Hearing that it would cover the travel and accommodation costs associated with workers travelling from Kitikmeot communities that were not direct points of hire that were required to travel through direct points of hire en-route to the mine site for employment."*[30]

Sabina will not require Kitikmeot Region residents to relocate to obtain employment at the Project. Sabina has committed to providing preferential employment for residents of all Kitikmeot communities and will coordinate and cover the costs of their travel and accommodations between their home communities and the Project.

Individuals who are experiencing negative effects on their health and well-being will have access to a number of potential remedies. For example, confidential access to trained counsellors through the Sabina's Employee and Family Assistance Program (EFAP) will be provided to all employees and their immediate family members 24 hours a day, 7 days a week (regardless of being on or off rotation). Employees will also have access to the Project's Inuit Employment and Training Coordinator and Community Liaison Officer, to whom they can speak in confidence with. Additional details are described in the Human Resources Plan (FEIS Volume 10, Chapter 28).

[30] M. Pickard, Sabina, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 999 to 1001

Sabina has committed to implementing other wellness-related programs at the Project and within the wider Kitikmeot Region. For example, Sabina will establish a country food kitchen at the Project site so that Inuit employees have a location to store and prepare personal country foods, and socialize with other Inuit employees while on rotation. Sabina will also make reasonable efforts to ensure country foods are made available on a semi-regular basis to employees working at the Project sites. Sabina will also consider to develop other Traditional Knowledge programs on-site, suggestions for which will be solicited from communities, the KIA, and Inuit Environmental Advisory Committee in the future. The Project IIBA that is being negotiating with the KIA is also expected to include provisions related to the development of TK and wellness-related programs. Sabina will also continue to support initiatives related to community wellness and traditional lifestyles in the Kitikmeot Region through its donations program. To-date, Sabina has provided over $155,000 and various in-kind supports to Kitikmeot Region causes and initiatives through its donations program.

Wherever possible, the frequent changing of accommodations within a work rotation will be avoided for Project employees. However, Project employees in a limited number of positions require changes in accommodation from time-to-time due to scheduling, seasonality of operations, and role within the organization. All Project accommodations, regardless of location, will be clean, safe, 'move-in ready' (similar to a hotel room), and equipped with all necessary furniture and have access to communication technologies (e.g., phone, internet, TV). Furthermore, any Project jobs that require frequent changes of accommodations within a work rotation will have this requirement listed in their job description and/or job advertisements, so that potential employees are aware of this in advance of applying.

The Board has stated that they have uncertainty in relation to the potential effects of the Project on the health and well-being of employees and their families. Sabina acknowledges the outstanding concern of the Board and remains willing and able to discuss any issues related to health and well-being of employees and their families. Sabina wishes to reiterate our commitment to the health, safety, and well-being of all personnel on the Back River Project site and that of their families at home. Sabina believes that the implementation of the programs detailed in the FEIS (FEIS Volume 10, Chapter 28) will serve to serve to safeguard and promote the health and well-being of our employees and their families. We take pride in the efforts of our team in establishing strong, lasting and supportive relationships with our employees and local communities and look forward to carrying these efforts forward throughout the life of the Project.

Attachment:

Not applicable

8.6 HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT (ADDENDA)

NIRB Section:	Section 5.11 – Human Health and Safety	Ref No.:	FHR-NIRB-5.11

Reference to NIRB Report:
Section 5.11 – Human Health and Safety

Conclusions and Recommendations of the Board (Section 5.11):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that there is considerable uncertaintly in relation to the potential effects of the Project on human health and safety **[FHR-NIRB-5.11(A)]**.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

FHR-NIRB-5.11(A) – Potential Effects of the Project on Human Health and Safety

The Board has stated that they have uncertainty in relation to the potential effects of the Project on human health and safety.

The Board acknowledges the adequacy of Sabina's on-site maintenance and management plans, and highlights the importance of employee orientation programs (Final Hearing Report, Section 5.11.3).

The people who work for Sabina are the key to our company's success and we are committed to the health, safety, and well-being of our entire workforce. This commitment is described in detail in our Occupational Health and Safety Policy (FEIS Volume 10, Chapter 25, Section 1.4), this policy is reviewed with all new employees and contractors, and is included in employment contracts and contractor contracts. This policy is also posted in multiple locations, both on site and in our head office, and is available on our website. The policy is available in English, Inuinnaqtun, and Inuktitut.

Sabina takes extreme pride in our pro-active zero harm approach to health and safety and have not had a loss time incident on site in nearly 5 years with 449,887 hours worked during that time. Sabina plans to continue to build on our strong health and safety culture over the life of the Project as we move forward with Construction, into Operations, and through Closure.

H. Maksagak from Cambridge Bay highlighted the importance of orientations and worker awareness:

> *"I worked underground for 10 years at Lupin, and I spent 8 or 10 months over in Diavik, the open pit scenario, and although they are two different approaches to the mining operation, safety is paramount in both situations. Orientation is important. The awareness of the workers is important."*[31]

Sabina believes it is critically important to ensure all employees, contractors, and visitors receive a site orientation upon arrival at the Project site and are aware of their individual responsibilities. This is then followed with a detailed individual review of the employee or contractor's duties and working environment before any work begins. These procedures are meant to ensure the health and safety of

[31] M. Maksagak, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1015, Lines 21 to 26; Pg. 1016, Line 1

every person who visits or works at the Project site, as well as ensuring they have the appropriate, proper training and equipment to complete their jobs.

Further detail on Sabina's Health and Safety plans for the Project can be found in the Occupational Health and Safety Plan in FEIS Volume 10, Chapter 25.

The Board raised a concern with the proposed distance between shelters on the winter ice road due to the potential for quick onset of multi-day storms and its remote location. As detailed in the Road Management Plan (FEIS Volume 10, Chapter 14):

> The "Field Guide for Ice Construction Safety" published by the Northwest Territories Department of Transportation (2007) will guide the planning and construction of the winter ice roads.

Prior to the construction and operation of the winter ice road, Sabina will gather current best practices from winter ice road operators in the Canadian Arctic. These will be evaluated to ensure the safety of all personnel on the winter ice road throughout the life of the Project.

To ensure the safety of all personnel on the winter ice roads, Sabina commits to including the following supplemental mitigation measures in the next version of the Road Management Plan (FEIS Volume 10, Chapter 14):

- Weather will be continuously monitored both by drivers and by site logistics.
- All drivers will be trained specifically for the Project site and will be in constant radio contact.
- All mobiles vehicles will be continuously tracked via GPS.
- All drivers will carry emergency supplies with them in their vehicles.
- Emergency shelter will be provided along the winter ice road.
- Should a vehicle become disabled, heavy equipment will be available to assist.
- Detailed procedures will be established for dispatching of convoys on the winter ice road.
- In the event that personnel must perform a task outside of the Project Area, or any of its extensions, a working in isolation procedure will apply.
- There will be regular traffic along the winter ice road, which will minimize the time that drivers could be isolated.

The Board has stated uncertainty regarding the consideration of noise and vibration impacts on humans at both the Goose and Marine Laydown Area camps.

In the FEIS, Sabina provided the following details on noise control measures, based on experience from other mine projects; this is included in the Noise Abatement Plan (FEIS Volume 10, Chapter 18):

- Ensuring equipment is fitted with appropriate mufflers and silencers.
- Identifying enclosures, berms, acoustic screening, and shrouding where stationary sources require control.
- Ensuring equipment is well maintained.
- Housing stationary sources in buildings, where feasible.
- Impulse events, such as blasting, will be limited to certain times of the day.
- Scheduling of take-off and landing aircrafts will be limited to certain times of the day.
- Other possible general noise abatement measures that can be implemented on site to minimize static noise due to generators, vehicles, and other sources.

With respect to noise and vibration impacts specifically in the Goose and Marine Laydown Area camps, Sabina has taken particular care around accommodation facilities to ensure all employees can be well rested and capable of performing their duties safely. This includes consideration during the design phase

to ensure accommodation facilities will be located as far as reasonable from potential sources of noise and vibration and that adequate insulation and noise barriers will be installed both in the camps and around potential sources of noise and vibration.

During Operations, Sabina will implement a noise monitoring program, whose purpose is to assess the magnitude of noise impacts from Project activities. Sabina will honour the regulations as outlined in Section 9.20 of the Consolidation of Mine Health and Safety Regulations (FEIS Volume 10, Chapter 18, Appendix A), which states that the manager shall ensure that a noise level survey is conducted at all work sites and the results of every noise level survey shall be given to the Occupational Health and Safety Committee and made available to an inspector.

The Board has stated that they have uncertainty in relation to the potential effects of the Project on human health and safety. Sabina acknowledges the outstanding concern of the Board and remains willing and able to discuss any issues related to human health and safety. Sabina wishes to reiterate our commitment to the health, safety, and wellbeing of all personnel on the Project site. We take extreme pride in the efforts of our team in establishing an industry-leading safety culture and look forward to carrying these efforts forward throughout the life of the Project.

Reference:

Northwest Territories Department of Transportation. 2007. Field Guide for Ice Construction Safety.

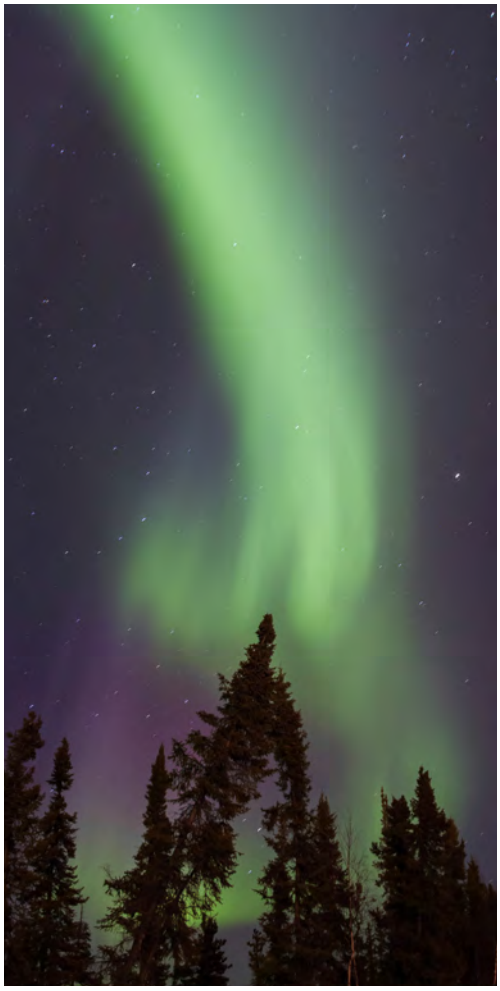
Attachment:

Not applicable

ADDENDUM APPENDIX V8-3C: COMMUNITIES AND DIAMONDS: 2015 ANNUAL REPORT (NEW)

TABLED DOCUMENT 28-18(2) TABLED ON MARCH 3, 2016

Communities and Diamonds



2015 **Annual Report** of the Government of the Northwest Territories under the Ekati, Diavik and Snap Lake Socio-Economic Agreements

PREPARED BY
Industry, Tourism and Investment
Education, Culture and Employment
Finance
Health and Social Services
Justice
NWT Bureau of Statistics
NWT Housing Corporation

Government of
Northwest Territories

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Executive Summary

The Communities and Diamonds Annual Report is produced partly in fulfillment of commitments made by the Government of the Northwest Territories (GNWT) in Socio-Economic Agreements (SEAs) with the mining companies operating in the Northwest Territories (NWT). There are currently two operating mines, one mine under construction, and one mine under care and maintainance. The operating mines are the Dominion Diamond Corporation Ekati Mine and the Diavik Diamond Mine. Gahcho Kue is currently under construction and the De Beers Snap Lake Mine went into care and maintainance in December 2015.

The purpose of the Communities and Diamonds Report is to determine if mine activity may be affecting residents of Yellowknife and seven Small Local Communities (SLCs) in the NWT by examining socio-economic indicators for changes since 1996, when the first mine, Ekati, began construction. The seven SLCs are Behchokǫ̀, Detah, Gamètì, Łutselk'e, Ndilǫ, Wekweètì, and Whatì. The report examines the data based on the GNWT Sustainable Development Policy five-point framework:

1. community, family and individual well-being;
2. cultural well-being and traditional economy;
3. non-traditional economy;
4. net effect on government; and
5. sustainable development.

Overall, the 2015 Communities and Diamonds Report highlights that the mining industry has provided employment and economic opportunities for businesses and residents across the NWT. Since the start of construction of Ekati, employment has increased, residents have less reliance on income assistance, education levels are improving, and businesses are seeing significant benefits. While challenges still exist, the report provides an outline of areas where improvements can be made to benefit NWT communities. Areas of community, family and individual well-being that have seen positive change in both Yellowknife and the seven SLCs included a lower birth rate for teens, fewer injuries and poisonings, and a decrease in the number of tuberculosis cases. Yellowknife also saw an increase to the number of households owned, while SLCs saw improvements to households in core needs, and fewer households with six or more people. Negative impacts observed for Yellowknife and SLCs were increases in the number of sexually transmitted infections, as well as increases in multiple crime indicators. SLCs saw increases to the potential years of life lost, and increases in both violent and federal statute crimes that were not seen in Yellowknife.

Cultural well-being and traditional economy indicators did not change in Yellowknife, while SLCs saw an increase in the number of people hunting and fishing, but a decrease in the number of people speaking Aboriginal languages.

Non-traditional economy saw increases to average income and education metrics in both Yellowknife and the SLCs. Yellowknife showed decreases to both employment and participation, while the SLCs showed increases in these same categories. As well, SLCs showed less use of income assistance and lower levels of unemployment.

The net effect on government has been an increase in demands for government programs and services. Examples of these include the addition and maintenance of infrastructure (e.g. roads), the need to address social stresses caused by development and income growth, the need to track environmental effects, and the need to invest in areas such as training to better equip Northerners to acquire jobs and fill business demand around them. To address these impacts, the GNWT makes strategic investments to realize the greatest benefit from development and mitigate adverse impacts. Resource development also brings money to the GNWT through property, fuel and corporate income taxes paid by the mines. In 2015, the GNWT shared 50 percent of resource royalties from the diamond mines with Aboriginal governments.

Table of Contents

5 **Executive Summary**

8 **Introduction**
Background information | Purpose of the report | Communities
Choice of indicators | Data sources

12 **Possible Effects of Mine Activity**

14 **Cultural Well-Being & Traditional Economy**
Fur sales | Trappers | Aboriginal language

18 **Wages**
Income assistance | Employment | Unemployment

19 **Education**

24 **Health & Families**
Potential years of life lost | Suicide rate | Teen births | Single-parent families | Injuries | Sexually transmitted infections | Tuberculosis
Children receiving services | Family violence

36 **Crime**

40 **Housing**
Core need | Ownership | Crowding

Table of Contents

Business 44
NWT gross domestic product | Mineral development strategy
Economic opportunities strategy

Net Effect on Government 48

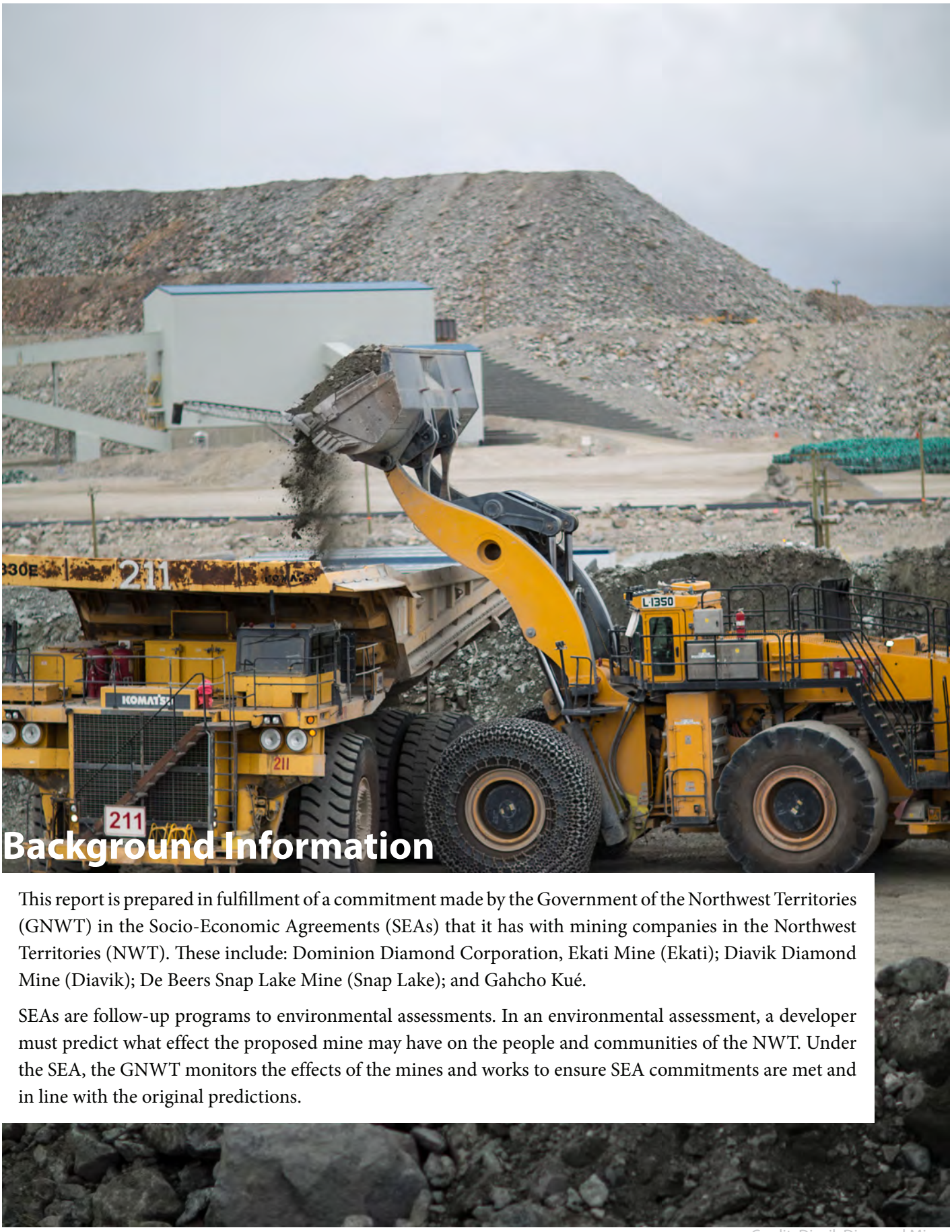
Glossary 50
Words to know

Appendix A 52
Company predictions on mine activity

Appendix B 58
Industrial, social and political events

Appendix C
Data tables | See attached disk on back cover of the report

Cover Photo Credit: Rashaad Bhamjee



Background Information

This report is prepared in fulfillment of a commitment made by the Government of the Northwest Territories (GNWT) in the Socio-Economic Agreements (SEAs) that it has with mining companies in the Northwest Territories (NWT). These include: Dominion Diamond Corporation, Ekati Mine (Ekati); Diavik Diamond Mine (Diavik); De Beers Snap Lake Mine (Snap Lake); and Gahcho Kué.

SEAs are follow-up programs to environmental assessments. In an environmental assessment, a developer must predict what effect the proposed mine may have on the people and communities of the NWT. Under the SEA, the GNWT monitors the effects of the mines and works to ensure SEA commitments are met and in line with the original predictions.

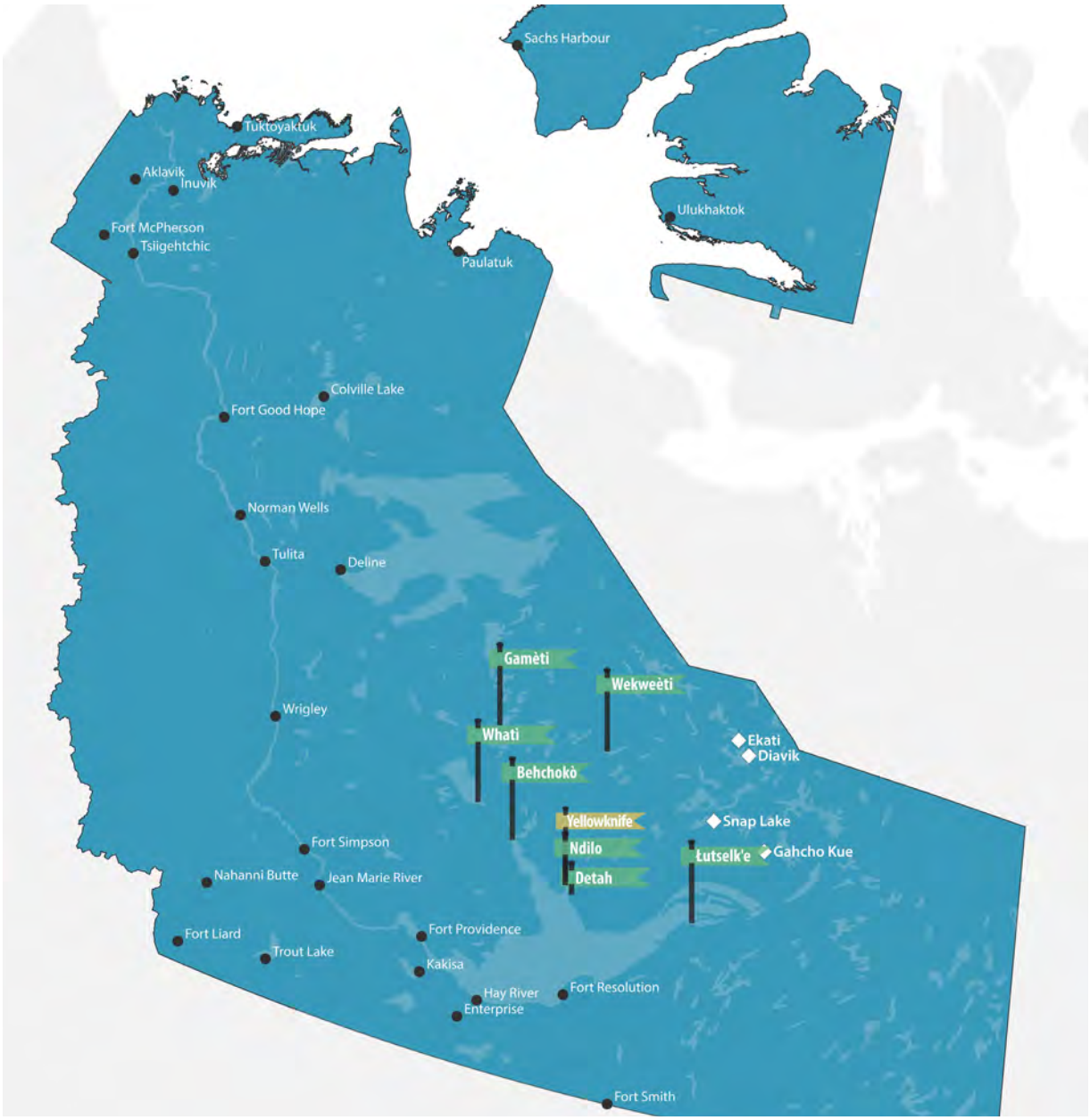
Credit: Diavik Diamond Mines

Purpose of the Report

This report examines a number of socio-economic variables to see if, and how much, each has changed since diamond mining began in 1996. The relative changes in indicators are presented on page 13.

Communities

This report provides data for the city of Yellowknife and seven smaller NWT communities. The seven smaller communities are Behchokǫ̀, Detah, Gamèti, Łutselk'e, Ndilǫ, Wekweèti, and Whatì. The map below displays these small local communities (SLCs) with green flags. The charts in the report always represent the SLCs with the same shade of green, Yellowknife with yellow, other NWT communities with dark grey, and the NWT as a whole with blue.



Choice of Indicators

An indicator is a measure that shows the state of something. After public consultation a set of indicators was developed which relate to the possible effects we may see from mining. These indicators were negotiated into the SEA. There have been some changes over time but the basic list of indicators applies broadly to all mine development.

The GNWT promotes and supports responsible development of natural resources for the social and economic benefit of all NWT residents. Using the GNWT Sustainable Development Policy 53.02 the GNWT looks at sustainable economic development through the lens of a five-point framework. The five groups are:

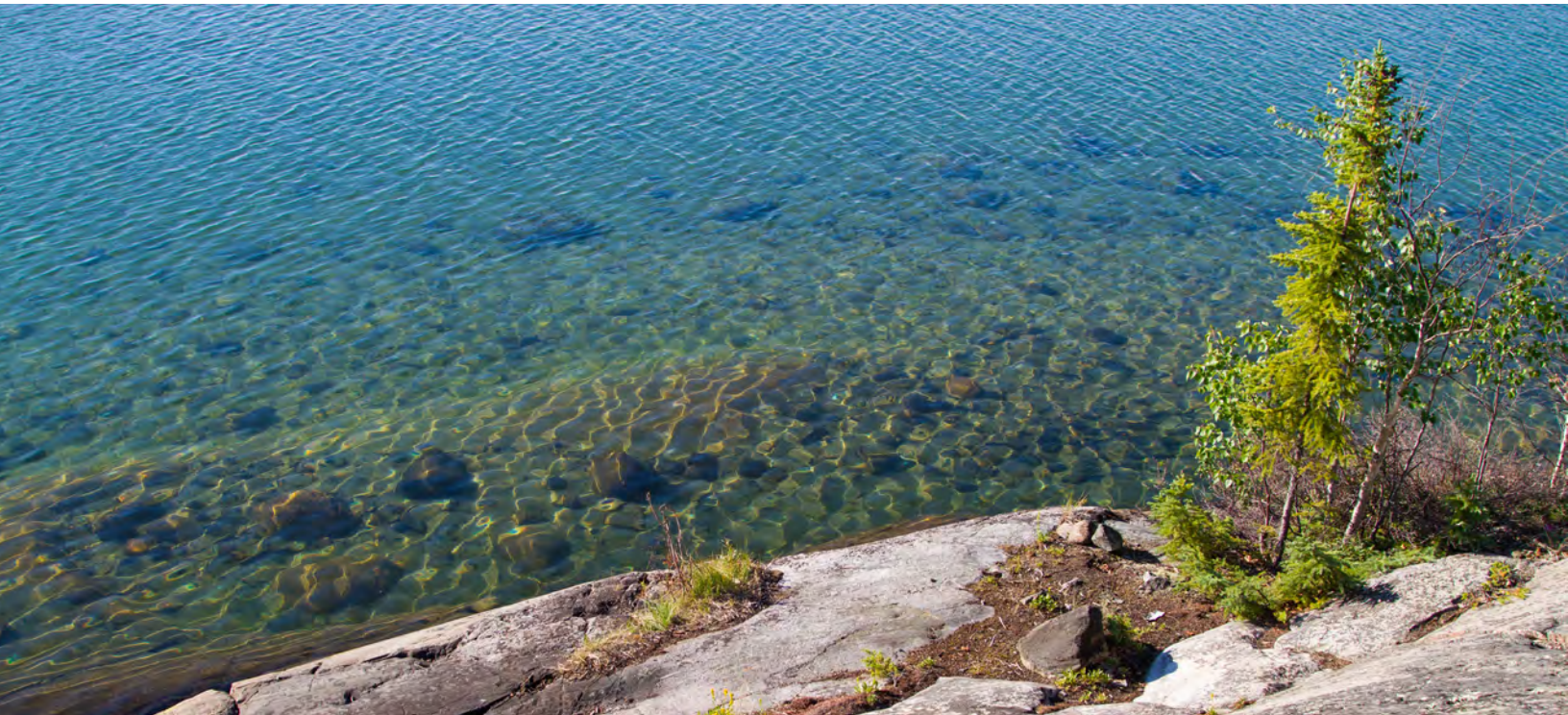
1. community, family and individual well-being;
2. cultural well-being and traditional economy;
3. non-traditional economy;
4. net effect on government; and
5. sustainable development.

Data Sources

The data used for the indicators in this report has come from various sources including: GNWT, Royal Canadian Mounted Police, NWT Bureau of Statistics, Statistics Canada and other sources. Due to the dates surveys are conducted and the time before survey data is released, not all data is current at time of publication.

Both N'dilo and the North Slave Métis Alliance are communities under the SEA. However, data is not always available for these groups. Appendix C includes any data that is available for those communities. The data source for each indicator is shown below each graph in the report and below each table in Appendix C. Appendix C includes all data that was used in this report, community-level data, where available, as well as some other indicators not presented in the report.

Credit: Rashaad Bhamjee



Indicators Identified in the SEAs

The table below lists the indicators required under each mine's SEA, grouped under the five-point framework.

Ekati	Diavik	Snap Lake	Page
Community, Family and Individual Wellness			
number of potential years of life lost			24
number of injuries	age standardized injuries	age standardized injuries	29
number of suicides			25
number of communicable diseases	communicable diseases (sexually transmitted infections, tuberculosis)	communicable diseases (sexually transmitted infections, tuberculosis)	30
number of teen births			26
	single-parent families/lone-parent families	lone-parent families	27
number of children receiving services	children in care	children in care	32
number of complaints of family violence	number of women and children referred to shelters	number of women and children referred to shelters	35
number of alcohol and drug-related crimes	police-reported crimes: violent, property, drug-related, other	police-reported crimes: violent, property, drug-related, other	36
number of property crimes			
housing indicators			40
Cultural Well-Being and Traditional Economy			
	ratio of home language use to mother tongue, by major age group	ratio of home language use to mother tongue, by major age group	16
	percentage of workforce-aged group engaged in traditional activities	percentage of workforce-aged group engaged in traditional activities	15
Non-Traditional Economy			
average income of residents	average income	proportion of high-income earners	App. C
number of social assistance cases	social assistance cases	income support cases	18
employment levels and participation	employment	employment participation rate	23
high school completion	number of people 15+ with less than Grade 9	number of people 15+ with a high school diploma	20
	registered businesses, bankruptcies and start-ups	registered businesses, bankruptcies and start-ups	N/A
Sustainable Development			
	secondary industry data and initiatives		N/A
Net Effect on Government			
	net effects on government of the project		48

Possible Effects of Mine Activity

The mining industry has provided employment and economic opportunities for businesses and residents across the NWT. Since the first diamond mine began production in 1998, employment has increased, residents are less reliant on income assistance, education levels have improved, and businesses have seen significant benefits. In 2014, the three operating diamond mines contributed over 3,200 person-years of employment and contributed over $653 million to Northern businesses, of which, about 33% were to Northern Aboriginal businesses.

The table to the right shows the indicators in this report and how they have changed since 1996 when the first diamond mine began construction. These changes may result from the mines alone, or from a combination of mines and other factors.

Credit: Rashaad Bhamjee

Red arrows (▲▼) indicate changes viewed as negative. Green arrows (▲▼) indicate changes viewed as positive. If no significant change ocurred then (/) was used.

Indicators	Direction of Change	
	Small Local Communities	Yellowknife
Cultural Well-Being and Traditional Economy		
Figures 1-3 : Fur sales	N/A	N/A
Figure 4: Aboriginal Language Use (Age 15-24)	▼	/
Figure 5: Aboriginal Language Use (Age 15+)	▼	/
Non-Traditional Economy		
Figure 6: Income Assistance	▼	/
Figure 7: Less than Grade 9 Education	▼	▼
Figure 8: Greater than High School Education	▲	▲
Figure 9: Employment Rate	▲	▼
Figure 10: Unemployment Rate	▼	/
Figure 11: Participation Rate	▲	▼
Community, Family and Individual Well-Being		
Figure 12: Potential Years of Life Lost	▲	/
Figure 13: Suicides	/	/
Figure 14: Birth Rate for Teen Females	▼	▼
Figure 15: Single-Parent Families	▲	▲
Figure 16: Physician Diagnosed Injuries & Poisonings	▼	▼
Figure 17: Nurse Diagnosed Injuries & Poisonings	N/A	N/A
Figure 18: Sexually Transmitted Infections	▲	▲
Figure 19: Tuberculosis Cases	▼	▼
Figure 20: Children Receiving Services	N/A	N/A
Figure 21: Spousal Assault	/	/
Figure 22: Women and Children in Shelters	N/A	N/A
Figure 23: Shelter Bed Days	N/A	N/A
Figure 24: Total Crimes	▲	▲
Figure 25: Violent Crimes	▲	/
Figure 26: 'Other' Criminal Code Crimes	▲	▲
Figure 27: Property Crimes	▲	▲
Figure 28: Federal Statute Crimes	▲	/
Figure 29: Household in Core Need	▼	▲
Figure 30: Households Owned	/	▲
Figure 31: Household Crowding	▼	/
Business		
Figure 32: NWT GDP Sectors	N/A	N/A
Figure 33: Trend in NWT GDP Sectors	N/A	N/A
Figure 34: Revenue Distribution	N/A	N/A

*Changes to reported indicators from the 2014 report are due to discontinued data and requests for new indicators from communities

Traditional Economy

Genuine Mackenzie Valley Fur Program

The Genuine Mackenzie Valley Fur (GMVF) Program provides NWT Trappers with "one window" access to the international fur auction market for fur harvested in the NWT. In addition, the Program actively markets and promotes fur at international venues through partnerships with other harvesting jurisdictions and the private sector.

Figure 1: NWT fur sale summary - 2014-2015

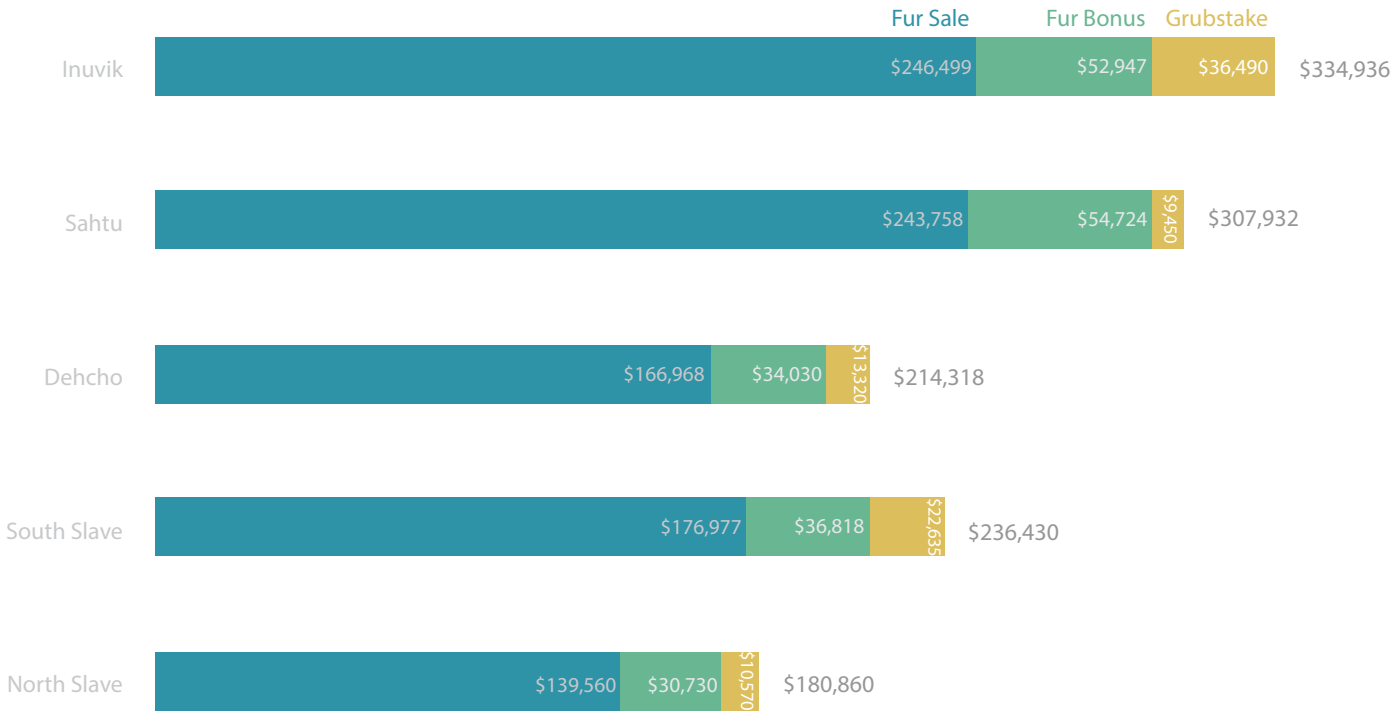
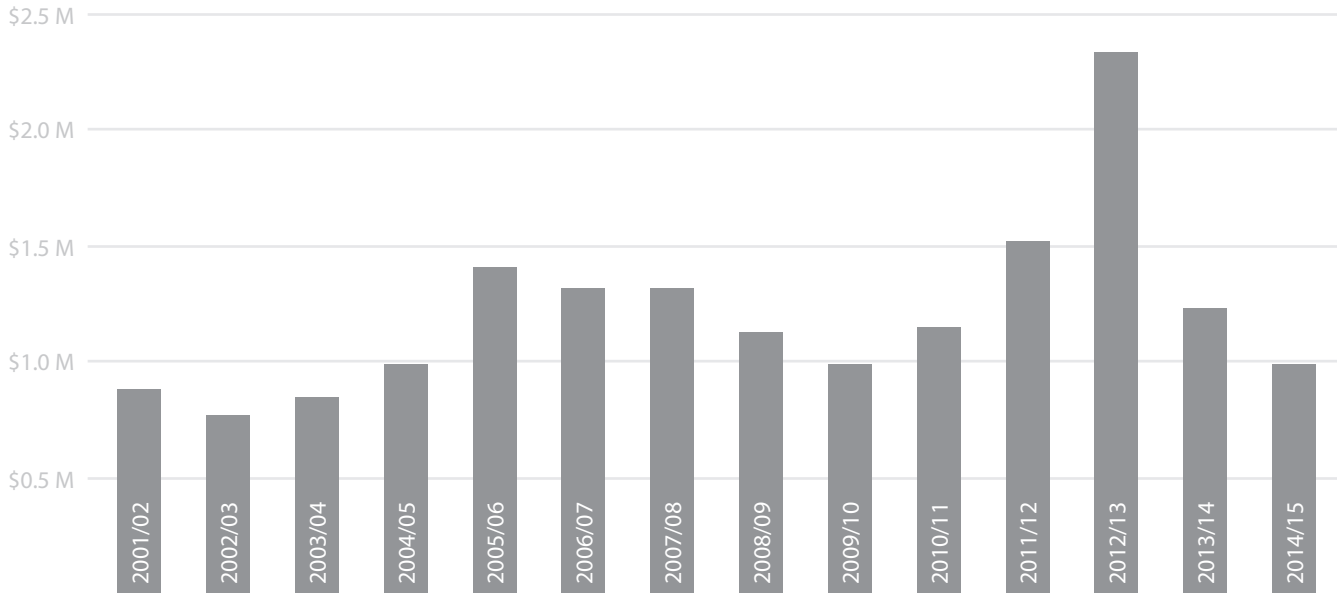


Figure 2: Number of trappers - 2014-2015

Figure 3: Annual fur sales

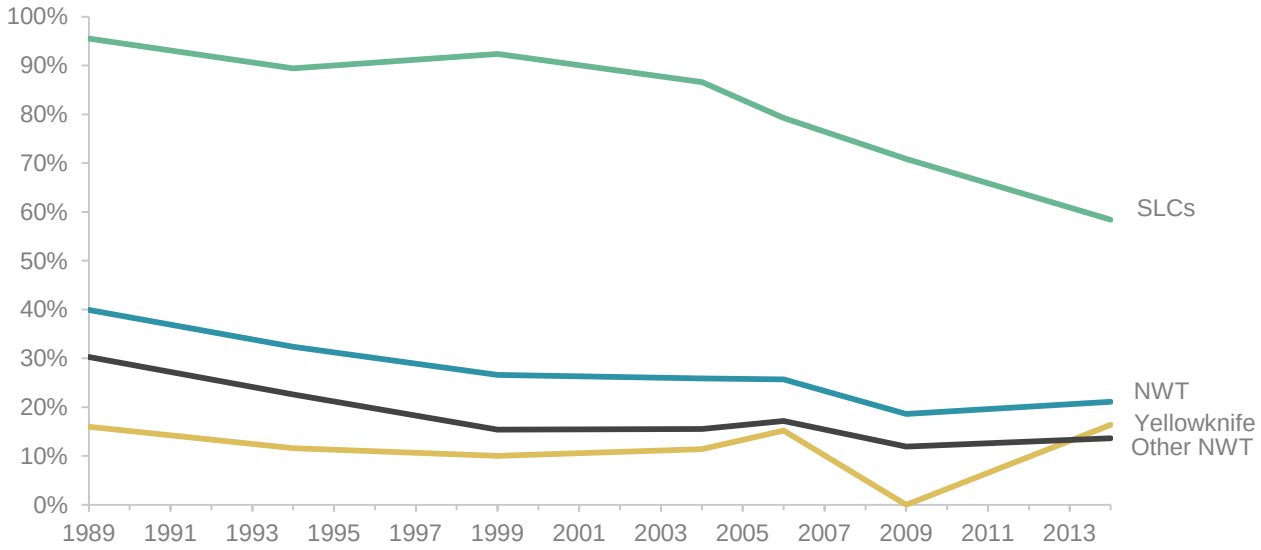


Aboriginal Languages

Aboriginal mine employees are immersed in English while they work and live on-site which may affect the use and health of Aboriginal languages in communities. Generally, use of Aboriginal languages has been declining in the NWT since before the diamond mines started up.

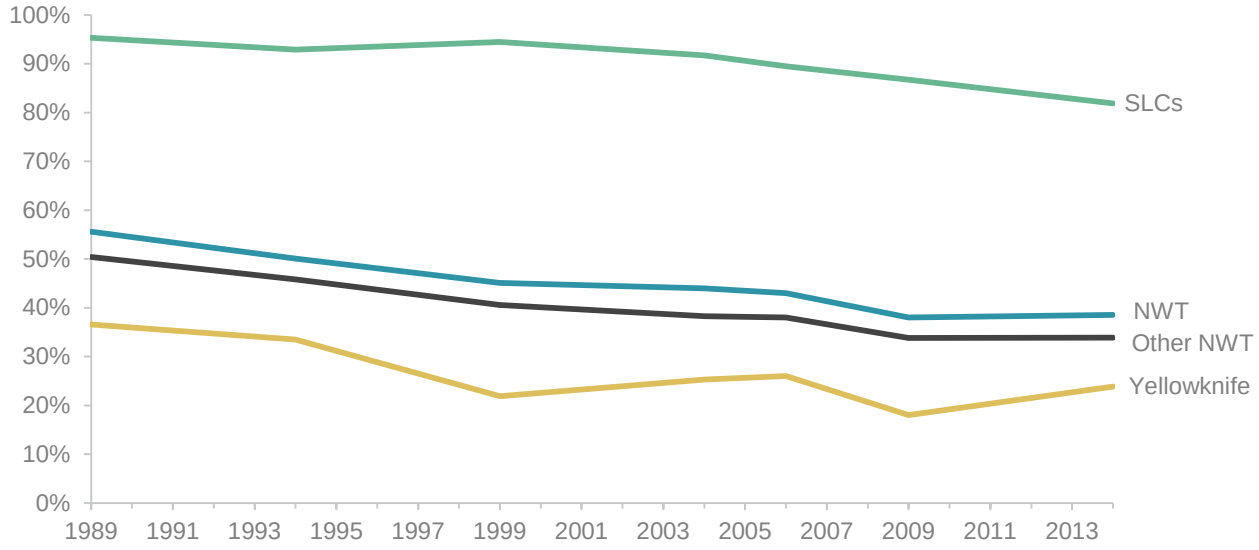
Figure 4 describes the percent of Aboriginal persons aged 15 to 24 that are able to speak an Aboriginal language. Information about this group is a good indicator as to whether the languages are being passed along.

Figure 4: Percent of Aboriginal Persons Age 15-24 who can speak an Aboriginal Language,1989-2014



Sources: 1989, 1994 and 1999 NWT Labour Force Survey; 2004, 2009 and 2014 NWT Community Survey; 2006 Statistics Canada Census; 2011 Statistics Canada National Household Survey.

Figure 5: Percent of Aboriginal Persons 15 & Older who can speak an Aboriginal Language, 1989 - 2014



Sources: 1989, 1994 and 1999 NWT Labour Force Survey; 2004, 2009 and 2014 NWT Community Survey; 2006 Statistics Canada Census; 2011 Statistics Canada National Household Survey.

The information in Figure 5 suggests a decline in the use of Aboriginal languages in the SLCs but a slight increase in other NWT communities and Yellowknife. Many factors affect the use of language, therefore there can be no clear evidence that the mines have caused a decline in Aboriginal language use because it was declining in the SLCs and other NWT communities before the start-up of the mines.

Credit: Rashaad Bhamjee

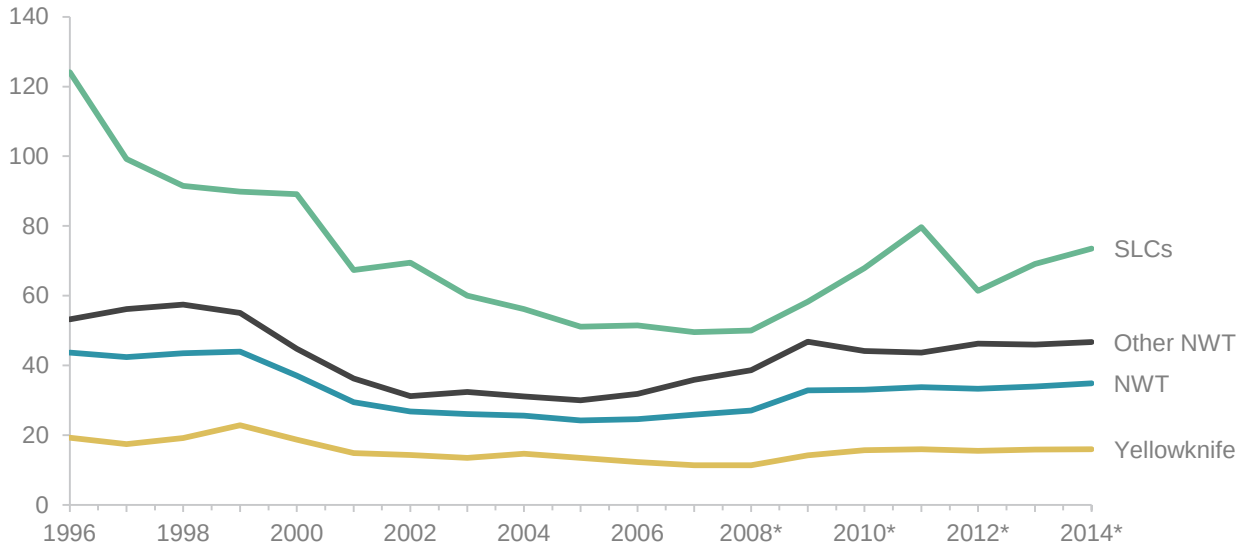
Wages

Income Assistance

The GNWT's Income Assistance (IA) Program helps people when they do not have enough money each month to pay for basic needs like food, shelter and utilities. The IA program also provides enhanced benefits for longer-term supports, such as clothing or disability allowance. The amount of support available to individuals is based on overall needs, where one lives, the size of the family, and the ability to provide his/her own financial resources. The program encourages people to make productive choices, allowing them to achieve self-reliance. A number of improvements have been made to IA with the intent to create stronger programs, with clear policies that benefit Northerners. Food and incidental benefits have increased to allow for the purchase of healthy foods in all Northwest Territories communities. Providing assistance for paying the actual cost of fuel and utilities for eligible IA clients helps ensure clients stay current with the cost of living.

Figure 6 illustrates that there has been an upward trend in the number of average monthly IA cases in SLCs, Yellowknife and the other NWT communities. IA cases dropped significantly around the time the mines started and while the average number of cases has increased in recent years, pre-mine levels have not been reached.

Figure 6: Average Monthly Income Assistance Rate per 1,000 Persons, 1996 - 2014



Sources: Education, Culture & Employment; NWT Bureau of Statistics.
* Due to Income assistance program changes in 2007, caution should be used when comparing with pre 2007 data
Notes: Rates before 1996 are not calculated since annual population is not available.

Education

"High school completion" means people who have a high school or grade 12 diploma or a General Education Diploma (GED). "Greater than high school" refers to people who have a trade certificate, college diploma, or university degree. When considering "Population with less than Grade 9 , those who are aged 15 and older with less than Grade 9 are counted along with the people who are still in Grade 9.

Overall the NWT population with less than Grade 9 education has declined significantly since 1989. It is unlikely that this change is due completely to the operating diamond mines as there were some changes in the delivery of education programs throughout the NWT. For example, grade extensions were offered in the smaller communities starting in the late 1990s. This led to an increase in the number of people completing Grade 9 and moving on to high school which has resulted in more high school graduates.

In the SLCs, Yellowknife, and the other NWT communities, the percent of the population with a less than Grade 9 education declined sharply between 1989 and 1994. This coincided with the addition of high school programs in a number of small community schools. The downward trend has continued.

Figure 7: Percent of Population with less than Grade 9 Education, 1989 - 2014

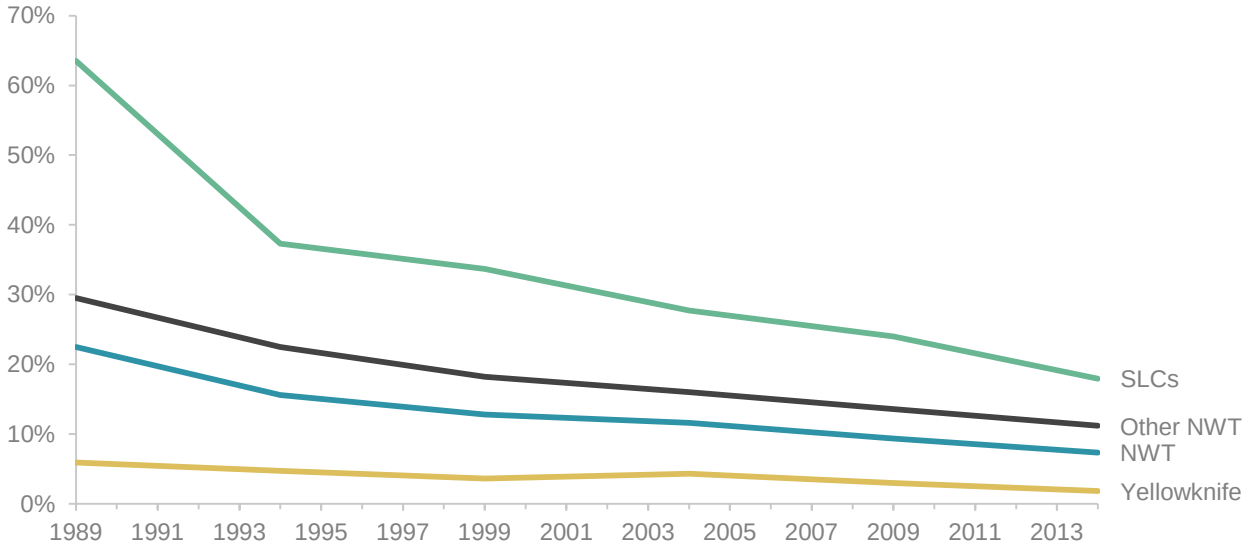
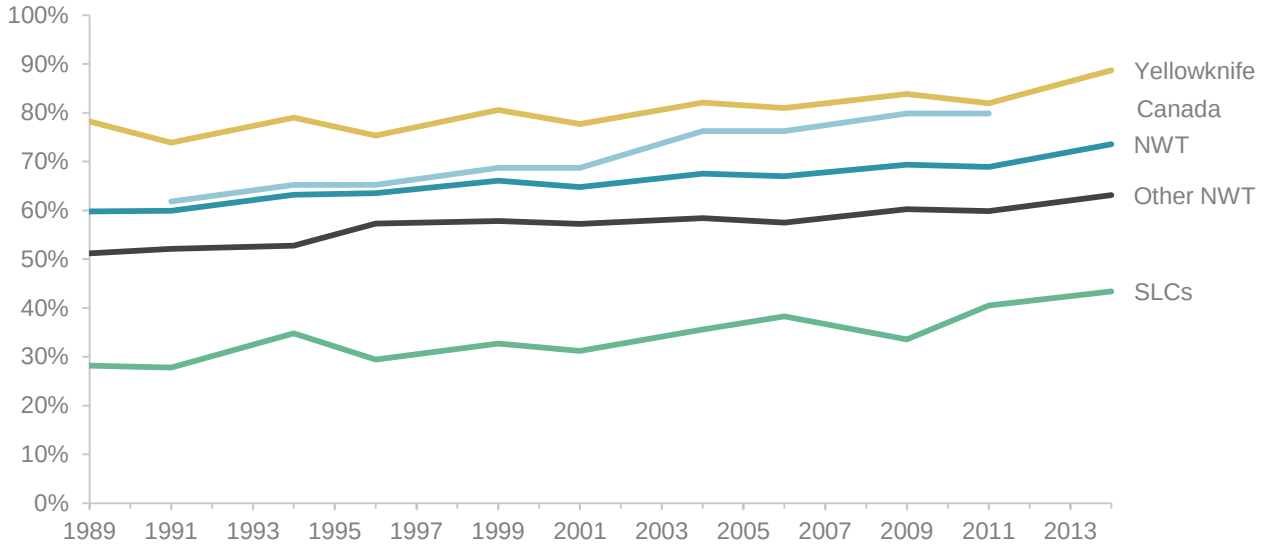


Figure 8: Percent of Population with High School or Greater, 1989 - 2014



There has been a consistent effort on the part of the GNWT and its partners, including the mining industry and the Mine Training Society, to help people become aware of the value of education. The mining industry in particular has done a great deal to highlight economic opportunities and link education to employment. Companies have offered Northern students incentives to stay in school and pursue education through scholarships, training programs and summer employment. Strong partnerships between government, industry and training providers continue to help raise education levels in the NWT.

Figure 8 describes the population with high school or greater. In the SLCs there was a drop in high school completion rates in 2009, which rebounded in 2011 and continued to rise through 2014. In Yellowknife and the other NWT communities the percent of the population with a high school or higher education has continued to rise since 1991 with minor fluctuations.

The NWT population with high school or higher education has increased since start-up of the diamond mines.

Employment

To describe the job situation in the NWT three rates are used:

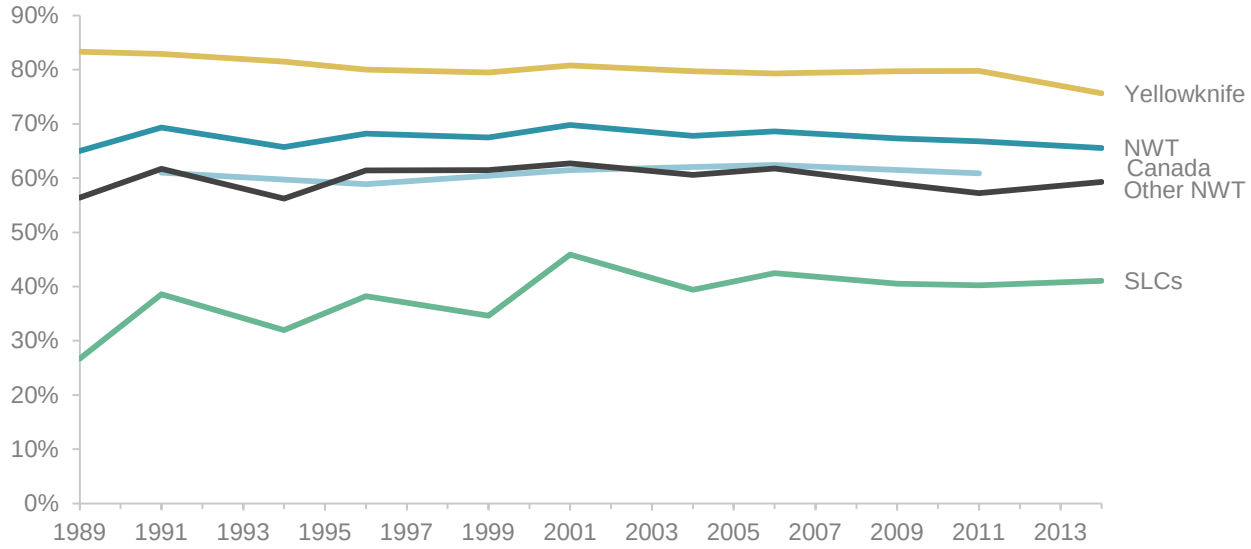
1. Employment rate – the percentage of people age 15 and older who have jobs;
2. Unemployment rate – the percentage of the labour force who are looking for work but not working; and
3. Participation rate – the percentage of people age 15 and over who are working or looking for work.

Employment at the mines is a contributing factor to the employment, participation, and the unemployment rates across the NWT. Job data comes from NWT surveys and from the Statistics Canada census. This information is collected at different times of the year which explains some of the change from one data point to the next.

As illustrated in Figure 9, employment trends in the SLCs show that employment is higher than it was before the diamond mine start-ups whereas the other NWT communities trend has been relatively stable. In Yellowknife employment was decreasing in the before-mine phase and although it has remained relatively stable since 1996, there has been a slight decline in employment since 2011.

The employment rate depends on a variety of factors which are determined by the economy as well as the local employment situation.

Figure 9: Employment Rate, 1989 - 2014



Sources: 1989, 1994 and 1999 NWT Labour Force Survey; 1996, 2001 & 2006 Statistics Canada Census; 2004, 2009 and 2014 NWT Community Survey: 2011 Statistics Canada National Household Survey.
Notes: Comparisons between the labour force survey (LFS) completed by the Bureau of Statistics and the Census should be done with caution. The LFS and NWT Community Survey were completed during the January-March period. The Census was done in May and June. Census indicators are often higher due to seasonal employment activities.

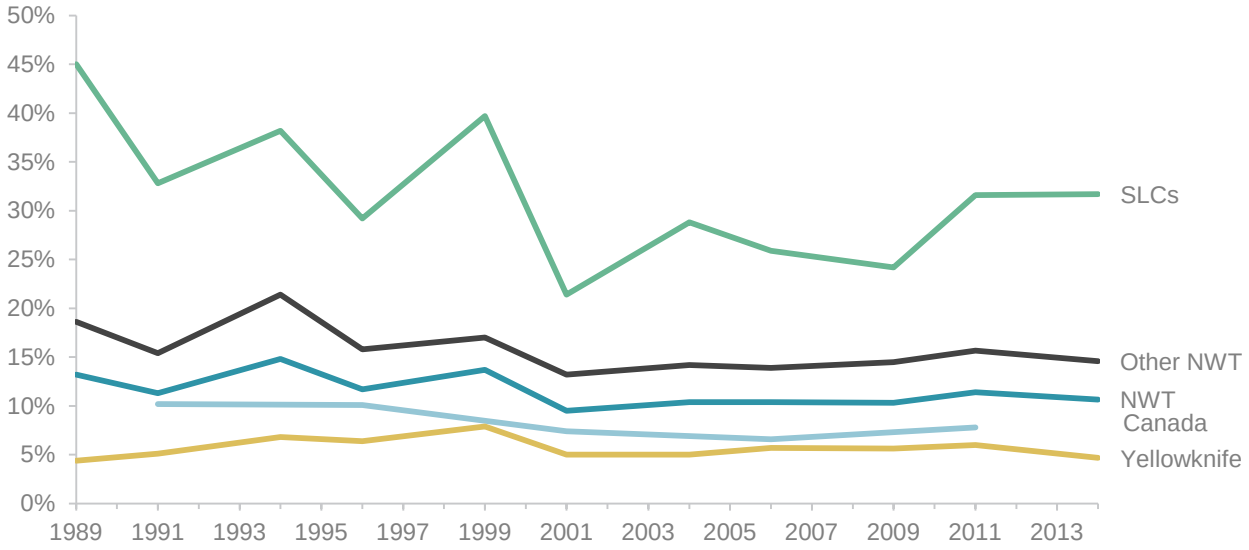
Unemployment

Figure 10 shows, that overall, the unemployment rate has been decreasing since 1989. While there has been some variability over the years, the unemployment rate is lower than before mine start-ups.

In the SLCs, despite yearly fluctuations, the unemployment rate has decreased significantly since mine start-ups. This trend is consistent with the other NWT communities experiencing a decrease in the unemployment rate with minor changes over the years. In Yellowknife, with the exception of a peak in 1999, the unemployment rate remained relatively unchanged since mine start-ups.

It is likely that the presence of the mines, as well as the increase in education levels, were contributing factors to the changes in the unemployment rate.

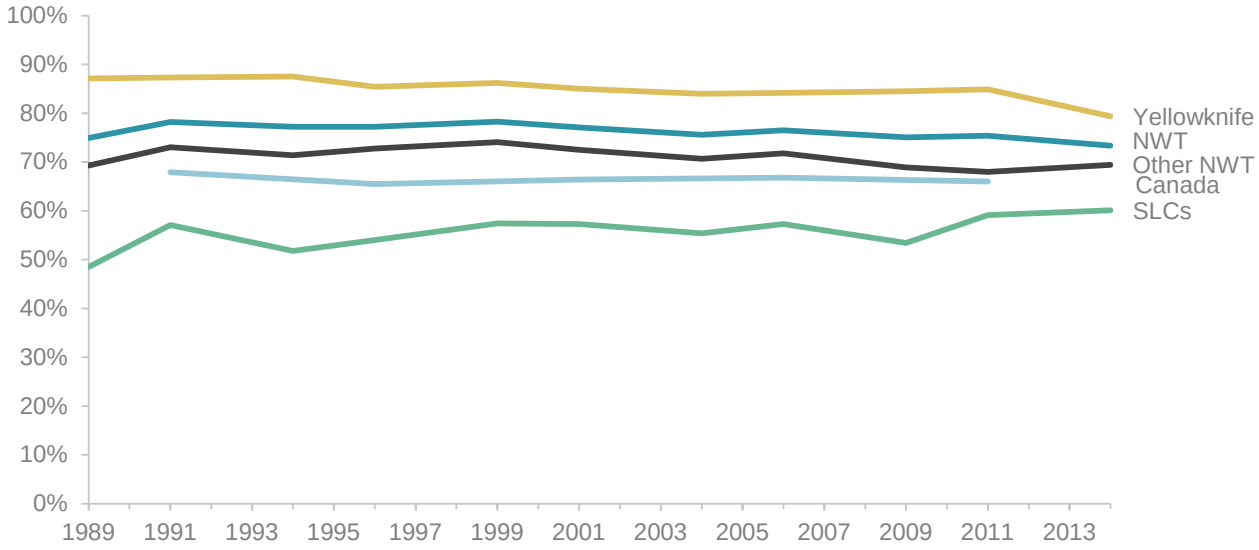
Figure 10: Unemployment Rate, 1989 - 2014



Source: 1989, 1994 and 1999 NWT Labour Force Survey; 1996, 2001 and 2006 Statistics Canada Census; 2004, 2009 and 2014 NWT Community Survey: 2011 Statistics Canada National Household.
Notes: Comparisons between the labour force survey (LFS) completed by the Bureau of Statistics and the Census should be done with caution. The LFS and NWT Community Survey were completed during the January-March period. The Census was done in May and June. Census indicators are often higher due to seasonal employment activities.

Participation Rate

Figure 11: Participation Rate, 1989 - 2014



Sources: 1989, 1994 and 1999 NWT Labour Force Survey; 1996, 2001 & 2006 Statistics Canada Census; 2004, 2009 and 2014 NWT Community Survey: 2011 Statistics Canada National Household Survey.
Notes: Comparisons between the labour force survey (LFS) completed by the Bureau of Statistics and the Census should be done with caution. The LFS and NWT Community Survey were completed during the January-March period. The Census was done in May and June. Census indicators are often higher due to seasonal employment activities.

As shown in Figure 11, in the SLCs the participation rate has increased from below 50% to above 60%, which means that more people are working or looking for work. There has been minimal variability in the participation rate since mine start-ups. In both the Yellowknife and the other NWT communities the participation rate has been decreasing since mine start-ups.

Health and Wellness

Potential Years of Life Lost

Potential Years of Life Lost (PYLL) shows early deaths[1]. PYLL helps demonstrate the health, well-being, and lifestyle choices that people are making.

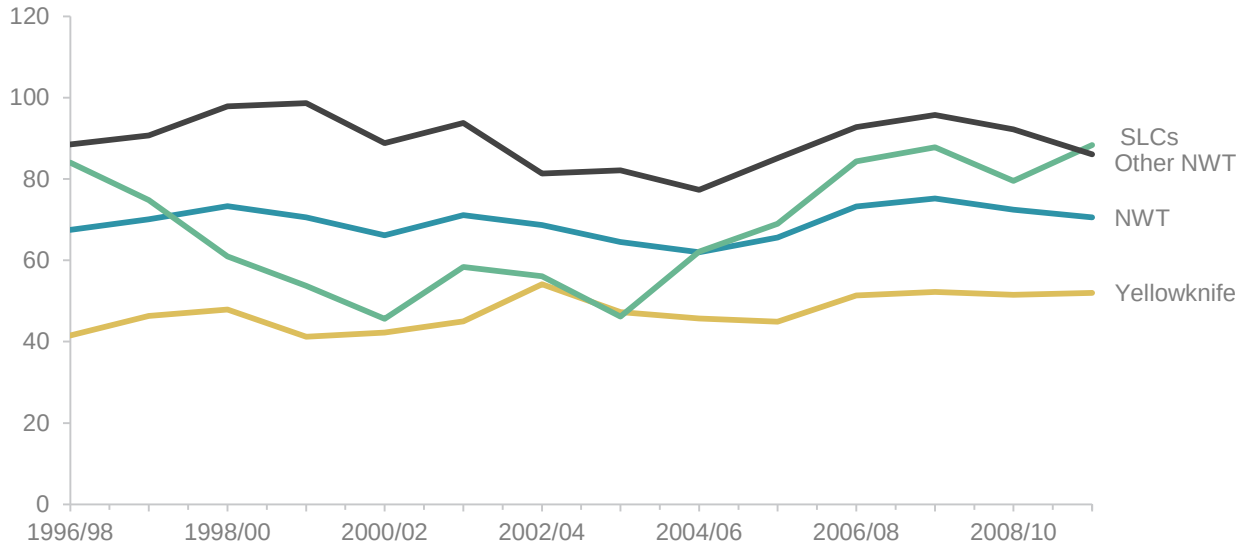
There can be large changes in PYLL rates from one year to the next. To highlight trends more clearly, PYLL is shown as a three-year average.

Prior to the mines the PYLL rate in the SLCs was going down sharply, and has continued to remain within historical boundaries. At this time mining does not seem to have an effect on the PYLL rate in the SLCs. The trend of PYLL in the SLCs is likely due to a natural cycle that cannot be directly attributed to mining. PYLL has remained lower in SLCs than in other NWT communities since mining activity began.

Since 1996, the PYLL rate in Yellowknife has been both higher and lower than in the pre-mine period. It seems to follow a natural cycle that may be unrelated to mining activity.

1 The PYLL for a population is the total of all the years of life lost by those who died before reaching the age of 75, the average age of life expectancy.

Figure 12: Potential Years of Life Lost (<75 Years), Rate Per 1,000 Persons, Three-Year Average



Suicide Rate

While there is no singular cause, suicide is often linked to both social issues and mental health problems including depression, divorce or separation, and drug abuse. The table below shows suicide deaths.

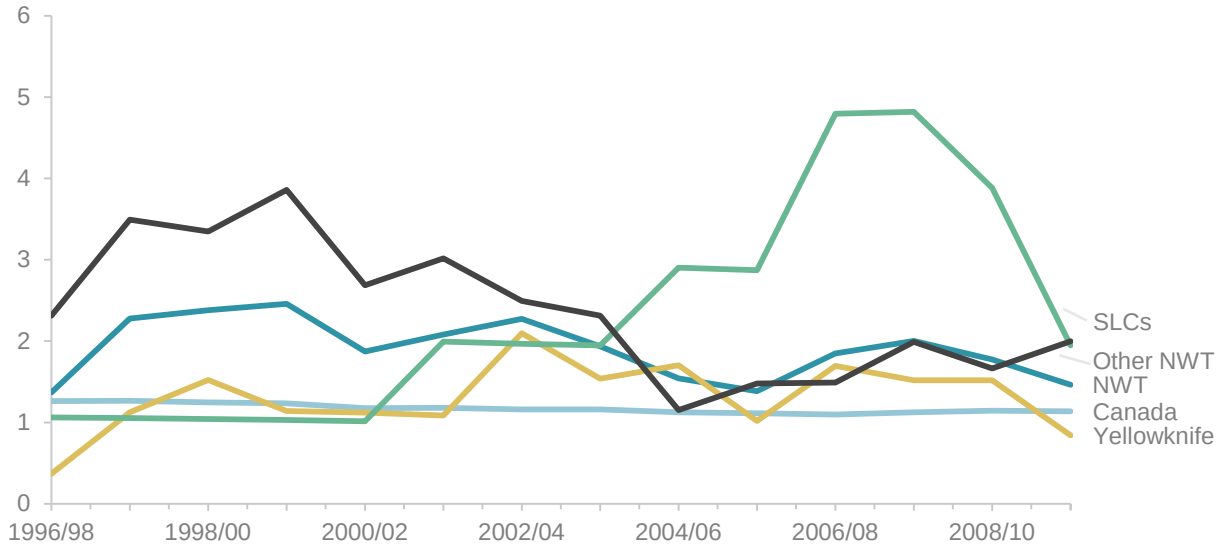
Three-year averages are used to smooth out the year-to-year changes seen with small numbers; readers should still view the trend lines with caution, however, as some areas may only have two or three suicides in a given three-year phase. This makes it hard to judge the data and any trends it may show.

The suicide rate had been going down in small local communities during the pre-mine period. The overall trend since 1995/1997 has been an increase, and in 2004/2006, the suicide rate in small local communities became higher than it had been in the pre-mine phase. Since 2003/2005, it has been higher than the suicide rate in Yellowknife.

For much of the time since 1996, the suicide rate in Yellowknife has been no higher or lower than it was in the before-mine phase. However, it had been going down until 1996/1998 and has gone up since then.

In the other NWT communities the rate has been going down since 1999/2001. The rate of suicides in Canada has also been going down. The rate in the NWT has remained similar before and after the mining phase. There is too little data to say if there is a link between mining and suicide rates in small local communities and Yellowknife.

Figure 13: Suicides, Rate per 10,000 Persons, Three-Year Average



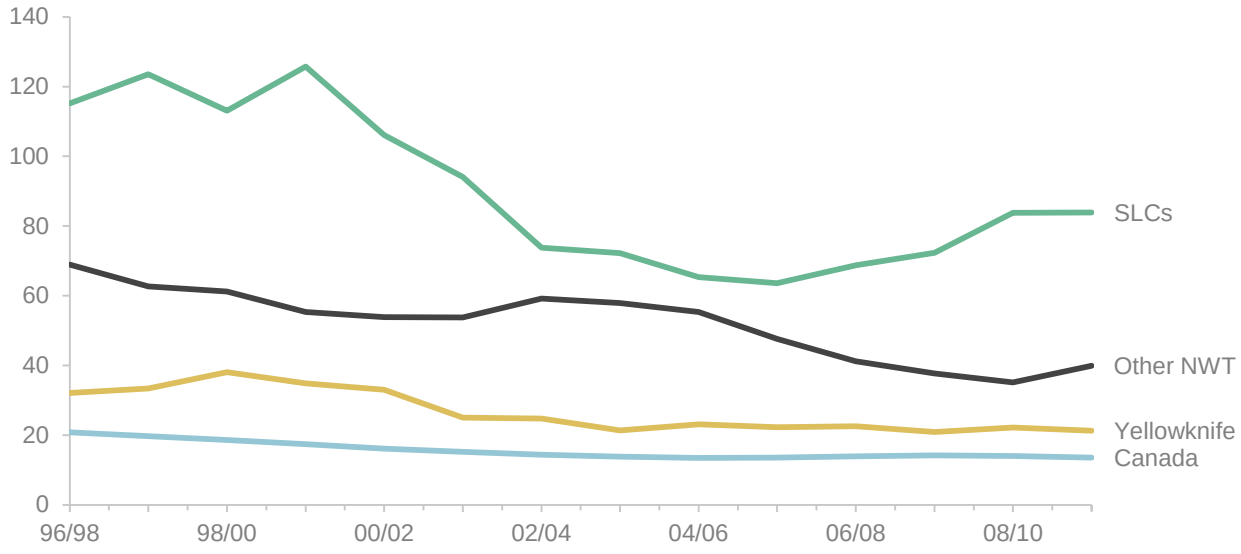
Teen Births

Some teen mothers may be mature enough to raise a child, while others may not be. Stress and lack of maturity may affect the well-being of both the child and parents. Teen mothers are also more likely to be single, which makes it more difficult for them to support their children and increases stress.

In small local communities, the rate of teenage births was steady in the before-mine phase. However, the rate of teenage births was still quite a bit higher than in other NWT communities, including Yellowknife. In the active-mine phase, the rate dropped quickly until 2002/2004, and continued to go down more quickly than in the rest of the NWT or Canada. However, since 2004/2006, it has been going up faster than in Canada, the rest of the NWT and Yellowknife.

In Yellowknife, the rate of teenage births has also been going down since the active-mine phase. Except for a peak in 1998/1999, the drop in the Yellowknife rate has mirrored the drop in the Canadian rate. The data does not indicate the mines have influenced the rate of teen births in Yellowknife.

Figure 14: Birth Rate For Teen Females Aged 15-19 (# Per 1,000), Three Year Average



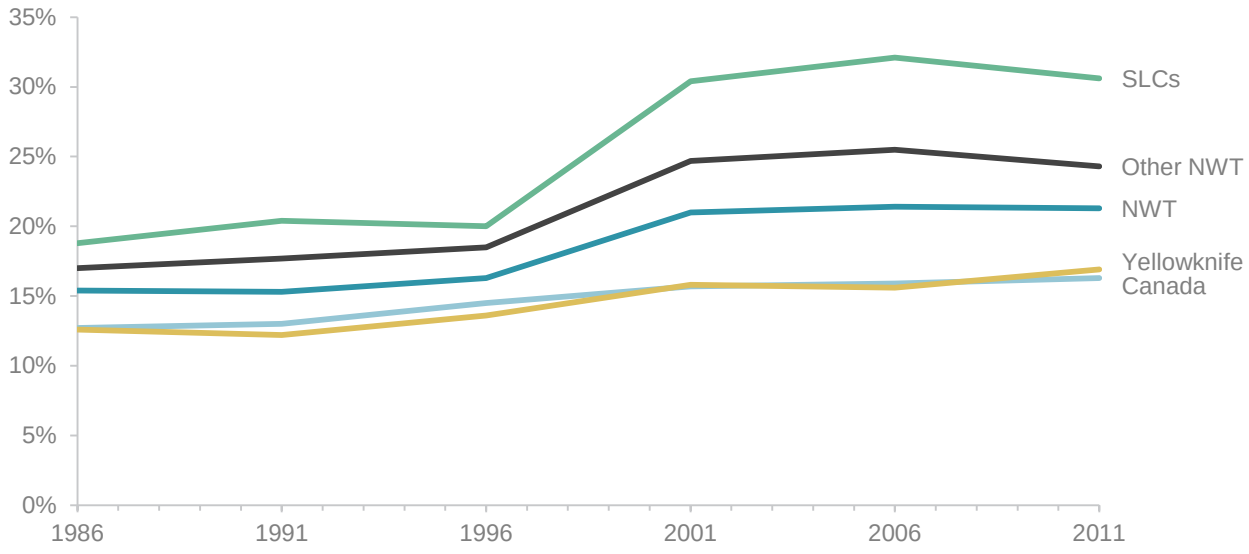
Single Parent Families

Single-parent families typically have lower incomes which can make providing basic needs more difficult. Single-parent families also face additional challenges such as finding daycare.

In SLCs the rate of single-parent families had been steady before the mines, but went up quickly after the mines began operations. The rate in other small and regional communities has also gone up, but not as quickly as in small local communities. The data suggests there may be a link between the rate of single-parent families in small local communities and mining activity.

In Yellowknife, the trend for single-parent families has also been going up, but not as much as in small local communities. These changes are similar to those seen across Canada; therefore it may be assumed the mines have not influenced the Yellowknife rate.

Figure 15: Percent Single Parent Families



Injuries

Physician and nurse diagnosed injury indicators measure the number of people whom a doctor or nurse have said to have been injured. Injuries include broken bones, severe burns, cuts or bruises and poisonings. One person can have more than one injury per year[1].

Keeping track of injuries tells us if more reckless actions or violence are taking place. These changes can happen when a community goes through a lot of change quickly.

The figures on the next page show the rate of physician and nurse diagnosed injuries and poisonings. The rate is for age-standardized injuries, which lets us look at groups of people at different ages and compare them over time. For example one community may have a greater number of older residents than another. Older residents tend to have more injuries requiring medical care than younger residents[2].

Since 1994/95, the rate of physician-diagnosed injuries has been going down in the NWT, including Yellowknife, small local communities and the other NWT communities. The trend of decreasing physician diagnosed injuries has been consistent since before the mines opened. The data does not suggest physician diagnosed injuries are linked to mining activity.

Most people who are injured in small local communities are seen by nurses. The rate of nurse diagnosed injuries in small local communities and the NWT as a whole have increased slightly since 2000/01. However, the way nurses record injuries changed in 2000. Due to this change, injuries reported by nurses cannot be compared between the before-mine and active-mine phases.

1 For more information on data limitations for doctor-diagnosed injuries, see data tables in Appendix C
2 For more information on age-standardization, see NWT Department of Health and Social Services, *Injury in the Northwest Territories*, 2000-2009, p. 77.

Credit: Rashaad Bhamjee

Figure 16: Physician diagnosed injuries and poisonings - Age standardized rate per 1,000

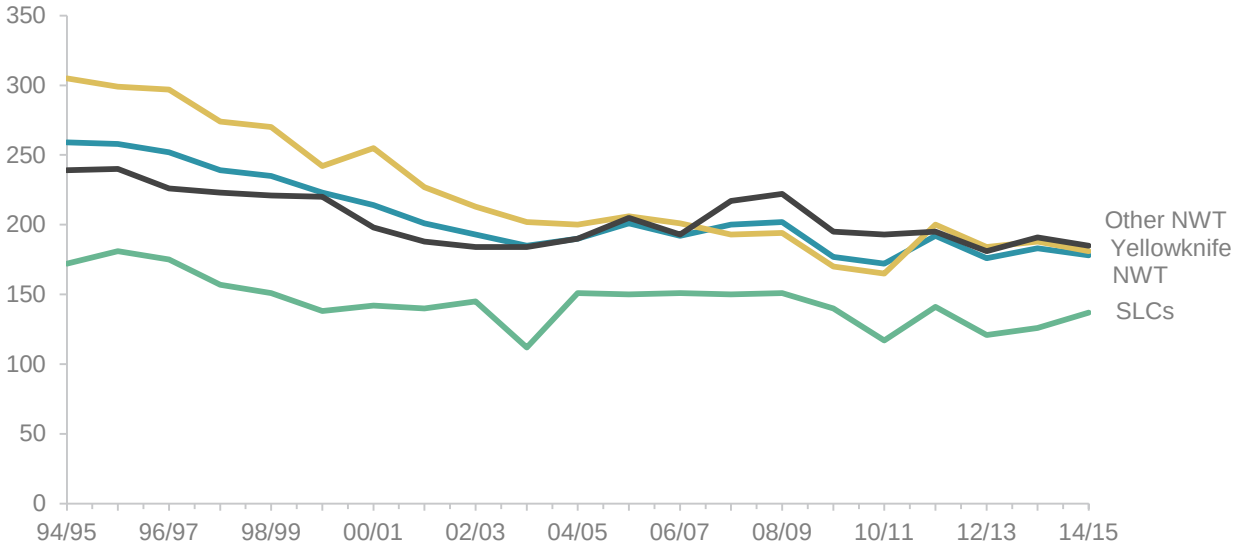
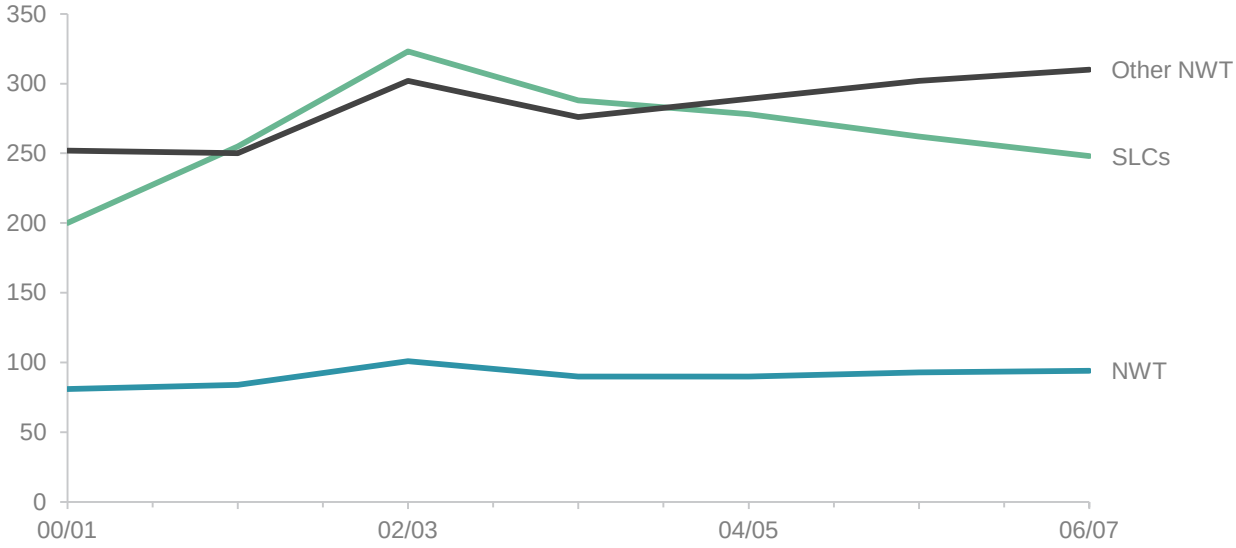


Figure 17: Nurse diagnosed injuries and poisonings - Age standardized rate per 1,000



Sexually Transmitted Infections

Sexually transmitted infections (STIs) can affect people's health and well-being. Risky sexual behavior can increase the chance of getting an STI. This report includes data on some of the most common STIs[1].

In 2008, the NWT experienced an outbreak of syphilis in smaller NWT communities and among a high-risk transient population in Yellowknife[2]. There had been only four cases in the NWT in the ten years before the outbreak[3]. The syphilis outbreak was first seen in Calgary and Edmonton and then spread into northern Alberta[4]. It is likely that the NWT outbreak came from Alberta.

Since the active-mine phase, the number of STIs in small local communities has been going up. However, the STI rate in small local communities was higher than other NWT communities before mining began. The STI rate has been going up across the NWT, but more quickly in the small local communities. The STI rate in the small local communities dropped following the 2008 outbreak and had remained below the pre-2006 rate; however the rate has been going up since 2011. Many factors influence STI rates. It is not possible to say whether STIs rates are impacted by mining activity.

Until 2005, the STI rate in Yellowknife was no higher or lower than the before-mine phase. The rate has gone up more quickly than in other parts of the NWT. STI rates have also gone up in the rest of Canada. Yellowknife's STI rate remains below the NWT average. The Yellowknife STI rate does not appear to be influenced by mine activity.

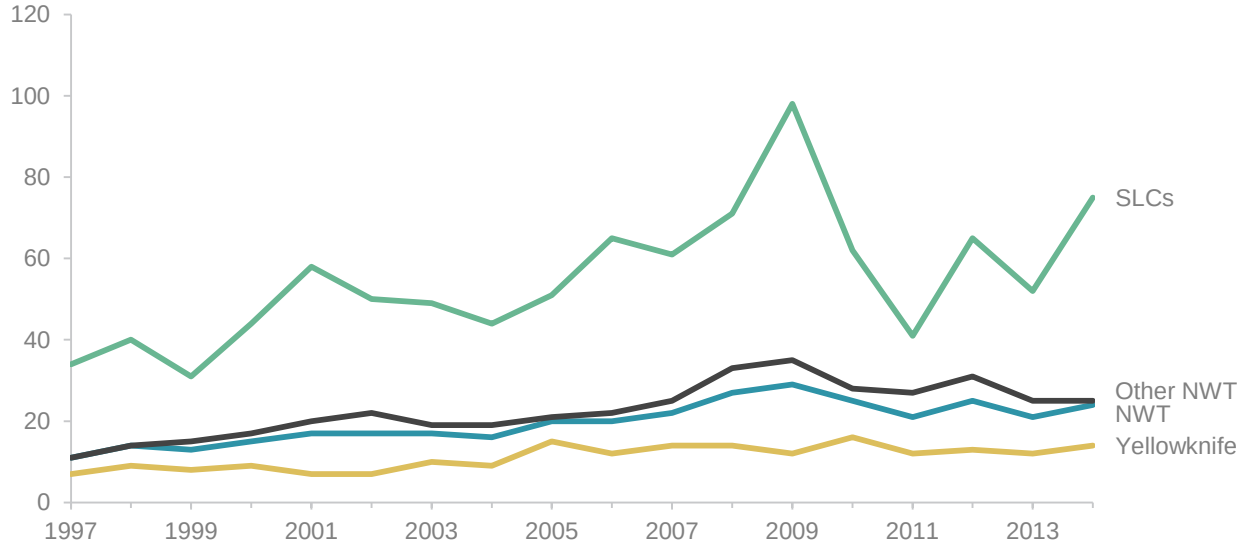
1 These include Chlamydia, gonorrhoea and syphilis. There are many other types of STIs such genital herpes, HIV/AIDS, human papillomavirus (HPV) and lymph granuloma venereum (LGV).

2 Northwest Territories Health Status Report, 2010

3 Case numbers include congenital, infectious and non-infectious syphilis. Syphilis case numbers are from the NWT Department of Health and Social Services, NWT Communicable Disease Registry found in the following departmental publications: Syphilis Update – To Week Ending January 30, 2009 [2000-2008], Epi North Winter 1999/2000, p. 19 [1999] and Epi North, Spring 1999, p. 18 [1998].

4 Alberta Blood-borne Pathogens and Sexually Transmitted Infections Surveillance Working Group, Alberta Blood-borne Pathogens and Sexually Transmitted Infections Surveillance Report 2008 (Edmonton, AB: Alberta Health and Wellness, 2008).

Figure 18: Sexually Transmitted Infections, Rates per 1,000



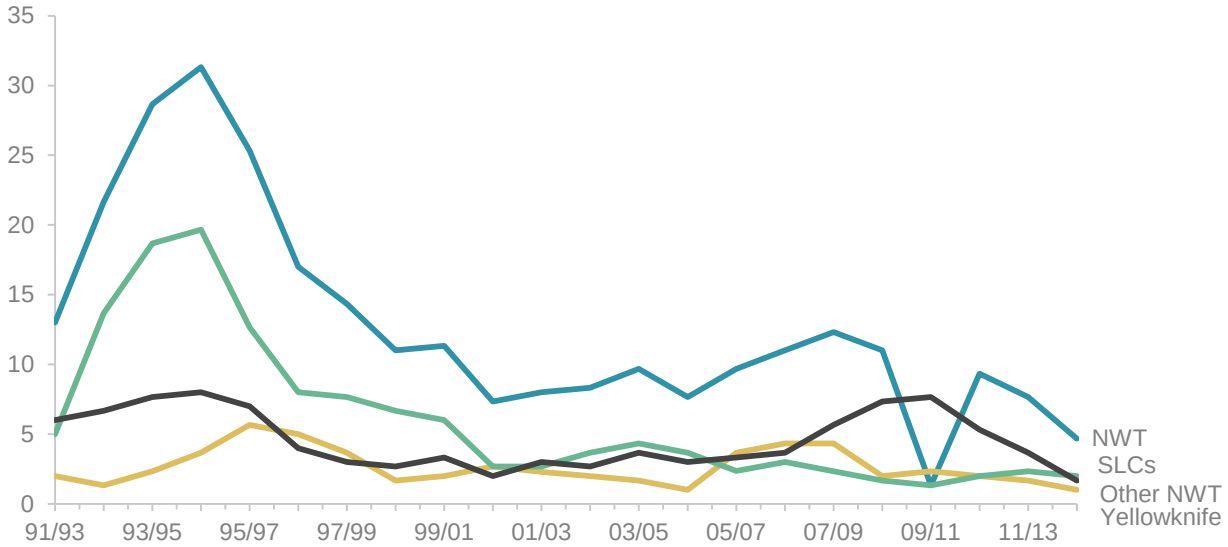
Tuberculosis

Tuberculosis (TB) is a disease caused by bacteria that attacks the lungs but can also spread to the brain, lymph nodes and bones. Although TB can be treated with antibiotics it is still a health concern. The annual rate of new TB cases has not changed much over the last 10 years. However, outbreaks still occur in the NWT and the TB rate in the NWT is much higher than in the rest of Canada.

TB rates are higher in all small NWT communities compared to regional centers and Yellowknife . There was a TB outbreak in the mid-1990s but the number of new cases soon went back to normal. The outbreak was in the pre-mining phase. The data does not show a relationship between mining activity and new TB cases in the small local communities.

New TB cases in Yellowknife have remained consistent before and after mining. The data does not show new TB cases in Yellowknife are influenced by mining activity.

Figure 19: Tuberculosis cases, Three-year average



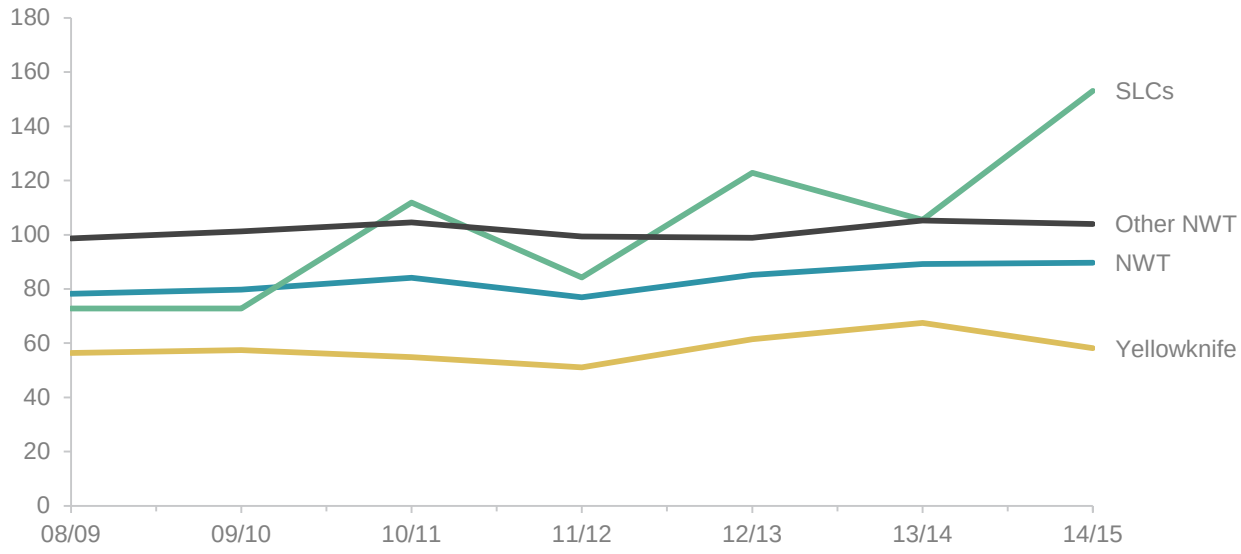
Children Receiving Services

Child welfare policy was changed in the late 1990s. In 1998, the *Child and Family Services Act* created a new choice for children at risk, allowing a child welfare worker to work with the child and family in their home and make a "plan of care" promise. The *Act* lets parents get help for their children or family without giving up their parental rights. This means that rates for children receiving services from the before-mine and from the active-mine phases cannot be compared.

In small local communities the number of children receiving services went up in 2009-2010, down in 2012-2013, then up again in 2014/15. At this time there is not an established trend. Small local communities often see the number of children receiving services go up and down. For example, if five children from one house are receiving services in a small community this could cause the rate for that community to increase if there are not many people living in that community. At the time of publishing this report, population estimates for children were not available and 2014 estimates were used. The 2014/2015 results should be interpreted with caution.

The number of children receiving services in Yellowknife did not change much from 2008/09 to 2014/15.

Figure 20: Children receiving services



Credit: Rashaad Bhamjee

Family Violence

The *NWT Protection Against Family Violence Act* defines family violence as actions that cause bodily harm, damage to property, actions or threats that cause fear for safety of oneself or children, sexual abuse, forcible confinement, as well as psychological, emotional or financial abuse.

A report released by Statistics Canada in January 2015 revealed that when analysing 2013 police-reported data , the NWT had the second highest rate of family violence in the country, following Nunavut. Just under half of all victims of family violence in Canada were victimized by a current or former spouse. The report highlights the impacts of spousal violence, including links to a heightened risk of chronic illness later in life, higher stress levels, an increased dependence on alcohol or drugs, risk of job loss and economic vulnerability. For children, being the victim of family violence or exposure to such violence can negatively impact their development and health, as well as their performance in school and socially.

Many factors increase the risk of family violence, such as unemployment, social isolation, substance abuse, mental health issues, low education rates, and common-law unions. Many of these factors are common in the NWT. Research also shows that both men and women experience and commit family violence; however, women tend to experience violence more often and more severely .

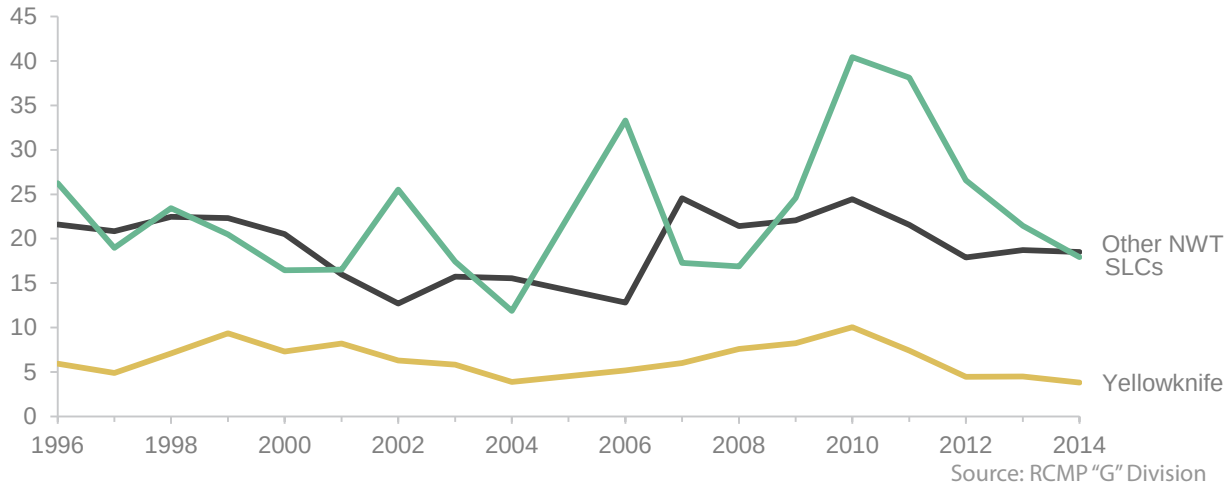
Understanding the actual levels of family violence in the NWT or Canada is not easy. This is because violent Criminal Code offences are reported as spousal assault only if the victim and offender are known to be spouses, and some victims do not report family violence out of fear or loyalty.

The indicators tracked in this report only show a partial picture. Police-reported spousal assaults, as well as data about shelter use, help give some measure of family violence in the NWT. Front-line workers suggest that many victims do not use shelters.

When the mines first became operational, the rate of spousal assault in small local communities was approximately 26 per 1,000 population aged 15 and over (Figure 21). Since then there has been variation in the rate, reaching a high point in 2010. However, 2014 saw a continuation of the decline below the 1996 spousal assault rate. The trend in Yellowknife seems to be relatively flat with some peaks and lows. Its 2014 spousal assault rate continued to be lower than the rate seen in 1996.

Overall, a clear link cannot be drawn that would indicate mining activity has been a factor in the rate of reported spousal assault in the NWT.

Figure 21: Rate of Police-Reported Spousal Assault Incidents per 1,000 Persons Aged 15+, 1996 to 2014



Source: RCMP "G" Division

Note: Detah and Ndilǫ statistics on spousal assault rates are captured under Yellowknife. Data for 2005 not available.

Admission of Women & Children to Shelters

The admission of women and children into NWT shelters peaked in 2002/2003, but steadily dropped in 2005/2006 and has not changed much since. Based on the number of admissions, the number of bed days gives us an idea of how many days, on average, each woman or child stayed in a shelter that year. The number of bed days went up from 2006/07 to 2009/10 but has continued to drop since. However, before-mine and active-mine phases cannot be compared since information from the shelter was only collected from 1999 and onward.

Figure 22: Admission of women and children to NWT shelters

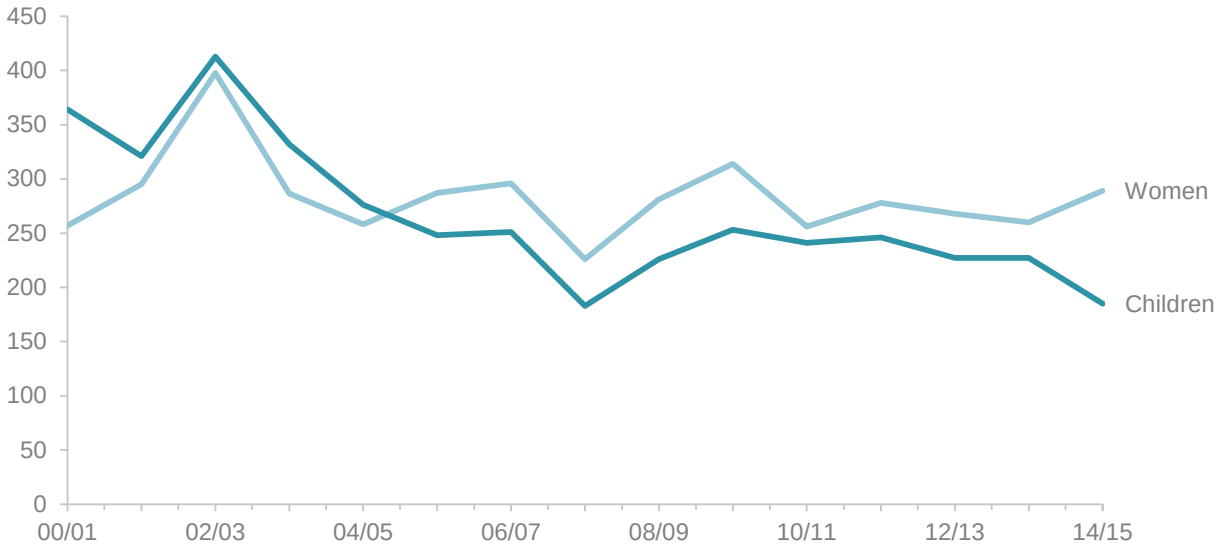
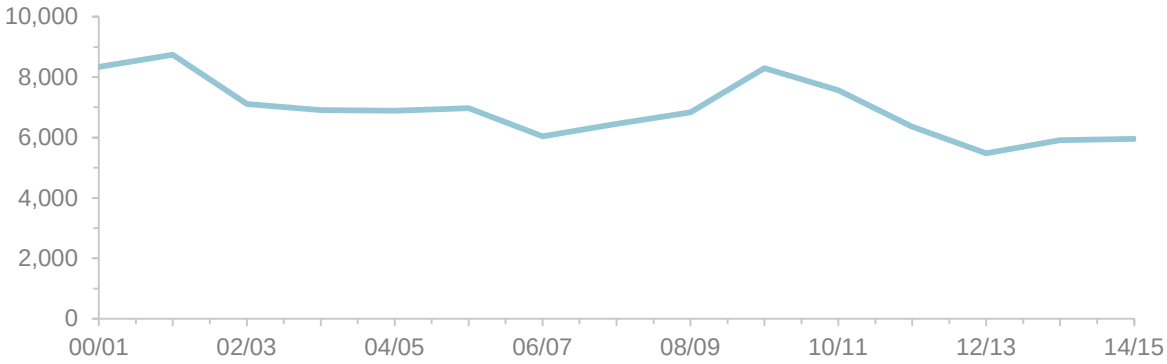


Figure 23: Total number of shelter bed days



Crime

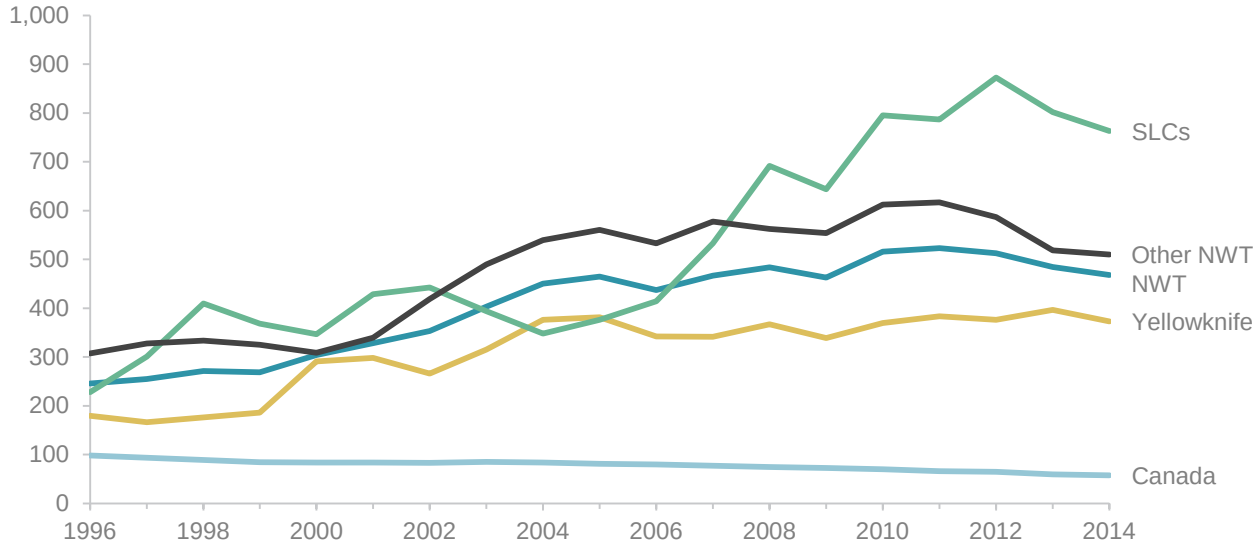
The communities of Detah and Ndilǫ do not have RCMP detachments at this time, and are patrolled out of Yellowknife. Wekweètì does not have an RCMP detachment at this time and is patrolled out of Behchokǫ̀. While Gamèti does not have a permanent detachment in the community, it has two dedicated RCMP members that are based out of Behchokǫ̀. Whatì and Łutselk'e both have detachments staffed by two RCMP members each. In communities without RCMP detachments, criminal incidents are reported as if they occurred in the community with the detachment that provides the policing services. For example, crimes that occur in Detah and Ndilǫ (patrolled out of Yellowknife) would show as part of the Yellowknife data. The only exception to this is Gamèti, whose statistics began being recorded separately in 2008.

A change in the way the RCMP collects and classifies some types of crimes has affected the rates that are reported for the NWT. There was a change in Yellowknife RCMP reporting between 1999 and 2000, and a similar change in reporting took place between 2000 and 2002 in the rest of the NWT. Some crimes that used to be reported as territorial offences (including *Liquor Act* offences) are now classified as *Criminal Code* offences (such as 'mischief' or 'disturbing the peace'). This change caused an increase in the rates for different reported crimes under the *Criminal Code*.

Crime rate increases in the NWT are largely driven by incidents of 'disturbing the peace' (classified as 'other' *Criminal Code* offences), and 'mischief' (classified as property offences). Both of these offences tend to be linked with substance abuse.

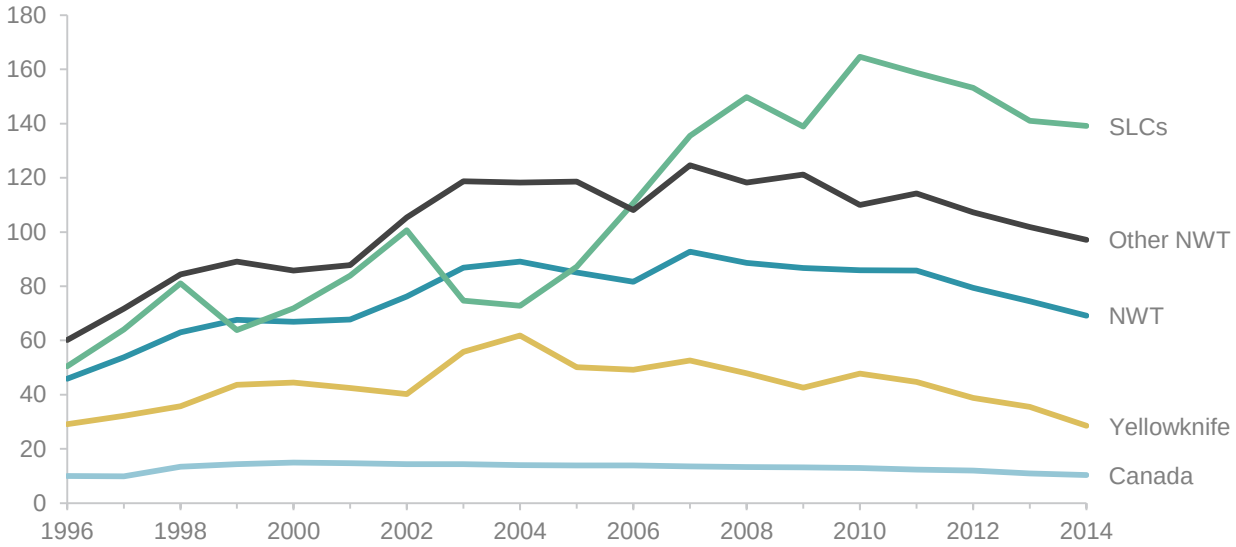
Increased crime has an impact on police services and many other parts of the justice system. More violent crime may lead to a demand for more resources for policing, corrections, and victims services. These crimes can also lead to an increased need for shelters, social workers, and other community supports.

Figure 24: Rate of Total Police Reported Crimes per 1,000 Persons 1996 – 2014



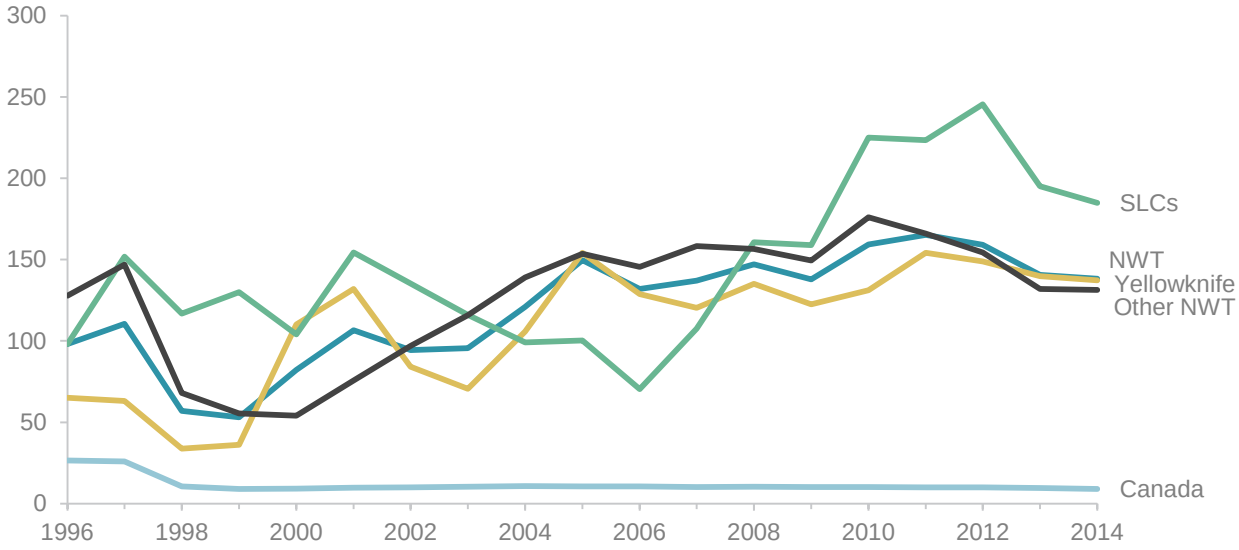
Source: Statistics Canada, Incident Based Uniform Crime Reporting Survey. Canada

Figure 25: Rate of Police Reported Violent Crimes per 1,000 Persons 1996 – 2014



Source: Statistics Canada, Incident Based Uniform Crime Reporting Survey. Canada

Figure 26: Rate of Police Reported 'Other' *Criminal Code* Offences per 1,000 Persons 1996 – 2014



Source: Statistics Canada, Incident Based Uniform Crime Reporting Survey. Canada

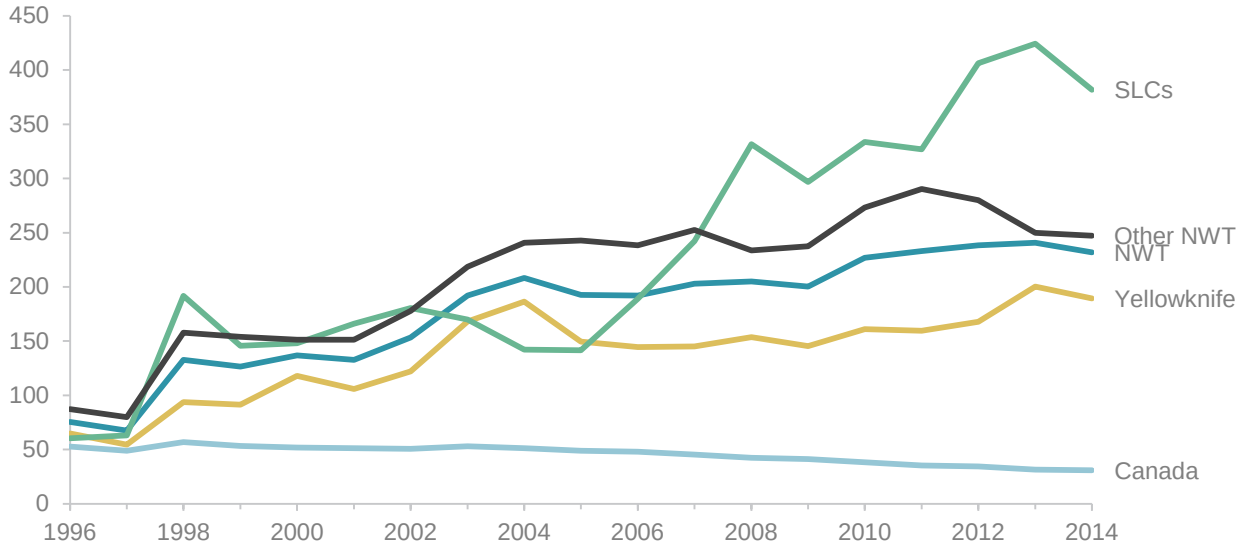
While the overall rate of police-reported crime has generally been increasing across the NWT, the small local communities continue to experience the highest rates (Figure 24). The rate of violent crime in the small local communities has experienced some fluctuation over the past several decades. It has been declining since reaching a high point in 2010, which was over three times the rate seen in 1996 (Figure 25). The rate of 'other' *Criminal Code* offences has also experienced years of fluctuation and reached a peak in 2012. However, a decline continued in 2014 (Figure 26). Property crime climbed between 2005 and 2013, with some periods of decline, including between 2013 and 2014 (Figure 27). Federal statute crimes (non-*Criminal Code* offences) saw a sharp decline between 2011 and 2014, after five years of consecutive increase (Figure 28). The majority of these are *Controlled Drugs and Substances Act* violations (i.e. drug crimes).

The overall police-reported crime rate in Yellowknife has remained stable since 2010 (Figure 24). The rate of violent crime in Yellowknife reached a high point in 2004, but has returned to a similar rate seen in 1996 (Figure 25). The rate for 'other' *Criminal Code* offences has remained fairly stable since reaching a high point in 2011 (Figure 26). Property crime has declined after reaching a peak in 2013 (Figure 27). The rate of federal statute crimes (other than *Criminal Code* offences) reached a high point in 2010, but has declined passed the rate seen in 1996 (Figure 28). Similar to the small local communities, the majority of federal statute crimes in Yellowknife are *Controlled Drugs and Substances Act* violations, such as possession of cannabis.

While it appears that there may be a causal relationship between mining activity and the rise of crime in Yellowknife and small local communities, it is not possible to make this conclusion definitively as there is a large array of factors that influence trends in crime.

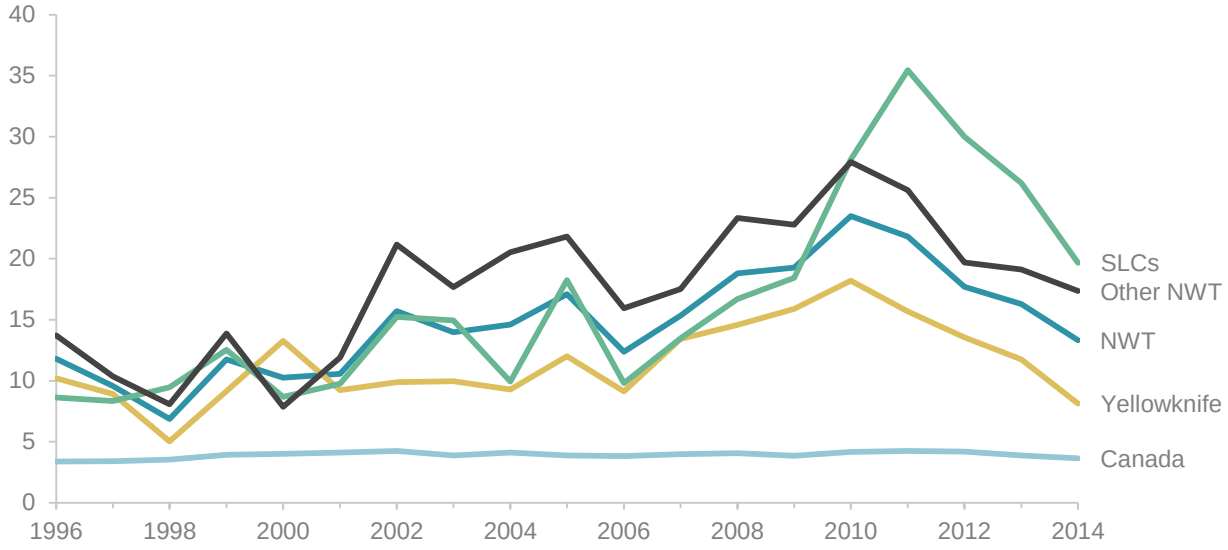
Credit: Rashaad Bhamjee

Figure 27: Rate of Police Reported Property Crimes per 1,000 Persons, 1996 – 2014



Source: Statistics Canada, Incident Based Uniform Crime Reporting Survey. Canada

Figure 28: Rate of Police Reported Federal Statutes Crimes per 1,000 Persons, 1996 – 2014



Source: Statistics Canada, Incident Based Uniform Crime Reporting Survey. Canada

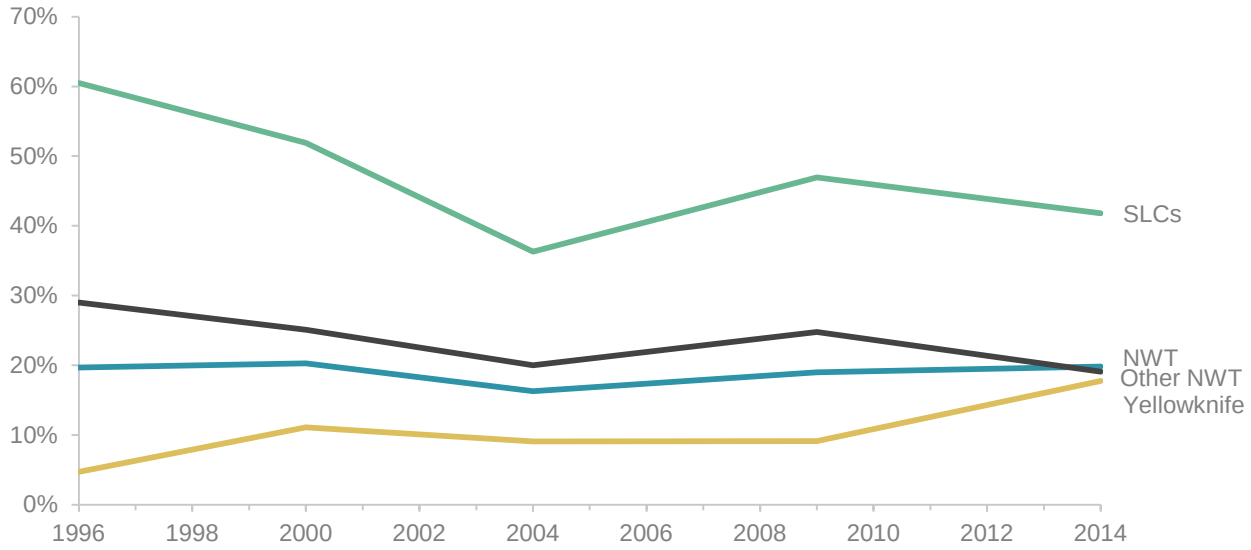
Housing

There are a few types of housing issues that are most often linked with resource development. These include: housing demand, the number of people who own a home and the number of people residing in a house.

The primary national indicator for measuring the demand for housing is core need. A household is in core need if they have an adequacy, suitability or affordability problem and do not have enough income to obtain appropriate housing. Adequacy problems refer to the condition of the dwelling, and whether it requires major repairs. Suitability refers to overcrowding, when a home does not have enough bedrooms for the size and makeup of the resident household, according to National Occupancy Standard requirements. Housing is unaffordable if the people in a household pay more than 30 percent of their gross income on housing. If a household has any of these three problems and its household income is below an income level calculated by the Northwest Territories Housing Corporation (NWTHC) called the Core Need Income Threshold (CNIT), then that household is in core need. The CNIT is the income needed in a particular community to own and operate a home or to rent in the private market without government assistance. The NWTHC updates the CNIT every two years to provide timely measurement of the true cost of shelter.

Core Need

Figure 29: Core need



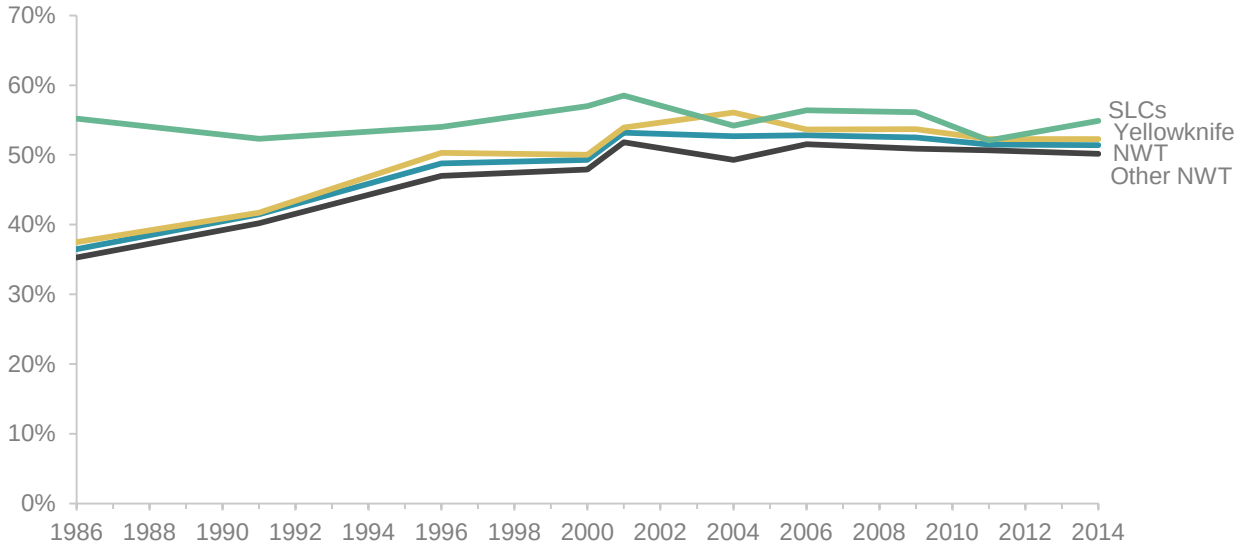
Source: 1996 and 2000 NWT Housing Needs Survey; 2004, 2009 & 2014 NWT Community Survey

In SLCs, the rate of core need fell significantly from 1996 to 2004, but increased until 2009. By 2014, core need resumed its trend downward and dropped in 24 communities. For Yellowknife, core need increased from 1996 to 2000 but has remained relatively unchanged from 2000 to 2009. In 2014, Yellowknife experienced an increase in core need.

Ownership

There was a steady increase of people owning homes in other NWT communities from 1986 to 2001 with the rate remaining relatively unchanged to 2014. Since 1986, homeownership increased in Yellowknife until 2004 and then experienced small declines to 2014. In the SLCs the homeownership pattern has had slight variations but remained somewhat constant.

Figure 30: Ownership

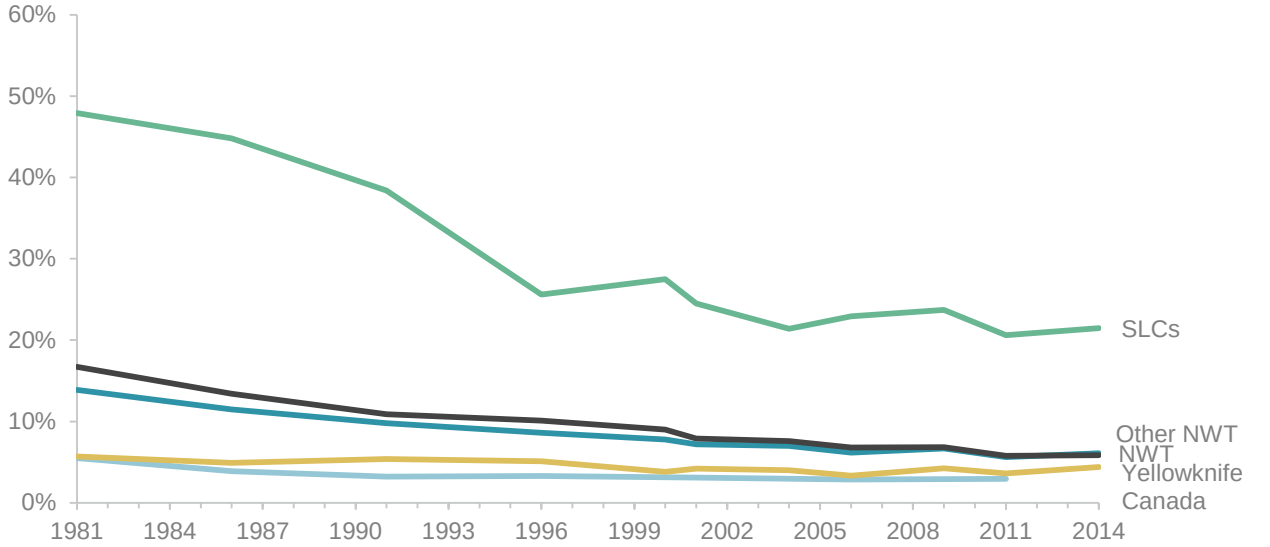


Source: 2000 NWT Housing Needs Survey; 2004, 2009 & 2014 NWT Community Survey; 1986, 1991, 1996, 2001 & 2006 Statistics Canada Census; 2011 Statistics Canada National Household Survey.

Northern sustainable house in Inuvik, NWT. Credit: NWTHC

Crowding

Figure 31: Crowding



Source: 2000 NWT Housing Needs Survey; 2004, 2009 & 2014 NWT Community Survey; 1986, 1991, 1996, 2001, 2006 & 2011

Overall, the number of dwellings with more than six people residing in the home has steadily decreased across the Northwest Territories, the most significant impact felt by the SLCs. In 2014 however, there was a slight increase across the Northwest Territories. In Yellowknife, Canada and the other NWT communities, the number of dwellings with more than 6 persons also fell, but at a less pronounced rate than the SLCs.

Possible Reasons for Changes

Changes in income resulting from resource development can influence the housing market. As incomes increase, housing becomes more affordable, households have greater resources to make repairs or to obtain housing that is appropriate to their family size. Households are also better able to access financing for repairs and home purchase. Given the strong link between core need and income, the availability of mining employment opportunities and other employment from economic development is important to decreasing core need.

Changes in household incomes may also provide some explanation for shifts in homeownership levels. In general, rising income levels lead to increases in homeownership rates. Availability of government homeownership programming, access to bank financing in smaller communities and lower interest rates also impact on homeownership levels. Another factor that may have an impact to the social housing market is that the Northwest Territories Housing Corporation revamped many of its programs since 2012 making them more accessible. New programs have also been introduced to assist low-middle income families and potential homeowners.

Statistics Canada reports tell us that the number of people employed in the resource industry dropped significantly in 2009 and onwards. This corresponds to the increase in core need that was reported in the *2009 NWT Community Survey*. In 2012 the NWT Bureau of Statistics reports that there was an increase in employment across the Northwest Territories, which could have an impact on both the level of homeownership and the decrease of core need in 24 communities within the NWT.

Family and household structures are experiencing change across the NWT. In the last ten years, the number of occupied dwellings has grown faster than the number of people has grown. Houses have fewer people living together as part of a single household. Values, family composition, what people want, what houses are ready for use and household income are all factors that help to shape the demand and supply of housing.

Credit: Rashaad Bhamjee

Business

NWT Gross Domestic Product

GDP is usually measured in real, or chained 2007 dollars to account for price inflation. Diamond mining's contribution to the economy has declined $529 million, or $1.1 billion in 2007 to $574 million in 2014; a decline of 48 percent. The industry also supports other business sectors, notably construction and transportation, which account for a further contribution of $474 million and $282 million respectively.

Figure 32: NWT GDP Sectors

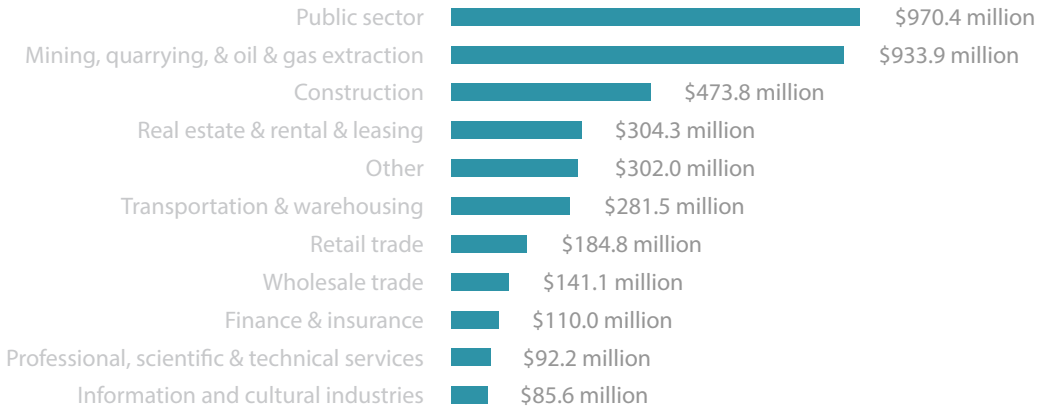
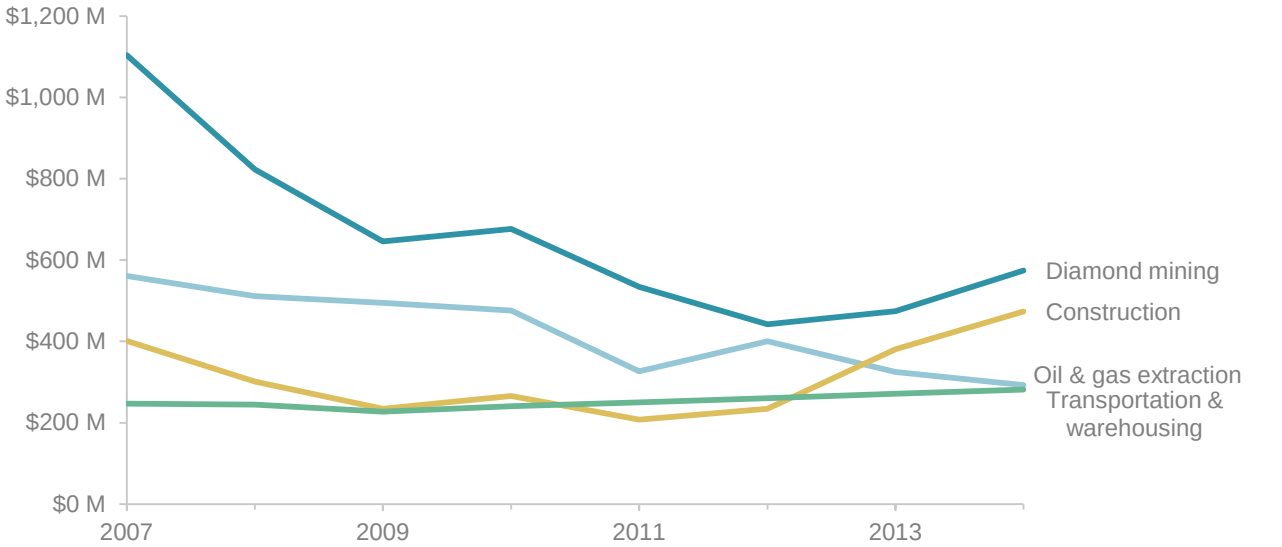


Figure 33: Trend in NWT GDP Sectors



Source: NWT Bureau of Statistics

Mineral Development Strategy (MDS)

The MDS is a partnership strategy prepared by the GNWT and the NWT and Nunavut Chamber of Mines. The development of a MDS was a stated priority of the 17th Legislative Assembly, and it was released in November 2013. The MDS is intended to complement the GNWT's comprehensive Economic Opportunities Strategy. It establishes a comprehensive plan to ensure the long-term growth of a sustainable mining industry that will create jobs and economic opportunities for the people of the NWT.

The NWT has four operating mines that have provided significant benefits to the economy, including increased GDP, employment, procurement, and value-added industries such as manufacturing. However, mineral exploration in the NWT has been decreasing and there is concern that the contribution of mineral exploration and mine operations to the NWT economy may be significantly reduced within ten to 15 years.

Public input on development of the MDS was sought through a series of engagement sessions held between February and April 2013. A three person external expert advisory panel led engagement sessions with key stakeholders to gather input into what would be required for a comprehensive strategy. This advisory panel released a summary of this input in June 2013, which included feedback from communities, industry, Aboriginal governments and organizations, regulatory boards, chambers of commerce, education/training institutions, and non-government organizations.

The *MDS Implementation Plan (MDS-IP) Progress Report, April 1, 2014 – March 31, 2015* has been released. The *MDS-IP Progress Report* includes specific goals to better position the GNWT in developing a viable and responsible mineral economy for a sustainable future. In 2014-15, an amount of $1.87 million was allocated to implement 28 MDS action items. Some of the notable achievements include:

- second year implementation of the highly subscribed Mineral Incentive Program to increase grassroots exploration;
- increase in public outreach programs to attract investment;
- the establishment of the Mineral Industry Advisory Board; and
- a dedicated Business Development Services Advisor position.

The continued advancement of a MDS is a necessary step to increase expenditures in mineral exploration and deposit appraisals, and thereby encourage the productive use of resources and lead to positive impacts on the quality of life of NWT residents, government revenues, business retention and expansion.

It is critical that the NWT continue to promote investment in minerals exploration and development because this industry, and its spin off activities, represents the most significant economic activity in the territory. This will likely remain so for the foreseeable future, and the GNWT sees the vital role it plays in establishing the conditions to encourage investment and ensure a sustainable and diversified economy.

Industry is looking to the GNWT to show definitive plans for maintaining a strong and progressive economy post-devolution. The GNWT already has devolution role in managing and encouraging investment in this sector. The MDS and Implementation Plan will give industry and the people of the NWT a clear picture of how the GNWT intends to move forward to expand and develop economic activities in a sustainable manner.

Economic Opportunities Strategy

The need for a definitive made-in the-NWT approach to guide and increase growth, diversity and certainty in the NWT economy was highlighted by the 17th Legislative Assembly as a priority.

The *NWT Economic Opportunities Strategy (EOS)* has been developed to address this priority. It was created with the direct input of NWT residents, governments, organizations, industries and businesses; and authored, collaboratively, by our Territory's foremost economic stakeholders: the federal and territorial governments, the NWT Association of Communities, the NWT Chamber of Commerce and the Northern Aboriginal Business Association.

In 2014 the EOS Implementation Plan (EOS-IP) was released. The EOS-IP maps out the priorities, methods and resources to address the 117 recommended actions outlined in the Strategy. The goals are to support the NWT business community; grow a stable and attractive entrepreneurial environment; pursue major investment projects; and attract, retain and prepare residents to be active participants in the prosperous and sustainable new economic environment that we are building.

Four themes provide the cornerstones for this ten-year economic strategy: Creating a climate for Growth; Building on previous success; Regional Diversification; and ensuring People and Opportunity readiness. Within each theme, targets and objectives have been identified that will: "help to guide the development and realization of economic potential in all regions of the NWT - strengthening and diversifying the NWT's economy – and resulting in an enhanced quality of life for all NWT residents."

The EOS aims to grow and diversify the NWT economy outside of its rich resource sector – in areas such as tourism, agriculture, fishing, manufacturing and the traditional economy – and to create the environment in which grass roots economic opportunities can be envisioned, pursued and realized by NWT residents and businesses in our Territory's communities and regions.

Locally owned and operated airlines, hotels, restaurants, construction firms, telecommunications and logistics companies and service and supply industries are evidence of the capacity of northern and Aboriginal-owned businesses to leverage investments from resource development and to participate and invest fully in the NWT's economy as successful business owners, operators and investors.

To increase participation in resource development, the *NWT Economic Opportunities Strategy* recommends the continued pursuit and enforcement of socio-economic agreements and contracts with large project proponents that ensure employment and business and educational opportunities for NWT residents.

Credit: Diavik Diamond Mines

Net Effect on Government

Expenditure

Mineral resource development creates demands on government spending through several channels, including the need for new roads and other infrastructure, particularly in remote areas. Mining activity also contributes to wear and tear on existing infrastructure. Development and income growth can create social stresses addressed by social programs. Mineral development creates environmental stresses, which require monitoring and regulation. The government encourages economic growth and mineral development through labour market training programs and commerce programs so that communities can directly participate in the economic development of mining.

Revenue

Diamond mines make a substantial contribution to the NWT economy. However, the link between mines and the fiscal capacity of the GNWT is weak, largely due to the federal fiscal arrangements.

The most important source of revenue for the GNWT is the Territorial Formula Financing (TFF) grant, which provides the majority of the GNWT's revenues. TFF largely neutralizes changes in own-source revenue, because adding capacity to raise revenues results in a lower TFF entitlement, and vice versa. For example, a large increase in own-source revenue will be partially offset by a corresponding decrease of TFF, resulting in only a minimal increase in the GNWT's total revenues. In this way, the GNWT's total revenues are buffered from economic growth patterns and large swings in revenue.

The grant's formula provides stability and predictability from year to year since it is not directly affected by mineral development. The primary channels through which mineral development could be expected to affect TFF are population and estimates of GNWT revenues. The main influence of mineral developments on the TFF grant is their economic benefits, especially the ability to attract people to the NWT. The growth in the NWT population is an important factor in increasing TFF payments over time. Efforts by the mine managers to increase the number of employees who live as well as work in the NWT will increase the TFF grant and increase the tax base, directly in the case of personal income tax and indirectly through more consumer demand and therefore increased business activity.

Resource projects, such as the diamond mines, provide the GNWT with a significant portion of corporate income tax (CIT), fuel tax, and property tax revenues and the projects' employees provide payroll tax and personal income tax revenues. In 2014-15, diamond mines contributed $44 million to CIT, fuel, property and payroll tax revenue out of an aggregate total of $122 million. The contribution from diamond mining companies grew 11% from the previous year.

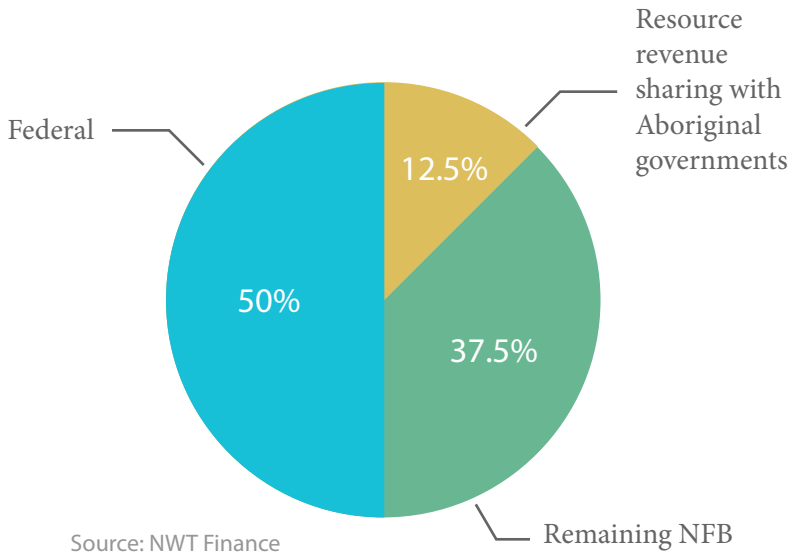
The GNWT collects all resource revenues, including royalties from the diamond mines. On an accrued basis, the GNWT collected a total of $63 million in 2014-15, but this is shared with the federal government and Aboriginal organizations.

Allocation of Resource Revenue

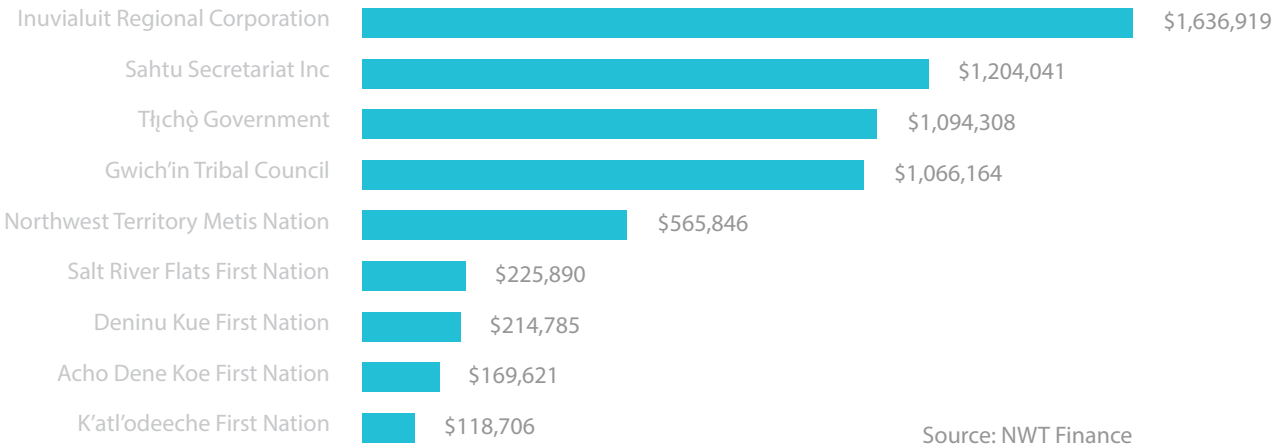
As of April 1, 2014, the GNWT collects all NWT resource revenues and shares with Canada and Aboriginal organization signatories to the Northwest Territories Land and Devolution Agreement. Under the Agreement, Canada receives 50 per cent of all resource revenues, excluding land claim payments, which are paid out according to settled agreements and not part of NWT resource revenues. The remaining half of resource revenues is called the net fiscal benefit (NFB) to the GNWT. A quarter of the NFB is dedicated to Aboriginal governments, pursuant to the Northwest Territories Intergovernmental Resource Revenue Sharing Agreement. A quarter of the remainder is allocated to savings in the Heritage Fund. The balance is dedicated towards strategic infrastructure and debt repayment.

Revenue Distribution

For 2014/15, resource revenue collected was distributed among nine Aboriginal organizations that were signatories to the Devolution agreement. The total $6.3 million shared was allocated in accordance to the agreed-to formula based on population and cost of living factors.



Source: NWT Finance



Source: NWT Finance

Glossary | Words to Know

Crimes

Violent Crimes - Offences under the *Criminal Code*, such as homicide, attempted murder, assault and sexual assault.

Property Crimes - Offences under the *Criminal Code*, such as non-violent theft, breaking and entering, fraud, and possession of stolen goods.

'Other' *Criminal Code* crimes - Offences under the *Criminal Code*, such as probation or bail violations, prostitution, illegal gambling, and arson.

Other Federal Statute crimes - Offences not under the *Criminal Code*. These can include offences under the *Controlled Drugs and Substances Act, Firearms Act*, among others.

Employment Rate

The percent of people aged 15 and older who have jobs.

Labour Force

Those people 15 years of age or older who are working or who are actively looking for work, laid off for a time and thought to return to work, or those who have made some plan to start a new job.

Participation Rate

The percent of people, 15 years of age and older, who are in the labour force.

PYLL - Potential Years of Life Lost

PYLL is found by taking away the age at which a person dies from an average life span that is 75 years of age. For instance, a person who died at age 65 would have a PYLL of ten (found by: 75 - 65 = 10).

A person who died at age 20 would have a PYLL of 55 (found by: 75 - 20 = 55).

The PYLL of an entire group of people is the sum of all the years of life lost by those who died before reaching the age of 75.

Single-Parent Families

Single-parent families have a parent at home with no spouse or common-law partner. They also have at least one child who has never been married and who lives in the home.

Socio-Economic

Socio-economic impacts include social, economic, and fiscal impacts. Social impacts can be sorted into two groups: demographic and socio-cultural.

Demographic Impacts: changes in people, such as the population, the number of men and women, how old everyone is, migration rates, and the services required by each group.

Socio-cultural Impacts: changes in social structures, the way people organize, relationships, and in culture and value systems such as language or beliefs.

Economic Impacts: change in the number of people with jobs, how much moeny they make, and how much business occurs.

Fiscal Impacts: the economic consequences of development for government organizaitons.

Unemployed

The number of people who, in the week prior to the survey:

1. were without work, had actively looked for work in the last four weeks, and were ready to work; or

2. had been laid-off for a time and thought they would soon return to their job; or

3. had sure plans to start a new job in the next four weeks.

Unemployment Rate

The percent of the labour force that is without jobs but that is looking for work.

Credit: Rashaad Bhamjee

Appendix A

Company Predictions of Mine Activity

Below are predictions made by BHP, Diavik and De Beers amout the possible impacts on the NWT from each of their projects. These statements are quoted from material submitted for the envirionmental assessment of each project. In the case of the BHP predictions, the Ekati Mine was sold to Dominion Diamond in 2012.

Company	Predicted Impact
Community, Family and Individual Well-Being	
BHP	"…project employment could aggravate existing social problems by increasing stress and related alcohol abuse, by alienating people from traditional lifestyles and by increasing the pace of change in communities already having difficulty dealing with change."
	"Small communities with less wage employment experience, particularly industrial employment, will be more affected by internal factors that determine their ability to handle change…even a half dozen people working directly for the project could increase total community personal income by as much as 15 percent. The impacts in these communities will be in direct relationship to a community's ability to cope with rotational employment absences and spending of new wage employment dollars."
De Beers	De Beers noted that expansion of the wage economy into communities, through the development of the Snap Lake Diamond Project, may exacerbate certain pre-existing dysfunctional conditions in the communities. It clarified this was a reference to substance abuse, drug addiction, suicide rates, teen pregnancy, fetal alcohol effect and fetal alcohol syndrome, sexual abuse, HIV/Aids, and Hepatitis C. "Job training programs may provide incentives to enrol in substance abuse and alcohol addiction treatment. This, in turn, may have long-lasting physical and mental health benefits to the individual being treated."
Diavik	"An inflow of single transient workers, and students involved in rotational employment may bring an element of instability to, and affect the human health of, the community."
	"Increased disposable income spent on alcohol and drugs may worsen human health conditions of individuals, families and the community."
	"The Diavik Diamonds Project, while offering benefits, could potentially add to the complexity of human health issues in the communities."
BHP	The Environmental Impact Statement (EIS) talked about indirect impacts of employment "resulting in greater family violence and family breakdown".
	"The 'at work' rotation is well below the length of time at which a measurable deterioration in worker… morale and family relationships begins (21 days)..."
De Beers	"Expansion of the wage economy into communities, through the development of the Snap Lake Diamond Project, may exacerbate certain pre-existing dysfunctional conditions in the communities." De Beers clarified this was a reference to, among other things, teen pregnancy.
Diavik	"Respecting … rotation work and associated absenteeism from home, there would likely be a period of personal and family adjustment lasting about two years. Potential effects could include additional demands on family and social services and protection services."
Single-Parent Families	
BHP	"Absence from home for two weeks at a time could have an impact on marriages … Stress caused by a number of factors – need for money, separation, suspected infidelity, are major causes of marriage breakdown. With a rotational work system, marriages are likely to experience some of the stress of separation. At the same time, the availability of jobs may relieve some financial stress."
	"… Rotational shift work … could create marital pressure for families not used to separation. Studies indicate that 68 percent of the Canadian long distance commuters work force are married (includes non Aboriginal people as well); however, the number of divorced employees is double that of the general public."
De Beers	"…families may break up as the educated or skilled family members go elsewhere to seek employment."
	"There is increased risk of marital and family breakdown associated with stop-overs in Yellowknife as some employees (mostly male) engage in extra-marital affairs."

Children Receiving Services	
BHP	In the 1995 EIS potential effects on human health resulting from identified causes included: "… an increase in social disruption with potential strain on policing and social services …"
De Beers	"Wage employment for an individual may result in a decline in reliance on social services, and a corresponding improvement in family relationships."
	"If many individuals and families are coping poorly with the adjustments, the demands for rigorous and relevant support services will increase. Such support mechanisms may include marital/relationship counselling, child care services."
Diavik	"Experience from previous northern projects indicates that new employees with large pay cheques tend to "blow" their money on alcohol first, taper off, and then spend more money and time on the home and family (Chenard 1979). Marriage and family problems caused by alcohol and absenteeism from home are prevalent in the younger generation and would place a short-term demand on counselling and protection services."
	"There would be an initial period of adjustment for employees and families … During the adjustment period there may be increased demand for protection services."
Family Violence and Other Crimes	
BHP	There may be "negative impacts of increased income such as alcohol and drug abuse, resulting in greater family violence and family breakdown."
	"… social problems existing within the Aboriginal communities may be compounded by an increase in wages. Additional expendable income can lead to alcohol and drug abuse and intensify existing problems such as violence."
De Beers	"In family situations where conflict, violence or other domestic problems are already present such issues may be exacerbated by the demands of the rotation schedule, resulting in increased social dysfunction and instability."
	"…in families with frequent conflict between spouses, decisions concerning the use of income may exacerbate conflict. Children may also be directly affected as victims of family violence and conflict."
Diavik	"…income and absence due to rotational employment may result in… family conflict."
BHP	"If alcohol and drug abuse (and crime that results from these abuses) increase, … additional law enforcement personnel would be required. … if the 'fast buck' businesses converge on larger centres, particularly Yellowknife, policing agencies may have to deal with more fraud."
	"Yellowknife is the most likely centre to experience an increase in drug trafficking. … Since many NWT residents employed by the project will have to pass through Yellowknife on their way home, there is a possibility that readily available drugs may be purchased and carried to smaller communities."
	"…if alcohol consumption increases, crime (particularly assaults) could increase."
	"… social problems existing within the Aboriginal communities may be compounded by an increase in wages. Additional expendable income can lead to alcohol and drug abuse and intensify existing problems such as violence."
De Beers	"As individuals and families try to cope with the lifestyle changes imposed by the rotational work schedule, the social fabric (i.e., relationships and support systems) of communities will be affected. Community members at large may suffer from the effects of friends, extended family, or neighbours resorting to substance abuse or alcoholism when dealing with emotional issues, living in high conflict or violent home situations, or neglecting community and family responsibilities. Social capacity or stability may decrease."
Diavik	"Respecting … rotation work and associated absenteeism from home, there would likely be a period of personal and family adjustment lasting about two years. Potential effects could include additional demands on… protection services."
	"Employment, income, transportation and closure have the potential of affecting local protection services."
Housing	
BHP	"Regular income can improve the standard of living of both individuals and communities. People with regular incomes can purchase/build their own homes, relieving some of the stress on housing in many communities. They can purchase more goods … and not only relieve stress of impoverished lifestyle, but circulate their dollars through the local economy to assist in overall improvements in the standard of living."
De Beers	"With a consistent monetary income, individuals will have a greater level of security in providing for basic material needs, such as food, housing, or clothing."
Diavik	"Employment income and associated economic changes should enable residents of study area communities; [sic] particularly the smaller Dene, Métis and Inuit communities to privately purchase or rent houses."

Cultural Well-Being and Traditional Economy	
BHP	The impact of the project on traditional Aboriginal lifestyle / culture was predicted to be negative but small.
De Beers	[for Aboriginal workers] "… impacts are primarily associated with… functioning in a pre dominantly non-Aboriginal work environment and culture."
	"The limited amount of time in the community may limit individuals' ability to pursue Aboriginal traditional activities, which impacts on individuals' lifestyle and the maintenance of a cultural identity."
	"The family as a whole will also be affected by the limited time available to engage in traditional activities with all family members present. This may complicate efforts to maintain cultural traditions and identity."
	"It is not possible to predict with reasonable certainty whether individual and community involvement mining activities will negatively or positively impact on the subsistence economy in communities."
Diavik	"… the context for expression important to the survival of Aboriginal languages could change."
	"Employment at the mine site in an English only environment may pose a risk to Aboriginal languages. The presence of other Aboriginal language speakers at the mine site and the opportunity for Aboriginal workers to reside in their home communities may reduce this risk."
	"…wage based activities may erode… Dene, Métis and Inuit culture."
	"Out-migration from smaller Aboriginal communities affect[s] community organization and weaken[s] culture."
	"Industrial work may erode traditional harvesting practices."
	"Possible in-migration of job seekers to Yellowknife may change… harvesting patterns… Conflicts resulting from increasing competition for land and resources may alienate traditional land users from important harvesting activities."
	"The renewable resource economy of study area communities should benefit from the proposed Project as more harvesters would have money to purchase equipment and supplies needed for harvesting activities."
Non-Traditional Economy	
Average Income	
BHP	"Project-generated employment could increase NWT wage income by three percent per year in the construction phase and five percent per year in the operations phase assuming 1995 employment levels. Aboriginal communities and Coppermine could experience substantial increases in earned income in both the construction and operations phase."
	"The project could also cause an increase of total earned income in these [Aboriginal] communities by over 33 percent."
	"Induced employment from household respending of NWT Diamonds Project direct and indirect employment dollars could generate an additional 155 jobs in the NWT. Annual income for these jobs will be approximately $5 million."
De Beers	"Job opportunities will largely accrue to the primary communities with the result being changes in the economic circumstance of many families of those communities as well as the communities themselves."
	During construction, "Total labour income impact for the NWT is estimated at some $102 million."
	"Annual labour income impacts for the NWT in the operations phase are estimated at some $81.2 million."
Diavik	"Employment and income effects associated with the proposed project are positive, long lasting, and complementary to northern and Aboriginal aspirations and needs."
	"The construction phase is … projected to increase labour income in the NWT by $182 million (all values are presented in constant 1997 dollars). … operation of the proposed Project will also increase labour income in the local study area by $27 million…"
Proportion of High-Income Earners	
BHP	"In smaller communities, mine wage employment could widen the gap between 'haves' and 'have nots' in the community."
De Beers	"In communities where employment opportunities remain limited to those created by the Snap Lake Diamond Project, community divisions and fractions may arise between 'have' and 'have-nots', which may exacerbate other social problems in the community."
Diavik	"Project workers of Aboriginal ancestry seeking residency in Yellowknife, N'dilo and Detah may be more affluent than other Aboriginal people. In small communities such as N'dilo and Detah this situation could increase the gap between the 'have' and 'have nots' resulting in stresses to interpersonal and family relationships."
Income Assistance Cases	
BHP	"In the study area .... Assuming that 400 people would no longer need social assistance, this could mean a $1.4 million annual savings…"

De Beers	"As the household income level is increased for families reliant on welfare, the family will no longer be eligible for welfare assistance."
Diavik	"Other benefits of the proposed Project would include … a fall in social assistance … payments as more NWT residents gain employment."
Employment Rate	
BHP	"… the NWT Diamonds Project will have a significant impact on… communities that… fail to benefit from other major industries... While Yellowknife… will be a major beneficiary… of new jobs, the smaller First Nations communities, as well as Coppermine and Hay River, can also expect significant employment benefits."
De Beers	"… the Project will create 450 construction jobs and in excess of 500 jobs in the operation of the mine facility. Job opportunities will largely accrue to the primary communities…"
Diavik	"Cumulative employment and income effects associated with the proposed Project would be positive, long lasting, and complementary to northern and Aboriginal aspirations and needs and should address one of the most pressing issues in the study area communities – lack of employment and business opportunities."
Unemployment Rate	
BHP	"Hiring by the project is expected to reduce unemployment in Aboriginal communities from almost 40 percent to 30 percent."
De Beers	"Through the creation of direct, indirect and induced employment opportunities, it is expected that the rates of unemployment will be reduced in Yellowknife, other primary study communities and the employment catchment communities."
Diavik	"The proposed Project would … contribute to a reduction in unemployment..."
Participation Rate	
BHP/De Beers	Neither BHP nor De Beers referred to the participation rate. However, statements on employment and unemployment imply the participation rate would increase.
Diavik	"The proposed Project would … contribute to … an increase in participation rates."
Education	
BHP	"Employment possibilities with the NWT Diamonds Project can provide an incentive for people to stay in school, if only to attain the education level required for apprenticeship positions."
	"Government, community and Proponent sponsored 'stay in school' programs will encourage more young people to complete at least Grade 10."
De Beers	"The opportunity for future wage employment may also motivate unqualified individuals to upgrade their educational level and general life skills to meet project standards for employment eligibility."
	"It is possible too, that individuals participating in training or educational programs will inspire other family members to improve their educational level or join in various skills development programs."
	"The achievement of a certain level of education and skills may, in the longer run, spur demands for further education and training programs…"
Diavik	"Diavik initiatives would contribute to the development of able and skilled employees, the support and encouragement of future employees, and the reduction of employment barriers. Through proposed education and training initiatives, opportunities for all northerners would increase..."
Business	
BHP	" … exploration activity has allowed businesses to start the expansion required to adequately service an expanded northern mining industry, and has added to the local supply of service and retail operations… Positive impacts far outweigh negative impacts in Yellowknife, since a project such as the NWT Diamonds Project is needed if Yellowknife is to continue to grow and prosper."
	"On the economic side, the impacts [for First Nations communities] would be positive. Increased dollars in the economy could foster the expansion of existing businesses or the start-up of new businesses, particularly in the retail and personal services area. In turn this could generate more employment and wage income."
De Beers	"If financial and human resources are spent in the community to provide basic education and skills training, but no support is provided to use these skills for local business initiatives… economic development at the community level will not occur."
	"Given that the mine is a major development project, it is expected to be a catalyst for benefiting Aboriginal and northern business."

Diavik	"Tourism services and infrastructure may improve and expand, particularly in the smaller Dene, Métis and Inuit study area communities…"
	"… initiatives could result in the expansion of existing businesses, the creation of new businesses…"
	"Use of the rail system to transport goods and fuel will have a positive affect… its continued use would enhance Hay River and Enterprise as northern gateway communities."
	"Anticipated increases in economic activity should stimulate local economies and support their development."
Net Effect on Government	
BHP	"Annual costs to the federal and territorial governments due mainly to the 1,000 people moving to the NWT as a result of the NWT Diamonds Project are expected to be $4 million and $10 million, respectively. Offsetting these costs is a potential $3 million annual savings in social assistance and subsidy payments as a result of increased employment…"
De Beers	"If many individuals and families are coping poorly with the adjustments, the demands for rigorous and relevant support services will increase."
Diavik	"Other benefits of the proposed Project would include a reduction in government expenditures due to a fall in social assistance and unemployment payments."
Sustainable Development	
Secondary Industry	
BHP	"… final cleaning and sorting of rough diamonds … is most likely to be Antwerp in Belgium."
De Beers	During the environmental assessment of the De Beers Snap Lake Project, De Beers indicated that it would support GNWT efforts to develop a secondary industry.

Credit: Rashaad Bhamjee

Appendix B

Industrial, Social & Political Events

Date	Event
Oct 1996	The GNWT signed an SEA with BHP Billiton for the Ekati Project.
1997	Royal Oak Mines laid off about 40 workers at Giant Mine.
1997 - 2003	Miramar Con Mine laid off about 120 workers.
	Licences were issued for oil and gas exploration. This started with the Sahtu in 1997, then Fort Liard and the Beaufort Delta Region. The size of rights issued increased as each new area was opened for exploration.
Jan 1997	Policy changes called "Productive Choices" took effect and changed how and to whom income assistance is given.
	Ekati Mine construction began.
Dec 1997	Royal Oak Mines closed Colomac Mine.
Jan 1998	Lupin Mine (Nunavut) entered care and maintenance status, laying off about 500 workers.
May 1998	Miramar Con Mine halted operations in labour strike.
Oct 1998	Ekati Mine began commercial operations.
	NWT Child and Family Services Act came into effect. The number of children receiving services may have increased due to this Act. The new Act created a plan of care agreement as a new way to provide services to children. Under a plan of care agreement, children could still be living in their parents' home but receive services from the Department of Health and Social Services. This was not an option under the old Act. Since the new Act came into force, parents have been more inclined to seek services for their children or family, now that they do not have to give up parental rights. Since the new Act, most of the increase in children receiving services has been from children who are living at home. Of these, most service agreements were voluntary, not court-ordered.
1999	Royal Oak Mines entered receivership. Mine transferred to AANDC.
Feb 1999	BHP sorting and valuation facility opened in Yellowknife.
Apr 1999	Territory of Nunavut created.
Jun 1999	Sirius Diamonds opened a cutting and polishing facility in Yellowknife.
Jul 1999	Miramar's Con Mine labour strike ended and operations resumed.
Oct 1999	The GNWT signed an SEA with Diavik Diamond Mines for the Diavik Project.
2000	Giant Mine operations began again on a smaller scale, with less than 100 employees.
	A government-wide coordinated effort called Maximizing Northern Employment started. Its purpose was to build partnerships with Aboriginal governments and the private sector.
Mar 2000	Deton'Cho Diamonds opened a cutting and polishing facility in Yellowknife.
Apr 2000	Lupin Mine operations began again with a smaller workforce.
Dec 2000	Diavik construction began.
	Arslanian Cutting Works opened a cutting and polishing facility in Yellowknife.
Early 2002	Ekati Mine opened Koala North pit for underground mining.
2003	Tiffany & Co. opened a cutting and polishing facility in Yellowknife under the name Laurelton Diamonds.
Jan 2003	Diavik Mine started production.
Apr 2003	Federal *Youth Criminal Justice Act* came into effect.
Aug 2003	Operations suspended at Lupin Mine (Nunavut), affected about 305 employees.
Nov 2003	Miramar closed Con Mine.
Apr 2004	NWT *Youth Justice Act* came into effect.

May 2004	The GNWT signed an SEA with De Beers Canada for the Snap Lake Project.
Feb 2005	De Beers Canada began construction of Snap Lake Diamond Mine.
Apr 2005	NWT *Protection Against Family Violence Act* came into effect.
Aug 2005	Tłı̨chǫ Land Claim and Self-Government Agreement effective date.
Early 2006	Ekati Mine opened Panda pit for underground mining.
May 2006	Canada Dene Diamonds closed.
2007	A new model for income assistance was created.
Jan 2007	The GNWT signed an SEA with Imperial Oil Resources Ventures, ConocoPhillips Canada, and Shell Canada Energy for the Mackenzie Gas Project.
Oct 2007	De Beers Snap Lake Mine officially opened.
Late 2007	Ekati Mine opened Koala pit for underground mining.
Jun 2008	De Beers Snap Lake Mine began commercial operations.
Oct 2008	Crossworks Manufacturing Ltd. opened a diamond processing factory in Yellowknife.
Nov 2008	GNWT Ministers of Education, Culture and Employment and ITI, and representatives from BHP, Diavik and De Beers signed a Memorandum of Understanding to address Northern workforce attraction and retention issues.
Late 2008	Global credit crunch and economic downturn occurred. A number of projects and contracts are postponed or cancelled. Job losses increased.
Early 2009	Global economic downturn led to reduced demand for diamonds. In response, Diavik and De Beers each planned two six-week temporary shutdowns in the summer and winter. Only the summer shutdown took place for each mine.
Nov 2009	Diavik announced plans to hire 150 new employees. Soon afterward, De Beers announced plans to hire 175 new employees.
Dec 2009	Arslanian Cutting Works and Polar Bear Diamond Factory closed.
Apr 2010	Responsibility for the Public Housing Rental subsidy program was transferred back to the NWTHC from the Department of Education, Culture and Employment.
Aug 2011	The GNWT signed an SEA with Canadian Zinc for the Prairie Creek Project.
Late 2012	Sale of the Ekati diamond mine from BHP Billiton Canada Inc. to Dominion Diamond Mines Corporation, a wholly-owned subsidiary of Harry Winston Diamond Mines Corporation was announced, with transfer of ownership to be completed in 2013.
Jan 2013	Mackenzie Valley Environmental Impact Review Board (MVEIRB) released its Report on the proposed Fortune NICO project. The Report included a requirement for Fortune to enter into a SEA with the GNWT for the NICO project.
Jun 2013	The GNWT signed a SEA with De Beers Canada for the Gahcho Kue project.
Jul 2013	The MVEIRB released its Report for the proposed Gahcho Kue project. The Report referenced the completed SEA between De Beers and the GNWT and stated that the SEA should satisfy the need for a socio-economic follow-up program for the Gahcho Kue project.
	MVEIRB released its Report for the proposed Avalon Nechalacho project. The Report included a requirement for Avalon to enter into a SEA with the GNWT for the Nechalacho project.
2015	Snap Lake Mine water license extended.
Dec 2015	Snap Lake Mine goes under care and maintenence citing a downturn in the cost of diamonds as well as technical difficulties mining the property

The GNWT takes no responsibility for financial losses suffered
as a result of reliance on the information in this report.

Communities and Diamonds

2015 **Annual Report** of the Government of the Northwest Territories under the Ekati, Diavik and Snap Lake Socio-Economic Agreements

Government of
Northwest Territories

Les collectivités et les **diamants**

Rapport annuel 2015 du gouvernement des Territoires du Nord-Ouest dans le cadre des accords socio-économiques liés aux projets d'Ekati, de Diavik et de Snap Lake

PRÉPARÉ PAR :
Industrie, Tourisme et Investissement
Éducation, Culture et Formation
Finances
Santé et Services sociaux
Justice
Bureau de la statistique des TNO
Société d'habitation des TNO

Gouvernement des
Territoires du Nord-Ouest

To request this complete document in French please call the Department of Industry, Tourism and Investment at 867-767-9204.

Si vous souhaitez obtenir le présent document en français dans son intégralité, communiquez avec le ministère de l'Industrie, du Tourisme et de l'Investissement en composant le 867-767-9204.

Résumé

Le rapport annuel sur les collectivités et les diamants est en partie produit pour honorer les engagements pris par le gouvernement des Territoires du Nord-Ouest (GTNO) dans le cadre des accords socio-économiques conclus avec les sociétés minières actives aux Territoires du Nord-Ouest (TNO). Les TNO comptent actuellement deux mines en exploitation, une mine en construction et une mine en phase d'entretien post-exploitation. Les mines exploitées sont la mine de diamants Ekati de la Dominion Diamond Corporation et la mine de diamants Diavik. La mine de Gahcho Kué est en construction et la mine Snap Lake, qui appartient à De Beers, est en phase d'entretien post-exploitation depuis décembre 2015.

Le présent rapport vise à établir si l'activité minière a des répercussions sur les résidents de Yellowknife et de sept petites collectivités locales (PCL) des TNO par l'examen d'indicateurs de changements socio-économiques suivis depuis 1996, année où a débuté la construction de la première mine, Ekati. Les sept PCL sont Behchoko, Dettah, Gamètì, Łutselk'e, Ndilo, Wekweètì et Whatì. Le rapport examine les données sous l'angle des cinq volets du cadre de la Politique du GTNO sur le développement durable, soit :

1. le bien-être des collectivités, des familles et des personnes;
2. l'épanouissement culturel et l'économie traditionnelle;
3. l'économie non traditionnelle;
4. l'effet net sur le gouvernement;
5. le développement durable en soi.

Le rapport de 2015 sur les collectivités et les diamants souligne que, de façon générale, l'industrie minière a créé des emplois et des débouchés économiques pour les entreprises et les résidents partout aux TNO. Depuis le début de la construction d'Ekati, les emplois sont plus nombreux, les résidents dépendent moins de l'aide au revenu, les niveaux d'instruction ont augmenté et les entreprises profitent d'importantes retombées. Bien qu'il reste des défis à relever, le rapport donne un aperçu des secteurs où les gains réalisés profitent aux collectivités ténoises. Parmi les avantages constatés à la fois à Yellowknife et dans les sept PCL sous l'angle du bien-être des collectivités, des familles et des personnes figuraient une baisse du taux de natalité chez les adolescentes, une diminution des blessures et des empoisonnements ainsi qu'une réduction des cas de tuberculose. La ville de Yellowknife a également vu augmenter les ménages propriétaires sur son territoire, alors que les PCL ont assisté à une diminution des ménages ayant des besoins impérieux de logement ou comptant six personnes ou plus. Des répercussions négatives ont aussi été observées à Yellowknife et dans les PCL, soit une hausse des infections transmissibles sexuellement ainsi qu'un accroissement de plusieurs indicateurs de la criminalité. De plus, les années potentielles de vie perdues ont augmenté dans les PCL, de même que le nombre de crimes violents et d'infractions aux lois fédérales, ce qui n'est pas le cas à Yellowknife.

Les indicateurs relatifs à l'épanouissement culturel et à l'économie traditionnelle n'ont pas changé à Yellowknife, alors que les PCL ont enregistré une hausse du nombre de chasseurs et de pêcheurs, mais une diminution de résidents s'exprimant dans les langues autochtones.

Du côté de l'économie non traditionnelle, des améliorations ont été notées quant au revenu moyen et aux niveaux d'instruction, et ce, à la fois à Yellowknife et dans les PCL. La ville de Yellowknife a dû composer avec un recul de l'emploi et de la participation à la vie active, contrairement aux PCL dans ces catégories. Par ailleurs, les PCL ont bénéficié d'une réduction de la dépendance à l'aide au revenu ainsi que des taux de chômage.

L'effet net sur le gouvernement s'est traduit par une hausse de la demande de programmes et de services gouvernementaux. Mentionnons, entre autres, l'ajout et l'entretien accru d'éléments d'infrastructure (p. ex. routes), l'adoption de mesures pour atténuer l'intensification du stress social attribuable au développement et à la croissance du revenu, l'obligation de suivre les effets sur l'environnement et le besoin d'investir dans des domaines comme la formation pour mieux outiller les Ténois, afin qu'ils obtiennent des emplois et répondent à la demande des entreprises. Pour s'adapter à ces répercussions, le GTNO procède à des investissements stratégiques qui l'aideront à profiter des retombées de l'exploitation et à atténuer les répercussions négatives. En outre, la mise en valeur des ressources injecte des fonds dans l'économie ténoise par l'impôt foncier, les taxes sur les carburants et l'impôt sur le revenu des sociétés que paient les mines. En 2015, le GTNO a partagé avec les gouvernements autochtones 50 % des redevances générées par les mines de diamants.

Les collectivités et les diamants

Rapport annuel 2015 du gouvernement des Territoires du Nord-Ouest dans le cadre des accords socio-économiques liés aux projets d'Ekati, de Diavik et de Snap Lake

Gouvernement des
Territoires du Nord-Ouest

ADDENDUM APPENDIX V8-3D: MEASURING SUCCESS 2014: NWT DIAMOND MINES CONTINUE TO CREATE BENEFITS (NEW)

NWT & NUNAVUT CHAMBER OF MINES

Measuring Success 2014: NWT Diamond Mines Continue to Create Benefits

The Positive Impact of Diamond Mining in the Northwest Territories – 1998-2013

Compiled by the NWT & Nunavut Chamber of Mines
November 2014

Measuring Success 2014

NWT Diamond Mines Continue to Create Benefits

Table of Contents

Highlights 2
Introduction 3
Proviso 3
NWT Diamond Production Value Down 4
But NWT Diamond Mining Benefits Continue to Be Strong 5
Employment continues to exceed original commitments 5
Committed to working safely 6
Training investment continues 6
Scholarships are supporting higher education 7
Northern business spending is robust 8
Payments to public governments 9
Diamond royalties shared with Aboriginal groups 10
Strong community payments and investments 11
Research contributions 12
Future Diamond Mining Opportunities & Benefits 13
Near-term, opportunities are projected to grow 13
Long term, opportunities are less clear 14
Barriers to Future Success 16
What We Are Doing 17
Conclusion 18

Measuring Success 2014

– NWT Diamond Mines Continue to Create Benefits –

This document provides information on the opportunities and benefits created by the NWT diamond mines. It is an update to the *Measuring Success 2013* report issued in January 2013, and incorporates additional data for the mines' efforts during 2013.

The information contained in this short report may not be exhaustive and the Chamber of Mines accepts full responsibility for any errors or omissions.

Highlights

- **Employment**
  - Initial predicted total mine employment was 1,826 workers
  - In 2013, total employment was 3,109 workers
  - Predicted northern employment in 2013 was 1,138 was but actual employment was 1,430, exceeding Initial predictions by 26%
  - Of the 1,430 northern workforce in 2013, 752 or 53% was Aboriginal
  - Total employment since 1996 is just under 44,000 person years of which 50% is northern, and half of the northern is Aboriginal
- **Training and education investment**
  - Industry has supported Mine Training Society programs with $16.7 million in cash and in-kind investments between 2004 and 2014
  - In total, 2,796 people have been assessed for training by the Mine Training Society between 2004 and October 2014, of whom 2,149 have received training or other support
  - In 2013, the mines reported they employed 69 apprentices
  - Nearly $464,000 was awarded by all three mines in scholarships in 2013
- **Business spending**
  - Mines spent $943 million in 2013. Of this, $621 million (66%) was with northern businesses, and $248 million (26%) was with Aboriginal business
  - Total spending to date to construct and operate the mines is $14.8 billion
  - Northern business spending to date is $10.6 billion (72%) of which $4.8 billion (32%) is with Aboriginal businesses
- **Community contributions**
  - During the period 2012-13, the three diamond mines provided approximately $23 million through various contributions to communities
- **Safety**
  - The diamond mines continue to set high standards for mine safety and their strong safety performance has made significant impacts on the safety culture not only within their organizations but also with many other businesses involved in their operations.

Measuring Success 2014

– NWT Diamond Mines Continue to Create Benefits –

Introduction

In January 2013, the NWT & Nunavut Chamber of Mines and its member companies prepared a report describing the positive impact on the Northwest Territories of the diamond mining industry.

This document, *Measuring Success 2014,* includes new data for the mines' efforts during 2013.

Measuring Success 2014 describes the combined benefit of over two decades of diamond exploration and mining, including:

- Increased skills base and capacity in our northern residents;
- Several thousand well-paying, meaningful jobs that have contributed to federal and territorial taxes, community growth, and healthy and stable families;
- Strong safety performance at the mine sites;
- Northern and Aboriginal businesses with proven ability to provide competitive mining services;
- Support for a resurgence in cultural activities, particularly hand games, through donations and sponsorships from the mines; and,
- Research and knowledge advancements as monitoring programs developed for and supported by the mining companies continues to expand our understanding of the northern ecosystem.

These benefits and more help confirm why the diamond mines are the largest single private sector contributor to the Northwest Territories economy, and the economies of many northern communities.

Proviso

The information contained in this short report may not be exhaustive. The Chamber of Mines accepts full responsibility for any errors or omissions.

For a more fulsome description of the mines' efforts and successes in meeting their socio-economic commitment, readers are advised to peruse each of the annual or semi-annual socio-economic reports that the mines submit to the NWT Government. These are available on their websites below.

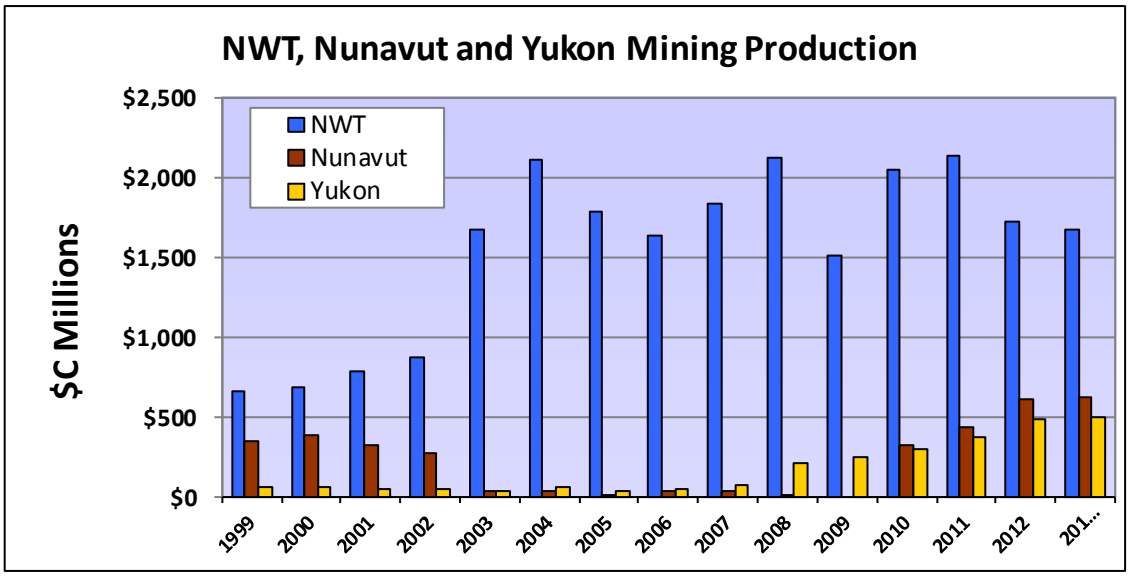
- Diavik Mine: www.diavik.ca
- Ekati Mine: www.ddcorp.ca
- Snap Lake Mine: www.canada.debeersgroup.com/

Additional sources of information can be found here:

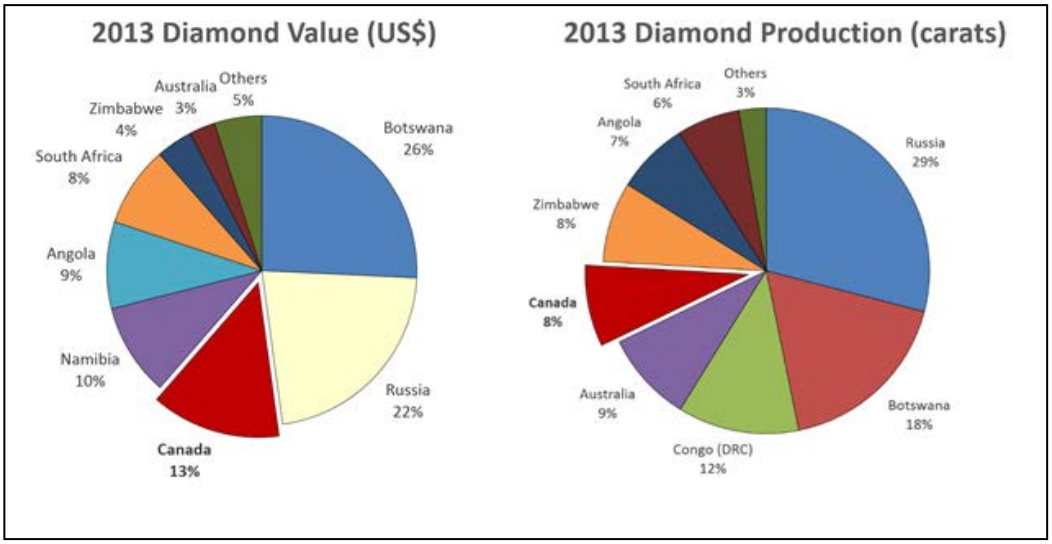
- Measuring Success 2013
- NWT & Nunavut Chamber of Mines website: www.miningnorth.com

NWT Diamond Production Value Down

The amount of diamonds produced by the NWT mines has been relatively continuous over the past three years at just under 10 million carats per year. The value of NWT diamond production dropped slightly in 2013. Natural Resources Canada data (chart below) projects the value of 2013 diamond production at $1.56 billion from sales of 9.9 million carats, compared to slightly higher $1.63 billion from slightly less production (9.8 million carats) in 2012. These are significant drops from the $2.1 billion in sales received from about the same weight of carats (9.95 million carats) sold in 2011 before.



Although the value of NWT production has dropped, the NWT (and Canada) continues to maintain its place as the third most valuable global diamond producer, according to Kimberley Process statistics (see chart below), a position it also held the previous year.



But NWT Diamond Mining Benefits Continue to Be Strong

Despite the declining proceeds from diamond sales, benefits from the NWT diamond mines continue to be strong, in all areas including people, business, government, and knowledge.

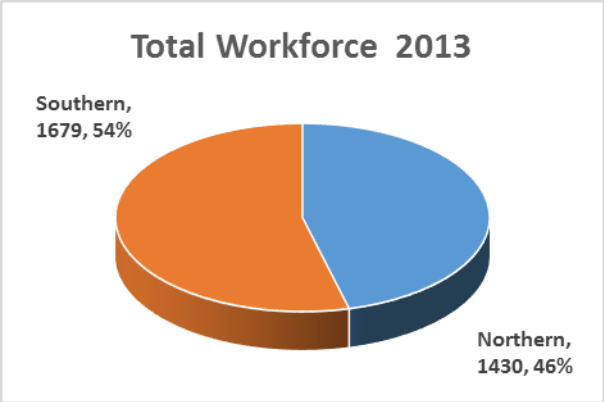
Employment continues to exceed original commitments

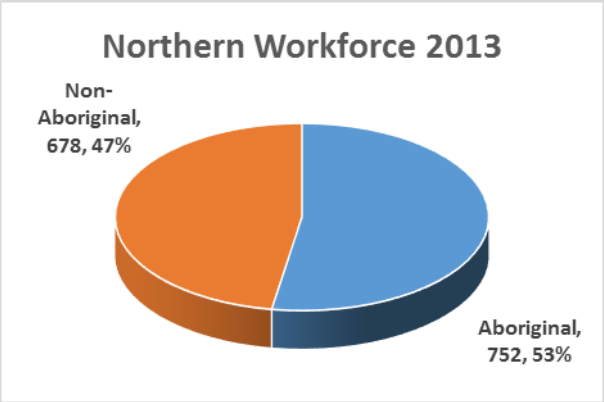
Diamond mining jobs continue to be a significant contributor to the NWT's economy. In 2013, the three mines employed 1,430 northern workers, of whom 752 (52%) were Aboriginal. The northern workforce represented 46% of the total workforce of 3,109. The total number of northerners employed at Ekati, Diavik and Snap Lake Mines in 2014 continues to exceed predictions made during the mines' environmental assessments by 292 workers (table below). Total employment since 1996 is just under 44,000 person-years of which 50% is northern, and half of the northern is Aboriginal.

2013 NWT Diamond Mine Employment – Actual vs Predictions

Mine	Predicted Total Workforce	Actual Workforce (Dec. 2013)*	Predicted Northern Workforce	Actual Northern Workforce*	Difference (Actual Northern vs Predictions)
Ekati	926	1,336	574	671 (50%)	+ 97
Diavik	400	997	264	485 (49%)	+ 221
Snap Lake	500	776	300	274 (35%)	- 26
Predicted Total	1,826	3,109	1,138	1,430 (46%)	+ 292

*Reported in person-years





2013 NWT Diamond Mine Employment – Northern & Aboriginal*

Mine	Northern Aboriginal			Total Northern			Total Workforce*
	Achieved		Committed	Achieved		Committed	
Ekati	377	28%	31%	671	50%	62% / 72%	1,336
Diavik**	236	24%	40%	485	49%	66%	997
Snap Lake	139	18%	n/a	274	35%	n/a	776
Total	**752**	24%	**n/a**	**1,430**	46%	n/a	**3,109**

*Reported in person-years
**Total Aboriginal employment

Committed to working safely

Our success story includes our shared commitment to mining diamonds safely, securely and profitably, without harm to our people.

Diavik has won four regional John T. Ryan Safety Awards and one national John T. Ryan Safety Award since 2004, and in 2010 recorded 3 million hours without a lost time injury.

Snap Lake Mine achieved one million hours without a lost time injury in October of 2013 and was John T. Ryan Regional Award winner for 2009 and 2013.

Ekati diamond mine won the national John T. Ryan Award in 2007 for the best safety performance in the Select Mine Category in recognition of over 2 million hours without a lost time injury and in 2011 achieved 1.3 million hours without a lost time injury.

Our mine rescue teams compete annually in friendly competitions hosted by the Workers Safety and Compensation Commission. Our mine rescue teams also compete at the regional and teams from the Ekati and Diavik mines competed at the international level. This test of skills and abilities demonstrates our commitments to safety excellence in a public arena.

Our collective approach to working safely has made a significant impact on the safety culture within our organizations but also with many other businesses and organizations involved in our operations. We believe that these safety standards will continue to rise as a result of our presence in the North.

Training investment continues

All three mining companies remain committed to training and supporting the development of the next generation of northern mining workers.

Much has been accomplished in cooperation with various training agencies, especially the Mine Training Society (MTS) of the NWT. Of the $33.7 million provided to MTS by various levels of government since 2004, $32.2 million went to support training for mine operation and mine service positions. Our industry has also supported MTS programs, with $16.7 million in cash and in-kind investments between 2004 and 2014.

That investment has resulted in 1,074 northern residents, of whom 1050 are Aboriginal residents, gaining employment. In total, 2796 people have been assessed for training by the MTS between 2004 and October 30, 2014, of whom 2149 have received training or other supports.

Through *Mining the Future*, the MTS has targeted training in a number of areas: Mineral Process Operating Technician; Camp Cook; Cook Apprenticeship; Heavy Equipment Operator; Geoscience Field Assistant; Introduction to Underground Mining; Underground Mining; and General Construction. Most recently, the MTS has undertaken a series of “Safety Boot Camps” designed with the input of industry. Focusing on Safety Leadership, as well as Fall Protection, Lock Out and Tag procedures and Confined Space Entry, the program meets or exceeds Canadian Safety Standards. In addition to specific job skills, each program will include life skills training to help participants settle into employment and be able to balance home and work life.

The training plan estimates that *Mining the Future* will assess the suitability for training of 400 Aboriginal persons, assist 250 Aboriginal applicants with removing barriers to employment (criminal records, lack of skills, low literacy), train 270 people and assist 270 participants in obtaining employment with mining and mine services companies in the NWT. The targets have been either exceeded or being

met. Under the *Mining the Future* project, the MTS has assessed 623 people for suitability, provided training or supports for 526 and has assisted 221 people attaching to the workforce.

Our industry partners have also been generous in the support of bridge financing for 2012 and 2013 to sustain the Mine Training Society programs until the Government of Canada makes its decision on the *Mining the Future* proposal and *Pan Territorial Northern Minerals Workforce Development Strategy*. These partnerships are essential for the continued training and development of Northerners.

All three diamond mines continue to support training provided through the Mine Training Society with annual cash and in-kind contributions. In addition, students from the Underground Miner Training Program and Mineral Process Operator Training Program are provided paid term training positions at the mines and many are hired into full-time positions.

In addition, all three mines invest significantly in their workforce to advance the skill base.

Apprenticeship positions continued to increase at the mines, increasing trade certifications.

At the Ekati mine, 162 people have been hired into apprenticeship positions since 1998, working for either Dominion Diamond or one of their contractor companies. In 2013, there were 35 apprentices working at the Ekati Diamond Mine: 15 for Dominion Diamond and 20 for on-site contractors. Of the 35 positions, 21 were northern Aboriginal. In 2014, Ekati revamped its apprenticeship program and increased their Apprenticeship positions for Dominion Diamond employees to 24.

At the Diavik mine, 35 apprentices have become certified journeypersons since operations began in 2003. In 2013, the Diavik mine employed 27 apprentices; all are northern and 14 are Aboriginal. In addition, 46 Diavik employees achieved Mining Industry Human Resources Canada (MiHR) underground miner certifications, and 50 employees achieved MiHR mineral processor certifications. Diavik served as a pilot site for this national underground miner certification program and continues its support of MiHR programs.

At Snap Lake mine, De Beers has provided training opportunities to 92 NWT residents through the end of 2013. In 2013, the De Beers employed 7 apprentices at its Snap Lake mine, all of whom are Aboriginal. To date, 39 trainees have completed their programs at Snap Lake, earning trades certification or journeyperson status, or moving into higher levels as underground miners. Approximately 25 process plant and underground miners have been certified under the MiHR certification program.

Scholarships are supporting higher education

The mines invest significantly to support higher education.

In 2013, the three companies provided nearly $464,000 in scholarships under a variety of banners including Impact Benefit or Participation Agreement beneficiaries, Socio-Economic Agreement commitments, employee dependants, special post-secondary scholarship and sponsorships, and to non-IBA Agreement recipients.

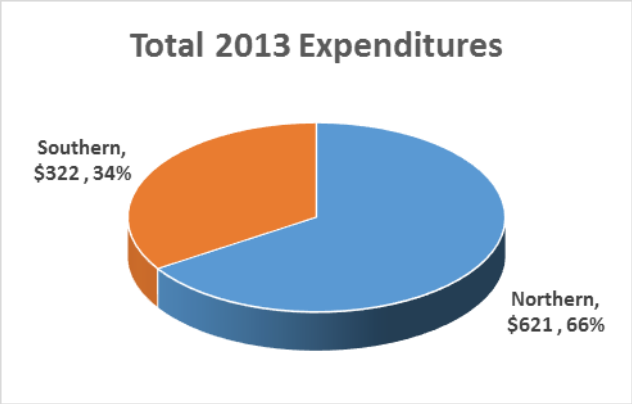
Details of 2013 scholarships include:

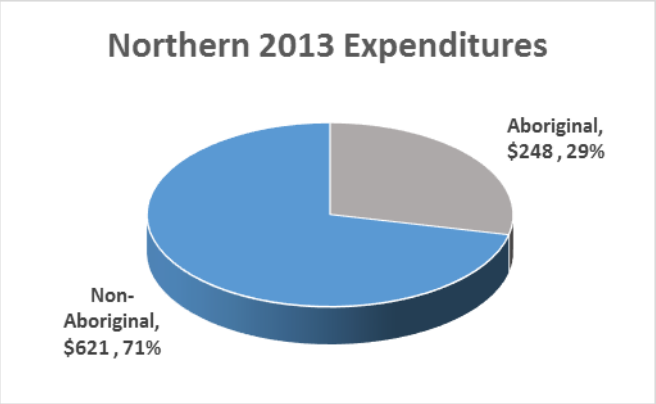
- Ekati awarded $133,309 in scholarships through Dependant Scholarships, IBA Scholarships, and Socio-Economic Agreement Scholarships;
- Diavik funding for Participation Agreement and other scholarships was $274,347;
- De Beers provided $56,000 in scholarships through Impact Benefit Agreements, its annual NWT Post-Secondary Scholarship program, and one NWT Post-Secondary Sponsorship.

Northern business spending is robust

Northern business spending continues to be robust. The mines spent $943 million in 2013, of which $621 million was with northern businesses. Of the northern business, $248 million was spent through Aboriginal firms.

2013 NWT Diamond Mine Purchasing ($ million)							
	Northern Aboriginal			Total Northern			Total North plus South
	Achieved		Committed	Achieved		Committed	
Ekati	$88	22%	n/a	$245	62%	70%	$394
Diavik	$116	32%	n/a	$261	72%	70%	$362
Snap Lake	$44	24%	n/a	$115	61%	70%	$187
TOTAL	**$ 248**	**26%**	**n/a**	**$ 621**	**66%**	**n/a**	**$ 943**





This brings the total combined spending to date to construct and operate the three diamond mines at nearly $15 billion. Of this, over $10.6 billion (73%) was spent with northern companies and joint ventures, including $4.8 billion (33%) with Aboriginal companies.

1996-2013 NWT Diamond Mine Purchasing ($ million)							
	Northern Aboriginal			Total Northern			Total North plus South
	Achieved		Committed	Achieved		Committed	
Ekati	$1,602	25%	n/a	$4,683	73%	70%	$6,423
Diavik	$2,403	38%	n/a	$4,533	72%	70%	$6,337
Snap Lake	$813	39%	n/a	$1,437	69%	70%	$2,081
TOTAL	**$4,818**	**33%**	**n/a**	**$10,653**	**73%**	**n/a**	**$14,841**

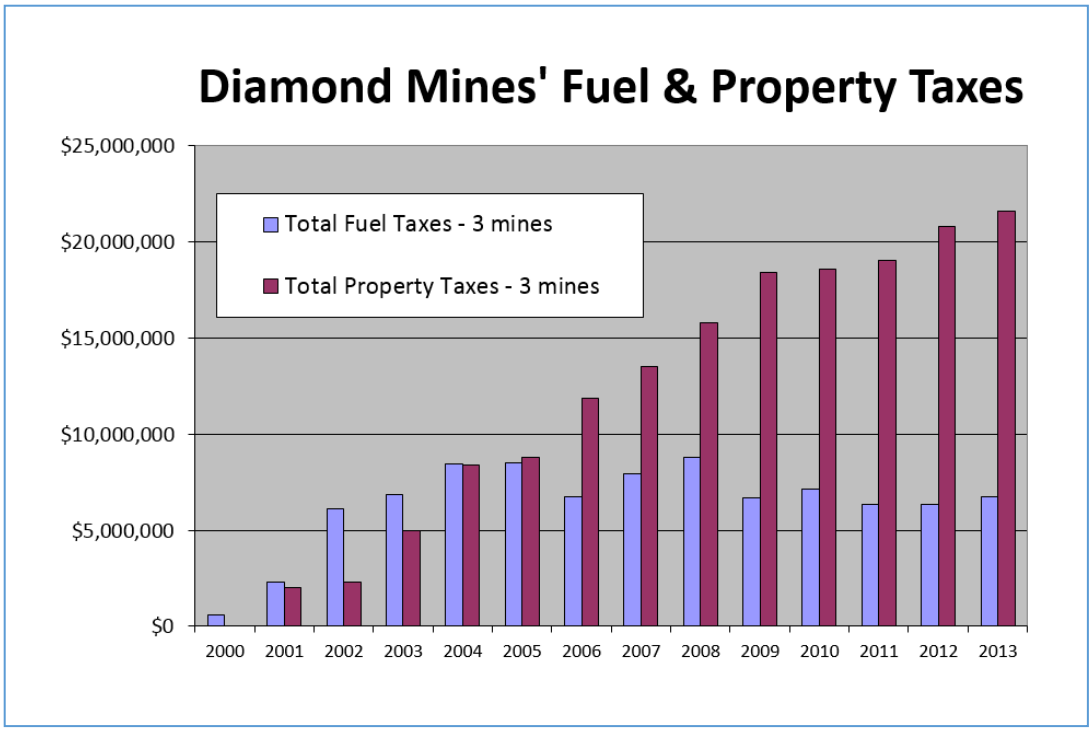
Payments to public governments

Besides the value of income tax generated through mine workers, the GNWT also benefits from direct taxation and now with devolution, will benefit from resource royalties.

In addition, there a number of additional taxes paid, including payroll taxes, bridge tolls, property, and fuel taxes. The latter two are detailed below.

Property & Fuel Taxes

Mines in the NWT pay taxes to the NWT Government on fuel consumed at the mine sites, and they pay property taxes assessed on the value of their mine site assets. Since 2000, the three mines have collectively paid over $89 million in fuel taxes and over $165 million in property taxes (chart below). The three existing diamond mines are projected to pay similar amounts to the end of their expected mine lives.

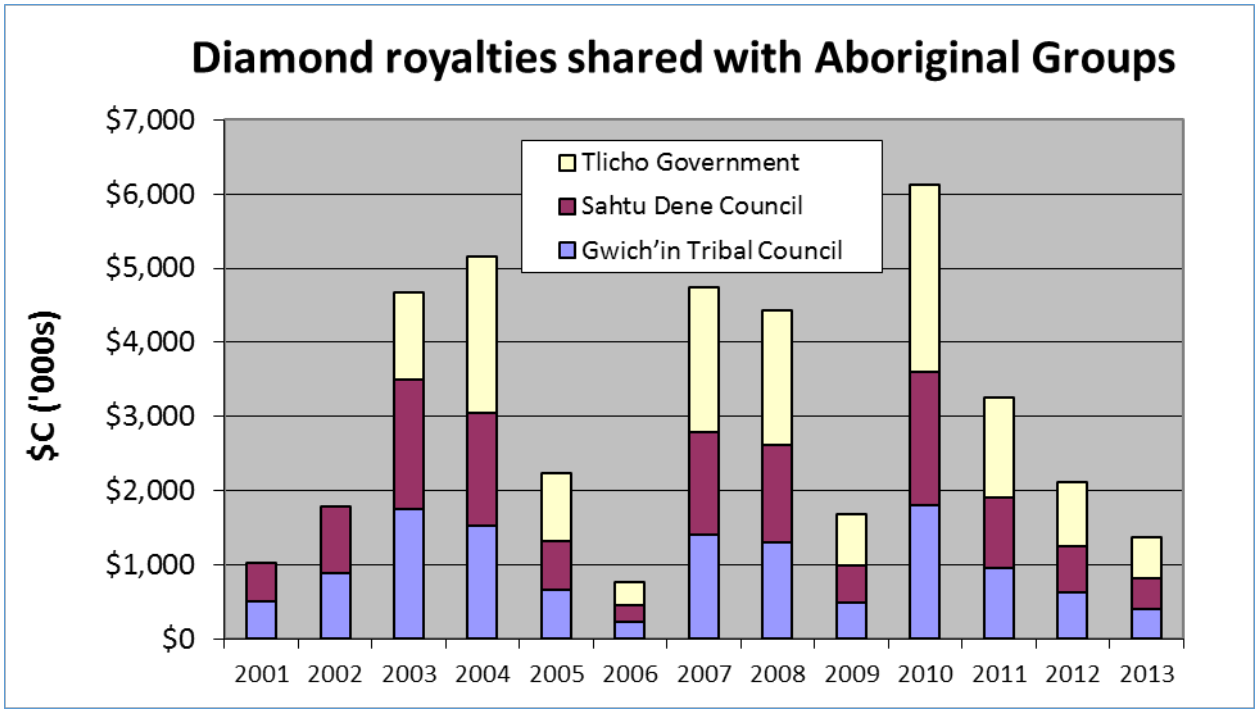


Diamond royalties shared with Aboriginal groups

Under the terms of the Gwich'in, Sahtu and Tlicho land claim agreements, each of these groups negotiated a share of royalties generated by the non-renewable resource industries in the Northwest Territories.

To date, $39 million of diamond royalties have been shared with the three Aboriginal groups, with the Gwich'in and Sahtu receiving over $12 million and the Tlicho over $14 million.

Royalty sharing with Aboriginal groups will be increasing as the NWT Government has committed to share 25% of the royalties they collect with Aboriginal signatories to the Devolution Agreement.



Strong community payments and investments

There has also been significant spending by the companies to support communities through social investment, including Participation and Impact Benefit Agreement payments, investments in community cultural programs and events, in healthy communities programs, and in scholarships.

During the period 2012-13, the three diamond mines provided approximately $23 million to communities. A variety of community organizations benefited from support provided by the diamond mining companies, including:

• Hay River Play School • Yellowknives Dene First Nation Career Fair • SideDoor Youth Centre • Aboriginal Sport Circle Annual Charity Golf Tournament • Yellowknife Community Foundation • Community Gov't of Gameti • Aven - Seniors • Behchoko Presence Office • Tree of Peace • Wekweeti Presence Office • Community of Wha Ti • RCMP Charity Golf • Yellowknife Family Center • Yellowknives Dene First Nation • Yellowknives Dene First Nation truck donation • CNIB Golf Tournament • Lutsel K'e Dene First Nation spring carnival • Open Sky Festival • Yellowknife Community Foundation • Bosco Homes • Hay River Health and Social Services - Supportive Services • Actua science camp in Lutsel K'e • Behchoko Youth Handgames • NWT Track and Field Championships • Hay River Women Hockey • Yellowknives Dene First Nation summer program • Yellowknife Community Foundation • Snowking Winter Festival • Yellowknife Community Foundation • NWT SPCA Raffle • Stanton Territorial Hospital Foundation • Yellowknives Dene First Nation Diavik Week • North Slave Metis Alliance Annual Fish Fry • Yellowknife Community Foundation • Deninu School • Lutsel K'e Dene First Nation annual spiritual gathering • Tlicho Annual Gathering • Yellowknife Seniors Society • Financial Literacy Training Program • Kimberlite Career and Technical Institute • Northern Student Education Initiative • Lutsel K'e Dene First Nation traditional knowledge archive project • Yellowknife Marine Rescue Society • Weledeh Catholic School • Actua science camp • Diavik 150 • Mine Training Society • Hay River Lights On program • Native Women's Association of the NWT • New Chemotherapy Suite planned at Stanton Territorial Hospital • New computers for Deninu School, Fort Resolution • United Way of the NWT • NWT Heritage Fair Society •Akaitcho Territory • Traditional Activities • Alexis Arrowmaker School, Wekweeti • Army Cadets • Aurora College's Literacy Outreach Centre • Aven Manor Silent Auction (In-Kind) • BETTY House (Lynn's Place) – Yellowknife Homelessness Coalition • Bosco Homes • Breakfast for Learning, NWT • Canadian National Institute for the Blind • Champions for Children KidSport • Chief Jimmy Bruneau School, Behchoko • City of Yellowknife, Bike Rodeo • CJCD Christmas Hampers • Elizabeth Mackenzie Elementary School, Behchoko • Food Rescue • Habitat for Humanity • Jean Wetrade School, Gameti • Jimmy Hikok Elementary School, Kugluktuk • Kalemi Dene School, Ndilo • Katldodeeche First Nation – Tanning Hide (In-Kind) • Kaw Tay Whee School, Dettah • Kugluktuk High School • Lutsel K'e Dene School • Mezi Community School, Whati • NACC – Storytelling Festival • Northern Youth Abroad • Northern Youth Leadership Society • NSMA – Aboriginal Day Celebration • NWT & NU Chamber of Mines Geoscience Forum • NWT Track & Field • Skills Canada NWT • Snow King Festival • Stanton Territorial Hospital Foundation – Festival of Giving • Team Koe – Curling • Tlicho Government – Traditional Activities • Tlicho Recreation – Youth Projects • Tree of Peace – Elder's Christmas (in-Kind) • Western Arctic Moving Pictures Youth Delegate Program •

Research contributions

All three mines invest in environmental and technology research that extends our knowledge reach.

Environment

All three mines have extensive environmental monitoring programs and they support many scientific and traditional knowledge studies that are increasing our knowledge and understanding of a variety of species. Some examples include:

- **Caribou**: the mines continue to support work to learn more about caribou. This included cash contributions of $75,000 each to the GNWT to help fund a variety of caribou studies, including the Bathurst Range Plan and Bathurst Caribou calving surveys. The mines also conducted their own work including traditional knowledge studies and camera monitoring on the Misery Road, and they are participating with government and other stakeholders in the Caribou and Wildlife monitoring workshops.
- **Grizzly Bear** and **Wolverine**: All three mining companies support regional monitoring programs for grizzly and wolverine. Many hundreds of thousand dollars are being invested to employ community monitors and consultants, to distribute hair snag posts to collect samples for DNA analysis, and to provide helicopter and other support services. Ekati leads and runs its own Grizzly Bear DNA program, and baseline programs in 2012-2013 exceeded $500k. Ekati invested another $60k in conducting a wolverine DNA program on its property, which is combined with the GNWT-ENR's program.
- **Wolf**: Ekati contributes $30k annually to GNWT-ENR's wolf study and collaring work.
- **Fish** and **aquatic studies** – some in partnership with universities and others – are providing better understanding of the movement of inland fish in Arctic lakes and various aquatic species that provide new insight into northern aquatic ecosystems.

Technology

Diavik operates the NWT's first large-scale wind farm and the world's largest wind-diesel hybrid power facility. Diavik's investment in a four 9.2 Megawatt turbine wind farm is providing new understanding of the operation of wind turbines in the harsh and remote climate of the Arctic barren lands.

The wind farm began delivering power to the mine's grid in September 2012, and in 2013, it provided 8.5 per cent of the mine's power needs. This reduced the mine's annual diesel fuel requirement by 3.8 million litres, an estimated reduction in emissions of 10,726 tonnes of CO2, and a reduction of Diavik's seasonal winter road fuel haul by approximately 100 loads.

The extreme location of the mine meant a highly innovative design was needed for the turbines, in order to maximize their output in the harsh arctic climate. To deal with winter temperatures as low as -40°C, the blades are equipped with de-icing technology, and represent a new benchmark for wind power in low temperatures.

Future Diamond Mining Opportunities & Benefits

In the near term opportunities arising from our diamond mines look good. Longer term opportunities are less well understood at this time.

Near-term, opportunities are projected to grow

A number of initiatives at the three diamond mines and at the advancing Gahcho Kué project are expected to sustain and even grow opportunities in the near term.

Ekati

Ekati has developments underway on a number of diamond deposits that they hope will keep mining robust until the projected mine closure in 2019, when the ore bodies are depleted.

- The 'pushback' to prepare the open pit for mining of the **Misery Main pipe**.
- Pre-stripping of the **Pigeon deposit** is now underway to prepare for open pit mining.
- The Lynx open pit project which will take advantage of the nearby Misery infrastructure.
- Ekati continues to advance the **Jay Deposit Project** as it represents the long term sustainability of the Ekati Diamond Mine beyond the current mine life of 2019. (For more details see *Long term opportunities*, later in this document.)

Diavik

In 2013, Diavik operated in its first full year as an all underground mine. Ore production exceeded targets, demonstrating that Diavik is now a proven underground mine. Also, in 2013, Diavik continued to examine the feasibility of open-pit mining the **A21 diamond deposit**, located just south of the existing mining operations. Three sampling programs were completed on the A21 kimberlite pipe, which included the initial drill sample, an on-ice drill sampling program, and construction of a 1.2 kilometre decline tunnel. A total of 9,635 carats of rough diamonds were recovered, allowing for accurate pricing predictions. A21 contains a resource of 4.7 million tonnes at a grade of 2.8 carats per tonne. The feasibility study is expected to be complete in 2014, after which Rio Tinto will complete a technical evaluation to determine if A21 development will proceed. Construction of a dike similar to the two constructed to mine three other ore bodies would be required. Mining of A21 Is not expected to add mine life, but would help the mine to maintain its current diamond production.

Snap Lake

De Beers is planning significant capital investment in 2015 to support increased production to improve the sustainability of Snap Lake Mine. This will require the purchase of additional mining equipment, expansion of their power generation and fuel storage capacity, and enhancing water management systems.

Gahcho Kué

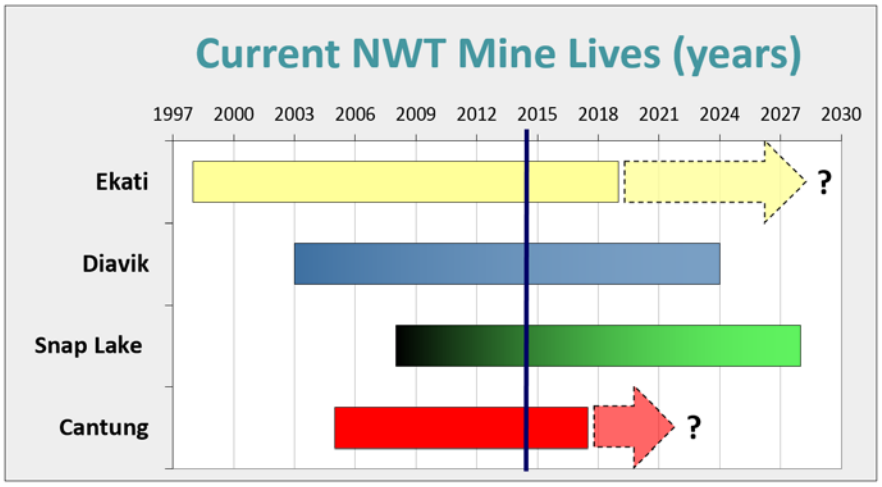
In September, the Gahcho Kué diamond mine project, owned De Beers Canada Inc. and Mountain Province Diamonds received the final licenses required for construction. Construction of the Gahcho Kué mine is expected to require approximately 700 jobs at the peak of its two years of construction. This will be followed by 12 years of mining with an operations workforce of approximately 400 jobs. In 2013, De Beers signed a Socio-Economic Agreement with the Government of the Northwest Territories, which sets NWT employment targets of 25%, or approximately 175 northern jobs during construction and 55%, or approximately 220 jobs during operations. Gahcho Kué will provide for at least 16 trades training positions, 10 apprenticeships and four education sponsorship positions during the life of mine. Already

during early work to prepare the site for a construction decision, approximately 70% of the people hired by De Beers to work at Gahcho Kué were from the NWT.

Long term, opportunities are less clear

Current reserves at each of our mines, coupled with market prices, controls mine lives.

Current mine lives paint a mixed picture for the future (see chart below). Ekati is projected to run out of ore in 2019, Diavik by 2024, Snap Lake in 2028, and Cantung sometime beyond 2017. This will have effects on the NWT economy.



Additional diamond mining opportunities

The addition of Gahcho Kué will add 12 years of production but will not offset the lost benefits from Ekati's projected closure in 2019. The workforce at Ekati is approximately 1,400 workers while the Gahcho Kué workforce is only 400.

Dominion Diamond continues to advance the **Jay Project**, which contains more carats of diamonds than have been mined to date at Ekati. The Jay deposit has the potential to extend Ekati's mine life by over 10 years and represents the future of the Ekati Diamond Mine beyond its current projected mine life of 2019. The timeline to have this project approved is critical as start of production needs to be timed with the completion of mining of the known ore reserves in 2019. Since purchasing the Ekati Mine, Dominion Diamond has worked with its stakeholders through public meetings and workshops to obtain important public input into their plan to extend the life of the mine. An important part of the execution for this project continues to be Ekati's engagement with community, government and regulatory stakeholders. This has helped them create a revised plan to mine the Jay kimberlite pipe with simplified construction and a significant reduction in the overall environmental disturbance of the Project.

Non-diamond mining opportunities

While not shown in the chart, when the Prairie Creek, NICO, and Nechalacho projects become mines, they would require approximately 650 workers. Along with the 400 workers that Gahcho Kué mine would bring, this would provide additional employment opportunities to the North. However, it is important to remember that this combined workforce of just under 1,100 workers would still be insufficient to offset the closure of just the one world-class mine, Ekati, which employs over 1,300 workers. It brings into focus the importance to the NWT economy of not only attracting new opportunities, but also sustaining existing ones, as proposed by Dominion Diamond with their Jay Project.

Mining Project Name (Operator)	Commodity		Expected Jobs
NICO (Fortune Minerals)	Gold, Copper, Cobalt, Bismuth		150
Nechalacho (Avalon Rare Metals)	Rare Earth Metals		286
Prairie Creek (Canadian Zinc)	Silver, Zinc, Lead, Copper		220
Gahcho Kué (De Beers, Mtn. Province)	Diamonds		400
		TOTAL JOBS	~ 1,056
EKATI Mine (closes in 2019)	Diamonds	TOTAL JOBS	± 1,400

Barriers to Future Success

As described in *Measuring Success: 2013* and in this report, diamond mining has made great inroads in creating opportunities and benefits. However, it is not without its challenges. While mining companies are taking actions to help overcome many of them, not all the challenges can be addressed by private industry alone.

Industry is not responsible for social programs. While we support our employees in addressing their personal challenges, it is the government's role to provide quality education and address community-based social issues like alcohol and drug dependency.

Some of the problems existed prior to the opening of the diamond mines and continue to this day:

- Lack of available skilled northern workers due to low literacy. This creates difficulties in training and advancing a greater number of northern employees into senior positions. Literacy and lack of education is most clearly demonstrated by high school students who are unable to pass trades entrance exams, a pre-requisite for apprenticeships. Nearly 50% of Aboriginal residents of the NWT have less than a Grade 12 education;
- Students limited knowledge and technical understanding of our largest industry, so as to have them pursue careers in it;
- Health and wellness issues like addictions, money management and the family pressures that come with adapting to a new work-life balance, which affect family life.

While regulatory certainty is improving through regulatory reform and devolution, there are still regulatory changes to be implemented by Canada. In addition, unsettled land claims in some areas continue to contribute to the barrier of uncertainty.

The high cost of living creates a barrier to enticing skilled southern workers to live and work in the North, and it is contributing to outmigration of workers. Ironically, after we invest in training workers, some are lured away to work in the south where their newfound skills are in high demand.

By taking actions to address these barriers, government can help industry in attracting and retaining the people it needs to grow the north and its economy.

What We Are Doing

Over the past several years, the Northwest Territories population has been declining as fewer people move north, and as northerners – even some long term and Aboriginal northerners – move south.

We have seen this in the mining industry. Since *Measuring Success 2013* was released, the total number of jobs has increased from 3,028 to 3,109. However, actual northern resident jobs have fallen from 1,541 to 1,430. However, mining is not the only area where we see this, and government and the business community are also having to fly workers in from the south on a rotational basis to meet their requirements.

Declining population is a serious concern as it decreases government revenues and community spending that contributes to a more robust NWT economy.

To help address skill drain, the NWT government has announced they wish to attract 2,000 people to the north over the next 5 years. They have opened discussions with the mining industry and business community to seek their assistance.

We must all do our part in addressing challenges to attracting, recruiting and retaining workers if we are to grow the economy. To this end, all three diamond mines remain committed to creating socio-economic opportunities and benefits as specified in their Socio-Economic Agreements, and continue to take steps to help grow a northern workforce:

- Participating in, or sponsor their own career fairs in many communities. In 2013, De Beers took apprentices and trainees from the Snap Lake Mine to Behchoko, Whati, Gameti, Lutsel K'e and N'dilo where students were able to meet and interact with them;
- Providing scholarships to encourage further education. Some, like De Beers education sponsorship, provide three years of financial support totalling $35,000 plus summer employment and a job upon graduation with a degree. Combined diamond mine scholarships have exceeded $300,000 annually;
- Flying workers to and from a variety of home communities. In addition, additional pickup points have been added by some companies. Today, the mines draw workers from Yellowknife (for Behchoko, Ndilo and Dettah), Whati, Gameti, Wekweeti, Lutsel K'e, Fort Smith, Hay River, Fort Simpson, Norman Wells, and Inuvik. We also fly workers in from Kugluktuk and Cambridge Bay in Nunavut;
- Reinvigorating northern and Aboriginal recruitment strategies, which include advertising all positions in northern newspapers and distributing postings to employment officers in several communities;
- Focused recruitment on special projects like Diavik's processed kimberlite containment dam raise project. Northern employment on this construction project was 71 per cent;
- Offering financial incentives to employees to encourage the choice of living in the north, including northern living allowances, fuel purchase plans and/or other competitive incentives;
- Providing financial relocation packages for the recruitment of southern employees who choose to relocate to the NWT;
- Supporting community social and cultural events, helping finance community development projects, and a variety of other community payments have seen a combined investment since 1998 that exceeds $100 million;
- The mines continue to invest millions of dollars with the NWT Mine Training Society partnership, which they helped found. The society continues to develop successful workers through its numerous training initiatives, including underground miner, mineral processor, building trades

helpers, small engine repair and mineral exploration field assistants. Since 2004, the society has assessed approximately 2,800 people for training suitability, provided training or other employment related assistance for over 2300 people, and has facilitated employment for over 1050 people;

- Financing and in-kind support of approximately $6.6 million over three years to the Mine Training Society as part of its Mining the Future proposal, which includes 32 training positions at the Snap Lake Mine and proposed Gahcho Kué Project, 12 training positions at Ekati Diamond Mine and 40 for the Diavik Diamond Mine;
- Offering a variety of Health and Wellness Programs/Initiatives, like Employee Family Assistance Programs (EFAP) to support employees and their families through counseling services, financial management training, work life balance, and substance abuse and addiction;
- Helping Aboriginal employees advance by providing training through Aurora College's Northern Leadership Training Program. In 2013, De Beers had two workers graduate, Diavik graduated 9, and Ekati graduated 6. In 2014, Diavik has 4 employees enrolled in the leadership development program in 2014, and De Beers has one enrolled.
- Dominion Diamond Corporation, strengthened its northern presence by moving its corporate office and sorting facilities from Toronto to Yellowknife. Its purchase of majority ownership of the Ekati diamond mine, combined with its existing 40% ownership of the Diavik mine, has made the 100% Canadian owned and operated company one of the largest firms in the NWT.

In 2009, all three diamond mines conducted an employee survey in partnership with the NWT Government, to better understand what diamond mine employees like and dislike about their current community of residence, factors they consider when thinking about relocation and barriers to moving to the Northwest Territories. The survey was designed to shed light on the residency issues faced by diamond mines and the GNWT.

Another survey of mine workers has now been completed and the NWT Government is currently analysing the data which can inform future actions by government, mining companies, and even communities to capture more northern opportunities and benefits.

Conclusion

The history of the diamond industry in the Northwest Territories has been a positive one. It has come through direct actions by the mining companies, by investments from government and Aboriginal groups, and by partnerships between all three.

In less than a generation, diamond mining has seen thousands of NWT residents trained, with skills that will carry them through long and productive careers in mining or other industries. We have seen billions of dollars spent with Northern companies, enabling them to build a strong foundation to compete anywhere on the globe. We have seen companies contribute substantial amounts to support the social and cultural well-being of people living in communities close by, from literacy and training, to recreation and health facilities, to social initiatives like Bailey House and Lynn's Place.

We are encouraged by the actions of the 17th NWT Legislative Assembly to launch a variety of strategies, including the *Mineral Development Strategy* and other economic and infrastructure strategies, as well as the *NWT Anti-Poverty Strategy*. Such initiatives and, just as importantly, the partnership approach that government is embracing, will help ensure that we grow our minerals industry and that we help prepare our communities and residents to take full advantage of the opportunities that a strong and healthy minerals industry and economy can provide.

A post devolution world demands it.

Produced by the NWT & Nunavut Chamber of Mines

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9. Volume 9 Addenda: Methodology, Effects of Environment on Project, Accidents and Malfunctions

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of Methodology, Effects of Environment on Project, Accidents and Malfunctions, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

Volume 9 includes the General Methodology for Project Effects Assessment, Cumulative Effects Assessment, and Transboundary Effects Assessment (Chapter 1), the Effects of the Environment on the Project (Chapter 2), and Accidents and Malfunctions (Chapter 3).

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines in respect of the new information provided on the topic of Methodology (Guidelines Section 7) and Accidents and Malfunctions (Guidelines Section 8.4) and provided an Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

GENERAL METHODOLOGY FOR PROJECT EFFECTS ASSESSMENT, CUMULATIVE EFFECTS ASSESSMENT, AND TRANSBOUNDARY EFFECTS ASSESSMENT (FEIS VOLUME 9, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

EFFECTS OF ENVIRONMENT ON PROJECT DESIGN (FEIS VOLUME 9, CHAPTER 2)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

ACCIDENTS AND MALFUNCTIONS (FEIS VOLUME 9, CHAPTER 3)

In the Final Hearing Report, the NIRB concluded that there is uncertainty in relation to the emergency preparedness and response regarding the shipping, offloading, and transport over land of bulk fuel. The Board also requested additional information about spill response be applied throughout all Project planning stages. Sabina has prepared new or updated information to address Section 6.2 of the Final Hearing Report. This information can be found in response FHR-NIRB-6.2 under FHR-NIRB-6.2(A) –

Emergency Preparedness and Spill Response Capability for Shipping, Offloading, and Transporting Bulk Fuel.

None of the additional information presented in the FEIS Addendum effects the conclusions presented in Accidents and Malfunctions (FEIS Volume 9, Chapter 3).

APPENDICES (FEIS VOLUME 9)

FEIS Appendix	Title	Summary of Change
Appendix V9-3A	2013 Bathurst Inlet Marine Diesel Fuel Spill Modelling Report (Updated June 2015)	No changes

9.3 ACCIDENTS AND MALFUNCTIONS (ADDENDA)

NIRB Section:	Section 6.2: Accidents and Malfunctions Assessment	Ref No.:	FHR-NIRB-6.2

Reference to NIRB Report:
Section 6.2 – Accidents and Malfunctions Assessment

Conclusions and Recommendations of the Board (Section 6.2.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has considerable uncertainty in relation to Sabina's capabilities to respond to spills within Bathurst Inlet, should neither the shipper nor the Canadian Coast Guard be in a position to respond. The Board notes Bathurst Inlet remains relatively pristine and untouched by large scale and potentially permanent impacts. Should the Proponent revise the proposed Project for a future submission, it the Board's view that an enhanced level of information about spill response, while shipping, transferring to land, as well as transport over land, be applied throughout all project planning stages **[FHR-NIRB-6.2(A)].**

Issues Highlighted within the Ministers' Referral Letter:

On the issue of the marine environment, the Board's conclusion was that it saw "considerable uncertainty" in the effects predicted for the proposed saline water discharge and emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet. Having reviewed the Board's recitation of the evidence, and the Board's views and conclusions, it is not clear why this uncertainty remains.

While we would have expected that the information before the Board on effects predictions and emergency preparedness would meet the appropriate standard for impact assessment, the Board appears to have concluded otherwise. However, at this stage, we do not have enough of an understanding of the Board's concern to come to our own conclusions.

This issue thus requires further review to make sure the Board's concerns are well understood by the parties and that, most importantly, they are given the opportunity to try to address them. By this approach, it seems reasonable to believe that the remaining uncertainty could be resolvable, and this process may bring with it the ability to make refined impact predictions and to develop additional mitigations if necessary.

Sabina Response:

The Board has expressed uncertainty in relation to emergency preparedness and spill response capability, while shipping, transferring to land, as well as transport over land, be applied throughout all project planning stages. The NIRB has also expressed concerns with regards to adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment.

<u>Emergency Preparedness and Spill Response Capability - Shipping</u>

Sabina notes that the Canadian Coast Guard (CGC) is the lead federal agency for all ship-source spills or pollution incidents in water under Canadian jurisdiction. Sabina recognizes our responsibility to manage the risks effectively and to be prepared to respond in the event of a spill. Response to spills that occur during the act of shipping will be covered under the vessel's Shipboard Oil Pollution Emergency Plan

(SOPEP). The SOPEP is a required document that must be reviewed and approved by TC[32], as stated during the FEIS Final Hearing.

Emergency Preparedness and Spill Response Capability – Fuel Transfer to Land

The *Canada Shipping Act,* 2001, stipulates that operators of designated oil handling facilities must have an Oil Pollution Emergency Plan (OPEP). As stated during the FEIS Final Hearing, an OPEP must be reviewed and approved by TC[33]. Since the FEIS Final Hearing, and in recognition of the NIRB's concern, Sabina has updated the OPEP to include more detail on bulk fuel transfer spill prevention measures (Section 11.3.2), marine mammal and fish sensitivities (Section 5.3.6), spill response kit locations at the MLA (Annex 2), guidelines for responding to multiple emergencies (Section 7.7), large spills (Section 10.1), and unexpected ice conditions (Section 5.3.5). For the NIRB's convenience, the updated OPEP can be found in FEIS Addendum Volume 10, Chapter 6.

Emergency Preparedness and Spill Response Capability – Transport Over Land

To address the NIRB's concerns regarding spill response during over land fuel transport, Sabina has provided an updated Fuel Management Plan (FEIS Addendum Volume 10, Chapter 4) and an updated Spill Contingency Plan (FEIS Addendum Volume 10, Chapter 5).

Regulatory Oversight

As outlined in Sabina (2016), TC and the CCG have the expertise, jurisdiction and mandate to advise on shipping and marine spill response, in accordance with the *Canada Shipping Act* and its regulations, which include numerous specific requirements relating to shipping in the Canadian Arctic and marine spill prevention and response. Other federal agencies and departments, such as DFO, the CCG and ECCC, have distinct but interrelated responsibilities for the management of marine transportation safety and environmental protection in the Arctic (FEIS Volume 10, Chapter 15, Appendix A).

For the NIRB's convenience, Sabina has further outlined the applicable Federal and Territorial legislation and guidelines in the following management plans:

- Fuel Management Plan (FEIS Addendum Volume 10, Chapter 4, Section 4);
- Risk Management and Emergency Response Plan (FEIS Volume 10, Chapter 3, Section 1.6);
- Spill Contingency Plan (FEIS Addendum Volume 10, Chapter 5, Section 1.6);
- Oil Pollution Emergency Plan (FEIS Addendum Volume 10, Chapter 6, Section 1.1); and
- Shipping Management Plan (FEIS Volume 10, Chapter 15, Section 5 and Appendix A).

Additionally, Sabina developed and presented additional specific management plans relating to the prevention of, and response to, any spill event including:

- Risk Management and Emergency Response Plan (FEIS Volume 10, Chapter 3);
- Fuel Management Plan (FEIS Addendum Volume 10, Chapter 4);
- Spill Contingency Plan (FEIS Addendum Volume 10, Chapter 5);
- Oil Pollution Emergency Plan (FEIS Addendum Volume 10, Chapter 6); and
- Shipping Management Plan (FEIS Volume 10, Chapter 15).

[32] D. Kirkland, TC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 546, Lines 24 to 26
[33] D. Kirkland, TC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 547, Lines 1 to 3

For the NIRB's convenience, a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by TC and agreed to by Sabina that are relevant to the topic of accidents and malfunction in the marine environment are listed in the table below.

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	TC-T-1	The Proponent will adhere to requirements for loading and handling explosives within the prescribed regulatory requirements.	TC
Term and Condition	TC-T-2	The Proponent must refer to the latest version of Transport Canada's Emergency Response Guide and update its Risk Management & Emergency Response Plan as appropriate.	TC

FHR-NIRB-6.2(A) – Emergency Preparedness and Spill Response Capability for Shipping, Transport to Land, Transporting Over Land, and Regulatory Oversight

Emergency Preparedness and Spill Response Capability - Shipping

The CGC is the lead federal agency for all ship-source spills or pollution incidents in water under Canadian jurisdiction. During the FEIS Final Hearing, the CGC confirmed their ability to implement a consistent approach for responding to marine pollution incidents in all regions of Canada:

> *"…the Canadian Coast Guard is the lead federal agency for all ship-source spills or pollution incidents in waters under Canadian jurisdiction…The Canadian Coast Guard's environmental response program's mission is to ensure an appropriate level of preparedness and response capability for all ship-source and mystery-source pollution incidents in waters under Canadian jurisdiction. To that end, the Canadian Coast Guard implements a consistent approach for responding to marine pollution incidents in all regions of Canada."*[34]

Sabina recognizes our responsibility to manage the risks effectively and to be prepared to respond in the event of a spill. Response to spills that occur during the act of shipping will be covered under the vessel's SOPEP. The SOPEP is a required document that must be reviewed and approved by TC[35], as stated during the FEIS Final Hearing.

A tremendous amount of attention is paid to emergency preparedness and response to shipping in Canada and particularly in the Arctic waters. TC has put in place a significant legislative and regulatory framework that apply to all vessels within Canadian waters. Shipping companies bringing goods and fuel to the MLA must remain in compliance with all regulatory requirements at all times.

Emergency Preparedness and Spill Response Capability - Fuel Transfer to Land

The *Canada Shipping Act,* 2001, stipulates that operators of designated oil handling facilities must have an OPEP. As stated during the FEIS Final Hearing, an OPEP must be reviewed and approved by TC[36].

Spills that occur during the transfer of fuel from a ship in Bathurst Inlet to the Project, Marine Laydown Area, Oil Handling Facility (MLA-OHF) will be responded to in accordance with the TC approved OPEP (FEIS Addendum Volume 10, Chapter 6). An OPEP outlines potential spill scenarios, and provides specific procedures for responding to spills while minimizing potential health and safety hazards and environmental damage. It provides instructions to guide all personnel in emergency spill response situations, defines the roles and responsibilities of management and responders and outlines the

34 Ms. Williston, DFO, on behalf of the CCG, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1163, Lines 15 to 26; Pg. 1164, Lines 1 to 10

[35] D. Kirkland, TC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 546, Lines 24 to 26

[36] D. Kirkland, TC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 547, Lines 1 to 3

measures taken to prevent spills, the related exercise and evaluation programme, and the mechanism for regular updates to the plan.

Since the FEIS Final Hearing, and in recognition of the NIRB's concern, Sabina has updated the OPEP to include more detail on bulk fuel transfer spill prevention measures (Section 11.3.2), marine mammal and fish sensitivities (Section 5.3.6), spill response kit locations at the MLA (Annex 2), guidelines for responding to multiple emergencies (Section 7.7), large spills (Section 10.1), and unexpected ice conditions (Section 5.3.5). Detailed procedures for safe bulk fuel transfer are presented in Annex 5 – Bulk Cargo Transfer Procedures of the OPEP. Additionally, the updated OPEP includes the following information (Section 11.3.2):

Several preventive measures are in place to minimize risk of spills during bulk fuel transfer including:

- The bulk fuel storage facility, pipeline and all related equipment and infrastructures are inspected prior to the bulk cargo transfer and the inspection methods are documented as a Standard Operating Procedure.
- Complete bulk cargo transfer procedures have been established, a copy of which is found in Annex 5 of this OPEP.
- As required by the applicable legislation the ship has a comprehensive Shipboard Oil Pollution Emergency Plan and a copy of this plan has been reviewed by Sabina.
- In addition to the legislative requirements, the charterer has implemented a shipboard spill response training program and performs routine exercises in spill response operations.
- The ship carries a compliment of spill response equipment as listed in Annex 6 of the OPEP and this equipment is ready at the ship's rail at all times for deployment during cargo operations.
- Sabina oil spill response equipment is on the beach, ready for immediate deployment at all times during cargo operations.
- The workboats and trained responders are available at all times during cargo operations for spill equipment deployment.
- Standard transfer procedures include hourly inspections by workboat of the floating hose for leaks or defects.
- During transfer operations the shore manifold is manned at all times.
- A low pressure alarm is installed at the shore manifold that is highly sensitive to differences in pressure during pumping. Any loss in the system will cause a drop in manifold pressure and results in an audible alarm, which is immediately reported by the manifold personnel.
- The bulk fuel storage facility is monitored at all times by Sabina personnel during the transfer.
- The pipeline is inspected hourly on foot during the transfer operation.

For the NIRB's convenience, the updated OPEP can be found in FEIS Addendum Volume 10, Chapter 6.

<u>Emergency Preparedness and Spill Response Capability - Transport Over Land</u>

To address the NIRB's concerns regarding spill response during over land fuel transport, Sabina has provided an updated Fuel Management Plan (FEIS Addendum Volume 10, Chapter 4) and an updated Spill Contingency Plan (FEIS Addendum Volume 10, Chapter 5).

The Fuel Management Plan has been updated to include more detail on the safe handling and storage of fuel. Specifically, more information has been added to roles and responsibilities (Section 5), potential environmental effects (Section 7.5), environmental monitoring (Section 8) and mitigation and adaptive management (Section 9).

The Spill Contingency Plan includes details of emergency response procedures for spills that could occur while transporting bulk fuel over land. Sabina acknowledges that the majority of over land fuel transfer

will occur on the winter ice road; therefore, the approach to spills on snow and ice (Section 8.2.3) are outlined:

> In general, snow and ice will slow the movement of hydrocarbons. The presence of snow may also hide the oil slick and make it more difficult to follow its progression. Snow is generally a good natural sorbent, as hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material is to be limited as much as possible. Snow and frozen ground also prevent hydrocarbons from migrating down into soil or at least slow the migration process. Ice prevents seepage of fuel into the water.
>
> Response to spills on snow and ice includes the general procedures previously detailed. Most response procedures for spills on land may be used for spills on snow and ice. The use of dykes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in snow or ice) slow the progression of the fuel and also serve as containment to allow recovery of the fuel. Free product is recovered by using a vacuum, a pump, or sorbent materials. Contaminated snow and ice is scraped up manually or using heavy equipment depending on volumes.
>
> Should spills enter waterways beneath ice cover, ice augers and pumps will be used when feasible to recover fuel and other materials under ice. Slots may be cut in ice over slow-moving water to contain oil. Tiger torches may be used to burn the fuel in place, if unrecoverable by other methods and when feasible and safe to do so.
>
> The contaminated snow and ice is placed in containers or within plastic lined berms on land. For contingency purposes, a contaminated snow storage site will to be designated and located in close proximity to each of the main Project work sites to facilitate inspection and monitoring, in an area which will still be readily accessible once it is time to remove the snow (i.e., spring or summer), and at least 31 m away from any body of water or ditch. Once enough snow has melted, the oily water can be removed from the storage site and processed through an oil-water separator that would be mobilized to site. Hydrocarbons recovered will be burned in the camp incinerator or shipped off-site.

Regulatory Oversight

The NIRB has expressed concerns with regards to adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment (FHR-NIRB-4.13(B)).

As outlined in Sabina (2016), TC and the CCG have the expertise, jurisdiction and mandate to advise on shipping and marine spill response, in accordance with the *Canada Shipping Act* and its regulations, which include numerous specific requirements relating to shipping in the Canadian Arctic and marine spill prevention and response. During the FEIS Final Hearing, this was confirmed by TC:

> *"Vessels operating in the north must comply with the Canadian Shipping Act, 2001 and the Arctic Waters Pollution Prevention Act. Operators of the oil-handling facilities that load and unload oil from vessels must have TC-approved OPEPs, or Oil Pollution Emergency Plans, to ensure that they comply with the Canada Shipping Act, 2001 and associated regulations."*[37]

Other federal agencies and departments, such as DFO, the CCG and ECCC, have distinct but interrelated responsibilities for the management of marine transportation safety and environmental protection in the Arctic (FEIS Volume 10, Chapter 15, Appendix A).

[37] A.Downing, TC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1161, Lines 10 to 16

For the NIRB's convenience, Sabina has further outlined the applicable Federal and Territorial legislation and guidelines in the following management plans:

- Fuel Management Plan (FEIS Addendum Volume 10, Chapter 4, Section 4);
- Risk Management and Emergency Response Plan (FEIS Volume 10, Chapter 3, Section 1.6);
- Spill Contingency Plan (FEIS Addendum Volume 10, Chapter 5, Section 1.6);
- Oil Pollution Emergency Plan (FEIS Addendum Volume 10, Chapter 6, Section 1.1); and
- Shipping Management Plan (FEIS Volume 10, Chapter 15, Section 5 and Appendix A).

During the FEIS Final Hearing, TC stated that they have no further concerns related to the Project components within their mandate:

> *"Transport Canada has provided multiple recommendations within our written submission and we are satisfied with the response that has been provided by Sabina.* ***Transport Canada has no further concerns*** *related to the project components within our mandate. Transport Canada will continue to participate in the project review throughout the regulatory stage, should the project be approved to ensure that the applicable legislation and regulations are being followed."*[38]

Additionally, Sabina developed and presented additional specific management plans relating to the prevention of, and response to, any spill event including:

- Risk Management and Emergency Response Plan (FEIS Volume 10, Chapter 3);
- Fuel Management Plan (FEIS Addendum Volume 10, Chapter 4);
- Spill Contingency Plan (FEIS Addendum Volume 10, Chapter 5);
- Oil Pollution Emergency Plan (FEIS Addendum Volume 10, Chapter 6); and
- Shipping Management Plan (FEIS Volume 10, Chapter 15).

References:

Sabina (Sabina Gold & Silver Corp.). 2016. Detailed Summary Regarding the Nunavut Impact Review Board Final Hearing Report of June 15, 2016 on the Back River Gold Mine Project. Issued July 2016 by Sabina Gold & Silver Corp.: Vancouver, BC.

Attachment:

Not applicable

[38] A.Downing, TC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 1162, Lines 19 to 26; Pg. 1163, Line 1

10. Volume 10 Addenda: Management Plans

VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of Management Plans, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 9) in respect of the new information provided on the topic of Environmental Management System, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

ENVIRONMENTAL MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

ENVIRONMENTAL PROTECTION PLAN (FEIS VOLUME 10, CHAPTER 2)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

RISK MANAGEMENT AND EMERGENCY RESPONSE PLAN (FEIS VOLUME 10, CHAPTER 3)

Concerns raised around risk management and emergency response were addressed in responses for other management plans including the Fuel Management Plan, Shipping Management Plan, OPEP, Road Management Plan, and Spill Contingency Plan. No specific concerns noted related to the Risk Management and Emergency Response Plan in the Final Hearing Report or Ministers' Referral Letter. No additional information is presented.

FUEL MANAGEMENT PLAN (REVISED; FEIS ADDENDUM VOLUME 10, CHAPTER 4)

In the Final Hearing Report, the NIRB expressed a view that an enhanced level of information about spill response, while shipping, transferring to land, as well as transport over land, be applied throughout all project planning stages. Sabina prepared new or updated information to support future water licence submissions which also address Section 6.2 of the Final Hearing Report. This information can be found in response FHR-NIRB-6.2 – Accidents and Malfunctions Assessment.

SPILL CONTINGENCY PLANS (REVISED; FEIS ADDENDUM VOLUME 10, CHAPTER 5)

In the Final Hearing Report, the NIRB requested that an enhanced level of information about spill response, while shipping, transferring to land, as well as transport over land, be applied throughout all project planning stages. Sabina prepared new or updated information to support future water licence submissions which also help address Section 6.2 of the Final Hearing Report. This information can be found in response FHR-NIRB-6.2 – Accidents and Malfunctions Assessment.

OIL POLLUTION EMERGENCY PLAN (REVISED; FEIS ADDENDUM VOLUME 10, CHAPTER 6)

In the Final Hearing Report, the NIRB expressed a view that an enhanced level of information about spill response, while shipping, transferring to land, as well as transport over land, be applied throughout all project planning stages. Sabina prepared new or updated information to support future water licence submissions which also help address Section 6.2 of the Final Hearing Report. This information can be found in response FHR-NIRB-6.2 – Accidents and Malfunctions Assessment.

The updates to the aforementioned plans, Fuel Management Plan, Spill Contingency Plan, and OPEP, provide new or updated information on how emergency preparedness and spill response will be addressed throughout all Project planning stages to address Section 6.2 of the Final Hearing Report. This information can be found in response FHR-NIRB-6.2 – Accidents and Malfunctions Assessment.

SITE WATER MONITORING AND MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 7)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

ORE STORAGE MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 8)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

MINE WASTE ROCK MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 9)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

WASTE MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 10)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

INCINERATION MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 11)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

HAZARDOUS MATERIALS MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 12)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

EXPLOSIVES MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 13)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

ROAD MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 14)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

SHIPPING MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 15)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

BORROW PITS AND QUARRY MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 16)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

AIR QUALITY MONITORING AND MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 17)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

NOISE ABATEMENT PLAN (FEIS VOLUME 10, CHAPTER 18)

No areas of concern noted within the NIRB Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

AQUATIC EFFECTS MANAGEMENT PLAN (SIGNIFICANTLY REVISED; FEIS ADDENDUM VOLUME 10, CHAPTER 19)

In the Final Hearing Report, the Board expressed concerns about the effects predicted for ground and surface water quality due to the limited development of the AEMP. Also, the Board expressed concerns that insufficient seasonal baseline data was considered when establishing the appropriate mitigation measures. In response to NIRB's concerns, Sabina has continued to develop the Aquatic Effects Management Plan in line with commitment KIA-C-1. The continued advancement of the AEMP addresses Section 4.7 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.7 under FHR-NIRB-4.7(A) – Aquatic Effects Management Plan.

WILDLIFE MITIGATION AND MONITORING PROGRAM PLAN (SIGNIFICANTLY REVISED; FEIS ADDENDUM VOLUME 10, CHAPTER 20)

In the Final Hearing Report, the Board concluded that there is uncertainty in relation to the effects predicted on caribou from the Project. Furthermore, the Board is not confident that greater than predicted adverse effects on wildlife and wildlife habitat could be adaptively managed because the highest and most protective version of the precautionary approach is called for.

Sabina has prepared new or updated information to address Section 4.11, 4.14, 6.4, and 6.7 of the Final Hearing Report regarding terrestrial wildlife and wildlife habitat, cumulative effects and transboundary effects. In recognition of the NIRB's concerns, Sabina has significantly revised and advanced its Wildlife Mitigation and Monitoring Program Plan. This addresses Section 4.11, 4.14, 6.4 and 6.7 of the Final Hearing Report and can be found in response FHR-NIRB-4.11, FHR-NIRB-4.14, FHR-NIRB-4.14, FHR-NIRB-6.4, and FHR-NIRB-6.7.

CONCEPTUAL FISH OFFSETTING PLAN (REVISED; FEIS ADDENDUM VOLUME 10, CHAPTER 21)

In the Final Hearing Report, the Board recognizes that the Bernard Harbour offsetting plan is supported by key parties but state that the Board has a lack of assurance that it would be sufficient to offset all anticipated serious harm to fish. In recognition of the NIRB's concern, Sabina has significantly revised and advanced its Conceptual Fish Offsetting Plan to address Section 4.9 of the Final Hearing Report. This

information can be found in response FHR-NIRB-4.9 under FHR-NIRB-4.9(C) - Bernard Harbour Offsetting Plan.

TAILINGS MANAGEMENT PLAN (FEIS VOLUME 10, CHAPTER 22)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

SOCIO-ECONOMIC MONITORING PLAN (FEIS VOLUME 10, CHAPTER 23)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

BUSINESS DEVELOPMENT PLAN (FEIS VOLUME 10, CHAPTER 24)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

OCCUPATIONAL HEALTH AND SAFETY PLAN (FEIS VOLUME 10, CHAPTER 25)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

COMMUNITY INVOLVEMENT PLAN (FEIS VOLUME 10, CHAPTER 26)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

CULTURAL AND HERITAGE RESOURCES PROTECTION PLAN (FEIS VOLUME 10, CHAPTER 27)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

HUMAN RESOURCES PLAN (FEIS VOLUME 10, CHAPTER 28)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

MINE CLOSURE AND RECLAMATION PLAN (FEIS VOLUME 10, CHAPTER 29)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

VEGETATION MONITORING PLAN (NEW; FEIS ADDENDUM VOLUME 10, CHAPTER 30)

In the Final Hearing Report, the Board encouraged Sabina to consider additional mitigation and monitoring for the protection of vegetation and additional measures to limit potential impacts due to the introduction of invasive species from construction and clearing operations. In recognition of NIRB's request, Sabina has provided addresses Section 4.10 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.10 under FHR-NIRB-4.10 - Vegetation.

CONCEPTUAL FISH-OUT PLAN (NEW; FEIS ADDENDUM VOLUME 10, CHAPTER 31)

In the Final Hearing Report, the Board identified concerns with the adequacy of the measures to mitigate effects of the planned fish-out and dewatering of multiple lakes due to the limited consideration of Inuit Qaujimaningit principles. In recognition of the NIRB's concern, Sabina has prepared new or updated information to address Section 4.9 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.9 under FHR-NIRB-4.9(A) - Planned Fish-Out and Dewatering.

4. FUEL MANAGEMENT PLAN (REVISED)

BACK RIVER PROJECT
Fuel Management Plan

July 2016

BACK RIVER PROJECT
FUEL MANAGEMENT PLAN

Table of Contents

Table of Contents i
List of Figures ii
List of Tables ii

Acronyms iii

1. Introduction 1-1

2. Scope and Objectives 2-1
2.1 Related Documents 2-1

3. Applicable Legislation and Guidelines 3-1

4. Planning and Implementation 4-1

5. Roles and Responsibilities 5-1

6. Facility Planning and Fuel Delivery 6-1
6.1 Facility Siting and Location 6-1
6.2 Fuel Supply 6-1
6.3 Marine Laydown Area 6-7
6.4 Goose Property 6-7
6.5 Fuel Consumption and Delivery 6-8

7. Environmental Protection Measures 7-1
7.1 Design Requirements 7-1
7.2 Siting and Storage 7-2
7.3 Fuelling Operations and Training 7-2
7.4 Bulk Fuel Truck Transfer Procedure 7-4
7.5 Fuel Inventory Management 7-4
7.6 Potential Effects Accidents or Malfunctions 7-5

8. Monitoring Program 8-1

9. Mitigation and Adaptive Management 9-1
9.1 Spill Prevention and Response 9-1
9.2 Adaptive management 9-2

10. Record Keeping and Environmental Reporting 10-1

11. Reclamation and Closure 11-1

12. References 12-1

List of Figures

FIGURE **PAGE**

Figure 6.1-1. Marine Laydown Area Fuel Storage 6-3

Figure 6.1-2. Goose Fuel Storage 6-5

List of Tables

TABLE **PAGE**

Table 3-1. Applicable Legislation for Back River Project Fuel Management 3-1

Table 6.3-1. Fuel Storage 6-7

Table 7.1-1. Fuel Storage Facility Design Requirements 7-1

Table 7.2-1. Fuel Facility Siting and Storage 7-2

Table 7.3-1. Fuelling Operations 7-3

Table 7.5-1. Facility Monitoring and Preventative Maintenance 7-5

Table 7.6-1. Potential Environmental Effects of Fuel Product Spill to Environment 7-5

Table 8-1. Proposed Bulk Fuel Storage Pooling Water Discharge Criteria 8-1

Table 9.1-1. Spill Prevention and Response 9-1

Acronyms

CCME	Canadian Council of Ministers of the Environment
FMP or Plan	Fuel Management Plan
MLA	Marine Laydown Area
NWB	Nunavut Water Board
Project	Back River Project
OPEP	Oil Pollution Emergency Plan
Sabina	Sabina Gold & Silver Corp.
SCP	Spill Contingency Plan
WHMIS	Workplace Hazardous Materials Information System
WIR	Winter Ice Road

1. Introduction

Sabina Gold & Silver Corp. (Sabina) is proposing two main areas of development as part of the Back River Project (the Project). These two main areas will be interconnected with winter ice roads (WIRs): the Goose Property and the Marine Laydown Area (MLA) situated along the western shore of southern Bathurst Inlet. Refer to base Figures 1 to 5 for general site layout and locations. A detailed project description is provided in the Main Application Document.

The Fuel Management Plan (FMP or Plan) outlines the approach for managing hydrocarbon products that are to be stored and managed at the Project. This Plan includes provisions for the MLA in southern Bathurst Inlet and the Goose Property. The FMP and other management plans are intended to support the Type A Water Licence Application for the Project.

The Plan was prepared following the requirements of the Supplementary Information Guidelines (SIG) for Mining and Milling MM3 and Water Works M1, issued by Nunavut Water Board (NWB 2010 a, b) and the Environmental Impact Statement Guidelines issued by the Nunavut Impact Review Board to Sabina (NIRB 2013) and in conformance with current Federal and Territorial statutory requirements

This Plan is a living document to be updated upon changes in related regulatory requirements, management reviews, changes to facility operation or maintenance, and environmental monitoring results, best practice updates or other Project specific protocols once construction starts through to Project Closure activities. Any updates will be filed with the Annual Report submitted under the Type A Water Licence.

The information presented herein is current as of July 2016. The next update will be initiated prior to the start of construction. The Plan will be reviewed as needed for changes in operation and technology and as directed by the Nunavut Water Board (NWB) in the Type A Water Licence or other regulatory authorization where appropriate. Completion of the updated Plan will be documented through signatures of the personnel responsible for reviewing, updating, and approving the Plan.

A record will document all significant changes that have been incorporated in the Fuel Management Plan subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Sabina will maintain a distribution list providing contact details for all parties to receive the Plan including key personnel, contractors, organizations, and external agencies.

2. Scope and Objectives

The Fuel Management Plan is one of the documents that forms part of Sabina's overall Emergency Response Program for the Project. This Plan has been written to meet requirements of a Type A Water Licence and applies to all Sabina projects in the Kitikmeot region.

This Plan is divided into the following components:

- Applicable Legislation and Guidelines (Section 3);
- Planning and Implementation (Section 4);
- Roles and Responsibilities (Section 5);
- Facility Planning and Fuel Delivery (Section 6);
- Environmental Protection Measures (Section 7);
- Monitoring Program (Section 8);
- Mitigation and Adaptive Management (Section 9);
- Record Keeping and Environmental Reporting (Section 10); and
- Reclamation (Section 11).

This Plan focusses on the environmental protection measures required for fuel management. This entails the implementation of procedures for transportation, handling, inspection, storage, transfer, reporting, and documentation for all fuel products throughout the mine life. These products include diesel, gasoline, lubricating oils, hydraulic fluids, propane, and paint thinner.

Sabina's intent is that through the diligent implementation of measures outlined in this Plan the frequency and severity of spill incidents will be minimized at the mine.

2.1 RELATED DOCUMENTS

Documents within the Application for the Type A Water Licence, which support this Plan include the following:

- Water Management Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan;
- Spill Contingency Plan;
- Oil Pollution Emergency Plan; and
- Occupational Health and Safety Plan (Final Environmental Impact Statement Volume 10, Chapter 25).

In the event of a spill in the marine environment or at the MLA oil handling facility, the Oil Pollution Emergency Plan (OPEP), or the Shipboard Oil Pollution Emergency Plan will apply. Note that the Shipboard Oil Pollution Emergency Plan is vessel specific and will be produced and approved by Transport Canada prior to commencement of shipping. In the event of a spill at the Goose Property, MLA, or along the WIR, the Spill Contingency Plan (SCP) will apply.

3. Applicable Legislation and Guidelines

Federal and Territorial legislation that is applicable to fuel management in Nunavut is presented in Table 3-1.

Other applicable standards, systems, and regulatory bodies include:

- Underwriters' Laboratories of Canada (ULC) Standards;
- Canadian Standards Association (CSA) Standards;
- Workplace Hazardous Materials Information System (WHMIS); and
- Workers' Compensation Board (WCB).

Table 3-1. Applicable Legislation for Back River Project Fuel Management

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197) *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301)	Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Transportation of Dangerous Goods Act (1992, c. 34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Fisheries Act (1985, c. F-14)		
		National Fire Code of Canada (2010)
Territorial – Nunavut and Northwest Territories		
Nunavut Environmental Protection Act	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) *Used Oil and Waste Fuel Management Regulations* (NWT Reg 064-2003)	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste
Nunavut Waters and Nunavut Surface Rights Tribunal Act (S.C. 2002, c.10)	*Nunavut Water Regulations (SOR/2013-69)*	Guidelines for Spill Contingency Planning, Aboriginal Affairs and Northern Development Canada
Territorial Lands Act		
Mackenzie Valley Resource Management Act		

4. Planning and Implementation

The Plan considers existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies, and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans will continue to be elaborated and executed throughout the Mobilization and Construction, Operations, and Closure phases of the Project.

Significance criteria have been developed that assist in identifying priority aspects, establish management criteria, and activity-specific mitigation measures. For social issues and effects, a key factor for determining significance is ongoing feedback from public consultation. These efforts will be used to communicate progress, and involve the public where necessary, on environmental performance.

Monitoring will be the principal mechanism to provide feedback to continually gauge the effectiveness of environmental performance. Operational control is facilitated through contractor job-specific standard operating procedures, work instructions, tailgate meetings where required, contract requirements, and service agreements. The effectiveness of physical operation controls will be reviewed and modified in accordance with preventative maintenance and procedural reviews.

5. Roles and Responsibilities

The General Manager is ultimately responsible for the success of this Plan and approves all relevant policies and documents, auditing, action planning, and the verification process.

The Environmental Superintendent is responsible for ensuring regular inspection of petroleum storage facilities at the Project and will coordinate with the relevant Superintendents with respect to their areas of responsibility. All employees, contractors, and contractor employees are responsible for complying with the intent of this Plan.

All manifests, training, and other tracking documentation will be maintained and kept readily available, as required, by the Environmental Superintendent or designate.

Contractors who will be interacting fuel will be trained with Sabina's FMP and in the safe handling procedures, emergency response, and spill contingency procedures consistent with Risk Management and Emergency Response Plan, OPEP, and SCP. As a contractual condition with penalties, Contractors will be obliged to comply with Sabina's approvals and environmental management plans, including this Plan. Sabina staff will monitor contractor performance and adherence to legislation and the commitments in the environmental management plans.

Refer to the Risk Management and Emergency Response Plan for additional details on roles and responsibilities related to emergency response measures.

6. Facility Planning and Fuel Delivery

6.1 FACILITY SITING AND LOCATION

Land based fuel storage facilities will be constructed and utilized at the MLA and Goose Property. The current conceptual fuel storage facility placements for each site are presented in Figures 6.1-1 and 6.1-2.

Details on the fuel storage facilities and logistical considerations are provided in subsequent sections of this Plan.

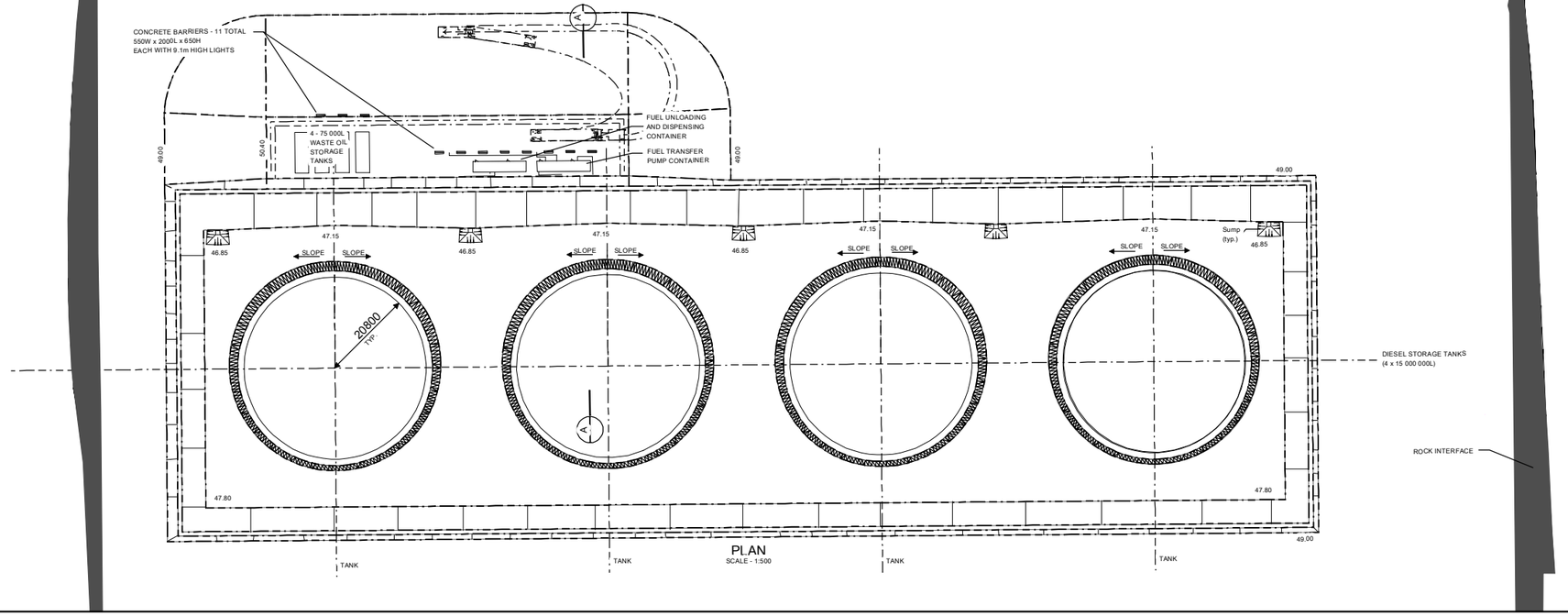
Sabina is committed to provide detailed designs for construction of temporary and permanent fuel storage and fuel transfer facilities to the NWB at least sixty (60) days prior to construction of fuel storage facilities and associated infrastructure. Sabina expects the Engineer of Record or the service provider through the Engineer of Record will confirm detailed implementation plans for fulfilling contractual responsibilities including procedures and schedules for testing of all fuel containments systems. The Engineer of Record or service provider will also confirm how their fire and contingency plans needs will be confirmed and integrated into Sabina's overall Risk Management and Emergency Response Plan.

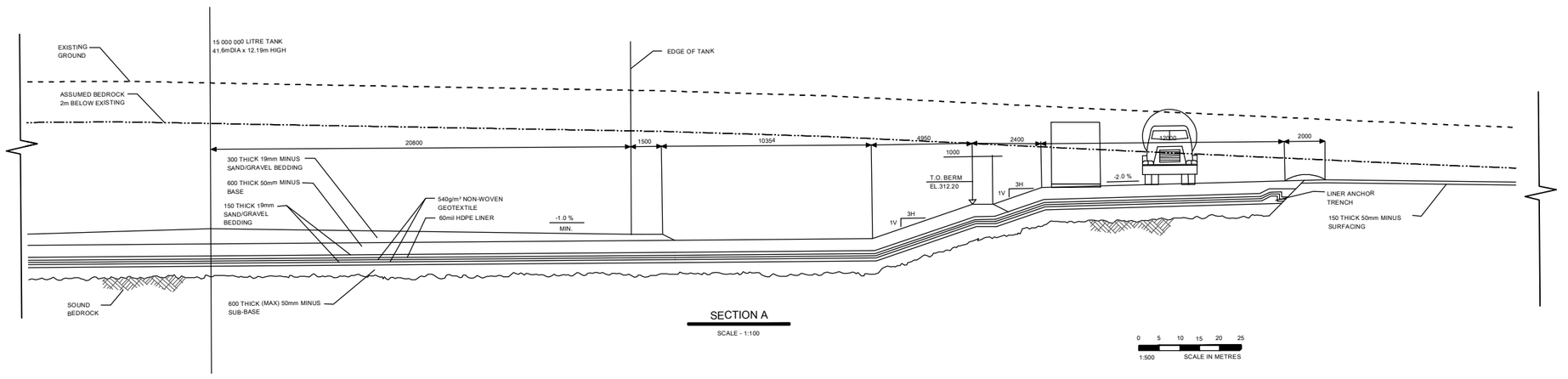
6.2 FUEL SUPPLY

Fuel will travel in tanker ships and/or barges, and then will be transferred through floating hose to on land storage tanks at the MLA. The summer sealift freight will originate from the east from Bécancour, Quebec or from the west from Vancouver, British Columbia, largely depending on the origin of the goods. Other points of origin, including international locations, may be considered in the future. Freight originating from Bécancour will travel by barges and ships, and by barges from Vancouver. The ships and barges will be self-sufficient for offloading cargo. Lightering barges will be used to transfer cargo from the vessel to the MLA Marshalling Area on shore.

Fuel will be transported from the MLA to the Goose Property via WIR. The Goose-Marine Laydown Area WIR is approximately 160 km in length.

381050





NOTE: mm for length and m for elevation unless otherwise noted

Sabina GOLD & SILVER CORP.

Projection: NAD 1983 UTM Zone 13N

Marine Laydown Area
Preliminary Fuel Storage Plan and Section
Type A Water Licence

Figure 6.1-1

DESCRIPTION	CHK'D	APP'D	DATE
ISSUED FOR PERMIT	CP	JE	16/05/26

Original Drawings Stamped and Signed by Engineer

This drawing is unconstructed when printed unless stamped and signed with orginal ink and recorded on a Distribution Register

PROFESSIONAL ENGINEERS STAMP

7393500

431050

N

CONCRETE BARRIERS - 8 TOTAL
550W x 2000L x 650H
EACH WITH 30' HIGH LIGHTS

3.3m WIDE BERM / 1.1m HIGH BERM

150 HIGH x 2000W
CURB - (TYP

CONCRETE BARRIERS - 4 TOTAL
1100W x 4000L x 1500H
EACH WITH 9.1m HIGH LIGHTS

315.00

316.40

315.00

14500

316.40

315.00

FUEL UNLOADING
AND DISPENSING

FUEL TRANSFER
PUMP

4 - 75 000L
WASTE OIL
STORAGE
TANKS

SLOPE

312.85

313.15

Sump
(typ.)

20800
TYP.

64390

313.80

DIESEL STORAGE TANKS
(3 x 15 000 000L)

14000

34800

62400

62400

34800

315.00

316.40

315.00

TANK

TANK

TANK

PLAN
1:500

7269500

EXISTING
GROUND

15 000 000 LITRE TANK
41.6mDIA x 12.19m HIGH

EDGE OF TANK

ASSUMED BEDROCK
4m BELOW EXISTING

20800

1500

10354

4950

1000

2400

1450

3300

300 THICK 19mm MINUS
SAND/GRAVEL BEDDING

600 THICK 50mm MINUS
BASE

150 THICK 19mm
SAND/GRAVEL
BEDDING

-1.0 %
MIN.

540g/m² NON-WOVEN
GEOTEXTILE

60mil HDPE LINER

T.O. BERM
EL.313.20

T.O. RAMP
EL.314.00

-2.0 %

3H
1V

LINER ANCHOR
TRENCH

150 THICK 50mm MINUS
SURFACING

BERM

- ROM FILL -

900 THICK 50mm MINUS
SUB-BASE

50mm MINUS
FILL

SOUND
BEDROCK

600 THICK (MAX) 50mm MINUS
SUB-BASE

SECTION A
SCALE 1:100

0 5 10 15 20 25
1:500 SCALE IN METRES

NOTE: mm for length and m for elevation unless otherwise noted

7269500

Sabina
GOLD & SILVER CORP.

Projection: NAD 1983 UTM Zone 13N

Goose Property
Preliminary Fuel Storage Plan and Section
Type A Water Licence

Figure 6.1-2

DESCRIPTION	CHK'D	APP'D	DATE
ISSUED FOR PERMIT	CP	JE	16/05/26

Original Drawings Stamped
and Signed by Engineer

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PROFESSIONAL ENGINEERS STAMP

6.3 MARINE LAYDOWN AREA

The MLA, located on the Bathurst Inlet in Nunavut, has been designed to be capable of offloading and storing 60 ML of diesel (Table 6.3-1). Fuel storage at the MLA is designed with capacity for a one-year supply of diesel fuel for the operational year with the maximum fuel usage. A total of four 15 ML field erected fuel tanks will be constructed at the MLA to handle the maximum requirement. Initially, one 15 ML fuel tank is erected in Year -3, two more 15 ML fuel tanks are erected in Year -2, and the last 15 ML tank is installed in Year -1. Note that in advance of the large tank erected in Year -3, six 90,000 L ISO containers or other portable fuel storage tanks will be installed at the MLA for fuel storage ahead of the construction of the first 15-ML fuel tank. During the Operations Phase, the portable fuel storage tanks will be used at the MLA or other sites as needed.

Table 6.3-1. Fuel Storage

Site	Ultimate Storage Capacity	Mobilization and Construction Year – 4 to -1	Operations Year 1 to 10	Peak Consumption
Marine Laydown Area	4 x 15 ML steel tanks 6 x 90,000 L ISO containers	Build and use 4 x 15 ML tanks Use six 90,000 L ISO containers	Use 4 x 15 ML tanks Use six 90,000 L ISO containers	2.5 ML (Year 7)
Goose Property	3 x 15 ML steel tanks 13 x 75,000 L double-walled fuel tanks	Use existing 75,000 L double-walled fuel tanks Build and use 3 x 15 ML tanks	Use 3 x 15 ML tanks	53 ML (Year 3)

Construction of the MLA will take place from Year -4 to Year -1. Initial fuel requirements will be delivered by sealift during the open water season with the vessels departing prior to winter ice formation in Bathurst Inlet.

The MLA Fuel Storage will be constructed in conformance with the Canadian Council of Ministers of the Environment (CCME) Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (CCME 2003), and the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (2008). Project fuel storage facilities will be designed to have bermed spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks, or 110% volume of the largest tank, whichever is greater. The fuel tank storage areas embankments (or bund) will be lined with HDPE for spill containment. The fuel storage areas will be provided with standard instrumentation and controls to monitor and safely manage the inventory in the tanks. Water management of the contact water from the fuel tank storage area will be incorporated into the Water Management Plan and the Landfill and Waste Management Plan.

Temporary storage of fuel during Mobilization and Construction may be required as permanent storage tanks are under construction and prepared for operation. In this case, temporary storage may utilize smaller portable double-walled fuel storage tanks or ISO containers with or without bermed spill containment.

6.4 GOOSE PROPERTY

The Goose Property fuel storage is currently comprised of thirteen 75,000 L double-walled fuel tanks and additional drummed fuel storage. These tanks will be maintained to support exploration activities. Pending Mobilization and Construction for mine development, fuel to support ongoing exploration activities and environmental monitoring programs will continue to be either flown to Goose by aircraft or hauled to Goose by Cat-train from a supply barge at the Bathurst Inlet. The handling and storage of

this fuel is currently licenced under NWB 2BE-GEO1520 and 2BE-GOO15020. Overland winter access activities (cat-train) for Sabina exploration activities is currently licensed under Kitikmeot Inuit Association land use permit: KTL304F049, and Indigenous and Northern Affairs Canada land use permit: N2010F0017. Sabina intends to maintain these licenses.

Sabina will construct a 45 ML fuel storage facility at the Goose Property (Table 6.3-1). One 15 ML fuel tank will be erected in Year -2 to support Construction, while the remaining two 15 ML fuel tanks will be built the following year. The 45 ML storage capacity will be utilized for Operations. Fuel storage at the Goose Property is designed with capacity for a ten-month supply of diesel fuel for the operational year with the maximum fuel usage.

Consistent with the MLA Fuel Storage facility, the Goose Property Fuel Storage will be constructed in line with CCME's requirements and the appropriate Regulations (2008). For additional information refer to Section 6.3.

Fuel dispensing equipment for mining, plant services, and freight vehicles will be located adjacent to the fuel tank bund and the fueling area will drain into the bund. A fuel transfer module will provide fuel to the Goose Power Plant day tank and diesel consumers in the Goose Process Plant. In addition, fuel within secondary containment will be stored at the airstrip in case of emergencies

6.5 FUEL CONSUMPTION AND DELIVERY

Arctic grade diesel fuel will predominantly be used by mining equipment, motor vehicles, and power generation. Limited quantities of propane will be used in maintenance facilities for smaller motorized equipment and machinery, and in the accommodation complex for meal preparation.

The number and size of the fuel storage tanks for Mobilization and Construction, and Operations' activities is presented in Table 6.3-1. The anticipated quantities and volumes of fuel will vary depending on the phase of the Project. The major consumers of fuel during Pre-production at Goose Property are power generation, open pit mining, construction equipment, and earthworks.

Fuel required for Construction, or due to unforeseen circumstances during Operations, may be flown to site using a Hercules, or a Boeing 737 jet, unless fuel can be transported by barge or tanker to the MLA in the preceding open-water season. More commonly, fuel required for Construction and Operations will be transported to the MLA using an ocean going vessel and trucked to the Goose Property on the WIR. The major consumers of fuel are power generation, site support, WIR construction, maintenance, haulage, and earthworks.

Fuel will be transported to the MLA via ice-class ocean going vessels. In the first year, it will be stored in the temporary fuel tanks and in subsequent years in the permanent fuel storage tanks.

7. Environmental Protection Measures

Fuel will be delivered by fuel tankers during the open water season. The floating hose method will be used for the transfer of fuel to the on land storage tanks. An OPEP has been developed to address fuel spill incidents related to the MLA facility.

Refuelling stations will be equipped with lined and bermed areas to contain minor spills or leaks that may occur during refuelling. The liner (e.g., 40 mm Hypalon liner or equivalent) will be protected by aggregate bedding. Vehicles and mobile equipment will drive onto this bedding for refuelling.

Fuel storage areas and vehicles will be equipped with spill kits for emergency response. Sabina's SCP identifies spill kit locations and appropriate response measures for spills. The spill kits will contain the appropriate type, size, and quantity of equipment for the volume/type of product present in each of the fuel storage facilities.

Sabina has designed the facilities taking into account storage, location/siting, and will implement standard operating procedures and appropriate training to minimize potential for accidents and malfunctions associated with fuel management.

7.1 DESIGN REQUIREMENTS

The fuel storage facilities will be designed with features that protect the environment as per Table 7.1-1.

Table 7.1-1. Fuel Storage Facility Design Requirements

Topic / Activity	Environmental Protection Measures
Design Features	• The CCME Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products will be followed in design, construction, and operation of the fuel storage facilities. • NWT Design Rationale for Fuel Storage and Distribution Facilities • All fixed location Above Ground Storage Tanks (AST) > 230 L will be constructed and maintained in accordance with Underwriters' Laboratories of Canada (ULC) tank specifications, and bear a current ULC certification plate or label. • All ASTs will be installed on firm foundations designed to minimize uneven settling and corrosion, and to prevent the design stress of the tank from being exceeded. • Fuel hose length will not exceed 4.5 m, or 6 m where a retracting system is used. • Fuel tanks will be locked (unless enclosed by a fence) when not being used for vehicle fuelling, or when not being filled by tanker trucks. • Fuel storage tanks must be vented to allow vapours to escape.
Moving Tanks	• Where a storage tank > 230 L is removed (e.g., moved from one site to another) or abandoned, it is permitted to be reused for the storage of flammable liquids and combustible liquids only after having been refurbished and found to conform to acceptable standards. • A fuel storage tank > 230 L requires spill control (or secondary containment) when it is removed from a mobile unit and installed in a fixed location. • Lighting will provide adequate illumination to ensure safe fuelling and allow users the ability to read safety placards and posted fuelling procedures, and to readily locate spill response equipment.

(continued)

Table 7.1-1. Fuel Storage Facility Design Requirements (completed)

Topic / Activity	Environmental Protection Measures
Moving Tanks (continued)	• There must be no leaks from the valve or pipe system to the pump. Draw-off valves must be threaded at the discharge end or otherwise designed to provide a liquid tight connection to the delivery hose. • Collision protection may include concrete filled steel posts placed more than 1 m from the outer edge of the tank shell and spaced less than 1.5 m apart. Concrete barriers, if used, will have a minimum height of 750 mm and be spaced at least 500 mm from the tank shell. Posts and barriers will be painted yellow and equipped with reflective stripes. Earthen materials may be used in similar manner to serve as traffic barriers.

7.2 SITING AND STORAGE

Table 7.2-1 summarizes the fuel storage facilities siting and storage requirements.

Table 7.2-1. Fuel Facility Siting and Storage

Topic / Activity	Environmental Protection Measures
Siting and Storage	• Design of fuel storage facilities will meet regulatory requirements for design and operation and will apply best management practices including: o fire prevention system design appropriate and adequate for the materials being stored; o tanks will have a minimum 1m separation between them; o siting away from ignition sources and environmentally sensitive areas; o drums, containers, and storage areas properly labelled, marked, placarded, and secured; and o containers or liner materials will be matched with the materials being stored. • All tanks for fuelling operations will be placed aboveground, and outside of buildings. • Tank siting will consider site drainage and surface flow routes for fluids if spilled during tank filling or product transfers. Grading and drainage will be designed to prevent liquids from reaching waterways, drain systems, and potable water sources. • Spill response and cleanup kits will be readily available in the refuelling area.
Secondary Containment & Collision Protection	• Fuel storage and dispensing systems will meet all applicable Nunavut regulations and all applicable Fire Code requirements. • Large or stationary equipment will be placed in secondary containment or will have a drip pan placed under vehicle/equipment prior to commencing any maintenance. • Precipitation accumulating within the containment area will be tested and treated if necessary prior to discharge. • Water collection facilities will be designed to convey water to oil/water separators for hydrocarbon removal. • Accidental damage to containment structures will be inspected immediately and appropriate repairs undertaken. The extent of damage, repairs, and any follow up inspection will be reported in accordance with best practices.

7.3 FUELLING OPERATIONS AND TRAINING

Environmental Protection Measures for fuel management entail the implementation of proper transportation, inspection, storage, transfer, and use of all petroleum products. Protection measures to ensure that fuel products are managed effectively are summarized in Table 7.3-1.

Table 7.3-1. Fuelling Operations

Topic / Activity	Environmental Protection Measures
Transportation	• Drivers making deliveries on site will receive a site orientation that includes relevant sections of the *Transportation of Dangerous Goods Act* (1992, c. 34), *Transportation of Dangerous Goods Regulations* (SOR/2001-286), Sabina safety requirements, and site traffic protocols. • Fuels will be trucked in sealed containers, be manifested, and equipment will be labelled and placarded in accordance with *Transportation of Dangerous Goods Regulations* (SOR/2001-286). • Applicable WHMIS signage and Transportation of Dangerous Goods (TDG) placards will be identifiable on all containers during transportation and storage. • Manifests will identify fuel type, quantity, and date of all deliveries to the mine site and will be retained on file at the contractor's head office for a period of two years. • Transportation vehicles will be equipped with spill kits of appropriate size and content. Vehicle operators will be trained in haul road safety and spill response. • Planning of delivery timing will consider weather conditions, road conditions, and availability of appropriate transportation equipment and personnel.
Bulk Transfer and Refuelling	• Only persons trained to safely handle fuels and aware of WHMIS and TDG requirements will implement procedures to transfer fuel. • Qualified personnel will continuously supervise the refuelling operation to ensure against overflow or spillage. • Daily inspections will be performed by the personnel responsible for the refuelling facility. • Refuelling will occur at a refuelling point with drainage capture / collection installed, in the event that refuelling occurs elsewhere, drip trays will be used under vehicles and equipment. • Refuelling and maintenance activities of equipment will not occur within 31 m of a watercourse or water body except where required due to equipment breakdown or approved activities near water. • Refuelling equipment from a tank vehicle is permitted if the fuelling is conducted using approved hose-reel and automatic closing nozzles, and appropriate training and equipment are supplied to deal with any incidental spillage. • Before fuel transfer, verify that a level shutoff device can be substituted for the person at the delivery tank, in which case operation of the shutoff should be verified each time it is used. • All connections will be bonded to prevent static discharge. • Any delivery hose that has the potential to cause a spill, if it were pulled from the delivery pump or valve, should be fitted with a breakaway valve. • Propane fuel delivery vehicle tanks will be manufactured and certified in accordance with applicable regulations and equipped to ensure the safe discharging of propane to a receiving tank. • Smoking is not permitted where dispensing is being carried out. • Spill control is required for small containers of flammable and combustible liquids that have the potential to spill. • When dispensing flammable liquids, ensure that static electrical charges are controlled by establishing an electrical connection between the tank or container and truck box fill stem, or by providing other appropriate measures as applicable. • Hose nozzle valves must conform to CAN/ULC-S620-M, "Hose Nozzle Valves for Flammable and Combustible Liquids" (FC 4.5.5.2.). • Valves at the storage tank must be constructed of steel according to the Fire Code. • An automatic shutoff nozzle must be used when using an integral hold-open device. • When a hose nozzle valve with a hold-open device is used, a break-away coupling conforming to CAN/ULC-S644-M, "Emergency Break-away Fittings for Flammable and Combustible Liquids" will be provided. • Do not use any object or device to maintain the flow of fuel that is not an integral part of the hose nozzle valve assembly. • Use only manufacturer's specified pressure relief security caps.

(continued)

Table 7.3-1. Fuelling Operations (completed)

Topic / Activity	Environmental Protection Measures
Bulk Transfer and Refuelling (continue)	• Use fuel dispensing pumps conforming to good engineering practice, and designed for flammable or combustible liquids. • Employees will remain at the dispensing nozzle whenever they are pumping fuel from any storage tank. • Tanks must not be filled beyond their safe filling level.
Training and Review	• Training for fuel dispensing attendants will include procedures for: supervising the dispensing of flammable and combustible liquids; taking appropriate measures to prevent sources of ignition from creating a hazard at the dispensers; taking appropriate action in the event of a spill to reduce the risk of fire; and shutting off the power to all dispensers in the event of a spill or fire. • Fuel management training for all employees and contractors will include: evacuation procedures and routes; distributing Material Safety Data Sheets (MSDS); alarm systems; when to attempt immediate response to an emergency and when to call for help; reporting procedures for personnel; shutdown procedures for equipment and electrical systems; types of potential emergencies; procedures for handling flammable liquids; importance of good housekeeping; importance of safe work habits; and procedures for control and cleanup of leaks and spills. • Training will be provided by a combination of trained, qualified mine staff and outside training service organizations, as appropriate. Training manuals will be developed before the mine begins operation.

7.4 BULK FUEL TRUCK TRANSFER PROCEDURE

A contract service provider or Sabina will fill the storage tanks in the Goose Fuel Storage Area. General procedures will ensure that the handling of fuel will meet the applicable legislation that includes the *Transportation of Dangerous Goods Act* and the *Transportation of Dangerous Goods Regulations.* The general procedures to be followed are listed below. Similar procedures would be followed for fueling remote station tanks. Before fuel transfer, verify that:

- All fuel transfer hoses are connected properly and couplings are tight;
- Transfer hoses are not obviously damaged;
- Fuel transfer personnel are familiar with procedures;
- Personnel are located at both the fuel delivery truck/barge and fuel transfer tank(s) and can manually shut off the flow of fuel;
- If a high liquid level shutoff device is installed at the transfer tank, verify that the shutoff is operating correctly each time it is used; and
- Fuel transfer proceeds per the established procedures of the contract supplier.

Any accident or spill must be reported immediately to the Operations Superintendent or Environment Department. Notification and response procedures are detailed in the SCP.

7.5 FUEL INVENTORY MANAGEMENT

All fuel products discussed in this plan will be transported to the Project and will be safely stored in the designated fuel storage areas as previously discussed. Total amounts of the fuel products received will be reconciled against amounts ordered. Fuel volumes will be measured (metered or manual dipping) as they are distributed for use from the bulk tanks. Inventory records will be updated when fuel is used and added to each tank. An unexplained loss of fuel may indicate a leak and will be immediately investigated.

Fuel tanks and fuelling equipment will be kept in good operating condition and the potential for inadvertent releases of product will be achieved through procedures provided in Table 7.5-1.

Table 7.5-1. Facility Monitoring and Preventative Maintenance

Topic / Activity	Environmental Protection Measures
Facility Monitoring and Preventative Maintenance	• Vehicles and equipment will be inspected prior to mobilization to the Project and malfunctions will be rectified. • Inspections will look for signs of deterioration, leaks, unsecured container lids or excess accumulation of materials in the containment areas. All visible leaks and releases will be documented and promptly corrected. • Equipment and light vehicle operators will conduct daily visual inspections at the start of their shifts to ensure equipment integrity, cleanliness, and the adequacy of spill prevention material. • Fuel tanks will be visually monitored on a weekly basis for signs of leakage. This will include looking for signs of corrosion, staining on the ground, and cracks or breaks in hoses and other ancillary equipment during the visual inspection. Tanks will be repaired as soon as problems are noted. • Signs on tanks will be visible and legible. • Containment areas will be kept clear of debris, excess snow, ice or standing water. • If sheen is visible on water within the secondary containment, it will be tested prior to discharge and treated if necessary. • Inspection, monitoring, and record keeping for tanks will be in accordance with regulatory requirements for the Project. • Inspection findings will be reviewed with transporters to correct deficiencies, maintain awareness, and to recognize negative or positive performance.

7.6 POTENTIAL EFFECTS ACCIDENTS OR MALFUNCTIONS

The potential effects to the environment in the event of an accident or malfunction causing a spill during transport, storage, or use of fuel are outlined in Table 7.6-1. Sabina's objective is to avoid accidents or malfunctions through implementation of effective operating practices, and ensuring proper training of employees and contractors. In addition, Sabina will ensure the petroleum, oils, and lubricant products are transported, stored, handled, transferred, and used in compliance with appropriate legislation to minimize the risk of potential environmental effects. However, if an accident or malfunction should occur Sabina will implement the SCP, Risk Management and Emergency Response Plan, Hazardous Materials Management Plan, OPEP, and the Shipboard Oil Pollution Emergency Plan where appropriate.

Table 7.6-1. Potential Environmental Effects of Fuel Product Spill to Environment

Material	Class	Potential Impact
Diesel	3	Water and soil contamination
Gasoline	3	Water and soil contamination
Aviation fuel	3	Water and soil contamination
Propane	2.1	Low risk to water and soil with proper handling
Lubricating oils	Non-regulated	Water and soil contamination
Hydraulic fluids	Non-regulated	Low risk to water and soil with proper handling
Paint thinner	Not classified	Harmful to aquatic life with long lasting effect

A complete list of potential environmental effects of hazardous materials is presented in the Hazardous Materials Management Plan.

8. Monitoring Program

Deliveries of fuel to the Project will be overseen by the operations department. Trained, -on-site staff will be responsible for observing and documenting the bulk transfer of fuel.

Monitoring of fuel storage tanks on site will be conducted in accordance with the CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (CCME 2003) and *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (2008).

Monitoring will be conducted environmental coordinators and if needed operational staff trained in spill prevention and response. Environmental monitoring staff trained in sample collection will follow-up with operations staff and conduct periodic inspections of fuel storage and transfer facilities and take water samples when needed. Sampling will be conducted consistent with established protocol and the Quality Assurance/Quality Control Plan. Contact information for environmental monitors' supervisors will be provided in Environmental Management and Protection Plan.

Water pooling within the secondary containment of the fuel storage facilities will be treated as necessary prior to release to the receiving environment in conformance with discharge water quality criteria (Table 8-1).

Table 8-1. Proposed Bulk Fuel Storage Pooling Water Discharge Criteria

Parameter	Maximum Average Concentration (mg/L)
Benzene	0.370
Ethyl benzene	0.090
Toluene	0.002
Xylene	0.300
Lead	0.200
Oil and Grease	15 and no visible sheen

Notes:
The concentrations for Benzene, Ethyl benzene, Toluene, Xylene, and Lead are Freshwater CCME Guidelines for the Protection of Aquatic Life (CCME 2013).
The concentration for Oil and Grease is included in CCME (2003).

Potentially contaminated water, ice, and snow from fuel storage areas will be collected in the fuel storage area bunds at the Goose Property and at the MLA. If water does no meet the proposed discharge criteria, Sabina will treat with oil water separators, located at each of the sites.

Treated water that meets discharge criteria and untreated water below discharge criteria, will be discharged to the terrestrial environment at a minimum setback of 31 m from all water bodies. The water discharge locations from fuel storage area secondary containment structures will be at the South and East sides of the Goose Fuel Storage Area containment structure and at each of the four sides of the MLA Fuel Storage Area containment structure. Discharges may vary year to year depending on operating conditions and the receiving environment. Sabina will not discharge any water from any fuel storage area directly to the aquatic receiving environment. Sabina may choose to direct the fuel storage area contact water to the active tailings facility.

The Type A Water Licence will confirm the monitoring stations and effluent discharge criteria to protect the receiving environment from discharges from any secondary containment fuel storage facility.

9. Mitigation and Adaptive Management

9.1 SPILL PREVENTION AND RESPONSE

Spill prevention will occur through design of fuel storage and transfer facilities including 110% secondary containment capacity where appropriate, inspections of storage areas and equipment for leaks, and the training of workers and contractors in the safe storage, transport, and use of fuel. Further details of spill prevention measures are provided in the OPEP, the SCP, and Section 7 of this Plan.

Spill response procedures, equipment, and organizations are based on a work and activity scope level assessment of potential spill risk. Sabina's comprehensive SCP and OPEP outline Sabina's plan for responding to hydrocarbon or other contaminant spill incidents that may occur at the Project.

In the event of a spill in the marine environment at the MLA the OPEP will apply. In the event of a spill at the Goose Property, MLA, or along the WIR, the SCP will apply. General spill prevention and response measures specific to fuel management are provided in Table 9.1-1.

Table 9.1-1. Spill Prevention and Response

Topic / Activity	Mitigation Measures
Spill Response Equipment (further detailed in Oil Pollution Emergency Plan and Spill Contingency Plan	• Spill kits appropriate for the hydrocarbon products being handled or transported will be positioned at refuelling areas. At a minimum, each kit will contain: o Sufficient hydrophobic absorbent material (e.g., oil absorbent booms and sorbent pads) to contain and cleanup potential drips, leaks or spills. o Gloves and heavy plastic bags to contain oily absorbent materials and contaminated soils or wastes. • Spill kits will be inspected daily to ensure sufficient materials are available. • Containment booms, linkable oil absorbent booms, and floating oil absorbent pads will be stored on-site to manage any releases to water. • Reserve spill response equipment such as booms, socks, and pads will be available for response to larger spill incidents, or to replenish materials used in the smaller equipment spill kits. • Sabina will ensure that relevant personnel are responsible for maintaining or providing necessary spill response equipment in their area, if there is a potential for an environmental spill. • Sabina will ensure secondary spill response teams are in place and capable of effecting containment, remediation, communication, and reporting.
Spill Response (further detailed in Oil Pollution Emergency Plan and Spill Contingency Plan)	• In the event a spill does occur, the following immediate actions will be taken by the responder (as is safe): o Identify source. o Stop release if safe to do so. o Contain spill to minimize impacts. o Notify the supervisor immediately. • Clean up in a manner appropriate to the spill, removing contaminated soil and snow. • Used spill kit materials will be disposed of in designated hazardous waste areas. • Spill kits will be restocked after use.
Spill Reporting	• All spills will be reported to appropriate personnel per the procedures defined in Sabina's Spill Contingency Plan.

9.2 ADAPTIVE MANAGEMENT

As Project development occurs, site experience may necessitate the need to update certain components of the Plan. Sabina will audit or review the Plan on a regular basis to identify those components that need updating or upgrading. Most important will be the review of the Plan aspects affecting safety of the environment, employees of the facility, contractors, and the general public. Operational aspects of the Plan, as well as any paperwork that deals with the Plan, will be reviewed. All aspects of the Plan will be continuously audited for effectiveness and management objectives adjusted to minimize impacts to the environment.

Formal evaluations of the Plan will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

This Plan represents an adaptive approach to understanding the effects of the Project on the landscape and the species that live there. In this context, the Plan is part of a continually evolving process that relies not only on the efficacy of data collection and analytical results, but is also dependent on feedback from the communities, government, Aboriginal groups, and the public. Having an adaptive and flexible program allows for appropriate and necessary changes to the design of monitoring studies, and the mitigation and monitoring plans. Some changes may come about through the observation of unanticipated effects or inadequacies in the sampling methods to detect measurable effects. Other changes may result from ecological knowledge acquired through working with Aboriginal community members and discussions with Elders, both in the field and through workshops.

Sabina is committed to considering and incorporating traditional knowledge into the Plan. The incorporation of traditional knowledge will occur throughout all stages of the Plan, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs to obtain feedback.

10. Record Keeping and Environmental Reporting

Records will be kept under the supervision of designated Sabina personnel at each Project site for reconciled bulk fuel inventory, weekly use summaries, weekly reconciliation for each storage tank, overfill alarm tests, pressure tests (if applicable), inspections and maintenance checks, any alteration to the system, reports of leaks or losses, reports of spill responses, and records of training.

A record will document all significant changes that have been incorporated in the FMP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Spill reporting will be conducted in accordance with Sabina's comprehensive SCP and also included as a component of the Project Risk Management and Emergency Response Plan. Reportable spills will be immediately and externally reported by the Operations Superintendent or designated alternate to the 24-hour NWT/Nunavut Spill Response Line as required.

11. Reclamation and Closure

The closure of Project, including fuel storage and associated infrastructure, is described in detail in the Interim Closure and Reclamation Plan. In general, steps will include:

- Fuel tanks will be steam cleaned, cut up, and landfilled. The rinse water will be treated before disposal;
- Concrete structures and rebar will be cut to grade, or infilled, and levelled;
- Developed areas will be re-graded to reduce the erosion potential;
- Fuel storage areas will be tested for hydrocarbon contaminated and soils remediated appropriately; and
- Excess fuel will be used, incinerated, or removed.

12. References

CCME (Canadian Council of Ministers of the Environment). 2003. *Environmental Code of Practice for Above Ground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.*

CCME. 2013. *Canadian Environmental Quality Guidelines Summary Table.* Retrieved from: http://st-ts.ccme.ca/

NIRB (Nunavut Impact Review Board). 2013. *Guidelines for the Preparation of an Environmental Impact Statement for Sabina Gold & Silver Corp.'s Back River Project*. NIRB File No. 12MN036).

NWB (Nunavut Water Board). 2010a. Mining and Milling Supplemental Information Guideline (SIG) for Mine Development (MM3). February 2010.

NWB. 2010b. Miscellaneous Supplemental Information Guideline (SIG) for General Water Works (including crossings, flood control, diversions, and flow alterations) (M1). February 2010.

5. SPILL CONTINGENCY PLANS (REVISED)

BACK RIVER PROJECT
Spill Contingency Plan

July 2016

BACK RIVER PROJECT
SPILL CONTINGENCY PLAN

Table of Contents

Table of Contents i
List of Figures iii
List of Tables iii
List of Appendices iii

Acronyms v

1. Introduction 1-1

2. Scope and Objectives 2-1
2.1 Related Plans and documents 2-1
2.1.1 Linkage with Sabina Oil Pollution Emergency Plan 2-2

3. Applicable Legislation 3-1

4. Roles and Responsibilities 4-1
4.1 Emergency Response Coordinator 4-3
4.2 Environment Superintendent 4-3
4.3 Incident Commander 4-4
4.4 Emergency Medical Personnel 4-5
4.5 Communications Officer 4-5
4.6 Security 4-6
4.7 Environmental Coordinator 4-6
4.8 Safety Coordinator 4-6
4.9 Team Leaders – (Emergency Response Team) 4-7

5. Training and Emergency Response Exercises 5-1
5.1 General 5-1
5.2 Site Orientation 5-1
5.3 Role Specific 5-1
5.4 Emergency Response Team 5-2
5.5 Spill Response Exercises 5-2

6. Emergency Response Team Contact Information 6-1

7. Planning and Implementation 7-1
7.1 Definitions and Spill Quantities 7-1
7.2 Inventory of facilities 7-2

7.3 Hazardous Materials On-site 7-7
7.4 Spill Prevention 7-7
7.5 Spill Response Equipment 7-7
7.6 Spill Response Procedures 7-10

8. General Spill Response 8-1
8.1.1 Source Control 8-1
8.1.2 Control of Free Product 8-1
8.1.3 Protection 8-1
8.1.4 Clean Up the Spill 8-1
8.1.5 Report the Spill 8-1
8.2 Response by Spill Location 8-1
8.2.1 Spills on Land 8-2
8.2.2 Spills on Water 8-2
8.2.3 Spills on Snow and Ice 8-3
8.2.3.1 Spills on the Winter Ice Road 8-4
8.3 Response by Type of Material Spilled 8-4
8.3.1 Fuel 8-4
8.3.2 Domestic Sewage 8-5
8.3.3 Tailings or Reclaim Water 8-5
8.3.4 Chemicals 8-6
8.3.5 Ammonium Nitrate and Explosives 8-7
8.4 Response to Fire 8-8
8.5 Disposal 8-8
8.6 Post-spill Monitoring and Remediation 8-8
8.7 Spill Follow-up Investigation 8-9

9. Spill Reporting 9-1
9.1 Marine Spill Reporting: 9-1
9.2 TDGR Reporting: 9-1
9.3 Internal Record Keeping 9-2

10. Adaptation Management 10-1

11. Reclamation 11-1

12. References 12-1

List of Figures

FIGURE **PAGE**

Figure 4-1. Sabina Spill Response Organization Chart 4-2

Figure 7.2-1. Marine Laydown Area General Arrangement Plan with Emergency Response Site Locations 7-4

Figure 7.2-2. Goose Property General Arrangement with Emergency Response Site Locations 7-5

Figure 7.2-3. Goose Plant Site Layout Emergency Response Site Locations 7-6

List of Tables

TABLE **PAGE**

Table 3-1. Legislation Applicable to the Spill Contingency Plan 3-1

Table 6-1. Emergency Response Management Team 6-1

Table 6-2. Contractor Contacts 6-1

Table 6-3. External Spill Response Contacts.....6-1

Table 6-4. Key Government Contacts.....6-2

Table 7.1-1. Externally Reportable Volumes (AANDC 2010, TDGR).....7-2

Table 7.5-1. General Equipment for Emergency Spill Response 7-9

Table 7.5-2. Environmental Emergency Trailer Equipment List.....7-9

Table 8.3-1. Simplified Spill Response Scenarios for Potential Explosives 8-8

List of Appendices

Appendix A. SDS for Hazardous Substances Stored On-Site

Appendix B. Expected Hazardous Materials Transported, Stored and Used On-site

Appendix C. Sabina Internal Report Form

Appendix D. NWT-NU Spill Report Form

Acronyms

CCME	Canadian Council of Ministers of the Environment
ERAP	Emergency Response Assistance Plan
ERC	Emergency Response Coordinator
ERT	Emergency Response Team
FEIS	Final Environmental Impact Statement
HMMP	Hazardous Materials Management Plan
INAC	Indigenous and Northern Affairs Canada
ISO	International Organization for Standardization
KIA	Kitikmeot Inuit Association
MLA	Marine Laydown Area
NWB	Nunavut Water Board
NWT	Northwest Territories
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
PPE	Personal Protective Equipment
Project	Back River Project
RMERP	Risk Management and Emergency Response Plan
Sabina	Sabina Gold & Silver Corp.
SDS	Safety Data Sheet
SCP or Plan	Spill Contingency Plan
STP	Sewage Treatment Plant
TDGR	Transportation of Dangerous Goods Regulations
TSF	Tailings Storage Facility
WHMIS	Workplace Hazardous Materials Information System

1. Introduction

Sabina Gold & Silver Corp. (Sabina) is proposing two main areas of development as part of the Back River Project (the Project). These two main areas will be interconnected with winter ice roads: Goose Property and the Marine Laydown Area (MLA) situated along the western shore of southern Bathurst Inlet. Refer to base Figures 1 to 5 for general site layout and locations. A detailed project description is provided in the Main Application Document.

This Spill Contingency Plan (SCP or Plan) outlines the spill prevention and response measures that Sabina will implement in responding to hydrocarbon or other contaminant spill incidents that may occur at the Project. The Plan addresses land and freshwater based emergency response and spill scenarios at the MLA in southern Bathurst Inlet, and the Goose Property. Marine response is detailed in the Oil Pollution Emergency Plan (OPEP). The SCP and other management plans are intended to support the Type A Water Licence Application for the Project.

Borrow pits and quarries are defined by the type of granular material extracted and the method of extraction. Quarries consist of rock material that is typically extracted by digging, cutting, or blasting and yields large stones that may then need to be crushed (INAC 2009). Borrows pits consist of fine grained fill materials, such as sand or clay, which are normally used at a nearby site (INAC 2009).

The Plan was prepared following the requirements of the Supplementary Information Guidelines (SIG) for Mining and Milling MM3 and Water Works M1, issued by Nunavut Water Board (NWB 2010 a, b) and the Environmental Impact Statement Guidelines issued by the Nunavut Impact Review Board to Sabina (NIRB 2013) and in accordance with best management practices and in conformance with current Federal and Territorial statutory requirements (see Applicable legislation and Guidelines Section 3.0).

This Plan is a living document to be updated upon changes in related regulatory requirements, management reviews, incident investigations, changes to facility operation or maintenance, and environmental monitoring results, best practice updates or other Project specific protocols once construction starts through to Project closure activities. Any updates will be filed with the Annual Report submitted under the Type A Water Licence.

The information presented herein is current as of July 2016. The next update will be initiated prior to the start of construction to update the applicable Safety Data Sheets (SDSs) in Appendix A, and emergency contact information in Section 6. The Plan will be reviewed as needed for changes in operation and technology and as directed by the NWB in the Type A Water Licence or other regulatory authorization where appropriate. Completion of the updated Plan will be documented through signatures of the personnel responsible for reviewing, updating, and approving the Plan.

A record will document all significant changes that have been incorporated in the Plan subsequent to the latest review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Sabina will maintain a distribution list providing contact details for all parties to receive the Plan including key personnel, contractors, organizations, and external agencies.

2. Scope and Objectives

The Spill Contingency Plan is one of the documents that forms part of Sabina's overall Emergency Response Program for the Project. This Plan has been written to meet requirements of a Type A Water Licence and applies to all Sabina projects in the Kitikmeot region.

The scope of this Plan focuses on the spill response and environmental protection measures required in the event of a hydrocarbon or other contaminant spill at any of the Project properties and associated infrastructure, including winter ice and all-weather access roads and airstrips. This entails the implementation of response procedures for Project-related spills, releases, or discharges to land, water, ice and snow of the following products:

- Hydrocarbon products including diesel fuel, gasoline, hydraulic oil;
- Soluble solids such as ammonium nitrate prill;
- Liquids such as glycols and paints;
- Tailings or reclaim water;
- Corrosive liquids including sulphuric acid and sodium cyanide;
- Compressed (inert and flammable) gas; and
- Other hazardous substances.

The SCP is designed to protect worker and public safety and minimize potential impacts to the environment in the event of a Project-related spill. This will be achieved through the application of best management practices implemented through predetermined lines of response and plans of action.

This Plan is divided into the following components:

- Applicable Legislation and Guidelines (Section 3);
- Roles and Responsibilities (Section 4);
- Training and Emergency Response Exercises (Section 5);
- Emergency Response Team (ERT) Contact Information (Section 6);
- Planning and Implementation (Section 7);
- General Spill Response (Section 8);
- Spill Reporting (Section 9);
- Adaptive Management (Section 10); and
- Reclamation (Section 11).

2.1 RELATED PLANS AND DOCUMENTS

Documents within the Application for the Type A Water Licence, which support this Plan include:

- Risk Management and Emergency Response Plan;
- Oil Pollution Emergency Plan;

- Fuel Management Plan;
- Landfarm Management Plan;
- Hazardous Materials Management Plan;
- Water Management Plan;
- Explosives Management Plan (Final Environmental Impact Statement [FEIS} Volume 10, Chapter 13);
- Occupational Health and Safety Plan (FEIS Volume 10, Chapter 15);
- Shipping Management Plan (FEIS Volume 10, Chapter 15); and
- Shipboard Oil Pollution Emergency Plan (to be provided in the future by Shipping Company).

Additionally, Emergency Response Assistance Plans (ERAPs) will be required for the transport of certain chemicals in accordance with Section 7 of the Transportation of Dangerous Goods Regulations (TDGR). This is discussed further in Sections 8.3.4 and 8.3.5.

Based on the quantity of fuel to be transferred from ship to shore at the MLA, the MLA will be considered an Oil Handling Facility (OHF). This SCP is intended to interface with the OPEP developed for the MLA and the Shipping Management Plan developed for the shipping component of the Project.

2.1.1 Linkage with Sabina Oil Pollution Emergency Plan

The *Response Organizations and Oil Handling Facilities Regulations* under the *Canada Shipping Act* stipulates that operators of designated OHFs must have an onsite OPEP that has been approved by Transport Canada.

The OPEP prepared for the MLA-OHF applies to marine spills that may occur during ship-to-shore fuel transfers. Ship-specific Shipboard Oil Pollution Emergency Plans specifically address marine spill incidents that may be associated with spills from shipping vessels while at sea. The OPEP prepared for the MLA has been designed to complement this Plan.

Sabina's ERT will be trained to adequately handle any emergencies that impact the ocean, land, and freshwater, including implementation of this SCP for land-based spills, and implementation of the OPEP for any spills that may occur during ship-to-shore fuel transfers.

3. Applicable Legislation

Specific legislation, regulations, and guidelines related to spill contingency planning and response in Canada, and specifically within Nunavut, are summarized in Table 3-1. Operational policies and procedures that fulfill conditions in applicable legislation will be further developed as the project proceeds.

Sabina will also be bound by the terms and conditions of its land use permits to be issued by Indigenous and Northern Affairs Canada (INAC) for Crown Lands and the Kitikmeot Inuit Association (KIA) for Inuit Owned Land, and its Type A Water Licence to be issued by the Nunavut Water Board.

Table 3-1. Legislation Applicable to the Spill Contingency Plan

Acts	Regulations	Guidelines
Federal		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c.A-12)	Arctic Shipping Pollution Prevention Regulations (C.R.C., c. 353)	
Canadian Environmental Protection Act (R.S.C.1999 c.33)	Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197) Environmental Emergency Regulations (SOR/2003-307) Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301) Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149)	Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (Canadian Council of the Ministers of Environment (CCME) 2003) Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (CCME 2008)
Fisheries Act (1985, c.F-14)	Metal Mining Effluent Regulations (SOR/2002-2222)	
Explosives Act (1985, c.E-17)	Ammonium Nitrate and Fuel Oil Order (C.R.C., c.598) Explosives Regulations (C.R.C., c.1516)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002)	Nunavut Water Regulations (2013)	
National Fire Code of Canada (2010)		
Transportation of Dangerous Goods Act (1992, C.34)	Transportation of Dangerous Goods Regulations (SOR/2001-286)	2016 Emergency Response Guidebook (Transport Canada and U.S. Department of Transportation, 2016)
Territorial Lands Act (R. S. 1985, c.T-7)	Northwest Territories and Nunavut Mining Regulations (C.R.C., c.1516) Territorial Land Use Regulations (C.R.C., c.1524) Territorial Lands Regulations (C.R.C., c. 1525)	

(continued)

Table 3-1. Legislation Applicable to the Spill Contingency Plan (completed)

Acts	Regulations	Guidelines
Hazardous Products Act *Nunavut Act* (1993 c.28)	*Controlled Products Regulations*	*Workplace Hazardous Materials Information System (WHMIS)*
Territorial – Nunavut		
Environmental Protection Act	Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93) Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003) The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment (DOE) as a waste generator as well as carrier (if applicable) prior to transport	Government of Nunavut (GN) Environmental Guidelines for the Management of: o General Management of Hazardous Waste in Nunavut (GN, 2010a) o Waste Paint (GN, 2010b) o Mercury-Containing Products and Waste Mercury (GN, 2010c) o Industrial Waste Discharges into Municipal Solid Waste and Sewage Disposal Facilities (GN, 2011a) o Waste Batteries (GN, 2011b) o Waste Solvent (GN, 2011c) o Waste Antifreeze (GN, 2011d) o Used Oil and Waste Fuel (GN, 2012) o Biomedical and Pharmaceutical Waste (GN, 2014) Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil (CCME 2008)
Mine Health and Safety Act (SNWT (Nu) 1994, c.25)	Mine Health and Safety Regulations (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1998, c.W-6)	Workers' Compensation General Regulations (Nu Reg 017-2010)	
Explosives Use Act (RSNWT (Nu) 1988, c.E-10)	Explosives Regulations (RRNWT (Nu) 1990, c.E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c.F-6)	Fire Prevention Regulations (RRNWT (Nu) 1990, c.F-12)	
Motor Vehicles Act (RSNWT (Nu) 1988, c.M-16)	Large Vehicle Control Regulations (RRNWT (Nu) 1990, c.M-30)	
Public Health Act (RSNWT (Nu) 1988, c.P12)	Camp Sanitation Regulations (RRNWT (Nu) 1990, c.P-12)	
Safety Act (RSNWT 1988, c.S-1)	General Safety Regulations (RRNWT (Nu) 1990, c.P-16) Work Site Hazardous Materials Information System Regulations (RSNWT 1988, c.81 (Supp))	
Transportation of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c.81 (Supp))	Transportation of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91)	

4. Roles and Responsibilities

The initial stage of any emergency or spill incident and resultant response is critical. An effective and timely response is essential to prevent an emergency or spill situation from escalating to a higher level. Therefore, all relevant personnel must be fully aware of their individual duties and responsibilities as presented in this Plan.

Figure 4-1 summarizes Sabina's generalized emergency and spill response organization chart. This organization chart is the generalized emergency response organization chart presented in the Risk Management and Emergency Response Plan (RMERP), as well as the OPEP, as the same roles and responsibilities apply to spills and other emergencies.

Specific responsibilities and duties inherent to personnel involved in emergency and spill response are outlined in Sections 4.1 to 4.9. In the SCP, all spills are emergencies. Having said that, and similar to other emergencies, the severity of the spill will determine the need and level of response and participation of the ERT members.

As a contractual condition with penalties, Contractors will be obliged to comply with Sabina's approvals and environmental management plans, including this Spill Contingency Plan. Sabina staff will monitor contractor performance and adherence to legislation and the commitments in the environmental management plans.

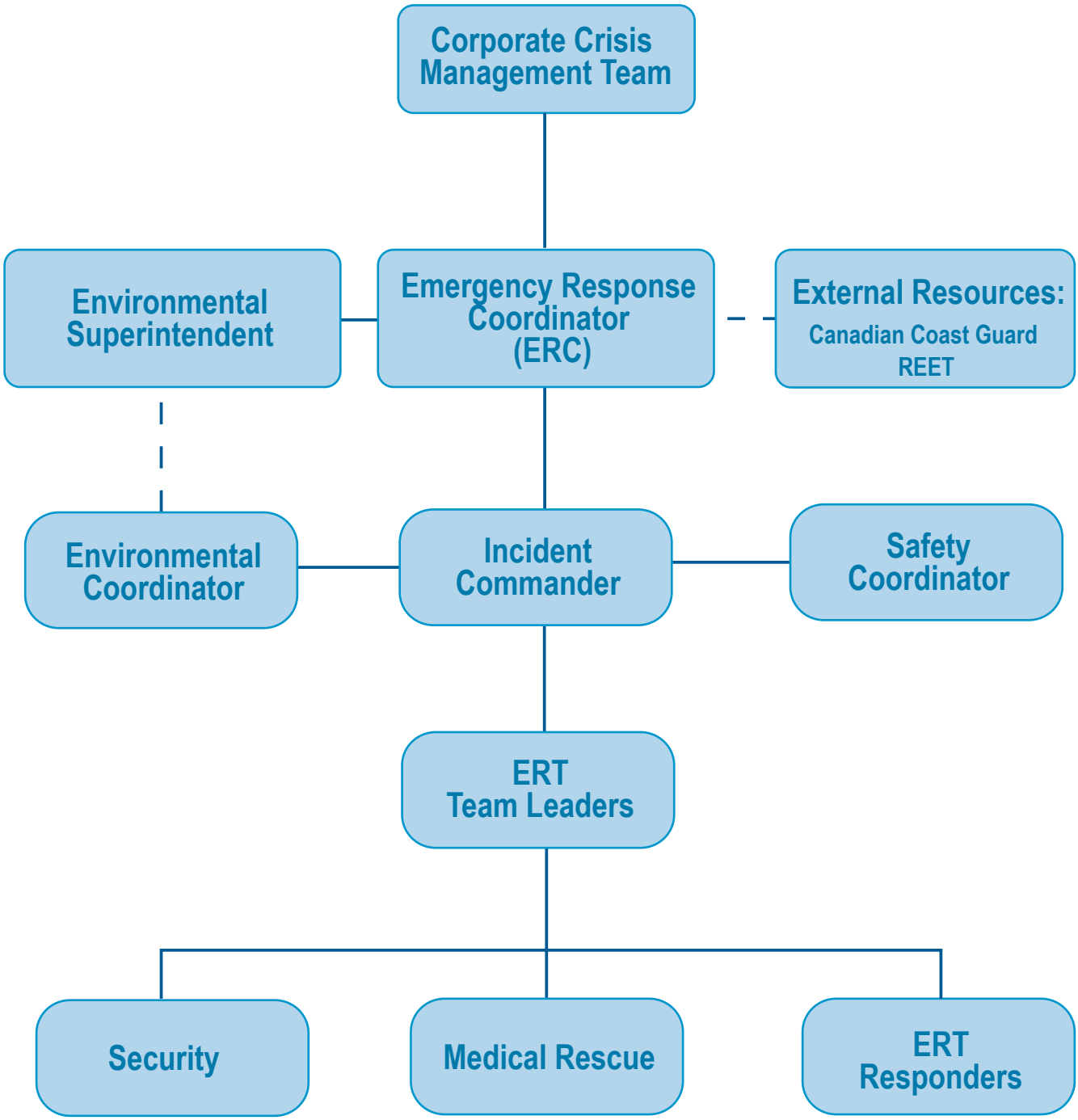

Figure 4-1

Sabina Spill Response Organization Chart

4.1 EMERGENCY RESPONSE COORDINATOR

The Emergency Response Coordinator (ERC) is the General Manager or his designate if absent. ERC duties during an emergency are detailed as follows:

- The ERC will ensure coordination of ERT support systems.
- Upon being notified of an emergency, the ERC will initiate response activities and assess the situation based on current information from the Incident Commander.
- Activate the emergency response process and escalate according to severity of incident.
- The ERC will coordinate all activities. In the event the ERC leaves his post, the ERC will designate an individual to coordinate in his absence.
- Ensure that the appropriate area manager/s has been notified.
- Provide internal notification as applicable based on the level of emergency.
- Provide instruction to ensure that appropriate external resources are notified.
- Receive information from the Incident Commander and ensure appropriate resources are made available.
- Provide support for the acquirement of additional supplies and resources as requested by the Incident Commander.
- Contact departmental resources via radio as required during the emergency response.
- Provide internal notification of the “all clear”.
- Ensure the coordination and establishment of an emergency debriefing session.
- Review incident log and post response incident report.
- Post incident debrief with Incident Commander.
- Provide necessary information to Public Relations for a media statement release if required.
- Complete a report on the events surrounding the incident.
- Coordinate collection of all incident notes, reports, statements and log of events.
- End the event in a project tracking system.

4.2 ENVIRONMENT SUPERINTENDENT

The duties of the Environment Superintendent during a spill emergency are detailed as follows:

- For major spills contact the ERC and report to the command center.
- Assist the ERC in evaluating the initial situation and assessing the magnitude of the spill.
- Report the spill to NWT-NU 24-hour Spill Report Line depending on whether threshold volume is triggered.
- Assist in developing an overall plan of action.
- Document all actions and decisions.
- Complete Government Agency notification processes.
- Act as the spokesperson with government agencies as appropriate.

- Collect photographic records of the spill event and cleanup efforts.
- Report to the ERC and provide recommendations on resource requirements (additional manpower, equipment, material) to complete the cleanup effort.
- Provide liaison with management to keep them informed of cleanup activities.
- Ensure that the spill is cleaned up and follow-up communication and reports are filed with the INAC and KIA.
- Assist in the accident/incident investigation process.
- Participate in post-emergency debriefing.
- Ensure that all involved departments complete reporting process.
- Ensure that spill reports submitted to INAC and KIA include photographic records and an updated map showing Universal Transverse Mercator (UTM) coordinates, date, and amount and nature of the spill.
- Implement a sampling procedure for the collection and analysis of samples to identify and monitor possible contaminant levels resulting from the spill.
- Document the cause of the spill and effectiveness of the cleanup effort, and recommend the appropriate measures to prevent a recurrence of the spill.
- Prepare and submit follow-up documentation required by appropriate regulators.

For marine spills at the OHF, the Environment Superintendent will be available to the Canadian Coast Guard during the entire incident.

4.3 INCIDENT COMMANDER

The Incident Commander is the site lead administrator for the ERT, responsible for ensuring the necessary emergency response equipment and adequate level of training for ERT members. The Incident Commander directs the ERT at the scene as ERT Leader. In the absence of the Incident Commander, a senior team member will be designated in his place.

The duties of the Incident Commander during an emergency are:

- Muster accordingly and brief team members.
- Report to the scene of the emergency.
- Take charge of the scene.
- Evaluate the details of the emergency as presented by those on scene.
- Assess the immediate situation, confirm the level of emergency and notify the ERC.
- Maintain contact with the ERC and provide support in coordination of the response.
- Direct ERT members in their respective tasks as required.
- Contact departmental resources via radio as required during the emergency response.
- Request internal/external resources as required.
- Advise ERT on aspects of internal/external support as they are received.
- Develop a written log of events indicating instructions given, action taken and outcomes achieved.

- Announce the 'all clear' to the ERC when the emergency has ended.
- Lead the post-emergency debriefing session.
- Ensure that all ERT equipment is returned to original order and/or replaced to ensure future rapid response.
- Provide assistance with ongoing investigation.
- Prepare a written report on response activities.

4.4 EMERGENCY MEDICAL PERSONNEL

Duties during an emergency are as follows:

- Respond when required as directed by the Incident Commander.
- Responsible for all decisions of medical-related situations on site.
- Responsible for assessing, administering and delegating emergency medical care.
- Advise the Incident Commander of the number and condition of any ill/injured personnel.
- Advise the ER Coordinator of off-site resources required.
- Maintain a log of events, actions and outcomes.
- Participate in a post-emergency debriefing session.

4.5 COMMUNICATIONS OFFICER

The Communications Officer manages the collection and dissemination of all information relating to an emergency, including:

- Government agencies, including those that may be involved in responding to any emergency;
- Communities (Hamlets, community groups and individuals); and
- Media.

The Communications Officer will be part of the Corporate Crisis Management Team identified on Figure 4-1, and most likely will be a corporate executive such as the Vice President, Environment & Sustainability, or a designate. The Communications Officer will get involved in large spills that warrant communication with stakeholders other than the KIA and INAC.

If the severity of the incident warrants, the Communications Officer or designate will control radio use and restrict it to emergency response only. The Communications Officer will also direct the collection and management of all written information, photographs, drawings and video recordings generated during the emergency. This includes the following records:

- A record of the chronology of events.
- Log of telephone calls.
- Log of written statements regarding the emergency (emails, press releases, etc.).
- A list of personnel on-site at the time of the emergency along with emergency contact information, in case it is needed.

All other communications of an emergency by other project personnel will be prohibited, to limit possible uncontrolled dissemination of misinformation.

4.6 SECURITY

Security personnel or designates are key in an emergency response in that they will receive an initial notification of an emergency and provide first communications to essential personnel and secure the area.

Duties during an emergency are as follows:

- Security will report muster and evacuation status to the Incident Commander and await further instruction.
- Provide traffic and personnel control at scene as directed by the Incident Commander.
- Assist in controlling access to the emergency area.
- Maintain open radio communication (via radio or telephone intercom system).
- Keep a written record of events throughout incident.
- Relay notification of 'all clear" order when directed by Incident Commander.
- Maintain Security of the scene as directed by the ERC or Incident Commander.
- Direct all off-site inquiries regarding the emergency to the ERC or designate.
- Participate in a debriefing session for the emergency response.

4.7 ENVIRONMENTAL COORDINATOR

The Environmental Coordinator will liaise with the Incident Commander to advise on direction of environmental response efforts once the scene has been assessed by the Incident Commander and all medical and/or fire emergencies are under control.

The Environmental Coordinator will:

- Directly proceed to the scene of the incident.
- Make recommendations for response methods and resources based on area sensitivities and incident severity through the Incident Commander as necessary.
- Make recommendations for additional resources through the Incident Commander as necessary.
- Participate in post-emergency debriefing.
- Maintain a log of events, actions, and outcomes.

4.8 SAFETY COORDINATOR

The duties of the Safety Coordinator during an emergency are detailed as follows:

- Contact the ERC.
- Respond to the scene and make direct contact with the Incident Commander.
- Establish perimeters around the area of the emergency and direct appropriate resource personnel responsible for traffic flow.

- Assist with identifying and assessment of potential hazards of the ERT response and notify the Incident Commander.
- Ensure appropriate personal protective equipment for involved ERT and non ERT personnel.
- Note pertinent information that may be relative to the investigation.
- Secure the area in coordination with site security.
- Participate in post-emergency debriefing.
- Assist in the accident/incident investigation and complete report.

4.9 TEAM LEADERS – (EMERGENCY RESPONSE TEAM)

The duties of the Team Leaders during an emergency are detailed as follows:

- Report to the scene of the incident.
- Work closely with the Incident Commander to determine appropriate response strategy for their respective work area.
- Contact departmental resources via radio as required during the emergency response.
- Direct ERT members in their respective tasks as required.
- Participate in a post-emergency debriefing session.

5. Training and Emergency Response Exercises

5.1 GENERAL

Training and awareness are two major elements of spill prevention. All site staff and contractors will review the contents of the SCP during their on-site orientation and will be informed of where copies of the Plan are stored. The mandatory site orientation will provide hazard awareness training, identify the locations of spill kits and other response equipment, and discuss appropriate application. A more detailed description of the training to be provided to site staff is provided in Section 7 of this Plan.

Sabina will ensure that relevant personnel involved in a response have received prior training and the requisite skills to safely minimize the impact of a spill to the environment.

The personnel directly linked to emergency (including spill) response operations will receive training to familiarize themselves with the SCP and the RMERP on a regular basis according to their duties and responsibilities. All completed training will be recorded in a training register, to be kept up to date by the ERT.

The personnel directly linked to spill response operations, contract employees and the other responders identified in the environmental emergency plan should take part in the yearly training program. Training will be conducted to ensure adequate numbers of responders are available for all levels, times, and work shifts.

As a contractual condition with penalties, Contractors will be obliged to comply with Sabina's approvals and environmental management plans, including this SCP. Sabina staff will monitor contractor performance and adherence to legislation and the commitments in the environmental management plans.

5.2 SITE ORIENTATION

On site orientation will be provided to all personnel to ensure employees are aware of:

- The RMERP, Explosives Management Plan (FEIS Volume 10, Chapter 13), SCP, OPEP, and Fire Action Plan.
- Applicable Legislation.
- Environmental Receptors (i.e., surface water and sensitive areas).
- What First Responders are to do in case of a spill.
- The location of SDS sheets and Spill Report Forms.
- The location of the Spill Response Kits.
- The general locations of fire extinguishers and firefighting equipment.
- The location of the SCP and the Fire Action Plan.

5.3 ROLE SPECIFIC

Specific training will be provided to all employees whose job function may have a higher probability of experiencing a spill, such as those handling chemicals, to ensure understanding of:

- Workplace Hazardous Materials Information Systems (WHMIS) and TDGR.
- Specialized handling and emergency/spill response procedures related to specific chemicals (e.g., explosives, cyanide, fuel) to minimize the risk of spills.
- Identify and avoid the conditions which may lead to a spill.
- Develop an understanding of the potential environmental impacts of a spill.
- Recognize the hazards associated with sources of ignition (smoking, electrical sparks) near a fuel source.
- Spill kit contents and use of them.

For employees involved in fuel handling, additional training would be provided regarding appropriate refueling techniques and drum handling procedures. Personnel not trained to handle chemical spills shall not attempt to clean up spills; they are to contact emergency response personnel for clean-up assistance. Medical staff potentially involved in supporting response workers will receive role-specific training including information on the details of the Plan and SDSs.

5.4 EMERGENCY RESPONSE TEAM

Members of the ERT will be provided a higher level of training to allow for safe and adequate response. The ERT members will receive 8 hours of training during each two-month period, or as prescribed by the *Mines Act*. ERT training includes:

- Information provided as part of the Role-Specific Training.
- First Aid training.
- Fire extinguishers and water pump locations and use.
- Details of the SCP and the Fire Action Plan.
- How to identify, evaluate and mitigate the hazards posed by any spilled product by using appropriate PPE (personal protective equipment).

5.5 SPILL RESPONSE EXERCISES

Spill response exercises will be conducted on occasion to validate on site capabilities, practice the internal and external notification processes and evaluate the management of the response through the decisions and actions of the spill management team participating in the exercise(s).

The exercises will involve the application of realistic hands-on scenarios where the ERT will deploy the appropriate equipment to respond to the specific spill scenario developed for the exercise. The spill exercise may be broken down into two or more sessions to ensure adequate coverage. Records of all spill response exercises will be kept on file and posted to provide access for those who were unable to attend.

6. Emergency Response Team Contact Information

Contact information for all Sabina Staff members involved in spill response is presented in Table 6-1. Contact information for Project contractors will be updated and presented in Table 6-2 when they become available. External contacts that may provide additional assistance as necessary are presented in Table 6-3. Key government contacts are provided in Table 6-4. These contacts will be reviewed and updated with every review of the SCP.

Table 6-1. Emergency Response Management Team

Title	Contact Name	Telephone No.
Emergency Response Coordinator	TBD	TBD
Environmental Superintendent	TBD	TBD
Incident Commander	TBD	TBD
Environmental Coordinator	TBD	TBD
Safety Coordinator	TBD	TBD
Operations Superintendent	TBD	TBD
Emergency Medical Personnel	TBD	TBD
Team Leaders	TBD	TBD
Communications Officer	TBD	TBD

Table 6-2. Contractor Contacts

Title	Telephone No.
TBD	TBD
TBD	TBD
TBD	TBD

Table 6-3. External Spill Response Contacts

Expediting Company	Contact Name	Telephone No.
Fuel Supplier, Mobile Environmental Response	TBD	TBD
Kitnuna	TBD	(867) 983-2331
Nuna Logistics Ltd.	TBD	(867) 682-4667
DuPont (Fuel Dye)	TBD	(905) 821-5660
Frontier Mining (Sorbents)	TBD	(867) 920-7617
Acklands (Sorbents)	TBD	(867) 873-4100
Canadian Coast Guard*	TBD	Phone: (800) 265-0237

** Refer to the OPEP for oil spill response in the marine environment.*

Table 6-4. Key Government Contacts

Agency/Organization	Contact Name	Telephone/Fax No.
NWT/NU 24hr Spill Report Line		Phone: (867) 920-8130 Fax: (867) 873-6924 Email: spills@gov.nt.ca
Indigenous and Northern Affairs Canada	Water Resources Officer Resource Mgmt. Officer A/Manager of Field Ops	Phone: (867) 669-2438 Phone: (867) 975-4296 Phone: (867) 975-4295
Canadian Coast Guard (in the event of a spill to the marine environment)		Phone: (800) 265-0237
Department of Fisheries and Oceans	fisheriesprotection@dfo-mpo.gc.ca	Phone: 1 (855) 852-8320
Environment Canada	Manager of Enforcement NWT/NU 24hour Spill Report Line	Phone: (867) 669-4730 Phone: (867) 920-8130
Government of Nunavut Environmental Protection	Director Environment	Phone: (867) 979-7800
Kitikmeot Inuit Association (KIA)	Lands Inspector	Phone: (867) 982-3310 x223
Nunavut Water Board	Exec. Director Manager of Licensing	Phone: (867) 360-6338 Phone: (867) 360-6338
RCMP (Kugluktuk)		Phone: (867) 982-2111
RCMP (Yellowknife)		Phone: (867) 669-1111
Workers Safety and Compensation Commission	Chief Inspector of Mines	Phone: (867) 669-4430 Fax: (867) 873-6924

7. Planning and Implementation

Planning for the SCP started with the development of the Draft Environmental Impact Statement which identified existing (baseline) conditions, assessed potential impacts of the Project, developed conceptual mitigation strategies, and developed specific mitigation measures to execute these strategies. Conceptual strategies and plans have advanced with FEIS and will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management will be tracked, reviewed, and updated through ongoing maintenance of the Plan. These updates will incorporate relevant feedback from the public, obtained during public consultation.

7.1 DEFINITIONS AND SPILL QUANTITIES

For the purpose of this Plan, a **major spill** is defined as an accidental release of product into the environment that has the potential for significant adverse impact and is a reportable quantity.

A **minor spill** is defined as any hazardous chemical spill that does not involve highly toxic, highly reactive, or explosive chemicals, in a situation that is not life threatening, nor poses immediate risk to the receiving environment. Furthermore, this type of spill presents a manageable physical or health hazard to personnel who, when wearing proper personal protective equipment (PPE), will not be exposed to any chemical at a level that exceeds any recognized action levels or permissible exposure limits.

Minimum reportable thresholds are provided by:

- Guidelines for Spill Contingency Planning, Appendix B-3: Immediately Reportable Spill Quantities (AANDC 2010).
- Transportation of Dangerous Goods Regulations – Part 8 – Accidental Release and Imminent Accidental Release Reporting Requirements.

The SCP is activated based on the lowest minimal reportable thresholds as shown in Table 7.1-1.

If a spill on site meets or exceeds the minimum reportable thresholds, or is thought to exceed the minimum reportable thresholds, the spill will be reported by the Environmental Superintendent (or designate) to the **NWT-NU 24-Hour Spill Report Line**. All spills of fuel or hazardous materials into a waterbody or ice will be reported to the Spill Report Line, to ensure compliance with the *Fisheries Act*.

Accidental releases of runoff from mining areas not conforming to facility designs (e.g., tailings supernatant, WRSA runoff from ponds, etc.), and from lined containment areas (i.e., tank farm berms) will be reported as “other contaminants” in Table 7.1-1.

Additional direction on the reporting of spills, including also TDGR requirements for reporting of spills of dangerous goods in transit, is provided in Section 9.2.

Procedures will be developed and implemented to require all non-reportable spills to be communicated by staff and responded to as needed.

Table 7.1-1. Externally Reportable Volumes (AANDC 2010, TDGR)

TDGA Class	Description of Contaminant	Amount Spilled
1	Explosives	Any amount
2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity greater than 100 litres
2.2	Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 litres
2.3	Compressed gas (toxic)	Any amount
2.4	Compressed gas (corrosive)	Any amount
3.1, 3.2, 3.3	Flammable liquid (hydrocarbon fuels)	100 litres
4.1	Flammable solid	25 kg
4.2	Spontaneously combustible solids	25 kg
4.3	Water reactant solids	25 kg
5.1	Oxidizing substances	50 litres or 50 kg
5.2	Organic peroxides	1 litre or 1 kg
6.1	Poisonous substances	5 litres or 5 kg
6.2	Infectious substances	Any amount
7	Radioactive	Any amount
8	Corrosive substances	5 litres or 5 kg
9.1 (in part)	Miscellaneous products or substances, excluding PCB mixtures	50 litres or 50 kg
9.1 (in part)	PCB mixtures of 5 or more parts per million	0. 5 litres or 0. 5 kg
9.2	Environmentally hazardous	1 litre or 1 kg
9.3	Dangerous wastes	5 litres or 5 kg
None	Other contaminants	100 litres or 100 kg

7.2 INVENTORY OF FACILITIES

Facilities on site for the storage of chemical, hazardous material and/or fuel at the MLA includes:

- Landfarm;
- Lined Hazardous Materials Management Area;
- Freight Storage Area; and
- Fuel Storage Area (4 x 15 ML tanks).

Refer to Figure 7.2-1 for the MLA facility arrangement.

Facilities on site for the storage of chemical, hazardous material and/or fuel at the Goose Property includes:

- AN Storage and AN Facility;
- Process Plant;
- Power Plant;

- Truck Shop/Dry Warehouse;
- Freight Storage;
- Fuel Unloading and Dispensing
- Laydown Storage;
- Haul Truck Fueling Station;
- Waste Oil Storage;
- Lined Hazardous Materials Management Area;
- Fuel Storage (3 x 12ML tanks); and
- Landfarm.

Refer to Figure 7.2-2 and 7.2-3 for Goose Property facility arrangement. For spill response equipment inventory refer to Section 7.5.

As Project planning and design progresses, more detail of specific products and expected amounts will be included in this Plan. A revised inventory of facilities and products quantities will be provided 60 days prior to construction and when needed to account for changes in operation and technology and as directed by the NWB in the Type A Water Licence or other regulatory authorization where appropriate.

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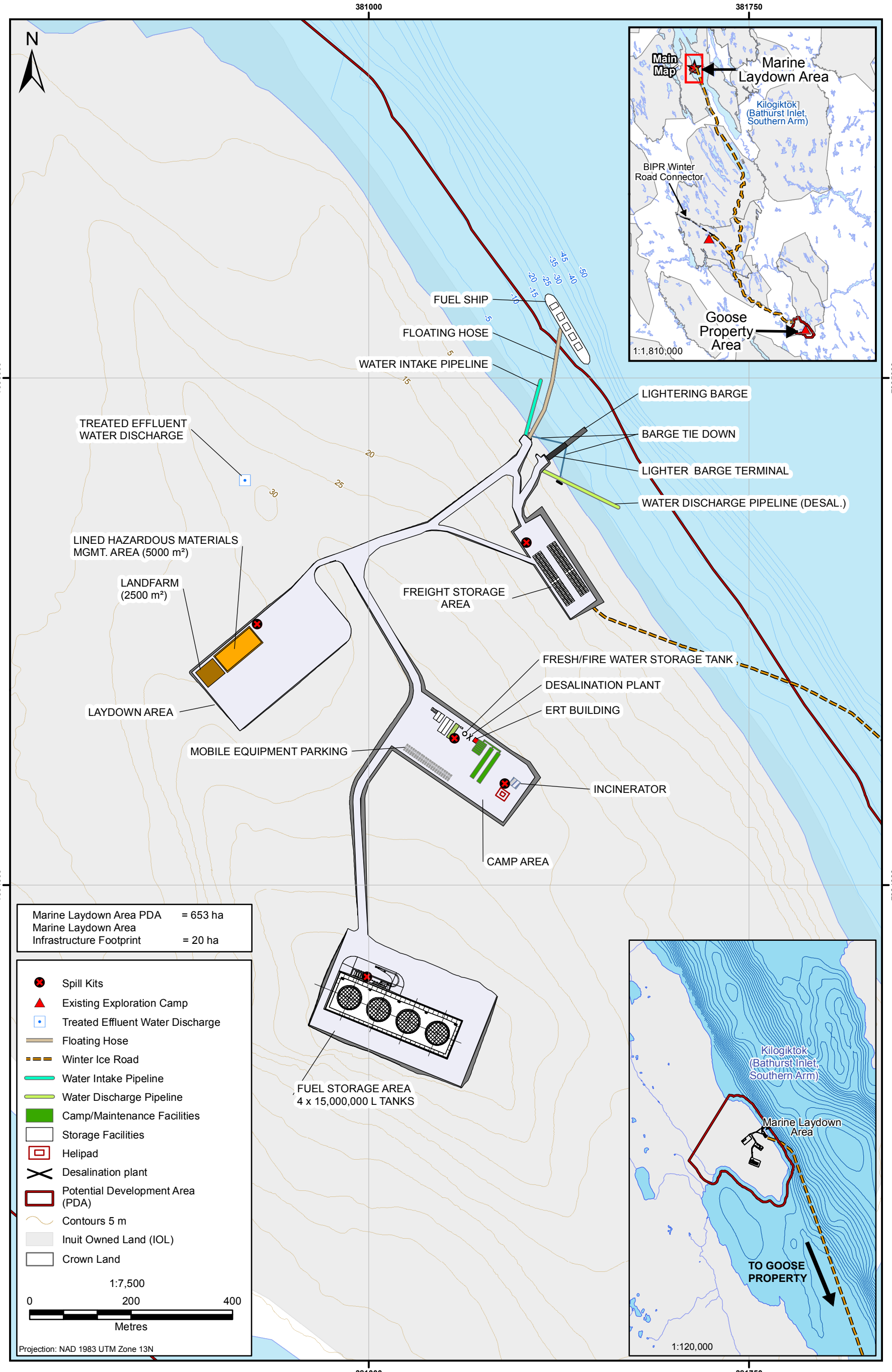

NOTE: All roads at the MLA are service roads

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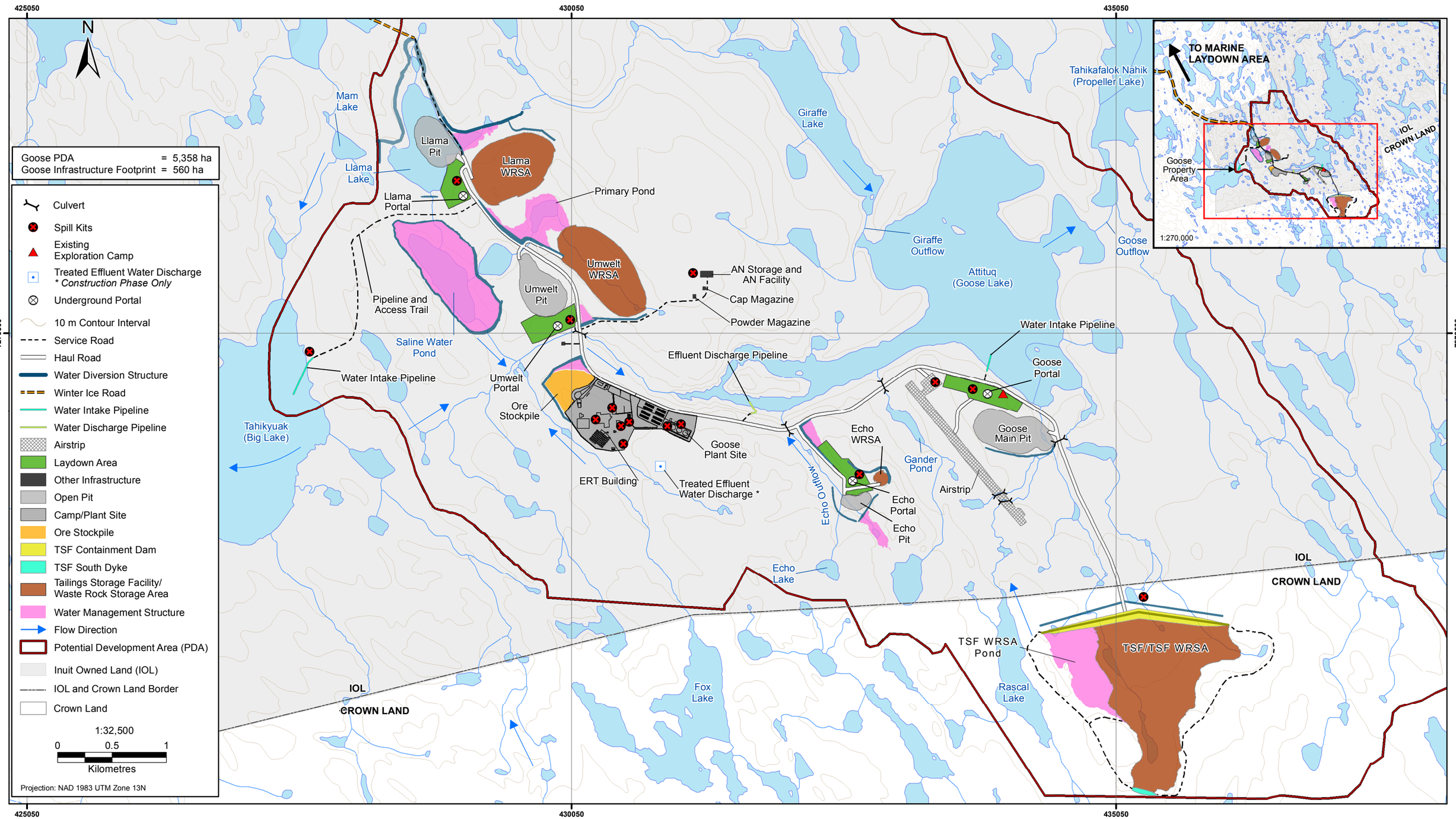
Figure 7.2-1

Marine Laydown Area
General Arrangement Plan with Emergency Response Site Locations



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Goose Property
General Arrangement with Emergency Response Site Locations

Figure 7.2-2

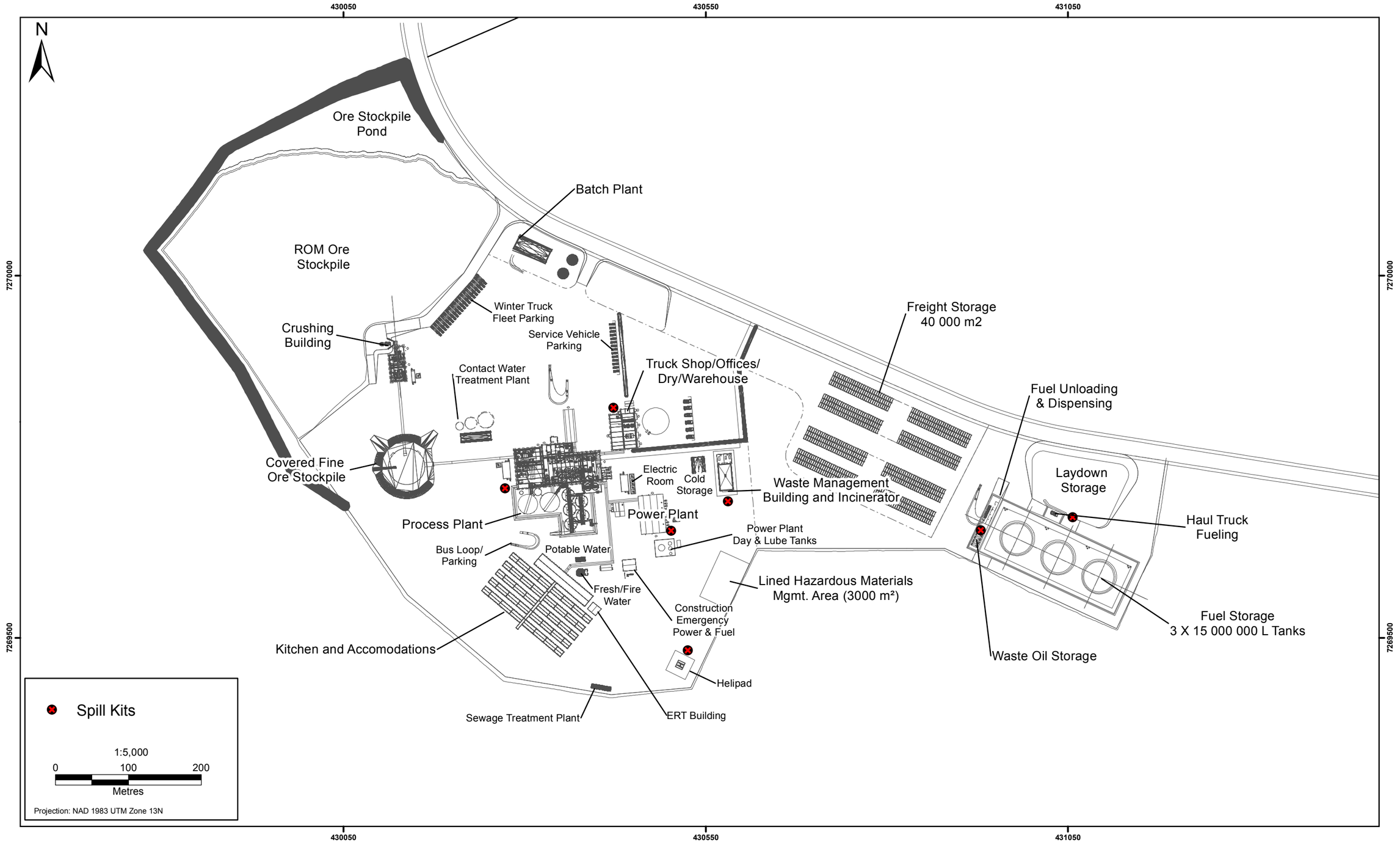

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Figure 7.2-3

Goose Plant Site Layout with Emergency Response Site Locations

7.3 HAZARDOUS MATERIALS ON-SITE

A number of hazardous materials are anticipated to be stored on site during all stages of construction and operations. The specific materials and quantities of hazardous materials being stored at one time will vary depending on the Project stage. A list of the main hazardous materials to be transported to and stored on site is provided within the Hazardous Materials Management Plan (HMMP) and in Appendix B of this Plan. As Project planning and design progresses, more detail of specific products and expected amounts will be included in this Plan.

Safety Data Sheets for select substances are presented in Appendix A this Plan. The SDS will be updated in a future version of Plan, once the materials have been procured and prior to sealift delivery to the MLA or air transport to the Goose Property.

7.4 SPILL PREVENTION

Training and awareness are two major elements of spill prevention. All site staff and contractors will review the contents of the SCP during their on-site orientation and will be informed of where copies of the Plan are stored. The mandatory site orientation will provide hazard awareness training, identify the locations of spill kits and other response equipment, and discuss appropriate application. A more detailed description of the training to be provided to site staff is provided in Section 6.0 of this Plan.

In addition to training, all work sites and hazardous materials storage facilities will be routinely inspected. Good housekeeping practices will be adopted with emphasis on storage facilities and loading zones.

General practices to be implemented by Sabina that support spill prevention include:

- Assign spill response personnel and clearly publish their contact information.
- Provide easy access to current SDS for all hazardous materials on site.
- Maintain updated inventory of hazardous materials present at each site (in the HMMP).
- Store materials in appropriate containers to the specified capacity, in areas adequately protected from weather and physical damage.
- Conduct regular inspections of storage facilities.
- Segregate incompatible materials.
- Provide training involving the SCP, Spill Kits and other response equipment.
- Stock adequate spill response materials and equipment, and have them readily available for transportation, transfer and storage of hazardous materials.
- Create an environment which promotes prompt communications of all spill incidents.

7.5 SPILL RESPONSE EQUIPMENT

Available heavy equipment and aircraft will be used as appropriate for emergency use to respond to spill incidents. Appropriately sized spill kits and spill response equipment will be strategically located in vehicles and all Project sites, especially the active mining areas.

Each department will be responsible for providing all necessary SDS and sufficient spill response kits in their respective work areas. Spill Kits and SDSs will be stored in marked areas, readily accessible to responders. The Spill Kit location maps for the MLA area as well as the Goose Property are identified in

Figure 7.2-1 and 7.2-2, respectively. Any spill kit location updates within either of these 2 areas will be applied to these reference maps as the project develops.

Spill kits will be customized to account for specific hazards and conditions in each work site. Customized spill kits particular for the activity and area will be selected for use on the site as required. At a minimum, each kit will contain:

- Sufficient hydrophobic absorbent material (e.g., oil absorbent booms and absorbent socks) to contain and cleanup potential drips, leaks, or spills.
- Gloves and heavy plastic bags to contain oily absorbent materials and contaminated soils or wastes.
- Barrier tape to keep personnel out of contaminated areas.
- Sorbent granular materials to soak up free oil.
- Other appropriate PPE such as disposal coveralls, rubber gloves and safety goggles.

A vehicle outfitted with a self-contained collection of spill response materials for rapid deployment to spill sites will be utilized.

Reserve spill response equipment such as booms, socks and pads will be available for response to larger spill incidents, or to replenish materials used in the smaller equipment spill kits. Spill kits will be inspected routinely and restocked after use.

Table 7.5-1 provides a general list of mobile and stationary equipment likely available on site. This list will vary by project phase and response requirements.

Table 7.5-1. General Equipment for Emergency Spill Response

Mobile Equipment	
Grader	Winch Trucks
Cranes	Pickup Trucks
Snowmobiles	Generator Sets
Vacuum Truck	Fire Truck
Loaders	Aluminium Boats
Backhoes	Fuel Trucks
Bulldozers	Bobcats
Forklifts	Haul Trucks
Water Trucks	Snow Cats
Excavators	
Temporary Containment Systems	
Booms	Spill Kits
Drums	Spill Absorbent Material
Tanks	Silt Fencing
Tailings Storage Facility	Lined Excavations
Emergency Transportation	
Aircraft (helicopter)	Snowmobiles
4-Wheel Drive Vehicles (e.g. Pickup trucks)	Boats
ATVs	
Communication Equipment	
Radios	Fax
Telephone	Wireless Communication Systems
Satellite phone	

A mobile environmental emergency trailer will be located on site at each of the Project properties; their typical contents are listed in Table 7.5-2.

Table 7.5-2. Environmental Emergency Trailer Equipment List

Equipment	
Pump/skimmer	White oil spill pads
Pump accessories	Universal booms
Vacuum ends	Cell U-Sorb
Tubing or pipes for vacuum or pumping	Sphag Sorb
45 gallon top	Wedge wood
Diesel fuel jerry can	Plug patties
Spill kit accessory	Quattrex bags
Drum opener	Hand shovel
Wescot (to open empty drum screw)	Ice Breaker Chisel
Empty drums	Sledge hammer
Drums berms	Rod bars
Tarps	

7.6 SPILL RESPONSE PROCEDURES

Spills may result from any of the following situations:

- Leaks or ruptures in tanks, drums or containers.
- Equipment failure including valves, hoses, piping or containment structures.
- Overfilling containers.
- Improper storage.
- Spills during transfer.
- Accidents during transportation.

Procedures will vary seasonally and based on the nature of the hazardous material spilled. The applicable SDS will be consulted to ensure that the materials are being handled safely and appropriately. Response procedures specific to land, water, snow and ice are presented in this section.

8. General Spill Response

All site personnel are briefed on the procedures to be followed to report a spill and initiate spill response. The following details the steps to be taken in the event of a spill. Steps are listed in order of importance; however, circumstances and conditions may alter the order of these steps to meet a specific situation. The Site Superintendent and Environmental Superintendent will be notified as soon as feasible for any spill. The first responder shall contact a supervisor or the Incident Commander, who will be responsible for initiating appropriate spill response.

The process of responding to multiple emergencies including spills is addressed in the REMRP, Section 5.6.

8.1.1 Source Control

Identify the product and determine the source. Reduce or stop the flow of product without endangering anyone. This may involve very simple actions such as turning off a pump, closing a valve, sealing a puncture hole with almost anything handy (e. g., a rag, a piece of wood, tape, etc.), raising a leaky or discharging hose at a level higher than the product level inside the tank, or transferring fuel from leaking containers.

8.1.2 Control of Free Product

Prevent or limit the spread of the spilled material. Accumulate/concentrate spilled product in an area to facilitate recovery. Barriers positioned down-gradient of the spill will slow or stop the progression of the spill. Barriers can consist of absorbent booms, dykes, berms, or trenches (dug in the ground or in snow/ice).

8.1.3 Protection

Evaluate the potential dangers of the spill in order to protect sensitive ecosystems and natural resources. Block or divert the spilled material away from sensitive receptors. This can also be achieved by using various types of barriers.

8.1.4 Clean Up the Spill

Recover and contain as much free product as possible. Recover and containerize/treat contaminated soil, water, and snow. Pressure-wash contaminated bedrock surfaces, shorelines, ice and recover as much as possible oily water for containerization and/or treatment.

8.1.5 Report the Spill

Provide basic information such as date and time of the spill, type and amount of product discharged, photographic records, location and approximate size of the spill, actions already taken to stop and contain the spill, meteorological conditions and any perceived threat to human health or the environment.

8.2 RESPONSE BY SPILL LOCATION

Spills may occur at the Goose Property and the MLA year-round. As such, spills may occur to unfrozen land and water as well as frozen ground, snow and ice. The SCP will be implemented as approved by the NWB. Sabina is committed to updating the Plan as needed to reflect changes in operation (i.e., Phase of

development) and technology and as directed by the NWB in the Type A Water Licence or other regulatory authorization where appropriate.

At the Goose Property, there are numerous lakes and streams in the vicinity, with Goose Lake and its tributaries being the primary waterbody that could be affected by fuel spills. There are no streams at the MLA and the closest waterway is the ocean (Bathurst Inlet).

Spills may also occur along the winter ice road route during the winter period only. Therefore, spills along the winter ice road will be onto snow and ice.

The location, weather conditions, and the time of year will influence the degree of environmental contamination that could result from a spill, as well as the response time and available resources. At both the Goose Property and the MLA, manpower and spill response equipment will be readily available, and road access around the properties will enable to rapid deployment of a response to spills.

8.2.1 Spills on Land

Response to spills on land will include the general procedures previously detailed.

Initially use the equipment that is quickly available to build a berm to contain the spill and stop the material from entering any waterway. This can be built with soil, booms, lumber, snow, etc.

These barriers should be placed down gradient (down-slope) from the source of the spill and as close as possible to the source. Barriers slow the progression of flow and also serve as containment to allow for recovery.

A plastic liner should be placed at the foot of and over the dykes to protect the underlying soil or other material and to facilitate recovery of the spill. Construct dykes in such a way as to accumulate a thick layer of free product in a single area (V shaped or U shaped).

Trenches are useful in the presence of permeable soil and when the spill is migrating below the ground surface. A plastic liner should be placed on the down-gradient edge of the trench to protect the underlying soil.

Large volumes of free product should be recovered, as much as possible, by using vacuums and pumps, and containerized. Mixtures of water and fuel may be processed through an oil-water separator. Absorbent sheets should be used to soak up residual spill to water, on the ground (soil and rock), and in vegetation.

8.2.2 Spills on Water

Response to spills on water includes the general procedures previously detailed.

Various containment, diversion and recovery techniques are discussed in the following sections. The following elements must be taken into consideration when conducting response operations:

- Type of waterbody or watercourse (lake, ocean, stream, river).
- Water depth and surface area.
- Wind speed and direction.
- Resonance and range of tides.
- Type of shoreline.

- Seasonal considerations (open-water, freeze-up, break-up, frozen).

If oil is spilled in a lake, containment can be achieved using mobile floating booms to intercept, control, contain and concentrate (i.e., increase thickness) the floating oil. One end of the boom is often anchored to shore while the other is towed by a boat or other means and used to circle the oil slick and return it close to shore for recovery using a skimmer. Reducing the surface area of the slick increases its thickness and thereby improves recovery. Mechanical recovery equipment (i.e., skimmers and oil/water separators) will be mobilized, if required. However, in some lakes it may not be possible to deploy booms using a boat. In this case, measures are taken to protect sensitive and accessible shoreline. The oil slick is monitored to determine the direction of migration. In the absence of strong winds, the oil will likely flow towards the discharge of the lake. Measures are taken to block and concentrate the oil slick at the lake discharge using booms where it can subsequently be recovered using a portable skimmer, a vacuum, or sorbent materials.

In small slow-flowing rivers, streams, channels, inlets or ditches, inverted weirs (i.e., siphon dams) can be used to stop and concentrate moving oil for collection while allowing water to continue to flow unimpeded. In the case of floating oil in a stream or migration to a culvert (i.e., at a road crossing) a culvert block can be used to stop and concentrate moving oil for collection while allowing water to continue to flow unimpeded. In both cases, oil will then be recovered using a portable skimmer or sorbent materials.

In the case of spills in larger rivers with fast moving currents, diversion booming is used to direct the oil slick ashore for recovery. Single or multiple booms (i.e., cascading) may be used for diversion. Typically, the booms are anchored across the river at an angle. The angle will depend on the current velocity. Choosing a section of a river that is both wider and shallow will make boom deployment easier. Diversion booming may also be used to direct an oil slick away from a sensitive area to be protected.

8.2.3 Spills on Snow and Ice

In general, snow and ice will slow the movement of hydrocarbons. The presence of snow may also hide the oil slick and make it more difficult to follow its progression. Snow is generally a good natural sorbent, as hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material is to be limited as much as possible. Snow and frozen ground also prevent hydrocarbons from migrating down into soil or at least slow the migration process. Ice prevents seepage of fuel into the water.

Response to spills on snow and ice includes the general procedures previously detailed. Most response procedures for spills on land may be used for spills on snow and ice. The use of dykes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in snow or ice) slow the progression of the fuel and also serve as containment to allow recovery of the fuel. Free product is recovered by using a vacuum, a pump, or sorbent materials. Contaminated snow and ice is scraped up manually or using heavy equipment depending on volumes.

Should spills enter waterways beneath ice cover, ice augers and pumps will be used when feasible to recover fuel and other materials under ice. Slots may be cut in ice over slow-moving water to contain oil. Tiger torches may be used to burn the fuel in place, if unrecoverable by other methods and when feasible and safe to do so.

The contaminated snow and ice is placed in containers or within plastic lined berms on land. For contingency purposes, a contaminated snow storage site will to be designated and located in close proximity to each of the main Project work sites to facilitate inspection and monitoring, in an area which

will still be readily accessible once it is time to remove the snow (i.e., spring or summer), and at least 31 m away from any body of water or ditch. Once enough snow has melted, the oily water can be removed from the storage site and processed through an oil-water separator that would be mobilized to site. Hydrocarbons recovered will be burned in the camp incinerator or shipped off-site.

8.2.3.1 Spills on the Winter Ice Road

Fuel and other materials will be transported by truck over the winter road each year, and a spill may occur if a truck accident were to occur, either due to a collision with another vehicle, or more likely, due to the truck slipping off the road. The remoteness of such an incident limits the ability to mount an immediate comprehensive response. Response to spills that occur as a result of Project traffic along the winter ice road will have varying response times, depending on the distance from nearby vehicles, the distance from a spill location along the winter ice road from either of the properties, and the weather conditions which could slow the response. Radio communication on the winter ice road is an important tool for communicating an incident and all vehicles transiting the roadways will be equipped with 2-way radio and/or satellite phone communication capabilities. Initial response will likely be left to the driver and possibly any nearby vehicles. Each winter ice road transport truck will be equipped with spill response equipment and drivers will be trained for such potential accidents. Winter conditions along the winter ice road will help contain spills and reduce the potential of spills from entering local waterways. The general spill response procedures, and those for spills on snow and ice described in Section 8.1 and Section 8.2.3 of this Plan provide appropriate guidance for such spills. The distinguishing factor with tanker or vehicle spills along the road is the remoteness of the spill location and therefore the delay in receiving assistance after notifying the environmental superintendent, and the priority on the health and safety of the driver and others involved.

Several preventive measures are in place to the minimize risk of spills during bulk fuel haul in addition to those listed above for bulk fuel transfer. These measures are explained in the Road Management Plan and this Plan. Spill prevention practices specific to winter roads include:

- Inspection and maintenance of roadways and vehicles (Road Management Plan).
- Adhering to traffic management and road safety practices (Road Management Plan).
- General spill prevention (Section 7.4).

8.3 RESPONSE BY TYPE OF MATERIAL SPILLED

8.3.1 Fuel

Regular inspections will be conducted to ensure that there has not been a leak or that conditions within fuel storage areas could result in a leak. These inspections will include the fuel drums and storage containers, secondary containment sumps and associated spill containment devices, any pumps and product-handling equipment, and overfill protection devices. Inspections will be recorded to include who completed the inspections, areas included in the visual inspection and any deficiencies noted.

Fuel spills, leaks at fuel storage or transfer facilities or vehicle accidents will be handled by following these steps:

- Identify the source of the leak or spill.
- Stop leaks from tank or barrel by closing valves, provided it is safe to do so.
- Contact the Environmental Superintendent/Site Superintendent.

- o Utilizing patching kits to seal leaks.
- o Placing plastic sheeting at the foot of the tank or barrel to prevent seepage into the ground.
- o Contain the spill and the source if possible.
- o Take photographs of the spill site before and after the clean-up.

Small spills will be cleaned up by removing the contaminated soil and storing it in empty 205 L drums for backhaul and disposal at an approved hazardous waste disposal site. Should a large spill occur, cleanup and disposal efforts will be coordinated as necessary with the appropriate authorities and agencies.

8.3.2 Domestic Sewage

Sewage treatment facilities at the MLA will consist of Pacto toilets; in the unlikely event that a spill occurs, it would be from a single unit and of small volume.

A sewage treatment plant (STP) will treat up to approximately 170 cubic metres per day (m^3/d) of domestic sewage at the Goose Property. The STP will be located in the Plant Site area and, during the Construction Phase, treated sewage effluent will be land discharged to maximize attenuation distance prior to entering an outflow watercourse from Fox Lake and ultimately entering Goose Lake. Off-specification treated sewage during upset conditions will be discharged to the closest collection pond. Any discharges of sewage effluent from the collection pond will need to meet the applicable discharge criteria (refer to Landfill and Waste Management Plan). In-pond treatment by coagulation can be applied if required as a contingency. During Operations, effluent will be discharged to the active tailings storage facility (TSF).

A spill of untreated or treated sewage could occur from the system itself or from a ruptured pipeline. Any problems with the STP will be promptly reported to the Site Superintendent.

In the event of a power failure, the stand-by generator will be put into operation as soon as possible. Similarly, in the case of a pump failure, the backup pump will be put on-line. As necessary appropriate safety equipment and personal protective clothing will be available to site personnel.

Should a spill of untreated sewage occur from the STP or pipelines at the Goose Property, priority will be to contain the spill and prevent release of the untreated sewage into local watercourses. The spilled effluent and any affected water will be recovered and discharged into the active tailings facility. It will not be necessary to remove affected ice or excavate affected soils.

8.3.3 Tailings or Reclaim Water

A spill of tailings or reclaim water may potentially occur. Though highly unlikely, a spill could occur from an overtopping or breach of the TSF embankment. Such a spill, however unlikely, could also occur from a tailings pipeline, or a reclaim water pipeline returning water from the TSF or TF to the process plant. Tailings or contact water may contain trace (< 1 mg/L) cyanide which can be toxic to aquatic organisms, but also breaks down rapidly and does not persist in the environment.

In the event of an unplanned release from the TSF, the emergency response plan will be implemented. The TSF embankments and supernatant water level in the TSF will be instrumented and regularly monitored as described in the Tailings Management Plan. In the instance of a pipeline rupture, pressure sensors instrumented in the pipelines will signal a loss of pressure that will signal an alarm to shut off the pumps, thereby limiting the volume of material that may be released.

Should a spill of tailings or reclaim water occur, priority will be to contain the spill and prevent the release of tailings or reclaim water into local watercourses. The spilled tailings or effluent will be recovered and disposed of in the active tailings facility.

8.3.4 Chemicals

Assess the hazard of the spilled material by referring to the relevant SDS. Each response will vary based on the specific material. If the chemical is hazardous, ensure PPE is utilized (latex gloves, eye protection, etc.) before approaching the spill. As most chemicals are only used in extremely small quantities on site, absorbent mats can be used to soak up spilled liquids then placed in appropriate containers for treatment and/or disposal.

Sodium cyanide is the main hazardous chemical that will be used in large quantities by the Project. It will be delivered by sealift in solid form in tote bags within shipping containers. They will be protected from the elements to prevent contact with water during transport and storage. Spillage, although unlikely, is possible during transport from the MLA to Goose Property over the winter ice road.

Sodium cyanide is used in the process plant to extract the gold and a cyanide destruction process reduces residual cyanide concentrations in the tailings supernatant, as discussed in the previous section. A Cyanide Management Plan included as an appendix to the HMMP describes the measures to be undertaken for the safe handling of cyanide and other hazardous materials on the Project. Cyanide breaks down into carbon and nitrogen in the presence of sunlight and ammonia breaks down into other nitrogen compounds.

Response to spills would involve clean-up of mainly solids and any affected soil, snow or ice. Clean up will be undertaken by workers with appropriate training in the safe handling of the chemical (sodium cyanide). Any affected waters can be contained and recovered for disposal if this is practical, or can be monitored for degradation, attenuation, and dilution.

General guidelines for cleaning up spills of chemicals including sodium cyanide are similar to previously identified Sections 8.2.2 and 8.2.3.

- For an accidental release to the land, depending on the topography, contain the discharge by constructing a perimeter dyke system.
- Collect the material through absorbent material, booming or absorbent matting. For release to water, depending on the circumstance, utilize damming, water diversion, skimming or booming to minimize the dispersion of the spilled material.
- Collect the contaminated soil and/or water as well as the absorbent materials used in the process afterwards for proper disposal in a certified waste handling facility. Collect any spilled material followed by placing same inside a container such as a 205 litre drum and seal with a lid.
- Label the drum(s), store within a designated area, keep closed and when available, transport to a licensed disposal facility for disposal.
- Ensure the spill area and equipment used to manage the spill has been cleaned prior to demobilizing from the spill area.
- Contact the appropriate regulatory groups through the notification procedure and advise of the spill situation depending on whether the spill is reportable or could adversely affect the environment.

The transport of sodium cyanide will require the development of ERAPs under Section 7 of the TDGR. The plans will outline what is to be done to respond to an actual or anticipated release of the specific dangerous goods in the course of their handling or transporting that could endanger public safety. The ERAPs require the approval of the Minister of Transport. With the permission of the supplier, a supplier's approved ERAP can be adopted and used by a user such as Sabina. Relevant ERAPs will be developed or adopted by Sabina or its contractors and incorporated into this SCP when they become available, for the Project's transport of the applicable dangerous goods.

8.3.5 Ammonium Nitrate and Explosives

Ammonium nitrate (AN) may be spilled during handling and ammonium nitrate fuel oil may be spilled during handling or during use in the open pit or underground. AN dissociates readily in water to ammonia which, in its unionized form, may be toxic to fish and other aquatic organisms.

With adherence to BMPs for AN storage and handling there is minimal risk of AN spillage. Storage on land, away from water, in containers protected from the elements, significantly reduces the risk of ammonia loss to water bodies. Release of these materials into a waterbody during the open water season is highly unlikely. Spill locations would be generally limited to single storage bags within the AN facility or ISO containers in the storage pad areas. These areas will be inspected regularly according to operating procedures.

General guidelines for cleaning up spills of these types of materials are similar to previously identified sections 8.2.2 and 8.2.3. Any affected waters can be contained and recovered for disposal if this is practical, or can be monitored for degradation, attenuation, and dilution.

Spill prevention and response actions will include the following:

- o establish and use SOPs for handling and working around storage areas;
- o ensure proper containers are used for the storage and transport of explosives and AN;
- o restrict access to authorized and trained personnel;
- o conduct regular inspections of storage areas, containers, and transport vehicles with frequency driven by activity levels;
- o clean up dry AN according to established SOPs, to minimize likelihood of nitrates entering watercourses;
- o manage and limit contact with snow and water, with particular anticipation of spring thaw/freshet period; and
- o properly dispose of spill material and any impacted rock pad material, which could include placing within a blast pattern prior to initiation.

The transport of potential explosives will require the development of ERAPs under Section 7 of the TDGR. The plans will outline what is to be done to respond to an actual or anticipated release of the specific dangerous goods in the course of their handling or transporting that could endanger public safety. The ERAPs require the approval of the Minister of Transport. With the permission of the supplier, a supplier's approved ERAP can be adopted and used by a user such as Sabina. Relevant ERAPs will be developed or adopted by Sabina or its contractors and incorporated into this Plan when they become available, for the Project's transport of the applicable dangerous goods.

Simplified spill response scenarios for potential explosives are presented in Table 8.3-1 below. More information will be provided as part of the supplier ERAP when it is available. Waste Management and

Pollution Prevention Strategies for Ammonium Nitrate, ANFO, and other hazardous materials are presented in Appendix A of this Plan.

Table 8.3-1. Simplified Spill Response Scenarios for Potential Explosives

Product	Location of Potential Spill	Potential Size of Spill	Response
Ammonium nitrate	Broken bags in the explosives storage area	1000 kg or more depending on the number of bags damaged	The blasting contractor or qualified mine personnel will clean up and salvage AN prill; damaged bags will be emptied into new bags and damaged bags burned in the incinerator.
	Broken tote bags in the mixing plant	Part of 1000 kg	
ANFO	Broken transport bags in the mixing plant	Up to 1000 kg	The blasting contractor will clean up and salvage ANFO; the plant area will be completely cleaned of ANFO and damaged bags will be burned in the incinerator.
	Spilled transport bags on the site delivery vehicle	1000 kg or more depending on the number of bags spilled	The blasting contractor will clean up and salvage ANFO. The spill area will be cleaned up and the spilled ANFO burned by the blasting contractor. The delivery truck will be cleaned if required.
Detonators and blasting caps	Transport to blast site	One or more containers of products	Will be cleaned up and disposed by explosive contractor.

8.4 RESPONSE TO FIRE

Various products, including fuel, may be flammable under certain circumstances. It is important to ensure that the spill does not present a risk of fire prior to commencing the cleanup. Site firefighting procedures can be found in the RMERP.

Water for firefighting will be provided from the fresh/firewater tank at the Goose Plant Site and the MLA. The tanks are sized considering facility design and applicable regulations to support firefighting (i.e., *Mine Health and Safety Act* and Regulations; National Fire Code). There will be firefighting equipment on-site, and the means to obtain additional water to support firefighting in an emergency. Water will likely be sourced from the existing pump houses at the site, but may also be obtained directly from waterbodies near to the fire.

8.5 DISPOSAL

Appropriate disposal for any recovered product and contaminated soil, water or absorbent clean up material is regulated and must be authorized by the agency investigating the incident. Obtain approval from all appropriate government agencies before disposal.

Fuel-contaminated soil can be remediated at camp through land-farming or incineration. Any non-reusable recovered product, contaminated soil and clean up material, which cannot be incinerated, will be stored in containers and returned to camp prior to eventual disposal in an approved disposal/treatment site.

8.6 POST-SPILL MONITORING AND REMEDIATION

Should there be any concern of contaminants remaining in the area following clean-up, appropriate sampling and monitoring should be undertaken to determine residual contamination. Based on the results of the monitoring program the site should be remediated as necessary. For spill response monitoring,

quality assurance / quality control measures and standard operating practices, using established monitoring protocols will be followed. Specific monitoring requirements will be implemented on a case by case basis as required. Additional monitoring may be directed and/or provided by the Lead Agency (i.e., lead governmental agency identified upon notification of spill to the hotline) and/or the Water Resources Officer.

8.7 SPILL FOLLOW-UP INVESTIGATION

The root cause of all spills will be investigated. An incident investigation will be performed by the Environmental Superintendent following every major spill. Minor spills as defined in Section 2.0, will be investigated by the appropriate supervisor. The likely cause of the spill will be determined, and remedial action will be taken to ensure that similar spills are prevented. Remedial action may involve:

- Additional training for personnel.
- Enhanced equipment maintenance or inspection program.
- Additional preventative infrastructure, such as containment berms, oil/water separators, etc.
- The performance of the spill response procedures will also be reviewed, and updated as necessary.

9. Spill Reporting

9.1 MARINE SPILL REPORTING:

Spills of a marine nature will be reported to the Canadian Coast Guard (Central and Arctic region):

- 1-800-265-0237 (24-hour).
- The fax number for transmission of the written report is (519) 337-2498.

Reporting of marine spills shall be conducted in accordance with Transport Canada Guideline TP-9834E, "Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants". Sabina will report any presence of oily sheens on the water near vessels at the port site to the NT-NU Spill Line.

The Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69) require that spills be reported to the nearest office of Transport Canada as follows:

Manager, Technical Services
Transport Canada, Marine Safety
Tel: 204 984 8618
Cell: 204 880 0754
Email: TBD

Manager, Marine Safety (PNR)
Transport Canada
Tel: 204 984 0397
Fax: 204 984 8417
Email: TBD

9.2 TDGR REPORTING:

In addition, the TDGR has immediate and 30-day reporting requirements for dangerous goods accidents or incidents if the spill occurred during transport. **Immediate reporting** is required by the TDGR to:

- The Local police
- Nunavut Emergency Services at 1 800 693 1666
- The person's employer;
- The consignor of the dangerous goods;
- The owner/lessee/charterer of the road vehicle involved (if applicable); and
- CANUTEC at 613 996 6666 for railway vehicles, ships, aircrafts, aerodromes or an air cargo facility; for Class 1 Explosives and Class 6.2 Infectious Substances; and for an accidental release from a cylinder that has suffered a catastrophic failure.

A **follow-up report** must be made by the employer of the person who had possession of the dangerous goods at the time of the accidental release, the "dangerous goods accident" or the "dangerous goods incident", or by the person if self-employed. The follow-up report must be made, in writing, to the

Director General within 30 days after the occurrence of the accidental release, the "dangerous goods accident" or the "dangerous goods incident". The follow-up report must include the following information:

- The name and address of the place of business of the person providing the information and the telephone number, including the area code, at which that person may be contacted;
- The date, time and location of the accidental release, the "dangerous goods accident" or the "dangerous goods incident";
- The name and address of the place of business of the consignor;
- The classification of the dangerous goods;
- The estimated quantity of dangerous goods released and the total quantity of dangerous goods in the means of containment before the accidental release, the "dangerous goods accident" or the "dangerous goods incident";
- A description of the means of containment involved based on the identification markings and a description of the failure or damage to the means of containment, including how the failure or damage occurred;
- For an accidental release from a cylinder that has suffered a catastrophic failure, the certification safety marks and a description of the failure;
  - For example, there was an explosion, a valve sheared off or there was a crack in the cylinder.
- The number of deaths and injuries resulting from the accidental release, the "dangerous goods accident" or the "dangerous goods incident";
- An estimate of the number of people evacuated from private residences, public areas or public buildings; and
- **I**f an emergency response assistance plan was activated, the name of the person who responded to the emergency in accordance with the emergency response assistance plan.

The address for the Director General is:

Transport Dangerous Goods (TDG)
Place de Ville, Tower C, 9th Floor, 330 Sparks St.
Ottawa, Ontario K1A 0N5

9.3 INTERNAL RECORD KEEPING

An internal log of spills, no matter how small, will be kept and maintained by the Environmental Department. Each record will include date, location, material spilled, volume, reason for release, any negative impact, status of cleanup, and corrective actions taken. Photos (before, during and after cleanup) shall also be taken of all significant spills. To assist with internal tracking, a Sabina Spill Form is included in Appendix C.

A record will document all significant changes that have been incorporated in the SCP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

10. Adaptation Management

The SCP will be updated annually to incorporate lessons learned from any incidents that may have occurred, amendments to legislation, new characteristics of the sites, the equipment on site, new policies of the company, environmental issues and to provide updated information on new staff, external contact details and other changes. Changes to roles and responsibilities will also be incorporated into the RMERP, as the emergency response team is the same.

Most important will be the review of aspects of the Plan affecting safety of employees of the facility, contractors, and the general public. Operational aspects of the Plan, as well as any paperwork that deals with the Plan, will be reviewed. All aspects of the Plan will be continuously audited for effectiveness.

The updated version of the Plan will be distributed to the distribution list. Formal evaluations of the SCP will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

11. Reclamation

Closure and final remediation of spills reported to the Spill Hotline will be verified by the Lead Agency (refer to Spill Report Form in Appendix D). Hazardous materials spill will be reclaimed as defined in the HMMP. In support of progressive reclamation, Sabina will apply bioremediation treatment of hydrocarbon contaminated soil, snow, and ice at the MLA and Goose Property using naturally occurring microorganisms to metabolize and breakdown petroleum hydrocarbons in soils. For additional information, refer to the Landfarm Management Plan. Additional details pertaining to Closure, are provided in the Interim Closure and Reclamation Plan.

12. References

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Appendix A. SDS for Hazardous Substances Stored On-Site

Material Safety Data Sheet

Desiccant: ACTIVATED CARBON

Revision Date: 06/27/14 Supersedes: 5/18/11

PRODUCT NAME: Activated Carbon

COMPANY IDENTIFICATION

Suppliers Name: SPX Flow Technology

Address: 4647 S.W. 40th Avenue
Ocala, Florida 34474-5799 USA

EMERGENCY TELEPHONE No. *352-237-1220*

FOR PRODUCT INFORMATION *352-237-1220*

1. PRODUCT IDENTIFICATION

Product Name: Activated Carbon

2. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS NO.	% by Weight
Carbon	7440-44-0	100

Non-hazardous components are listed at 3% or greater; acute hazards are listed when present at 1% or greater and chronic hazards are listed when present at 0.01% or greater.

3. HAZARDS IDENTIFICATION

OSHA Regulatory Status: Not regulated.

HMIS Classification:		NFPA Classification:	
Health:	0	**Health:**	0
Flammability:	1	**Flammability:**	1
Reactivity:	0	**Reactivity:**	0
Special:		**Special:**	

0 = minimum; 1 = slight; 2 = moderate; 3 = high/serious; 4 = extreme/severe; W = water reactive; OX = oxidizer

Protective Equipment: Safety glasses with side shields or goggles, gloves, long sleeve shirt or lab coat, long pants recommended.

Health: See Section 4.

Environmental Effects: See Section 12.

GHS Classification:
Eye Irritation Category 2B.
Respiratory Irritation Category 3

WARNING: Contact may cause eye irritation. Dust may be slightly irritating to eyes and respiratory tract. Wet activated carbon removes oxygen from air causing a severe hazard to workers in enclosed or confined space.

Precautionary Statements:
Prevention: Avoid generation of dust during handling. Avoid breathing dust. Wash thoroughly after handling. Use in well-ventilated area.

Response: If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
If in eyes: Rinse cautiously with water for several minutes.

Storage: Store in a well-ventilated place. Keep container tightly closed.

Material Safety Data Sheet

Revision Date: 06/27/14 Supersedes: 05/18/11

PRODUCT NAME: Activated Carbon

4. FIRST AID MEASURES

Route of Exposure:

Inhalation: Dust may cause mild irritation to the upper respiratory tract.
Skin: Dust may cause mild irritation, possibly reddening.
Eyes: Dust may cause mild irritation, possibly reddening.
Ingestion: Dust may cause mild irritation to digestive track resulting in nausea or diarrhea.

Signs/Symptoms of Exposure: Dust may cause irritation and redness of eyes, irritation of skin and respiratory system. The effects of long-term, low-level exposures to this product have not been determined.

Emergency and First Aid Procedures:

For Eye Contact: Flush eyes with plenty of water for at least 15 minutes, lifting both upper and lower lids occasionally. Seek medical attention.
For Skin Contact: Wash with soap and warm water. Seek medical attention.
For Inhalation: Remove to fresh air and rest as needed. Seek medical attention for any breathing difficulty.
For Ingestion: Drink plenty of water. Seek medical attention.

Medical Conditions Generally Aggravated by Exposure: People with pre-existing skin conditions or eye problems or impaired respiratory function may be more susceptible to the potential effects of the dust.

5. FIRE AND EXPLOSION HAZARD DATA

Suitable Extinguishing Media: Use an extinguishing media suitable for the surrounding fire.

Unsuitable Extinguishing Media: None known.

Specific Hazards: As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Activated carbon is difficult to ignite and tends to burn slowly (smolder) without producing smoke or flame.

Carbon monoxide and carbon dioxide gas may be emitted upon combustion of material.

Contact with strong oxidizers such as ozone or liquid oxygen may cause rapid combustion.

Protective Equipment and Procedures: Wear NIOSH approved self-contained breathing apparatus suitable for the surrounding fire.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Wear protective equipment, keep necessary personnel away, and ventilate area of spill.

Environmental Precautions: The material is not soluble, but can cause a particulate emission if discharged to waterways; therefore, dike all entrances to sewers and drains to avoid introducing the material into the waterways.

Containment and Clean-Up: Dike all entrances to sewers and drains. Vacuum or shovel spilled material and place in closed container for disposal.

Remove product to appropriate storage area until it can be properly disposed of in accordance with local, state and federal regulations. Avoid dust formation

Other Information: Not Applicable.

7. HANDLING AND STORAGE

Precautions for Safe Handling: Avoid prolonged contact with eyes and skin. Keep away from ignition sources. Use in well ventilated areas. Protect containers from physical damage. Wash hands after handling.

Precautions for Safe Storage: Store in cool, dry, ventilated area and in closed containers. Keep away from oxidizers, heat or flames. Store away from ignition sources.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

	OSHA PEL	ACGIH TLV
Activated Carbon	Data not available	Data not available

Exposure Guidelines: Wet activated carbon removes oxygen from air posing a hazard to workers in enclosed or confined space. Before entering such an area, sample the air to assure sufficient oxygen supply. Use work procedures for low oxygen levels, observing all local, state and federal regulations.

Engineering Controls: Exhaust ventilation should be designed to prevent accumulation and recirculation in the workplace and safely remove carbon black from the air.

NOTE: Wet activated carbon removes oxygen from air causing a severe hazard to workers in enclosed or confined space.

If risk of overexposure exists, wear an approved respirator. Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Equipment: Use of NIOSH approved particulate filter is recommended if dust is generated in handling. The usual precautionary measures for handling chemicals should be followed, i.e. gloves, safety glasses with side shields or goggles, long sleeve shirt or lab coat, dust respirator if dusty and/or other protective clothing/equipment as determined appropriate.

General Hygiene: The usual precautionary measures for handling chemicals should be followed: i.e. Keep away from food and beverage; remove contaminated clothing immediately; wash hands before breaks or eating; avoid contact with eyes and skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Black granular or powder material
Odor: None.
pH Value: Not applicable.
Melting Point: Not applicable.
Freezing Point: Not applicable.
Initial Boiling Point: Not applicable.
Flashpoint: Not applicable.
Evaporation Rate: Not applicable.
Flammability: > 220°C
UEL: Not applicable.
LEL: Not applicable.

Molecular Weight: Not applicable.
Odor Threshold: None.
Vapor Pressure: 0
Vapor Density: Solid
Relative Density: 0.4 to 0.7
Solubility: Not Soluble.
Partition Coefficient: Not applicable.
Auto Ignition Temperature: > 220°C
Decomp. Temperature: Not applicable.
Viscosity: Not applicable.

10. STABILITY AND REACTIVITY

Chemical Stability: Stable.

Conditions to Avoid: None.

Possibility of Hazardous Reaction: Will not occur.

Conditions to Avoid: None.

CAUTION: High concentrations of organics in air will cause temperature rise due to heat of adsorption. At very high concentration levels this may result in a thermal excursion, referred to as a bed fire. High concentrations of Ketones and Aldehydes may cause a bed temperature rise due to adsorption and oxidation.

Materials to Avoid: Alkali metals and strong oxidizers such as ozone, oxygen, chlorine, permanganate, etc.

Hazardous Decomposition Products: Carbon monoxide and carbon dioxide gas may be generated during combustion of this material.

11. TOXICOLOGICAL INFORMATION

Acute Effects:

Toxicity Studies: Oral LD_{50}: Not determined on the finished product.
Dermal LD_{50}: Not determined on the finished product.
Inhalation: See section 4.
Ingestion: See section 4.
Eye Irritation: See section 4.
Skin Irritation: See section 4.
Sensitization: Not determined on the finished product.
Target Organ(s) or System: Eyes, skin and upper respiratory system.
Signs and Symptoms of Exposure: Irritation and redness of eyes, irritation of skin and respiratory system may result from exposure to carbon dust. See sections 3 and 4.

Chronic Effects:

Carcinogenicity: Not determined on the finished product.
Mutagenicity: Not determined on the finished product.
Reproductive Effects: Not determined on the finished product.
Developmental Factors: Not determined on the finished product.

12. ECOLOGICAL INFORMATION

Ecotoxicity: Not determined on the finished product.

Persistence/degradability: Not determined on the finished product.

Bioaccumulation/Accumulation: Not determined on the finished product.

Mobility in Environmental Media: Not determined on the finished product.

Other Adverse Effects: Not determined on the finished product.

13. DISPOSAL CONSIDERATIONS

Vacuum or shovel material into a closed container. Storage and disposal should be in accordance with applicable local, state, and federal laws and regulations. Local regulations may be more stringent than state or federal requirements. Activated carbon is an adsorbent media; hazard classification is generally determined by the adsorbate that the carbon has picked up. Consult with the US EPA Guidelines listed in 40 CFR Part 261.3 for the classifications of hazardous waste prior to disposal.

14. TRANSPORT INFORMATION

This information as presented below only applies to the material as shipped. The identification based on characteristic(s) or listing may apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Land:

DOT Regulations:
UN/NA Identification Number: None
UN Proper Shipping Name: Not Regulated.
Transport Hazard Class: None
Packing Group: None
Marine Pollutant: None
Canadian WHMIS:
Hazard Class: None

Water:

IMO/IMDG:
UN/NA Identification Number: None
UN Proper Shipping Name: Not Regulated.
Transport Hazard Class: None
Packing Group: None
Marine Pollutant: None

Air:

ICAO/IATA:

UN/NA Identification Number: None
UN Proper Shipping Name: Not Regulated.
Transport Hazard Class: None
Packing Group: None
Marine Pollutant: None

This product has been tested according to the *United Nations Transport of Dangerous Goods* test protocol for a "self-heating substance". It has been specifically determined that this product does not meet the definition of a self heating substance or any other hazard class, and therefore is not a hazardous material and not regulated.

15. REGULATORY INFORMATION

SARA TITLE III 302: Product is not subject to SARA Title III, section 302 regulation.
SARA TITLE III 313: Product is not subject to SARA Title III, section 313 regulation.
TSCA: Product is listed.
California Proposition 65: Product is not listed.

Canadian Classification: **WHMIS CLASSIFICATION:** Product is listed.
DSL#: Product is listed.

EEC Council Directives relating to the classification, packaging and labeling of dangerous substances and preparations.
Risk (R) and Safety (S) phrases:
R36: Irritating to the eyes.
R37: Irritating to the respiratory tract.
R38: Irritating to the skin.

Activated Carbon (CAS: 7440-44-0) is found on the following regulatory lists:
Canada – British Columbia Occupational Exposure Limits
Canada – Yukon Permissible Concentrations for Airborne Containment Substances
Canada – Domestic Substances List (DSL)
International Air Transport Association (IATA) Dangerous Goods Regulations
OECD Representative List of High Production Volume (HPV) Chemicals
US – Hawaii Air Contaminant Limits
US – Idaho – Toxic and Hazardous Substances – Mineral Dust
US – Minnesota Hazardous Substance List
US – Minnesota Permissible Exposure Limits (PELs)
US – Rhode Island Hazardous Substance List
US – Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants
US – Washington Permissible Exposure Limits of Air Contaminants
US DOE Temporary Emergency Exposure Limits (TEELs)
US EPA High Production Volume Program Chemical List
US FDA CFSAN Color Additive Status List 4
US FDA CFSAN Color Additive Status List 6

16. OTHER INFORMATION

Supersedes: 05/18/11

Intended Use: Generally used for treatment of liquids and gases.

Desiccant: ACTIVATED CARBON

Material Safety Data Sheet

ATTENTION: Plant Manager/Safety Director:

This MSDS supersedes all prior data sheets received for this product. We urge you to study it carefully. This is provided with each container as our way of communicating Health, Safety, and Environmental Protection Information to our customers.

This information is provided to ensure safe handling and storage of our products in accordance with OSHA Hazard Communication Standard 29 CFR 1910.1200. The information contained in this MSDS must be passed on to all employees in your firm that handle and/or become involved in the implementation or control of operations involving use of the product. We strongly urge you to forward this MSDS to all parties that have a need to know the information contained herein!

Deltech®

LEGEND:

ACGIH	American Conference of Government Industrial Hygienists
AICS	Australian Inventory of Chemical Substances
CAS	Chemical Abstract Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOT	Department of Transportation
DSL	Domestic Substances List (Canada)
ECOIN	European Core Inventory
EPA	Environmental Protection Agency
IARC	International Agency for Research on Cancer
LC_{50}	Lethal Concentration (50% kill)
LC_{LO}	Lowest Published Lethal Concentration
LD_{50}	Lethal Dose (50% kill)
LD_{LO}	Lowest Published Lethal Dose
NFPA	National Fire Protection Agency
NIOSH	National Institute of Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PIN	Product Identification Number
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TCLP	Toxic Chemicals Leachate Program
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average

atm	atmosphere
cm	centimeter
g, gm	gram
in	inch
kg	kilogram
lb	pound
m	meter
mg	milligram
ml, ML	milliliter
mm	millimeter
n.o.s.	not otherwise specified
ppb	parts per billion
ppm	parts per million
psia	pounds per square inch
µ, u	micron
µg	microgram

The information contained herein is based upon data considered true and accurate. However, the supplier makes no warranties (express or implied) as to the accuracy or adequacy of the information contained herein or the results to be obtained from the use thereof. This information is offered solely for the user's consideration, investigation and verification. Since the use and conditions of use of this information and the material described herein are not within the supplier's control, the supplier assumes no responsibility for injury to the user or third persons. The material described herein is sold only pursuant to the supplier's Terms and Conditions of Sale, including those limiting warranties and remedies contained therein. It is the responsibility of the user to determine whether any use of this data and information is in accordance with applicable Federal, State or Local Laws and Regulations.

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

Product Identifier

Product Form: Mixture

Product Name: Amex™, Amex™ UG, Amex™ WR

Product Code: 3001

Synonyms: ANFO, Ammonium Nitrate Fuel Oil, Water Resistant ANFO, Water Resistant Amex™, Underground AMEX, and Underground ANFO

Intended Use of the Product

Booster sensitive blasting agent and water resistant blasting agent. For professional use only.

Name, Address, and Telephone of the Responsible Party

Canada:

Orica Canada Inc.
301 Rue Hotel-de-Ville
Brownsburg-Chatham, QC
J8G 3B5
For SDS Requests:
1-855-26-ORICA
sds.na@orica.com
www.oricaminingservices.com

USA:

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For SDS Requests: 1-303-268-5000

Emergency Telephone Number

Emergency Number : **Canada:** 1-877-561-3636 (Orica Transportation Emergency Response)
USA: 1-800-424-9300 (CHEMTREC)

FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.5 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

Classification (GHS-US)

Expl. 1.5	H205
Ox. Sol. 3	H272
Eye Irrit. 2A	H319
Carc. 2	H351
STOT RE 2	H373

Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US) :

GHS03 GHS07 GHS08

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) :
H205 - May mass explode in fire
H272 - May intensify fire; oxidizer
H319 - Causes serious eye irritation
H351 - Suspected of causing cancer
H373 - May cause damage to organs (thymus, liver, bone marrow) through prolonged or repeated exposure

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P210 - Keep away from heat, hot surfaces, open flames, sparks - No smoking.
P220 - Keep/Store away from clothing, combustible materials.
P221 - Take any precaution to avoid mixing with combustible materials.
P240 - Ground/bond container and receiving equipment.
P250 - Do not subject to friction, grinding, shock.
P260 - Do not breathe dust, fume, gas.
P264 - Wash hands, forearms, and exposed areas thoroughly after handling.
P280 - Wear eye protection, protective clothing, protective gloves.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313 - IF exposed or concerned: Get medical advice/attention.
P314 - Get medical advice and attention if you feel unwell.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Do NOT attempt to fight fire. Evacuate area.
P372 - Explosion risk in case of fire.
P373 - DO NOT fight fire when fire reaches explosives.
P401 - Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.
P405 - Store locked up.
P501 - Dispose of contents/container according to local, regional, national, territorial, provincial, and international regulations.

Other Hazards

Aquatic Chronic 3 H412
H412 - Harmful to aquatic life with long lasting effects
P273 - Avoid release to the environment
Ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia.

Unknown Acute Toxicity (GHS US) Not available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product Identifier	% (w/w)	Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	80 - 95	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Fuels, diesel	(CAS No) 68334-30-5	5 - 10	Flam. Liq. 3, H226 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304

Full text of H-phrases: see section 16

SECTION 4: FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, IMMEDIATELY seek medical advice (show the label where possible).
Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice immediately if you feel unwell.
Skin Contact: Remove contaminated clothing. Gently wash with plenty of soap and water followed by rinsing with water for at least 15 minutes. Call a POISON CENTER or doctor/physician if you feel unwell. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
Ingestion: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomit, rinse mouth and have victim drink plenty of water. Never give anything by mouth to an unconscious person.

Most Important Symptoms and Effects both Acute and Delayed

General: Causes eye irritation and respiratory tract irritation. Suspected of causing cancer.
Inhalation: Causes irritation to the respiratory tract. May be harmful if inhaled in high concentrations.
Skin Contact: May be irritating to the skin.
Eye Contact: Causes serious eye irritation.
Ingestion: May be harmful if swallowed. May cause cyanosis.
Chronic Symptoms: Causes damage to organs (thymus, liver, bone marrow) through prolonged or repeated exposure.

Indication of any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get IMMEDIATE medical advice and attention.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.
Unsuitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smothering this product could lead to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidisable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

Special Hazards Arising from the Substance or Mixture

Fire Hazard: Not itself combustible but assists fire in burning materials (oxidizing). The product does not flash. Rate of burning: will accelerate burning. After fire has started, this product will continue to burn in the absence of air.
Explosion Hazard: Explosive. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.
Reactivity: Oxidizer- accelerates the rate of burning materials and will continue to burn in the absence of air.

Advice for Firefighters

Precautionary Measures Fire: This product is a high explosive with mass detonation hazard. DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.
Firefighting Instructions: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS.
Protection During Firefighting: When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.
Hazardous Combustion Products: Carbon oxides (CO, CO_2). Nitrous oxides. Ammonium nitrate fumes.

Reference to Other Sections

Refer to section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Do not get in eyes, on skin, or on clothing. Do not breathe dust or fumes. Keep away from heat, sparks, open flames, hot surfaces – No smoking. Eliminate every possible source of ignition. Evacuate danger area.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: When controlling fire before involvement of explosives, emergency response personnel should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.
Emergency Procedures: Stop release is safe to do so. Eliminate ignition sources. Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up
For Containment: Avoid dust formation; wet spillage with water. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment.
Methods for Cleaning Up: Use only non-sparking tools. Avoid the use of metal tools containing iron, copper or brass. Be careful to avoid shock, friction, and contact with grit. Ground equipment electrically. Clear up spills immediately and dispose of waste safely.

Reference to Other Sections
Refer to section 8, Exposure Controls and Personal Protection.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling
Hygiene Measures: This product is an explosive and should only be used under the supervision of trained and licensed personnel. Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including any Incompatibilities
Technical Measures: Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555.
Storage Conditions: Store under moderate temperatures recommended by a technical services representative. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, spark and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials; combustibles, and sources of heat. Ideal storage temperature is 10-27°C (50-80°F).
Incompatible Materials: Combustibles, heat sources, copper, zinc, alloys of copper or zinc, aluminum powder, mild steel.
Special Rules on Packaging: Keep only in the original container.

Specific End Use(s)
Booster sensitive blasting agent and water resistant blasting agent. For professional use only.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Ammonium nitrate (6484-52-2)		
ORICA Guideline	Internal TWA (mg/m³)	5 mg/m³

Fuels, diesel (68334-30-5)		
USA ACGIH	ACGIH TWA (mg/m³)	100 mg/m³
Alberta	OEL TWA (mg/m³)	100 mg/m³
British Columbia	OEL TWA (mg/m³)	100 mg/m³
Manitoba	OEL TWA (mg/m³)	100 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	100 mg/m³
Nova Scotia	OEL TWA (mg/m³)	100 mg/m³
Ontario	OEL TWA (mg/m³)	100 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	100 mg/m³
Saskatchewan	OEL STEL (mg/m³)	150 mg/m³
Saskatchewan	OEL TWA (mg/m³)	100 mg/m³

Exposure Controls
Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in immediate vicinity of any potential exposure. Product to be handled under strictly controlled conditions. Observe applicable regulations in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555.

Personal Protective Equipment: Gloves. Protective clothing. Respiratory protection. Safety Glasses or goggles.

Materials for Protective Clothing: Chemically resistant material.
Hand Protection: Wear chemically resistant protective gloves.
Eye Protection: Chemical goggles or safety glasses.
Skin and Body Protection: Wear suitable protective clothing. Wear long sleeves.
Respiratory Protection: Where Occupational Exposure Limits are expected to be exceeded, wear approved respiratory protection.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information On Basic Physical And Chemical Properties

Physical State	:	Solid
Appearance	:	Green, Blue, Gray, Orange, or Off-White Prills/Granuals
Odor	:	Smells like diesel fuel
Odor Threshold	:	Not available
pH	:	Not available
Relative Evaporation Rate (butyl acetate=1)	:	Not available
Melting Point	:	170°C (338°F)
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	52 °C (126 °F)
Auto-ignition Temperature	:	210-265°C (410-509°F)
Decomposition Temperature	:	Spontaneously decomposes at temperatures above 210°C (410°F)
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	0.01 – 0.4 mmHg @ 20°C
Relative Vapor Density at 20 °C	:	Not available
Density	:	0.76 - 0.99 g/cc
Specific Gravity	:	Not available
Solubility	:	Dissolves slowly with prolonged exposure to water
Log Pow	:	Not available
Log Kow	:	Not available
Viscosity, Kinematic	:	Not available
Viscosity, Dynamic	:	Not available
Explosion Data - Sensitivity to Mechanical Impact	:	1.5D - Explosive substances and articles
Explosion Data - Sensitivity to Static Discharge	:	1.5D - Explosive substances and articles

SECTION 10: STABILITY AND REACTIVITY

Reactivity Accelerates the rate of burning materials. Oxidizer.
Chemical Stability Stable at standard temperature and pressure. Decomposes at elevated temperatures (>210°C/>410°F).
Possibility of Hazardous Reactions Hazardous polymerization will not occur.
Conditions to Avoid Extremely high or low temperatures. Open flame. Heat. Sparks.
Incompatible Materials Combustibles, heat sources, copper, zinc, alloys of copper or zinc, aluminum powder, mild steel.
Hazardous Decomposition Products Carbon oxides (CO, CO_2). Nitrous oxides. Ammonium nitrate fumes.

SECTION 11: TOXICOLOGICAL INFORMATION

Information On Toxicological Effects - Product

Acute toxicity : Not classified

LD50 and LC50 Data: Not available
Skin Corrosion/Irritation: Not classified
Serious Eye Damage/Irritation: Causes serious eye irritation.
Respiratory or Skin Sensitization: Not classified
Germ Cell Mutagenicity: Not classified
Teratogenicity: Not available
Carcinogenicity: Suspected of causing cancer.
Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.
Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): May cause respiratory irritation.
Aspiration Hazard: Not classified
Symptoms/Injuries after Inhalation: Causes irritation to the respiratory tract. May be harmful if inhaled in high concentrations.
Symptoms/Injuries after Skin Contact: May be irritating to the skin.
Symptoms/Injuries after Eye Contact: Causes serious eye irritation.
Symptoms/Injuries after Ingestion: May be harmful if swallowed. May cause cyanosis.
Chronic Symptoms: Causes damage to organs (thymus, liver, bone marrow) through prolonged or repeated exposure.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data

Ammonium nitrate (6484-52-2)	
LD50 oral rat	2217 mg/kg
LC50 inhalation rat (mg/l)	> 88.8 mg/l (Exposure time: 4 h)

Fuels, diesel (68334-30-5)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg
LC50 Inhalation Rat (mg/l)	4.6 mg/l/4h

Fuels, diesel (68334-30-5)	
IARC Group	2B

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ammonium nitrate (6484-52-2)	
LC50 fish 1	65 - 85 mg/l (Exposure time: 48 h - Species: Cyprinus carpio [semi-static])

Fuels, diesel (68334-30-5)	
LC50 Fish 1	35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Persistence and Degradability Not available

Bioaccumulative Potential

Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

Mobility in Soil Not available

Other Adverse Effects Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Burn under supervision of a licensed expert at an explosive burning ground or destroy by detonation in boreholes, in accordance with applicable local, state, provincial, territorial, federal and international regulations. Comply with regulations as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555.
Ecology - Waste Materials: Hazardous waste due to aquatic toxicity.

SECTION 14: TRANSPORT INFORMATION

In Accordance with ICAO/IATA/DOT/TDG

UN Number

UN-No.(DOT): 0331

UN Proper Shipping Name

DOT Proper Shipping Name : Explosive, blasting, type B

Hazard Labels (DOT) : 1.5D - Explosive substances and articles

Packing Group (DOT) : II - Medium Danger

Additional Information

Emergency Response Guide (ERG) Number : 112

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

Amex™, Amex™ UG, Amex™ WR	
SARA Section 311/312 Hazard Classes	Reactive hazard Sudden release of pressure hazard Delayed (chronic) health hazard Immediate (acute) health hazard

Ammonium nitrate (6484-52-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Fuels, diesel (68334-30-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

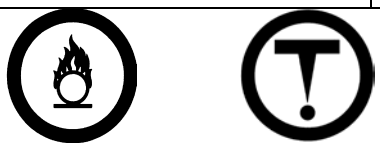
Ammonium nitrate (6484-52-2)
U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)
U.S. - Delaware - Accidental Release Prevention Regulations - Sufficient Quantities
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term

Fuels, diesel (68334-30-5)
U.S. - Illinois - Toxic Air Contaminant Carcinogens
U.S. - Illinois - Toxic Air Contaminants
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2

U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term

Canadian Regulations

Amex™, Amex™ UG, Amex™ WR	
WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects Class D Division 2 Subdivision A - Very toxic material causing other toxic effects



Ammonium nitrate (6484-52-2)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class C - Oxidizing Material

Fuels, diesel (68334-30-5)
Listed on the Canadian DSL (Domestic Substances List) inventory.

Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by CPR.

SECTION 16: OTHER INFORMATION

Indication of Changes : 08/06/2013

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Expl. 1.5	Explosive Category 1.5
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 3	Flammable liquids Category 3
Ox. Sol. 3	Oxidizing solids Category 3
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H226	Flammable liquid and vapor
H272	May intensify fire; oxidizer
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
H319	Causes serious eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure

Party Responsible for the Preparation of this Document:

Orica Canada Inc.

Phone Number: 1-450-533-4201

The information contained herein is provided only as a guide for the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. This Material Safety Data Sheet is not all-inclusive. The circumstances of use and handling may involve additional considerations that have not been addressed by this Data Sheet. No warranty of any kind is provided or implied by this Data Sheet. Orica will not be liable for any damages, losses, injuries or indirect damages that may result from the use of, or reliance on, any information contained herein.

North America GHS US 2012 & WHMIS

SAFETY DATA SHEET **SDS No.:** AA0295 **OXIDIZER STORAGE CODE YELLOW**

Section 1 Chemical Product and Company Information

5100 West Henrietta Rd
PO Box 92912
Rochester, NY 14692-9012
Tel: (800) 962-2660

CHEMTREC 24 Hour Emergency
Phone Number (800) 424-9300
For laboratory use only.
Not for drug, food or household use.

Product	**AMMONIUM NITRATE**
Synonyms	Nitric Acid Ammonium Salt

Section 2 Hazards Identification

This substance or mixture has not been classified as hazardous according to the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals.

Signal word: WARNING
Pictograms: GHS03 / GHS07
Target organs: Liver, Kidneys, Blood

GHS Classification:
Oxidizing solid (Category 3)
Acute toxicity, oral (Category 5)
Skin irritation (Category 2)
Eye irritation (Category 2A)

GHS Label information: **Hazard statement(s):**
H272: May intensify fire; oxidizer.
H303: May be harmful if swallowed.
H315: Causes skin irritation.
H319: Causes serious eye irritation.

Precautionary statement(s):
P210: Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P220: Keep away from clothing/incompatible/combustible materials.
P221: Take any precaution to avoid mixing with combustibles/acids/oxidizers.
P264: Wash hands thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P312: Call a POISON CENTER or doctor if you feel unwell.
P302+P352: IF ON SKIN: Wash with plenty of water and soap.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332+P313: If skin irritation occurs: Get medical attention.
P337+P313: If eye irritation persists: Get medical attention.
P362+P364: Take off contaminated clothing and wash it before reuse.
P370+P378: In case of fire: Use dry chemical, alcohol foam, carbon dioxide or water spray to extinguish.
P501: Dispose of contents/container to a licensed chemical disposal agency in accordance with local/regional/national regulations.

Ca Prop 65 - This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%	EINECS
Ammonium nitrate	6484-52-2	100%	229-347-8

Section 4 First Aid Measures

INGESTION: MAY BE HARMFUL IF SWALLOWED. Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.

INHALATION: MAY BE HARMFUL IF INHALED. MAY CAUSE RESPIRATORY TRACT IRRITATION. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

EYE CONTACT: CAUSES EYE IRRITATION. Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.

SKIN ABSORPTION: CAUSES SKIN IRRITATION. Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.

Section 5 Fire Fighting Measures

Suitable Extinguishing Media: Carbon dioxide, dry chemical, dry sand, alcohol foam. **Protective Actions for Fire-fighters:** In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool. **Specific Hazards:** During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Strong oxidizer. If heated under confinement, material may explode. Ammonium nitrate of any grade, including fertilizer, when contaminated with oil, charcoal or other organic materials should be considered an explosive capable of dentonation by combustion or by explosion of adjacent explosive materials. Combustion by-products include oxides of nitrogen and ammonia. Closed containers may rupture violently when heated.

Section 6 Accidental Release Measures

Personal Precautions: Evacuate personnel to safe area. Use proper personal protective equipment as indicated in Section 8. Provide adequate ventilation.

Environmental Precautions: Avoid runoff into storm sewers and ditches which lead to waterways.

Containment and Cleanup: Remove all sources of ignition. Sweep or vacuum up and place in a suitable container for proper disposal. Wash spill area with soap and water.

(2012 EMERGENCY RESPONSE GUIDEBOOK, (PHH50-ERG2012), GUIDE # 140)

Section 7 Handling & Storage

Precautions for Safe Handling: Read label on container before using. Do not wear contact lenses when working with chemicals. Keep out of reach of children. Avoid contact with eyes, skin and clothing. Do not inhale dusts. Use with adequate ventilation. Avoid ingestion. Wash thoroughly after handling. Remove and wash clothing before reuse.

Conditions for Safe Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from ignition sources.

Section 8 Exposure Controls / Personal Protection

Exposure Limits:

Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
Particulates not otherwise classified/regulated	None established.	TWA: 5 mg/m^3 Respirable fraction	None established.

Engineering controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles, or faceshield, lab coat or apron, appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

Respiratory protection: None should be needed in normal laboratory handling at room temperatures. If dusty conditions prevail, work in fume hood or wear a NIOSH/MSHA-approved respirator.

Section 9 Physical & Chemical Properties

Appearance: Hygroscopic solid. White granules
Odor: No odor.
Odor threshold: Data not available.
pH: 5.4
Melting / Freezing point: 169°C (338°F)
Boiling point: Decomposes
Flash point: Data not available

Evaporation rate (= 1): Data not available
Flammability (solid/gas): Data not available.
Explosion limits: Lower / Upper: Data not available
Vapor pressure (mm Hg): Data not available
Vapor density (Air = 1): Data not available
Relative density (Specific gravity): 1.73 @ 23°C
Solubility(ies): 118 g/100 g water @ 30°C

Partition coefficient: Data not available
Auto-ignition temperature: Data not available
Decomposition temperature: 210°C (410°F)
Viscosity: Data not available.
Molecular formula: NH_4NO_3
Molecular weight: 80.05

Section 10 Stability & Reactivity

Chemical stability: Stable
Hazardous polymerization: Will not occur.
Conditions to avoid: Excessive temperatures and other sources of ignition. Combustible and organic materials.

Incompatible materials: Peroxides, strong oxidizers, reducing agents, organic materials.

Hazardous decomposition products: Nitrogen oxides.

Section 11 Toxicological Information

Acute toxicity: Oral-rat LD50: 2217 mg/kg ; Inhalation-rat LC50: >88.8 mg/L/4 hours [Ammonium nitrate]
Skin corrosion/irritation: Data not available
Serious eye damage/irritation: Data not available
Respiratory or skin sensitization: Data not available
Germ cell mutagenicity: Data not available
Carcinogenity: Data not available
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
Reproductive toxicity: Data not available
STOT-single exposure: Data not available
STOT-repeated exposure: Data not available
Aspiration hazard: Data not available
Potential health effects:
Inhalation: Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.
Ingestion: May cause gastroenteritis and abdominal pains. Purging and diuresis can be expected. Rare cases of nitrates being converted to the more toxic nitrites have been reported, mostly with infants.
Skin: Causes irritation to skin. Symptoms include redness, itching, and pain.
Eyes: Causes irritation, redness, and pain.
Signs and symptoms of exposure: Small repeated oral doses of nitrates may cause weakness, depression, headache, and mental impairment. Persons with stomach diseases and infants are much more sensitive to nitrate ion toxicity.
Additional information: RTECS #: BR9050000 [Ammonium nitrate]

Section 12 Ecological Information

Toxicity to fish: Cyprinus carpio (Fish, fresh water) LC50: 74 mg/L/48 hours
Toxicity to daphnia and other aquatic invertebrates: Daphnia magna (Crustacea) EC50: 555 mg/L
Toxicity to algae: Scenedesmus quadricauda (Algae) EC50: 83 mg/L
Persistence and degradability: No data available
Bioaccumulative potential: No data available
Mobility in soil: No data available
PBT and vPvB assessment: No data available
Other adverse effects: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Section 13 Disposal Considerations

These disposal guidelines are intended for the disposal of catalog-size quantities only. Federal regulations may apply to empty container. State and/or local regulations may be different. Dispose of in accordance with all local, state and federal regulations or contract with a licensed chemical disposal agency.

Section 14 Transport Information

UN/NA number: UN1942
Shipping name: Ammonium nitrate
Hazard class: 5.1
Packing group: III
Reportable Quantity: No
Marine pollutant: No
Exceptions: Limited quantity equal to or less than 5 Kg
2012 ERG Guide # 140

Section 15 Regulatory Information

A chemical is considered to be listed if the CAS number for the anhydrous form is on the Inventory list.

Component	TSCA	CERLCA (RQ)	RCRA code	DSL	NDSL	WHMIS Classification
Ammonium nitrate	Listed	Not listed	Not listed	Listed	Not listed	C

Section 16 Additional Information

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

Revision Date: February 26, 2013 **Supercedes:** November 22, 2011

SAFETY DATA SHEET

Revision Date: 02/17/2015
Print Date: 9/28/2015
MSDS Number: R0294485
Version: 3.2

Zalta™ MA11-751 ANTISCALANT
™ Trademark, Solenis or its subsidiaries or affiliates, registered in various countries
784892

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Solenis LLC 500 Hercules Road Wilmington, Delaware 19808	Contact us at	www.solenis.com
	Emergency telephone number	1-844-SOLENIS (844-765-3647) / 606-329-5705
Product name	Zalta™ MA11-751 ANTISCALANT ™ Trademark, Solenis or its subsidiaries or affiliates, registered in various countries	
Product code	784892	

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance: liquid, yellow

CAUTION! MAY CAUSE EYE IRRITATION.

Potential Health Effects

Exposure routes
Inhalation, Skin absorption, Skin contact, Eye Contact, Ingestion

Eye contact
Can cause eye irritation. Symptoms include stinging, tearing, redness, and swelling of eyes.

Skin contact
May cause slight skin irritation.

Ingestion
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Inhalation
Breathing of vapor or mist is possible. Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms are not expected at air concentrations below the recommended exposure limits, if applicable (see Section 8.).

Aggravated Medical Condition
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material:, lung (for example, asthma-like conditions), Kidney

Symptoms

Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include:, stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), thirst

Target Organs

Overexposure to this material (or its components) has been suggested as a cause of the following effects in humans:, kidney damage

Carcinogenicity

This material is not listed as a carcinogen by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), or the Occupational Safety and Health Administration (OSHA).

Reproductive hazard

No data.

Other information

Swallowing or other exposure to large amounts of sodium chloride may cause death due to loss of water in internal organs.

3. COMPOSITION/INFORMATION ON INGREDIENTS

WHMIS hazardous composition: No ingredients are hazardous according to the CPR criteria.

4. FIRST AID MEASURES

Eyes

If symptoms develop, immediately move individual away from exposure and into fresh air. Flush eyes gently with water for at least 15 minutes while holding eyelids apart; seek immediate medical attention.

Skin

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

Ingestion

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

Inhalation

If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

Notes to physician

Hazards: No information available.
Treatment: No hazards which require special first aid measures.

5. FIREFIGHTING MEASURES

Suitable extinguishing media

Dry chemical, Carbon dioxide (CO2), Water spray

Hazardous combustion products

carbon dioxide and carbon monoxide, corrosive vapors, hydrogen chloride, phosphine, Oxides of phosphorus, Sodium oxides, toxic fumes

Precautions for fire-fighting

Wear full firefighting turn-out gear (full Bunker gear), and respiratory protection (SCBA). Use water spray to cool fire exposed containers and structures until fire is out if it can be done with minimal risk. Avoid spreading burning material with water used for cooling purposes.

NFPA Flammable and Combustible Liquids Classification

Not applicable

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

For personal protection see section 8. Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed.

Environmental precautions

Prevent spreading over a wide area (e.g. by containment or oil barriers). Do not let product enter drains. Do not flush into surface water or sanitary sewer system.

Methods for cleaning up

Keep in suitable, closed containers for disposal. Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).

Other information

Comply with all applicable federal, state, and local regulations.

7. HANDLING AND STORAGE

Handling

Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed.

Storage

Store in a cool, dry, ventilated area. Keep from freezing.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Contains no substances with occupational exposure limit values.

General advice

These recommendations provide general guidance for handling this product. Personal protective equipment should be selected for individual applications and should consider factors which affect exposure potential, such as handling practices, chemical concentrations and ventilation. It is ultimately the responsibility of the employer to follow regulatory guidelines established by local authorities.

Exposure controls

Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below exposure guidelines (if applicable) or below levels that cause known, suspected or apparent adverse effects.

Eye protection

Wear chemical splash goggles when there is the potential for exposure of the eyes to liquid, vapor or mist.

Skin and body protection

Wear normal work clothing including long pants, long-sleeved shirts and foot covering to prevent direct contact of the product with the skin. Launder clothing before reuse. If skin irritation develops, contact your facility health and safety professional or your local safety equipment supplier to determine the proper personal protective equipment for your use.
Wear resistant gloves (consult your safety equipment supplier).

Respiratory protection

A NIOSH-approved air-purifying respirator with an appropriate cartridge and/or filter may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits (if applicable) or if overexposure has otherwise been determined. Protection provided by air-purifying respirators is limited. Use a positive pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are not known or any other circumstances where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	liquid
Colour	yellow, brown
Odour	acrylic-like
Boiling point/boiling range	212 °F / 100 °C @ 1,013.33 hPa Calculated Phase Transition Liquid/Gas
Melting point/range	6 °F / -14 °C

pH	5
Flash point	Not applicable
Evaporation rate	(>)1 Ethyl Ether
Vapour pressure	23.333 hPa @ 68 °F / 20 °C Calculated Vapor Pressure
Relative vapour density	(>)1 AIR=1
Density	1.260 g/cm3 @ 77.00 °F / 25.00 °C
Water solubility	completely soluble

10. STABILITY AND REACTIVITY

Stability
Stable.

Conditions to avoid
None known.

Incompatible products
Oxidizing agents, Strong acids Oxidizing agents, strong mineral acids

Hazardous decomposition products
carbon dioxide and carbon monoxide, corrosive vapors, hydrogen chloride, phosphine, Oxides of phosphorus, Sodium oxides

Hazardous reactions
Product will not undergo hazardous polymerization.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation
Skin absorption
Skin contact
Eye Contact
Ingestion

Product

Acute oral toxicity : No data available

Acute inhalation toxicity : No data available

Acute dermal toxicity	:	No data available
Skin corrosion/irritation	:	No data available
Serious eye damage/eye irritation	:	No data available
Respiratory or skin sensitisation	:	No data available
Target Organ Systemic Toxicant - Repeated exposure	:	Target Organs: Overexposure to this material (or its components) has been suggested as a cause of the following effects in humans:, kidney damage
Aspiration toxicity	:	No aspiration toxicity classification

Components:

No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Product:

Toxicity to fish	:	LC 50 (Oncorhynchus mykiss (rainbow trout)): 7,070 mg/l Exposure time: 96 h Test Method: static test LC 50 (Pimephales promelas (fathead minnow)): 6,160 mg/l Exposure time: 96 h Test Method: static test
Toxicity to daphnia and other aquatic invertebrates	:	LC 50 (Daphnia magna (Water flea)): 2,020 mg/l Exposure time: 48 h Test Method: static test

Components:

No data available

Persistence and degradability

Product:

Biochemical Oxygen Demand (BOD)	:	Biochemical oxygen demand within 5 days 1,600 mg/l
Chemical Oxygen Demand (COD)	:	200,000 mg/l Method: Chemical oxygen demand

Components:

No data available

Bioaccumulative potential

Product:

No data available

Components:

No data available

Mobility in soil

Product:

No data available

Components:

No data available

13. DISPOSAL CONSIDERATIONS

Waste disposal methods

Dispose of in accordance with all applicable local, state and federal regulations.

14. TRANSPORT INFORMATION

REGULATION

ID NUMBER	PROPER SHIPPING NAME	*HAZARD CLASS	SUBSIDIARY HAZARDS	PACKING GROUP	MARINE POLLUTANT / LTD. QTY.

U.S. DOT - ROAD

Not dangerous goods

U.S. DOT - RAIL

Not dangerous goods

U.S. DOT - INLAND WATERWAYS

Not dangerous goods

TRANSPORT CANADA - ROAD

Not dangerous goods

TRANSPORT CANADA - RAIL

Not dangerous goods

TRANSPORT CANADA - INLAND WATERWAYS

Not dangerous goods

INTERNATIONAL MARITIME DANGEROUS GOODS

Not dangerous goods

INTERNATIONAL AIR TRANSPORT ASSOCIATION - CARGO

Not dangerous goods

INTERNATIONAL AIR TRANSPORT ASSOCIATION - PASSENGER

Not dangerous goods

MEXICAN REGULATION FOR THE LAND TRANSPORT OF HAZARDOUS MATERIALS AND WASTES

Not dangerous goods

***ORM = ORM-D, CBL = COMBUSTIBLE LIQUID**

Dangerous goods descriptions (if indicated above) may not reflect quantity, end-use or region-specific exceptions that can be applied. Consult shipping documents for descriptions that are specific to the shipment.

15. REGULATORY INFORMATION

WHMIS Classification

Not Rated

WHMIS Ingredient Disclosure List IDL: No component is listed on the WHMIS ingredients disclosure list.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Canadian National Pollutant Release Inventory (NPRI) Canadian National Pollutant Release Inventory (NPRI): No component is listed on NPRI.

Notification status

US. Toxic Substances Control Act	y (positive listing)
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL). (Can. Gaz. Part II, Vol. 133)	y (positive listing)
Australia. Industrial Chemical (Notification and Assessment) Act	y (positive listing)
Japan. ENCS - Existing and New Chemical Substances Inventory	n (Negative listing)
Korea. Toxic Chemical Control Law (TCCL) List	y (positive listing)
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	y (positive listing)
China. Inventory of Existing Chemical Substances	y (positive listing)

	HMIS	NFPA
Health	2*	2
Flammability	0	0
Physical hazards	0	
Instability		0
Specific Hazard	--	--

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by the Solenis Environmental Health and Safety Department.

List of abbreviations and acronyms that could be, but not necessarily are, used in this safety data sheet :
ACGIH : American Conference of Industrial Hygienists
BEI : Biological Exposure Index
CAS : Chemical Abstracts Service (Division of the American Chemical Society).
CMR : Carcinogenic, Mutagenic or Toxic for Reproduction

FG : Food grade
GHS : Globally Harmonized System of Classification and Labeling of Chemicals.
H-statement : Hazard Statement
IATA : International Air Transport Association.
IATA-DGR : Dangerous Goods Regulation by the “International Air Transport Association” (IATA).
ICAO : International Civil Aviation Organization
ICAO-TI (ICAO) : Technical Instructions by the “International Civil Aviation Organization”
IMDG : International Maritime Code for Dangerous Goods
ISO : International Organization for Standardization
logPow : octanol-water partition coefficient
LCxx : Lethal Concentration, for xx percent of test population
LDxx : Lethal Dose, for xx percent of test population.
ICxx : Inhibitory Concentration for xx of a substance
Ecxx : Effective Concentration of xx
N.O.S.: Not Otherwise Specified
OECD : Organization for Economic Co-operation and Development
OEL : Occupational Exposure Limit
P-Statement : Precautionary Statement
PBT : Persistent , Bioaccumulative and Toxic
PPE : Personal Protective Equipment
STEL : Short-term exposure limit
STOT : Specific Target Organ Toxicity
TLV : Threshold Limit Value
TWA : Time-weighted average
vPvB : Very Persistent and Very Bioaccumulative
WEL : Workplace Exposure Level

CERCLA : Comprehensive Environmental Response, Compensation, and Liability Act
DOT : Department of Transportation
FIFRA : Federal Insecticide, Fungicide, and Rodenticide Act
HMIRC : Hazardous Materials Information Review Commission
HMIS : Hazardous Materials Identification System
NFPA : National Fire Protection Association
NIOSH : National Institute for Occupational Safety and Health
OSHA : Occupational Safety and Health Administration
PMRA : Health Canada Pest Management Regulatory Agency
RTK : Right to Know
WHMIS : Workplace Hazardous Materials Information System

Material Safety Data Sheet

LA2569
Copper Sulphate

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Id: LA2569
Product Name: Copper Sulphate
Synonyms: Copper (II) Sulphate Pentahydrate, Blue Vitrol; Cupric Sulphate Pentahydrate.
Chemical Family: Inorganic copper compound
Application: Mineral flotation. Also, where licensed and labeled correctly it can be used as an animal feed micronutrient or a fungicide or algaecide.

Distributed By:
Univar Canada Ltd.
9800 Van Horne Way
Richmond, BC
V6X 1W5

Prepared By: The Environment, Health and Safety Department of Univar Canada Ltd.
Preparation date of MSDS: 29/Sep/2014
Telephone number of preparer: 1-866-686-4827

24-Hour Emergency Telephone Number (CANUTEC): (613) 996-6666

2. HAZARDS IDENTIFICATION

Potential Acute Health Effects:
Eye Contact: May cause severe eye irritation. May cause clouding of the cornea.
Skin Contact: May cause skin irritation. May be harmful if absorbed through skin. Repeated or prolonged contact may cause irritation.
Inhalation: May be harmful if inhaled. May cause respiratory tract irritation. May cause ulceration of the nose and throat.
Ingestion: May be harmful if swallowed. May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredients	Percentage (W/W)	LD50s and LC50s Route & Species:
Copper Sulphate 7758-98-7	98-100	Dermal LD50 Rabbit = 1000 mg/kg Oral LD50 Rat = 300 mg/kg

Note: Pentahydrate CAS#: 7758-99-8

4. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with copious quantities of water for at least 20 minutes holding lids apart to ensure flushing of the entire surface. Seek immediate medical attention.
Skin Contact: Remove contaminated clothing and launder before reuse. Wash with soap and water. Get medical attention if irritation persists.
Inhalation: Remove person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, get immediate medical attention.
Ingestion: Do NOT induce vomiting. Never give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.
Notes to Physician: Treatment based on sound judgment of physician and individual reactions of patient.

5. FIRE FIGHTING MEASURES

Flash Point: None.
Flash Point Method: Not applicable.
Autoignition Temperature: Not available.
Flammable Limits in Air (%): Not Available.
Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Exposure Hazards: Not Available.
Hazardous Decomposition/Combustion Materials (under fire conditions): Not available.
Special Protective Equipment: Fire fighters should wear full protective clothing, including self-contained breathing equipment.
NFPA RATINGS FOR THIS PRODUCT ARE: HEALTH 2, FLAMMABILITY 0, INSTABILITY 0
HMIS RATINGS FOR THIS PRODUCT ARE: HEALTH 2, FLAMMABILITY 0, REACTIVITY 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures: Wear appropriate protective equipment.
Environmental Precautionary Measures: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. Consult local authorities.
Procedure for Clean Up: Isolate hazard area and restrict access. Ventilate area. Pick up solids and put in an appropriate sealed container for later disposal.

7. HANDLING AND STORAGE

Handling: Avoid contact with eyes, skin and clothing. Avoid breathing in dust. Wash thoroughly after handling.
Storage: Store in an area that is cool and dry. Protect against physical damage. Store in accordance with good industrial practices.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:

Localized ventilation should be used to control dust levels.
Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH approved respirator. In case of spill or leak resulting in unknown concentration, use a NIOSH approved supplied air respirator.
Gloves:

Impervious gloves. Rubber gloves.
Skin Protection: Impervious clothing. Apron, coveralls and/or other resistant protective clothing.
Eyes: Safety glasses. Goggles.
Other Personal Protection Data: Ensure that eyewash stations and safety showers are proximal to the work-station location.

Ingredients	Exposure Limit - ACGIH	Exposure Limit - OSHA	Immediately Dangerous to Life or Health - IDLH
Copper Sulphate	Not available.	Not available.	Not Available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid Crystals or Powder
Color: Blue

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor: Odorless
pH 4
Specific Gravity: 2.286
Boiling Point: Not Available.
Freezing/Melting Point: Copper sulfate pentahydrate loses two water molecules of hydration at 30°C, 2 more at 110°C and becomes anhydrous by 250°C. Melts at 110°C. Decomposes at 560°C.
Vapor Pressure: Not Available.
Vapor Density: Not Available.
% Volatile by Volume: Not Available.
Evaporation Rate: Not Available.
Solubility: Soluble in water.
VOCs: Not Available.
Viscosity: Not Available.
Molecular Weight: 249.68
Other: Not Available.

10. STABILITY AND REACTIVITY

Chemical Stability: Stable.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Heating to decomposition. Incompatible materials.
Materials to Avoid: Magnesium. Hydroxylamine.
Hazardous Decomposition Products: Oxides of sulphur. Toxic fumes.
Additional Information:

Solution can react with magnesium to evolve hydrogen. Contact with hydroxylamine will ignite hydroxylamine. When dissolved, forms acidic solution which is corrosive to most metals. Copper dust or mist may react with acetylene gas to form shock sensitive copper acetylides.

11. TOXICOLOGICAL INFORMATION

Principle Routes of Exposure

Ingestion: May be harmful if swallowed. May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns.
Skin Contact: May cause skin irritation. May be harmful if absorbed through skin. Repeated or prolonged contact may cause irritation.
Inhalation: May be harmful if inhaled. May cause respiratory tract irritation. May cause ulceration of the nose and throat.
Eye Contact: May cause severe eye irritation. May cause clouding of the cornea.

Additional Information: Prolonged skin contact may cause irritation and eczema.

Acute Test of Product:
Acute Oral LD50: Not Available.
Acute Dermal LD50: Not Available.
Acute Inhalation LC50: Not Available.

Carcinogenicity:

Ingredients	IARC - Carcinogens	ACGIH - Carcinogens
Copper Sulphate	Not listed.	Not listed.

Carcinogenicity Comment: No additional information available.

Reproductive Toxicity/ Teratogenicity/ Embryotoxicity/ Mutagenicity: Not Available.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:

Ingredients	Ecotoxicity - Fish Species Data	Acute Crustaceans Toxicity:	Ecotoxicity - Freshwater Algae Data
Copper Sulphate	0.1 mg/L LC50 (Oncorhynchus mykiss) 96 h	Not Available.	Not Available.

Other Information:
No additional remark.

13. DISPOSAL CONSIDERATIONS

Disposal of Waste Method: Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations.
Contaminated Packaging: Empty containers should be recycled or disposed of through an approved waste management facility.

14. TRANSPORT INFORMATION

DOT (U.S.):
DOT Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE SOLID, N.O.S (COPPER SULPHATE)
DOT Hazardous Class 9
DOT UN Number: UN3077
DOT Packing Group: III
DOT Reportable Quantity (lbs): Not Available.
Note: No additional remark.
Marine Pollutant: Yes.

TDG (Canada):
TDG Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (COPPER SULPHATE)
Hazard Class: 9
UN Number: UN3077
Packing Group: III
Note: Regulated for marine transportation only, if transported by road or rail product is not TDG Regulated.
Marine Pollutant: Yes.

15. REGULATORY INFORMATION

U.S. TSCA Inventory Status: All components of this product are either on the Toxic Substances Control Act (TSCA) Inventory List or exempt.

Canadian DSL Inventory Status: All components of this product are either on the Domestic Substances List (DSL), the Non-Domestic Substances List (NDSL) or exempt.

Note: Not available.

U.S. Regulatory Rules

Ingredients	CERCLA/SARA - Section 302:	SARA (311, 312) Hazard Class:	CERCLA/SARA - Section 313:
Copper Sulphate	Not Listed.	Listed	Not Listed.

California Proposition 65: Not Listed.
MA Right to Know List: Listed.
New Jersey Right-to-Know List: Listed.
Pennsylvania Right to Know List: Listed.

WHMIS Hazardous Class:
D1B TOXIC MATERIALS
D2B TOXIC MATERIALS

16. OTHER INFORMATION

Additional Information: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Disclaimer: NOTICE TO READER:
Univar, expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a Product Specification Sheet and/or a Certificate of Analysis. These can be obtained from your local Univar Sales Office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

*****END OF MSDS*****

Material Safety Data Sheet

B-975

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	B-975
Product Identifier	B-975
MSDS No.	Product 002
Product Family	Degreasers
Manufacturer	Supersaul Chemmex Inc., 56022 Range Road 14, Onoway, Alberta, T0E-1V0, 780-266-4414, www.supersaulchemmex.com
Supplier	Supersaul Chemmex Inc., 56022 Range Road 14, Onoway, Alberta, T0E-1V0, 780-266-4414, www.supersaulchemmex.com
Emergency Contact Information	Supersaul Chemmex Inc., 780-266-4414
Use	Degreaser

2. HAZARDS IDENTIFICATION

Emergency Overview	Clear yellow - orange viscous liquid. Sweet odour. Presents little or no hazard if accidentally released. Will not burn.

Potential Health Effects

Route of Exposure	Inhalation. Skin contact. Skin absorption. Eye contact. Ingestion.
Inhalation	Can irritate the nose and throat.
Skin Contact	May cause mild irritation.
Eye Contact	May cause mild irritation.
Ingestion	Can cause effects as described for skin contact.
Effects of Long-Term (Chronic) Exposure	Effect(s) from long-term exposure are similar to effects described for short-term exposure.
Carcinogenicity	Not known to cause cancer.
Teratogenicity / Embryotoxicity	Not known to harm the unborn child.
Reproductive Toxicity	Not known to be a reproductive hazard.
Mutagenicity	Not known to be a mutagen.

Potential Environmental Effects

Biodegrades with exposure to air. with exposure to microorganisms in soil, water or sediment.
Product and/or byproducts are not likely to bioaccumulate.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Contains no hazardous ingredients.

4. FIRST AID MEASURES

First Aid Procedures

Inhalation	Move victim to fresh air. Call a Poison Centre or doctor if the victim feels unwell.
Skin Contact	Flush with lukewarm, gently flowing water for 5 minutes. Clean clothing, shoes and leather goods. Call a Poison Centre or doctor if the victim feels unwell.
Eye Contact	Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 5 minutes, while holding the eyelid(s) open. If irritation or pain persists, see a doctor.
Ingestion	Have victim rinse mouth with water. Call a Poison Centre or doctor if the victim feels unwell.

5. FIRE FIGHTING MEASURES

Flammable Properties	Does not burn.
Suitable Extinguishing Media	Not combustible. Use extinguishing agent suitable for surrounding fire.
Unsuitable Extinguishing Media	Not applicable.
Specific Hazards Arising from the Chemical	This product presents no unusual hazards in a fire situation. Not known to generate any hazardous decomposition products in a fire.
Protective Equipment and Precautions for Firefighters	No special precautions are necessary. Chemical protective clothing (e.g. chemical splash suit) and positive pressure SCBA may be necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	No special precautions are necessary. Use the Personal Protective Equipment recommended in Section 8 of this MSDS.
Environmental Precautions	No special precautions are necessary. It is good practice to prevent releases into the environment.
Methods for Containment and Clean-up	No special clean-up methods are necessary. Stop or reduce leak if safe to do so. Contain and soak up spill with absorbent that does not react with spilled product.
Other Information	Report spills to local health, safety and environmental authorities, as required.

7. HANDLING AND STORAGE

Handling	No special handling precautions are necessary. Prevent uncontrolled release of product. Avoid generating vapours or mists. If product is transferred to another container, ensure new container is suitable for the product.
Storage	Store in an area that is: ventilated. Comply with all applicable health and safety regulations, fire and building codes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Not available.

Exposure Guideline Comments	ACGIH® = American Conference of Governmental Industrial Hygienists. A4 = Not classifiable as a human carcinogen. Consult local authorities for provincial or state exposure limits.

	OSHA = US Occupational Safety and Health Administration. Consult local authorities for provincial or state exposure limits. AIHA = American Industrial Hygiene Association. Consult local authorities for provincial or state exposure limits.
Engineering Controls	The hazard potential of this product is relatively low. General ventilation is usually adequate.

Personal Protective Equipment (PPE)

Eye/Face Protection	Not required but it is good practice to wear safety glasses or chemical safety goggles.
Skin Protection	Not required. Avoid repeated or prolonged skin contact.
Respiratory Protection	Not normally required if product is used as directed.
General Hygiene Considerations	No special precautions are necessary. It is good practice to: avoid breathing product; avoid skin and eye contact and wash hands after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Clear yellow - orange viscous liquid.
Particle Size	Not applicable
Odour	Sweet
Odour Threshold	Not available
Molecular Formula	Not applicable
Molecular Weight	Not applicable
Boiling Point	104 ºC (219 ºF)
Decomposition Temperature	Not available
Melting Point	Not applicable
Freezing Point	-5 ºC (23 ºF)
Relative Density (water = 1)	1.024
Bulk Density	Not available
Solubility in Water	Soluble in all proportions.
Solubility in Other Liquids	Soluble in all proportions in acids (e.g. acetic acid).
pH	7.3 - 7.9 (100% solution)
Partition Coefficient, n-Octanol/Water	Not available
Viscosity-Kinematic	Not available
Surface Tension	Not available
Vapour Pressure	Not available
Vapour Pressure at 50 deg C	Not available
Saturated Vapour Concentration	Not available
Critical Temperature	Not applicable
Vapour Density (air = 1)	Not applicable
Evaporation Rate	Not available
Flash Point	Not applicable
Lower Flammable/Explosive Limit	Not applicable
Upper Flammable/Explosive Limit	Not applicable

Auto-ignition Temperature	Not applicable
Electrical Conductivity	Not available

10. STABILITY AND REACTIVITY

Chemical Stability	Normally stable.
Conditions to Avoid	None known.
Incompatible Materials	None known.
Hazardous Decomposition Products	None known.
Possibility of Hazardous Reactions	None known.

11. TOXICOLOGICAL INFORMATION

LC50: No information was located.

LD50 (oral): No information was located.

LD50 (dermal): No information was located.

Skin Irritation / Corrosion

No information was located.

Eye Irritation / Corrosion

No information was located.

Effects of Short-Term (Acute) Exposure

Inhalation

No information was located.

Skin Absorption

No information was located.

Ingestion

No information was located.

Effects of Long-Term (Chronic) Exposure

No information was located.

Respiratory and/or Skin Sensitization

Not a respiratory sensitizer.
Not a skin sensitizer.

Carcinogenicity

IARC:
Not specifically listed.

ACGIH®:
Not specifically designated.

NTP:
Not specifically listed.

OSHA:
Not specifically listed.

Key to Abbreviations

ACGIH® = American Conference of Governmental Industrial Hygienists.
IARC = International Agency for Research on Cancer.

NTP = National Toxicology Program.
OSHA = US Occupational Safety and Health Administration.

Teratogenicity / Embryotoxicity

No information was located.

Reproductive Toxicity

No information was located.

Mutagenicity

No information was located.

Toxicologically Synergistic Materials

No information was located.

12. ECOLOGICAL INFORMATION

General Comments	This section is not required by WHMIS. This section is not required by OSHA.
Ecotoxicity	Studies were not located.
Persistence and Degradability	No ingredient of this product or its degradation products is known to be highly persistent. Biodegrades with exposure to air. in water. in soil and sediment.
Bioaccumulation / Accumulation	No information was located.
Mobility	Studies are not available.

13. DISPOSAL CONSIDERATIONS

This product is a non-hazardous waste.
Recycle and reuse product, if possible.
Recommended disposal methods are for the product, as sold. (Used material may contain other hazardous contaminants.)
The required hazard evaluation of the waste and compliance with the applicable hazardous waste laws are the responsibility of the user.

14. TRANSPORT INFORMATION

Shipping Information

Not regulated under Canadian TDG Regulations. Not regulated under US DOT Regulations.

Other Transport Information

Special Shipping Information	Not applicable

15. REGULATORY INFORMATION

Canada

WHMIS Classification

Not a WHMIS controlled product.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by the Controlled Products Regulations.

Domestic Substances List (DSL) / Non-Domestic Substances List (NDSL)

All ingredients are listed on the DSL or are not required to be listed.

USA

US OSHA Regulatory Status

This material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Toxic Substances Control Act (TSCA) Section 8(b)
All ingredients are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.

16. OTHER INFORMATION

NFPA Rating	Health - Not assigned. Flammability - Not assigned. Instability - Not assigned.
MSDS Prepared By	Supersaul Chemmex Inc.
Phone No.	780-266-4414
Date of Preparation	April 15, 2013
Key to Abbreviations	ACGIH® = American Conference of Governmental Industrial Hygienists AIHA = American Industrial Hygiene Association HSDB® = Hazardous Substances Data Bank IARC = International Agency for Research on Cancer NFPA = National Fire Prevention Association NIOSH = National Institute for Occupational Safety and Health NTP = National Toxicology Program OSHA = US Occupational Safety and Health Administration RTECS® = Registry of Toxic Effects of Chemical Substances
References	CHEMINFO database. Canadian Centre for Occupational Health and Safety (CCOHS). HSDB® database. US National Library of Medicine. Available from Canadian Centre for Occupational Health and Safety (CCOHS). Registry of Toxic Effects of Chemical Substances (RTECS®) database. Symyx Software, Inc. Available from Canadian Centre for Occupational Health and Safety (CCOHS). NIOSH Pocket Guide database. National Institute for Occupational Safety and Health. Available from Canadian Centre for Occupational Health and Safety (CCOHS).
Disclaimer	Note: The above information is presented in good faith and is believed to be accurate as of the effective/revision date shown. No warranty is expressed, applied or implied. Regulatory requirements are subject to change and may very from one location to another. It is the buyers responsibility to ensure that its' activities comply with currant federal, state or provincial, and local requirements and regulations. Note: Have all persons who may contact this product, aware of the information contained in this M.S.D.S.. Note: The information contained herein relates only to this product or material and may not be valid when used in combination with any other products or materials or in any process. The statements, technical information and recommendations contained herein, is to the best of our knowledge and belief, accurate, complete and reliable as of the date compiled, but they are given without warranty or guarantee of any kind express or implied. We assume no responsibility for any loss, damage or expense, direct or consequential arising out of their use. It is the users' responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use and adopt such safety precautions and procedures as be necessary. Note: If you need any more information from us for making the determinations which you have to make in order to use this product safely, and effectively please contact Supersaul Chemmex Inc. at Fax 780-967-5174

Section 1: IDENTIFICATION

Product Identifier:	Diesel
Other Means of Identification:	#2 Diesel Clear; Diesel Government Use; F76 Navy Distillate; Heating Oil #2; Low Sulfur Diesel-Off Road; Ultra Low Sulfur Diesel-Clear; Ultra Low Sulfur Diesel-Dyed; #2 Fuel Oil, ULSD.
SDS Number:	844
Product Code:	#2 Diesel Clear (311100); Diesel, Govt. Use (312400); Dyed Premium Diesel, Ultra Low (302301); Dyed Ultra Low Diesel w/ CENEX (3023002); F76 Navy Distillate (311400); Heating Oil (312200); Low Sulfur Diesel, Off Road (312300); Ultra Low Premium Diesel, Clear (301101); Ultra Low Sulfur Diesel, Clear (301100); Ultra Low Diesel Clear w/ CENEX (302301); Ultra Low Sulfur Diesel, Dyed (Dock) (3023003); Ultra Low Sulfur Diesel, Dyed (302300).
Product Use:	Fuel.
Restrictions on Use:	Not available.
Manufacturer/Supplier:	U.S. OIL & REFINING CO. 3001 Marshall Ave. Tacoma, WA 98421
Emergency Phone:	U.S. OIL & REFINING CO.: (253) 383-1651 CHEMTREC: 800-424-9300 NATIONAL POISON CENTER: 1-800-222-1222
Date of Preparation of SDS:	February 24, 2015

Section 2: HAZARD(S) IDENTIFICATION

CLASSIFICATION:
Flammable Liquids, Category 3
Skin Irritation, Category 2
Carcinogenicity, Category 2
Specific Target Organ Toxicity (Single Exposure), Category 3 - Narcotic Effects
Aspiration Hazard, Category 1

LABEL ELEMENTS

Hazard Symbol(s):

Signal Word: Danger

Hazard Statements:
Flammable liquid and vapor.
Causes skin irritation.
Suspected of causing cancer.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.

PRECAUTIONARY STATEMENTS

Prevention:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, and hot surfaces. – No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, ventilating, and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing mist, vapors, or spray.
Wash thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Wear protective gloves, protective clothing and eye protection.

Response:
If swallowed: Immediately call a poison center or doctor.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a poison center or doctor if you feel unwell.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.
In case of fire: Use dry chemical, CO_2, water spray or regular foam to extinguish.

Storage:
Store in a well-ventilated place. Keep container tightly closed.
Keep cool.
Store locked up.

Disposal:
Dispose of contents/container in accordance with applicable regional, national and local laws and regulations.

Hazards Not Otherwise Classified: No applicable information was found.

Ingredients with Unknown Acute Toxicity: 100% of this product mixture consists of ingredient(s) of unknown acute toxicity.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% wt./wt.
Fuels, Diesel, No. 2	Diesel Fuel No. 2	68476-34-6	0, 99.5 - 100*
Fuels, Diesel	Not available.	68334-30-5	0, 99.5 - 100*
Fuel Oil, No. 2	Fuel Oil No. 2	68476-30-2	0, 99.5 - 100*
Naphthalene	Not available.	91-20-3	0 - 0.1, 0.1 - 0.5*

* Multiple concentration ranges are listed due to production variability, and in conformance with Canadian WHMIS requirements.

Section 4: FIRST-AID MEASURES

Inhalation: If inhaled: Remove person to fresh air and keep comfortable for breathing. If symptoms persist, get medical attention/advice. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness.

Skin Contact: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower for at least 15 minutes. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Acute and delayed symptoms and effects: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Eye Contact: If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persist, get medical attention/advice.

Acute and delayed symptoms and effects: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Ingestion: If swallowed: Do NOT induce vomiting. Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR)

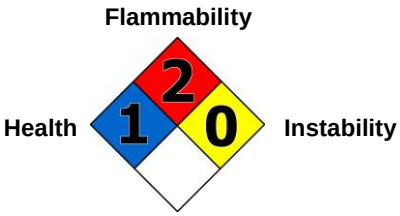
respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE-FIGHTING MEASURES

NFPA 704



SUITABLE/UNSUITABLE EXTINGUISHING MEDIA

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, water spray or regular foam.

Large Fire: Water spray, fog or regular foam. Move containers from fire area if it can be done safely.

Unsuitable Extinguishing Media: Do not use straight streams.

SPECIFIC HAZARDS

Flammable liquid and vapor. Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Fire involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Products of Combustion: Oxides of Carbon. Oxides of Sulfur. Oxides of Nitrogen. Aromatic Hydrocarbons.

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.

Sensitivity to Static Discharge: Take precautionary measures against static discharge. This material is sensitive to static discharge.

SPECIAL PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Runoff from fire control or dilution water may cause pollution. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions: Do not touch or walk through spilled material. Use personal protection recommended in Section 8.

Protective Equipment: Emergency eyewash capability should be available. Wear respiratory protection as conditions warrant.

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.

METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP

Methods for Containment: Stop leak if it can be done without risk. A vapor suppressing foam may be used to reduce vapors. Prevent spreading of material into sewers. Avoid allowing water runoff to contact spilled material.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.

Section 7: HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING:

Do not swallow. Avoid breathing mist, vapors, or spray. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wash thoroughly after handling. Use only outdoors or in a well-ventilated area.

CONDITIONS FOR SAFE STORAGE:

Store in a cool, dry, well-ventilated place. Use approved containers that are tightly closed and clearly labeled. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Protect storage containers from physical damage, sunlight, and all sources of ignition. Post area as “No Smoking”.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

Component	ACGIH	OSHA
Diesel Fuel No. 2 [CAS No. 68476-34-6]	100 mg/m³ (TWA); Skin; A3; Inhalable fraction and vapor (2007)	No PEL established.
Fuels, Diesel [CAS No. 68334-30-5]	100 mg/m³ (TWA); Skin; A3; Inhalable fraction and vapor (2007)	No PEL established.
Fuel Oil No. 2 [CAS No. 68476-30-2]	100 mg/m³ (TWA); Skin; A3; Inhalable fraction and vapor (2007)	No PEL established.
Naphthalene [CAS No. 91-20-3]	10 ppm (TWA); Skin; A3 (2013)	10 ppm (TWA), 50 mg/m³ (TWA); 15 ppm (STEL) [Vacated]

PEL: Permissible Exposure Limit
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit

ENGINEERING CONTROLS

Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, gas, etc.) below recommended exposure limits. Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:

Wear safety glasses. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3-92 and OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection:

Wear protective gloves. Consult manufacturer specifications for further information.

Skin and Body Protection:

Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.

Respiratory Protection:

If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH approved air-purifying respirator, with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.

General Hygiene Considerations:

Handle according to established industrial hygiene and safety practices. Consult a competent industrial hygienist to

determine hazard potential and/or the PPE manufacturers to ensure adequate protection. Emergency eyewash should be available near operations presenting a potential splash exposure. Avoid skin exposure. Promptly remove contaminated clothing, gloves, and shoes.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Transparent liquid.
Color:	Varies, clear, yellow (pale to straw), greenish-yellow, red, green color.
Odor:	Faint petroleum odor.
Odor Threshold:	Not available.
Physical State:	Liquid.
pH:	Not available.
Melting Point / Freezing Point:	Not available.
Initial Boiling Point:	150 °C (300 °F)
Boiling Range:	150 to 360 °C (300 to 680 °F)
Flash Point:	> 52 °C (126 °F)
Evaporation Rate:	Not available.
Flammability (solid, gas):	Not applicable.
Lower Flammability Limit:	Approximately 0.7 %
Upper Flammability Limit:	Approximately 5.0 %
Vapor Pressure:	Not available.
Vapor Density:	> 1 (Air = 1)
Relative Density:	0.84 to 0.88 (Water = 1) at 16 °C (60 °F)
Solubilities:	Insoluble in water.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	257 °C (495 °F)
Decomposition Temperature:	Not available.
Viscosity:	3 cSt at 40 °C (104 °F)
Percent Volatile, wt. %:	Not available.
VOC Content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Reactivity: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Chemical Stability: Stable under normal storage conditions.

Possibility of Hazardous Reactions: None known.

Conditions to Avoid: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Incompatible Materials: Strong acids. Strong oxidizers.

Hazardous Decomposition Products: None known.

Section 11: TOXICOLOGICAL INFORMATION

LIKELY ROUTES OF EXPOSURE: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

ACUTE EXPOSURE

PRODUCT TOXICITY

Oral: Not available.

Dermal: Not available.

Inhalation: Not available.

COMPONENT TOXICITY

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Diesel Fuel No. 2	68476-34-6	Not available.	Not available.	Not available.
Fuels, Diesel	68334-30-5	7500 mg/kg (rat)	> 5000 µL/kg (rabbit)	Not available.
Fuel Oil No. 2	68476-30-2	12000 mg/kg (rat)	4720 µL/kg (rabbit)	Not available.
Naphthalene	91-20-3	490 mg/kg (rat)	> 2500 mg/kg (rat)	> 340 mg/m³ (rat); 1H

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Blood. Liver. Kidneys. Central nervous system.

SYMPTOMS (including delayed and immediate effects)

Inhalation: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. Hemolytic anemia (destruction of red blood cells) is the primary health concern for humans exposed to Naphthalene for either short or long periods of time. Other effects may include nausea, profuse perspiration, vomiting, kidney damage and liver damage. Optic neuritis (inflammation of the optic nerve) has

been observed. Cataracts have also occurred.

Eye: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching. Naphthalene may be absorbed through the skin in harmful amounts.

Ingestion: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea. Naphthalene may cause liver and kidney damage. May cause blood abnormalities, methemoglobinemia, cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood), convulsions, and death. Ingestion of large quantities of Naphthalene may cause severe hemolytic anemia and hemoglobinuria.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

Medical Conditions Aggravated By Exposure: Exposure to Naphthalene may aggravate Glucose-6-Phosphate Dehydrogenase deficiency.

CHRONIC EFFECTS (from short and long-term exposure)

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Central nervous system. Cardiovascular system. Blood. Liver. Kidneys. Central nervous system. Thymus.

Chronic Effects: Prolonged or repeated contact may dry skin and cause irritation. High vapor concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Diesel fuel may cause damage to the blood, thymus and liver through prolonged or repeated exposure.

Carcinogenicity: May cause cancer. Lifetime skin painting studies in animals with petroleum distillates have produced tumors in animals following prolonged and repeated skin contact.

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Diesel Fuel No. 2	A3	Not listed.	Not listed.	Not listed.	Not listed.
Fuels, Diesel	A3	Not listed.	Not listed.	Not listed.	Not listed.
Fuel Oil No. 2	A3	Not listed.	Not listed.	Not listed.	Not listed.
Naphthalene	A3	Group 2B	List 2	OSHA Carcinogen.	Listed.

Mutagenicity: Not available.

Reproductive Effects: Not available.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Not available.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: This product is potentially toxic to aquatic organisms and should be kept out of sewage and drainage systems and all bodies of water.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Other Adverse Effects: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

REGULATORY INFORMATION	ID NUMBER	EMERGENCY RESPONSE GUIDEBOOK	PROPER SHIPPING NAME	CLASS	PACKING GROUP	PLACARD
DOT Classification	NA1993	Guide 128	FUEL OIL	3	III	
TDG Classification	UN1202	Guide 128	DIESEL FUEL	3	III	
IATA/ICAO	UN1202	Guide 128	DIESEL FUEL	3	III	

Section 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

FEDERAL REGULATIONS

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification: Class B3 - Combustible Liquids.
Class D2A - Carcinogenicity.
Class D2B - Skin irritant.

Hazard Symbols:

United States
This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Naphthalene	Not listed.	Not listed.	100	313	U165	Not listed.

SARA SECTION 311/312 - EPA HAZARD CATEGORIES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	–	–

State Regulations
California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Naphthalene	cancer

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Date of Preparation of SDS:	February 24, 2015
SDS Expiry Date (Canada):	February 23, 2018
Version:	1.3
GHS SDS Prepared by:	**Deerfoot Consulting Inc.**
	Phone: (403) 720-3700

MATERIAL SAFETY DATA SHEET

603 N Monitor Road
Springdale, AR 72764
PH: (479) 756-5874

PRODUCT NAME: EC+ PLUS Wash-Water Flocculant
MSDS NO: 9-10023.06

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE CALL: CHEMTREC 1-800-424-9300 OUTSIDE US CALL 1-703-527-3887	FOR MEDICAL EMERGENCY CALL ROCKY MOUNTAIN POISON CENTER: 1-303-623-5716	HEALTH HAZARD: (0 None > 4 Extreme) Health =1 Flammability =1 Reactivity =0

SECTION 1 – PRODUCT IDENTIFICATION

DATE PREPARED: December 16, 2009 SUPERSEDES: September 18, 2006

PREPARED BY: EHS Manager

D.O.T. SHIPPING CLASS: Product is not regulated during land, air or marine transportation.

SECTION 2 – HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENTS	CAS. NO.	OSHA PEL	ACGIH TLV	ORAL LD50 RAT	Per-Cent

Contains no hazardous components as per 29 CFR 1910.1200

SECTION 3 – PHYSICAL & CHEMICAL CHARACTERISTICS

BOILING POINT: > N/A SOLUBILITY IN WATER: Emulsifiable SPECIFIC GRAVITY: 1.03–1.07

VAPOR PRESSURE mm/hg: 23 @ 70 °F: N/E VAPOR DENSITY (Air=1): N/E

REACTIVITY IN WATER: No pH 5% SOLUTION = 7- 8

FREEZING POINT: -4 °F APPEARANCE AND ODOR: Opaque off-white liquid, slight hydrocarbon odor.

SECTION 4 – FIRE & EXPLOSION DATA

FLASH POINT: > 212 °F FLAMMABILITY LIMITS IN AIR % BY VOLUME:

METHOD USED: ASTM D-93 LEL LOWER: None UEL UPPER: None

AUTO-IGNITION TEMPERATURE: None

EXTINGUISHER MEDIA: Dry Chemical, Carbon Dioxide, extinguishing agents suitable for class B fires. Do not use water unless flooding amounts are available.

SPECIAL FIRE FIGHTING PROCEDURES: Water in contact with product will cause slippery floors. Wear a full face positive-pressure breathing apparatus and protective suit.

UNUSUAL FIRE & EXPLOSION HAZARDS: None

SECTION 5 – PHYSICAL HAZARDS (REACTIVITY DATA)

STABILITY: Stable under normal conditions.

INCOMPATIBILITY (MATERIALS TO AVOID): Avoid strong oxidizing agents (chlorine, hydrogen peroxide, etc.)

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of carbon and nitrogen under fire.

HAZARDOUS POLYMERIZATION: Will NOT occur

CONDITIONS TO AVOID: Addition of water results in gelling. Avoid freezing conditions. Water in contact with product will cause slippery floors.

SECTION 6 – HEALTH HAZARDS

ACUTE: May cause eye and skin irritation with prolonged contact.

CHRONIC: Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.

SIGNS & SYMPTOMS OF EXPOSURE: Eye irritation – Skin irritation

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None

CARCINOGEN OR POTENTIAL CARCINOGENS: OSHA: None NTP: None IARC: None ACGIH: None

EMERGENCY FIRST AID:

EYES: Immediately flush with water for 15 minutes while holding eyelids open. Get medical attention.

SKIN: Remove contaminated clothing and wash affected area thoroughly with water. Get medical attention if irritation develops.

INHALATION: Remove to fresh air, treat symptomatically.

INGESTION: Do not induce vomiting without medical advice. Wash out mouth and drink water. Seek medical attention if symptoms develop.

ROUTES OF ENTRY:

INHALATION: Not likely a route of exposure. If swallowed a jelly mass may form which in digestion may cause blockage.

EYES: May cause eye irritation

SKIN: May cause skin irritation

INGESTION: Not likely a route of exposure. If swallowed a jelly mass may form which in digestion may cause blockage.

SECTION 7 – SPECIAL PRECAUTIONS & SPILL / LEAK PROCEDURES

HANDLING & STORAGE:	Store in a cool dry area. DO NOT FREEZE. Keep closed when not in use. Store separately from oxidizers.
OTHER PRECAUTIONS:	Normal good housekeeping practices.
IN CASE OF SPILL:	Shut off leak, if this can be done without injury. Do Not Use water, water in contact with product will cause slippery floors. Soak up small spills with absorbent material. Place residues in a suitable, covered, properly labels container. Contain large spills using absorbent material or diking and place in recovery or salvage drums or pump to a salvage tank for proper disposal.
WASTE DISPOSAL:	Dispose of in accordance with all Federal, State and Local pollution control regulations. Do not discharge directly into lakes, ponds, streams, waterways or public water supplies. Not considered a hazardous waste as defined by RCRA 40 CFR 261.

SECTION 8 – SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	Not normally needed.
VENTILATION:	Use with adequate ventilation.
PROTECTIVE GLOVES:	Nitrile gloves or PVC gloves
EYE PROTECTION:	Safety / Splash Glasses or Goggles
OTHER:	Wear standard protective clothing.
HYGIENIC PRACTICES:	Wash thoroughly after handling. Do not get in eyes, on skin or on clothing.

SECTION 9 – COMMUNITY RIGHT TO KNOW LIST

	CHEMICAL NAME:	C.A.S. NO.
1.	Anionic Acrylamide Copolymer	N/A

NA = Not Applicable NE = None Established

The information provided in this Material Safety Data Sheet has been compiled from our experience and data presented in various technical publications. It is the users responsibility to determine the suitability of this information for the adoption of safety precautions as may be necessary. We reserve the right to revise Material Safety Data Sheets from time to time as new technical information becomes available. The information herein is furnished without warranty of any kind.

SAFETY DATA SHEET

1. Identification

Product identifier	**GASOLINE**
Other means of identification	
Product code	2738
Synonyms	Ethanol Blended Gasoline * Non-Ethanol Blended Gasoline * Unleaded Gasoline * Gasoline * Regular Gasoline * Premium Gasoline * Premium Unleaded Gasoline * Mid Grade Gasoline * Gasoline (Export) * Petroleum Naphtha
Recommended use	Motor fuels.
Recommended restrictions	None known.
Manufacturer/Importer/Supplier/Distributor information	
Manufacturer	Consumers' Co-operative Refineries Limited
Address	P.O. Box 260; 9th Avenue North Regina, SK S4P 3A1 Canada
Telephone	(306) 721-5353 -or- (306) 719-4353
Supplier	Federated Co-operatives Limited
Address	P.O. Box 1050, 401 - 22nd Street East Saskatoon SK S7K 3M9 Canada
Telephone	(306) 244-3447
24 Hour Emergency Telephone	(613) 996-6666 - Canutec

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 2
Health hazards	Skin corrosion/irritation	Category 2
	Germ cell mutagenicity	Category 1B
	Carcinogenicity	Category 1B
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Specific target organ toxicity, repeated exposure	Category 1 (hematopoietic system)
	Aspiration hazard	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 2
	Hazardous to the aquatic environment, long-term hazard	Category 2

Label elements

Signal word	Danger
Hazard statement	Highly flammable liquid and vapor. Causes skin irritation. May cause genetic defects. May cause cancer. May cause drowsiness or dizziness. Causes damage to organs (hematopoietic system) through prolonged or repeated exposure. May be fatal if swallowed and enters airways. Toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep container tightly closed. Ground and bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use non-sparking tools. Take action to prevent static discharges. Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.
Response	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell. IF exposed or concerned: Get medical advice/attention. In case of fire: Use alcohol resistant foam, water fog, carbon dioxide, dry chemical powder for extinction. Collect spillage.
Storage	Store in a well-ventilated place. Keep container tightly closed. Keep cool. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.

Other hazards Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Gasoline	86290-81-5	60-100
Ethanol	64-17-5	0-10
Benzene	71-43-2	<1.5

Composition comments All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.

Skin contact In case of contact, flush skin with plenty of water for at least 20 minutes, while removing contaminated shoes and clothes. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Eye contact Immediately flush eyes with plenty of water for at least 20 minutes. Remove contact lenses, if present and easy to do. Get medical attention if irritation develops and persists.

Ingestion Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed Skin irritation. May cause redness and pain. Direct contact with eyes may cause temporary irritation. May cause drowsiness and dizziness. Headache. Nausea, vomiting. Causes damage to organs (hematopoietic system) through prolonged or repeated exposure. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia. Prolonged exposure may cause chronic effects.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

General information Take off all contaminated clothing immediately. IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical	Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. This product is a poor conductor of electricity and can become electrostatically charged. If sufficient charge is accumulated, ignition of flammable mixtures can occur. To reduce potential for static discharge, use proper bonding and grounding procedures. This liquid may accumulate static electricity when filling properly grounded containers. Static electricity accumulation may be significantly increased by the presence of small quantities of water or other contaminants. Material will float and may ignite on surface of water. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	Highly flammable liquid and vapor.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Use appropriate containment to avoid environmental contamination. Transfer by mechanical means such as vacuum truck to a salvage tank or other suitable container for recovery or safe disposal. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Prevent entry into waterways, sewer, basements or confined areas. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid release to the environment. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground. Inform appropriate managerial or supervisory personnel of all environmental releases. Use appropriate containment to avoid environmental contamination.

7. Handling and storage

Precautions for safe handling	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Explosion-proof general and local exhaust ventilation. Minimize fire risks from flammable and combustible materials (including combustible dust and static accumulating liquids) or dangerous reactions with incompatible materials. Handling operations that can promote accumulation of static charges include but are not limited to: mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Do not breathe mist or vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. When using, do not eat, drink or smoke. Should be handled in closed systems, if possible. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices. For additional information on equipment bonding and grounding, refer to the Canadian Electrical Code in Canada, (CSA C22.1), or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents" or National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity" or National Fire Protection Association (NFPA) 70, "National Electrical Code".

Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Keep in an area equipped with sprinklers. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Ethanol (CAS 64-17-5)	STEL	1000 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	8 mg/m3
		2.5 ppm
	TWA	1.6 mg/m3
		0.5 ppm
Ethanol (CAS 64-17-5)	TWA	1880 mg/m3
		1000 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Ethanol (CAS 64-17-5)	STEL	1000 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm

Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Ethanol (CAS 64-17-5)	STEL	1000 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Ethanol (CAS 64-17-5)	STEL	1000 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	15.5 mg/m3
		5 ppm
	TWA	3 mg/m3
		1 ppm

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
Ethanol (CAS 64-17-5)	TWA	1880 mg/m3 1000 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Benzene (CAS 71-43-2)	25 µg/g	S-Phenylmercapturic acid	Creatinine in urine	*

* - For sampling details, please see the source document.

Exposure guidelines

Canada - Alberta OELs: Skin designation

Benzene (CAS 71-43-2) Can be absorbed through the skin.

Canada - British Columbia OELs: Skin designation

Benzene (CAS 71-43-2) Can be absorbed through the skin.

Canada - Manitoba OELs: Skin designation

Benzene (CAS 71-43-2) Can be absorbed through the skin.

Canada - Ontario OELs: Skin designation

Benzene (CAS 71-43-2) Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Benzene (CAS 71-43-2) Can be absorbed through the skin.

Appropriate engineering controls Explosion-proof general and local exhaust ventilation. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles). Wear face shield if there is risk of splashes.

Skin protection

Hand protection Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier.

Other Wear appropriate chemical resistant clothing. Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended where the potential of flash fire exists.

Respiratory protection In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment. Wear a NIOSH-approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations When using do not smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance Amber liquid.

Physical state Liquid.

Form Liquid.

Color Amber.

Odor Gasoline-like.

Odor threshold < 0.25 ppm

pH Not available.

Melting point/freezing point Not available.

Initial boiling point and boiling range > 95 °F (> 35 °C)

Flash point < -40.0 °F (< -40.0 °C) Closed Cup

Evaporation rate 4 (Butyl acetate = 1)

Flammability (solid, gas)	Flammable gas. Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	1.2 %
Flammability limit - upper (%)	7.1 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	> 1 (Air=1)
Vapor density	3 - 4 (Air=1)
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Insoluble in water.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	842 °F (450 °C)
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.
Specific gravity	0.69 - 0.75
VOC (Weight %)	100 %

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Thermal decomposition of this product can generate carbon monoxide and carbon dioxide. Sulfur oxides. Hydrocarbons.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May cause damage to organs through prolonged or repeated exposure by inhalation. May cause drowsiness and dizziness. Headache. Nausea, vomiting.
Skin contact	Causes skin irritation. Benzene can be absorbed through skin.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.
Symptoms related to the physical, chemical and toxicological characteristics	Skin irritation. May cause redness and pain. Direct contact with eyes may cause temporary irritation. May cause drowsiness and dizziness. Headache. Nausea, vomiting. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia. Causes damage to organs (hematopoietic system) through prolonged or repeated exposure. Prolonged exposure may cause chronic effects.

Information on toxicological effects

Acute toxicity	Not expected to be acutely toxic.

Components	Species	Test Results
Ethanol (CAS 64-17-5)		
Acute		
Inhalation		
LC50	Rat	20000 ppm, 10 Hours
Oral		
LD50	Rat	6.2 g/kg

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization Not a respiratory sensitizer.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity May cause genetic defects.

Carcinogenicity May cause cancer.

ACGIH Carcinogens

Benzene (CAS 71-43-2)	A1 Confirmed human carcinogen.
Gasoline (CAS 86290-81-5)	A3 Confirmed animal carcinogen with unknown relevance to humans.

Canada - Alberta OELs: Carcinogen category

Benzene (CAS 71-43-2)	Confirmed human carcinogen.

Canada - Manitoba OELs: carcinogenicity

BENZENE (CAS 71-43-2)	Confirmed human carcinogen.
ETHANOL (CAS 64-17-5)	Confirmed animal carcinogen with unknown relevance to humans.
GASOLINE (CAS 86290-81-5)	Confirmed animal carcinogen with unknown relevance to humans.

Canada - Quebec OELs: Carcinogen category

Benzene (CAS 71-43-2)	Detected carcinogenic effect in humans.

IARC Monographs. Overall Evaluation of Carcinogenicity

Benzene (CAS 71-43-2)	1 Carcinogenic to humans.
Gasoline (CAS 86290-81-5)	2B Possibly carcinogenic to humans.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure May cause drowsiness and dizziness.

Specific target organ toxicity - repeated exposure Causes damage to organs (hematopoietic system) through prolonged or repeated exposure.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Causes damage to organs through prolonged or repeated exposure. Prolonged exposure may cause chronic effects.

12. Ecological information

Ecotoxicity Toxic to aquatic life with long lasting effects.

Components		Species	Test Results
Ethanol (CAS 64-17-5)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia obtusa)	10100 - 11200 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	13480 mg/l, 96 hours

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential

Partition coefficient n-octanol / water (log Kow)

Benzene (CAS 71-43-2)	2.13
Ethanol (CAS 64-17-5)	-0.31

Mobility in soil The product is insoluble in water.

Other adverse effects The product contains a substance which has a photochemical ozone creation potential.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	D001: Waste Flammable material with a flash point <140 F D018: Waste Benzene The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

TDG

UN number	UN1203
UN proper shipping name	PETROL
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IATA

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	Yes
ERG Code	3H
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

15. Regulatory information

Canadian regulations

Controlled Drugs and Substances Act

Not regulated.

Export Control List (CEPA 1999, Schedule 3)

Not listed.

Greenhouse Gases

Not listed.

Precursor Control Regulations

Not regulated.

International regulations

Stockholm Convention

Not applicable.

Rotterdam Convention

Not applicable.

Kyoto protocol

Not applicable.

Montreal Protocol

Not applicable.

Basel Convention

Not applicable.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other Information

Issue date	25-August-2015
Revision date	25-August-2015
Version #	02
Further information	The classification for health and environmental hazards is derived by a combination of calculation methods and test data, if available.
Disclaimer	To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Glycol

Section 1. Product and Company Identification

Product name : Glycol
Product code : B28454
Synonym : Glycerine; Glycerol
Material uses : Other non-specified industry: Analytical reagent.
Manufacturer : EMD Chemicals Inc.
P.O. Box 70
480 Democrat Road
Gibbstown, NJ 08027
856-423-6300 Technical Service
Monday - Friday: 8:00 - 5:00 PM
Validation date : **4/3/2006.**
Print date :
In case of emergency : 800-424-9300 CHEMTREC (USA)
613-996-6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

Section 2. Hazards Identification

Physical state : Liquid. (Viscous liquid.)
Odor : Odorless.
OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview : WARNING!
CAUSES DAMAGE TO THE FOLLOWING ORGANS: KIDNEYS, RESPIRATORY TRACT, SKIN, EYES, EYE, LENS OR CORNEA.
MAY CAUSE EYE AND SKIN IRRITATION.
Avoid contact with skin and clothing. Wash thoroughly after handling.
Routes of entry : Inhalation. Ingestion.
Potential acute health effects
Eyes : Moderately irritating to eyes.
Skin : Moderately irritating to the skin.
Inhalation : No known significant effects or critical hazards.
Ingestion : Practically non-toxic if swallowed.
Carcinogenic effects : No known significant effects or critical hazards.
Mutagenic effects : No known significant effects or critical hazards.
Teratogenicity / Reproductive toxicity : No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure : Repeated skin exposure can produce local skin destruction or dermatitis. Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to the substance can produce target organs damage.

See toxicological information (section 11)

Section 3. Composition/Information on Ingredients

United States

Name	CAS number	% by Weight
Glycerin	56-81-5	100

Section 4. First Aid Measures

Eye contact : Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention.
Skin contact : Flush contaminated skin with plenty of water. Continue to rinse for at least 10 minutes. Get medical attention. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Inhalation : Move exposed person to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if symptoms occur. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Ingestion : Wash out mouth with water. Remove dentures if any. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the

exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if symptoms occur. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

Section 5. Fire Fighting Measures

Flammability of the product : No specific hazard.

Products of combustion : These products are carbon oxides (CO, CO_2).

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Not available.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental Release Measures

Personal precautions : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : If emergency personnel are unavailable, contain spilled material. For small spills, add absorbent (soil may be used in the absence of other suitable materials), scoop up material and place in a sealable, liquid-proof container for disposal. For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal.

Section 7. Handling and Storage

Handling : Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Storage : Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8. Exposure Controls/Personal Protection

Product name	Exposure limits
United States	
Glycerin	**ACGIH TLV (United States, 1/2005). Notes: Inhalable fraction. See Appendix C, paragraph A. Inhalable Particulate Mass TLVs (IPM-TLVs) for those materials that are hazardous when deposited anywhere in the respiratory tract.** TWA: 10 mg/m^3 8 hour/hours. Form: Mist **OSHA PEL (United States, 8/1997).** TWA: 5 mg/m^3 8 hour/hours. Form: Respirable fraction TWA: 15 mg/m^3 8 hour/hours. Form: Total dust **OSHA PEL 1989 (United States, 3/1989).** TWA: 5 mg/m^3 8 hour/hours. Form: Respirable fraction TWA: 10 mg/m^3 8 hour/hours. Form: Total dust

Consult local authorities for acceptable exposure limits.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control airborne levels. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.
Recommended: splash goggles

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Body: Recommended: lab coat

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: neoprene

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 9. Physical and Chemical Properties

Physical state	:	Liquid. (Viscous liquid.)
Flash point	:	Closed cup: 159.85 C (319.7 F).
Auto-ignition temperature	:	369.85 C (697.7 F)
Color	:	Colorless.
Odor	:	Odorless.
Molecular weight	:	92.11 g/mole
Molecular formula	:	C3-H8-O3
Boiling/condensation point	:	290 C (554 F)
Melting/freezing point	:	19.85 C (67.7 F)
Relative density	:	1.261 (Water = 1)
Vapor density	:	3.1 (Air = 1)

Section 10. Stability and Reactivity

Stability and reactivity	:	The product is stable.
Incompatibility with various substances	:	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous polymerization	:	Will not occur.
Conditions of reactivity	:	Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and oxidizing materials. Explosive in the presence of the following materials or conditions: oxidizing materials.

Section 11. Toxicological Information

Toxicity data
United States

Product/ingredient name	Test	Result	Route	Species
Glycerin	LD50	12600 mg/kg	Oral	Rat
	LD50	4090 mg/kg	Oral	Mouse
	LD50	7750 mg/kg	Oral	Guinea pig

Chronic effects on humans	:	Causes damage to the following organs: kidneys, upper respiratory tract, skin, eyes, eye, lens or cornea.
Other toxic effects on humans	:	Hazardous in case of skin contact (irritant), of eye contact (irritant).
Specific effects		
Carcinogenic effects	:	No known significant effects or critical hazards.
Mutagenic effects	:	No known significant effects or critical hazards.
Teratogenicity / Reproductive toxicity	:	No known significant effects or critical hazards.
Sensitization		
Ingestion	:	No known significant effects or critical hazards.
Inhalation	:	No known significant effects or critical hazards.
Eyes	:	Moderately irritating to eyes.
Skin	:	Moderately irritating to the skin.

Section 12. Ecological Information

Ecotoxicity data
United States

Product/ingredient name	Species	Period	Result
Glycerin	Oncorhynchus mykiss (LC50)	96 hour/hours	54000 mg/l

Environmental precautions	:	No known significant effects or critical hazards.
Products of degradation	:	These products are carbon oxides (CO, CO_2) and water.
Toxicity of the products of biodegradation	:	The product itself and its products of degradation are not toxic.

Section 13. Disposal Considerations

Waste disposal	:	The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

Section 14. Transport Information

Regulatory information	UN number	Proper shipping name	Class	PG*	Label	Additional information
DOT Classification	-	CHEMICALS, N.O.S.	-	-		Not available.

PG* : Packing group

Section 15. Regulatory Information

United States

HCS Classification : Irritating material
Target organ effects

U.S. Federal regulations : TSCA 8(b) inventory: Listed
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Glycerin
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Glycerin: Immediate (acute) health hazard, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations : Pennsylvania RTK: Glycerin: (generic environmental hazard)
Massachusetts RTK: Glycerin

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

CEPA DSL/CEPA NDSL : CEPA DSL: Glycerin

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

EU regulations

Risk phrases : This product is not classified according to EU legislation.

International regulations

International lists : Australia (NICNAS): Glycerin

China: Glycerin

Germany water class: Glycerin

Japan (METI): Glycerin

Korea (TCCL): Glycerin

Philippines (RA6969): Glycerin

Section 16. Other Information

Label requirements : WARNING!
CAUSES DAMAGE TO THE FOLLOWING ORGANS: KIDNEYS, RESPIRATORY TRACT, SKIN, EYES, EYE, LENS OR CORNEA.
MAY CAUSE EYE AND SKIN IRRITATION.

National Fire Protection Association (U.S.A.) :

	1	**Flammability**
Health	1	0 **Instability**
		Special

Notice to reader

The statements contained herein are based upon technical data that EMD Chemicals Inc. believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EMD CHEMICALS INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

Safety Data Sheet

Hydrated Lime

Revision date:
May 1, 2015

1. Identification

Product Name: Hydrated Lime

Synonyms: Industrial Hydrate

Recommended Uses: Water treatment, steel flux, caustic agent, pH adjustment, acid gas absorption, construction

Manufacturer: Carmeuse Lime & Stone

US Office
11 Stanwix Street, 21st Floor
Pittsburgh, PA 15222
Phone: (412) 995-5500
Fax: (412) 995-5594

Canadian Office
PO Box 190
Ingersoll, ON N5C 3K5
Phone: (519) 423-6283
Fax: (519) 423-6545

Emergency Contact: Infotrac: (800) 535-5053 (24 hrs a day, 7 days a week)

2. Hazards Identification

GHS classification

Physical Hazards

None

Health Hazards

Skin Irritation	Category 2
Eye Damage	Category 1
Carcinogenicity	Category 1A
Specific Target Organ Toxicity – Single Exposure	Category 3

GHS Label Elements:

Signal Word: Danger

Hazard Statements:
Causes skin irritation.
Causes serious eye damage.
May cause respiratory irritation.
May cause cancer through inhalation

Precautionary Statements:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep container tightly closed
Do not breathe dust.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in well-ventilated area
Wear protective gloves, clothing and eye protection

Pictograms:

3. Composition

Chemical name	% by weight	CAS#
Calcium hydroxide	> 85	1305-62-0
Silica-crystalline quartz	< 1	14808-60-7

4. First Aid Measures

Eyes: Immediately flush eyes with generous amounts of water for at least 15 minutes. Pull back the eyelid to ensure that all lime dust has been washed out. Seek medical attention immediately. Do not rub eyes.

Skin: Wash exposed area with large amounts of water. Seek medical attention immediately.

Ingestion: Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth unless instructed to do so by medical personnel.

Inhalation: Move victim to fresh air. Seek medical attention if necessary. If breathing has stopped, give artificial respiration

Most Important Symptoms: Irritation of skin, eyes, gastrointestinal tract or respiratory tract.

Immediate medical attention / special treatment? See first aid information above. Note to Physicians: Provide general supportive measures and treat symptomatically.

5. Fire Fighting Measures

Suitable (and unsuitable) fire extinguishing media: Use dry chemical fire extinguisher. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of this product.

Specific hazards arising from the product Inhalation, skin or eye contact, can result in serious injury. This product is not combustible or flammable. This product is not considered to be an explosion hazard, although reaction with water or other incompatible materials may rupture containers. When this product is wet, it can be very slippery and can result in a slip hazard. Hazardous Combustion Products: None.

Special protective equipment and precautions for fire fighters Wear full fire-fighting turn-out gear (full Bunker gear), and respiratory protection (SCBA) to prevent inhalation, skin or eye contact.

6. Accidental Release Measures

Personal precautions, protective equipment, emergency procedures:

Avoid inhalation, eye and skin contact. Avoid generating airborne dust. Wear appropriate protective clothing as described in section 8.

Methods and materials for containment and clean up:

Utilize cleanup methods that minimize generating dust: vacuum. Avoid dry sweeping. Residue on surfaces may be removed with copious amount of water or vinegar.

7. Handling & Storage

Safe Handling: Avoid inhalation, skin and eye contact. Avoid generating airborne dust. An eye wash station should be readily available when this product is handled.

Safe Storage: Keep in tightly closed containers. Protect containers from physical damage. Store in a cool, dry, and well-ventilated location. Do not store near incompatible materials (see Section 10 below). Keep away from moisture. Long-term storage in aluminum containers is not recommended, as calcium oxide may corrode aluminum over long periods of time

8. Exposure Controls/Personal Protection

Occupational Exposure Limits

	OSHA PEL (mg/m^3)	ACGIH TLV (mg/m^3)	Ont. Reg. 833 TWAEV (mg/m^3)
Calcium hydroxide	15 (total) 5 (respirable)	5	5
silica - crystalline quartz	30 / (% silica +2) (total) 10 / (% silica +2) (respirable)	0.025 (respirable)	0.1

Engineering Controls: Use with adequate general or local exhaust ventilation and to maintain exposure below occupational exposure limits.

Individual Protection Measures (Personal Protective Equipment):

Specific Eye / Face Protection: Safety glasses with side shields. In windy conditions, or if work activity generates elevated airborne dust levels, dust proof or chemical goggles are recommended. Contact lenses should not be worn.

Specific Skin Protection: When there is a risk of skin contact, wear appropriate clothing and gloves to prevent contact.

Specific Respiratory Protection:	If exposure limits are exceeded, an approved particulate respirator, or supplied air respirator, appropriate for the airborne concentrations, should be used. Selection and use of the respiratory protective equipment must be in accordance with applicable regulations and good industrial hygiene practices.
Other:	An emergency eye wash fountain and shower are recommended.

9. Physical & Chemical Properties

Appearance:	White powder
Odor:	Odorless
Odor threshold:	Not Applicable
pH at 25 degrees C:	12.45
Melting Point:	1076 °F (580 °C)
Boiling Point and range:	5162 °F (2850 °C)
Flash Point:	Not Applicable
Evaporation Rate:	Not Applicable
Flammability:	Not Applicable
Upper/lower flammability or explosive limits	Not Applicable
Vapor pressure/density:	Non Volatile
Relative density:	2.24
Solubility:	Slightly soluble in water: 0.2% @ 0 °C. Soluble in acids, glycerin, and sugar solutions
Partition coefficient: n-octanol/water	Not applicable
Auto-ignition temperature:	Not Available
Decomposition temperature:	Not available
Viscosity:	Not Applicable

10. Stability & Reactivity

Reactivity:	Reacts with acids to form calcium salts, releasing heat. Reacts with carbon dioxide in air to form calcium carbonate. See also Incompatibility below.
Chemical stability:	Stable under normal storage and handling conditions.
Possibility of Hazardous Reactions:	See “reactivity” above.
Conditions to avoid:	Vicinity of incompatible materials.

Incompatibility: This product should not be mixed or stored with the following materials, due to the potential for violent reaction and release of heat:

- acids
- reactive fluoridated compounds
- reactive brominated compounds
- reactive powdered metals
- reactive phosphorous compounds
- aluminum powder
- organic acid anhydrides
- nitro-organic compounds
- interhalogenated compounds

Hazardous decomposition products: None

11. Toxicological Information

Likely routes of exposure & symptoms:

Eyes: Contact can cause severe irritation or burning of eyes, including permanent damage.

Skin: Contact can cause severe irritation or burning of skin, especially in the presence of moisture.

Ingestion: This product can cause severe irritation or burning of gastrointestinal tract if swallowed.

Inhalation: This product can cause severe irritation of the respiratory system.

Chronic health effects: This product contains trace amounts of crystalline silica. Prolonged or repeated inhalation of respirable crystalline silica can cause silicosis, as serious lung disease.

Respiratory or skin sensitization: This material is not known to cause sensitization

Germ cell mutagenicity: No data available.

Carcinogenicity: This product is not listed as carcinogenic by OSHA, IARC, NTP, ACGIH, or the EU Directives. This product may contain trace amounts of crystalline silica quartz which is listed by IARC as “Carcinogenic to Humans” (Group 1) and “Known to be a Human Carcinogen" by NTP (National Toxicology Program).

Reproductive toxicity: No Data Available.

Numerical Measures of Toxicity

Crystalline Silica: Oral Rat LD_{50} > 22,500 mg/kg
Calcium Hydroxide: Oral (rat) LD_{50}: 7340 mg/kg

12. Ecological Information

Because of the elevated pH of this product, it might be expected to produce some ecotoxicity upon exposure to certain aquatic organisms and aquatic systems in high concentrations
This material shows no bioaccumulation effect or food chain concentration toxicity.

13. Disposal Considerations

Dispose of contents in accordance with federal, state, provincial and local regulations.

14. Transport Information

Not regulated by Department of Transportation, Transport of Dangerous Goods

15. Regulatory Information

CERCLA Hazardous Substances	Not listed
SARA Toxic Chemical (40 CFR 372.65)	Not listed
SARA Section 302 Extremely Hazardous Substances (40 CFR 355)	Not listed
SARA 311/312	Not listed
SARA Section 313 Toxic Chemicals reporting requirements	None
Threshold planning quantity (TPQ)	Not listed
RCRA Hazardous Waste Classification (40 CFR 261)	Not Classified
EPA Toxic Substances Control Act (TSCA) Status	All of the components of this product are listed on the TSCA
California Proposition 65	Airborne crystalline silica particulates of respirable size are known to the State of California to cause cancer.
NFPA ratings	Health: 3 Fire: 0 Reactivity: 0
HMIS Ratings	Health: 3 Fire: 0 Reactivity: 0 Personal protection: E
OSHA Specifically regulated substance (29 CFR 1910)	Not listed
OSHA Air contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)	Listed
MSHA	Not listed
Canada DSL	Listed
Canadian WHMIS Classification	D2A, Materials Causing other toxic effects. E, Corrosive Material

Canada CPR This product has been classified in accordance with the hazard criteria of the Controlled Products Regulation of a Canada and this SDS contains all the required information.

Ontario Regulations Refer to Regulation 845: Designated Substances - Silica

16. Other Information

List of GHS Hazard Statements:	H315: Causes skin irritation H318: Causes serious eye damage H335: May cause respiratory irritation. H350: May cause cancer through inhalation
List of GHS Precautionary Statements:	P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P233: Keep container tightly closed P260: Do not breathe dust. P264: Wash thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in well-ventilated area P280: Wear protective gloves, clothing and eye protection

Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act	RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act	IARC	International Agency for Research on Cancer
NTP	National Toxicology Program		

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SECTION I-MATERIAL IDENTIFICATION AND USE

Material Name/Identifier:	**Hydraulic Oil**	**Stock No.**	**929/930/931/932/933/934/935/936/937**
Manufacturer's Name:	**Kleen-Flo Tumbler Industries Ltd**	**Street Address:**	**75 Advance Blvd.**
City:	**Brampton**	**Province:**	**Ontario**
Postal Code:	**L6T 4N1**	**Emergency Phone #:**	**(905) 793-4311**
Chemical Name:	**N.Ap. (Mixture)**	**Chemical Family:**	**Petroleum Oil**
Chemical Formula:	**N.Ap. (Mixture)**	**Trade Names & Synonyms:**	**Hydraulic Oil**
Material Use:	**Lubricating Hydraulic Oil**	**Molecular Weight:**	**N.Ap.**

SECTION II-HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	C.A.S.	Approximate Conc. %wt.	LD50 Species & Route	LC50 Species & Route
Mineral oil, Petroleum base	64742-65-0	80 - 100	N/Av.	N/Av.
Antiwear additive*	N/Av.	0.1 - 1.0	N/Av.	N/Av.
Zinc alkyldithiophosphate	68649-42-3	0.1 - 1.0	N/Av.	N/Av.

This material is not known to contain any chemicals listed as carcinogenicor suspected carcinogenic by the US OSHA, IRAC or US National Toxicology program at concentration greater than 0.1%.

***It was reported to the U.S. EPA that in preliminary tests, certain zinc dialkyldithiophosphates, when applied to the skin of male rabbits over a period of time, adversely affected spermatogenetic activities**

SECTION III-PHYSICAL DATA FOR MATERIAL

Physical State:	**Liquid**	**Odor/Appearance:**	**Characteristic petroleum odor/ clear red oil**
Specific Gravity:	**0.86-0.88**	**Odor Threshold(p.p.m.):**	**N/E**
Boiling Point:	**> 180ºC**	**Evaporation Rate:**	**N/E**
Freezing Point:	**-30ºC**	**Solubility in Water:**	**None**
% Volatile(by volume):	**N/E**	**Vapor Pressure(mm)Hg:**	**N/E**
Vapor Density(Air=1):	**N/E**	**Coefficient of Water/Oil Distribut:**	**N/E**
pH	**N.Ap.**		

SECTION IV-FIRE AND EXPLOSION HAZARD OF MATERIAL

Flammability Yes/No	**No**	**If yes under which conditions?:**	**N.Ap.**
Auto Ignition Temperature	**N/E**	**Means of Extinction: carbon dioxide, dry chemical, foam, water fog**	
Flashpoint and Method:	**171ºC**	**Hazardous Combustion Products: oxides of carbon, sulfur,**	
	Tag C.C	**phosphorous, calcium, zinc**	
Upper Flammable limit (%vol)	**N/E**	**Lower Flammable Limit(% by volume):**	**N/E**
Explosion Data:	**Sensitivity to Mechanical Impact: No**	**Sensitivity to Static Discharge:**	**No**

SECTION V-REACTIVITY DATA

Chemical Stability Yes/No:	**Yes**	**If NO under which conditions?**	**N.Ap.**
Incompatibility to Other Substances Yes/No:	**Yes**	**If so which ones? Avoid acids, oxidizing agents & halogens**	
Reactivity and under what conditions?	**Open flame, fire**		
Hazardous Decomposition Products:	**Oxides of carbon, sulfur, phosphorus, calcium and zinc**		

N/E: not established **N.Ap.: not applicable** **N/Av.: not available**

SECTION VI-TOXICOLOGICAL PROPERTIES OF PRODUCT

Route of Entry:	--SKIN CONTACT -x-SKIN ABSORPTION -x-EYE CONTACT --INHALATION -x-INGESTION		
Effects of Acute Exposure:	May cause eye irritation, nausea vomiting, cough, pulmonary edema, dizziness.		
Effects of Chronic Exposure:	None known		
LD 50 of Product:	N/Av.	LC 50 of Product:	N/Av.
Irritancy of Product:	slight eye irritant	Exposure Limits of Product: ACGIH: 5mg/m3, oil mist.	
Sensitization of Product:	N/E	Toxicologically Synergistic Materials:	N/Av.
--CARCINOGENICITY --REPRODUCTIVE EFFECTS --TERATOGENICITY --MUTAGENICITY			none known

SECTION VII-PREVENTIVE MEASURES

Personal Protective Equipment to be used:

Gloves(specify):	Neoprene or nitrite rubber	Eye(specify):	Safety glasses
Respiratory(specify):	Not Required in normal use	Clothing:	Not Required
Respiratory Protection:	If used indoors or on a continuous basis, use of cartridge type respirator is recommended		
Engineering Controls:	Local and mechanical ventilation		
Leak and Spill Procedure:	Dyke and absorb spill with inert material. Pick up free liquid for recycling. Keep spill out of sewers.		
	Wash area with detergent and water.		
Waste Disposal:	Dispose according to federal, state (Provincial) and local regulations		
Storage Requirements:	Keep at room temperature		
Handling Procedures and	No special procedure required.		
Equipment:			
DSL listing	All components in this material is listed on DSL.		
TDG Classification:	Non-regulated		
WHMIS Classification:	Non-controlled		

SECTION VIII-FIRST AID MEASURES

Eye:	Wash with water for at least 15 minutes. Seek medical help if irritation persists.
Skin:	Wash with soap and water
Inhalation:	Remove patient from further exposure. Avoid aspiration. Seek medical attention
Ingestion:	DO NOT INDUCE VOMITING.If spontaneouse vomiting occurs, hold patient's head below hips.
	Seek medical attention immediately.

SECTION IX-PREPARATION DATE OF M.S.D.S.

Additional Info/Comments:		Sources Used: Handbook of Poisoning By: R.H. Dreisbach	
Phone Number:	(905) 793-4311	Prepared By: Quality Control Laboratory	
Date Prepared:	January 16, 2009.	Kleen-Flo Tumbler Industries Limited	

THIS SHEET SUPERSEDES ANY OTHER M.S.D.S. PREVIOUSLY PREPARED

N/E: not established N.Ap.: not applicable N/Av.: not available

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 24-Aug-2009 **Revision Date** 28-Oct-2014 **Revision Number** 1

1. Identification

Product Name **Hydrochloric Acid**

Cat No. : **A144-212; A144-212LC; A144-500; A144-500LB; A144-500LC; A144-612GAL; A144C-212; A144C-212EA; A144P-19; A144P-20; A144S-212; A144S-212EA; A144S-500; A144SI-212**

Synonyms Muriatic acid

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 B
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure) Target Organs - Respiratory system.	Category 3
Specific target organ toxicity - (repeated exposure) Target Organs - Kidney, Liver.	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
May be corrosive to metals

Causes severe skin burns and eye damage
May cause respiratory irritation
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Water	7732-18-5	62-65
Hydrochloric acid	7647-01-0	35-38

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms/effects Causes burns by all exposure routes. . Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Corrosive Material. Causes burns by all exposure routes. Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products
Hydrogen chloride gas
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing.

Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Hydrochloric acid	Ceiling: 2 ppm	Ceiling: 5 ppm Ceiling: 7 mg/m^3 (Vacated) Ceiling: 5 ppm (Vacated) Ceiling: 7 mg/m^3	IDLH: 50 ppm Ceiling: 5 ppm Ceiling: 7 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Hydrochloric acid	Ceiling: 5 ppm Ceiling: 7.5 mg/m^3	Ceiling: 5 ppm Ceiling: 7 mg/m^3	CEV: 2 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	pungent
Odor Threshold	No information available
pH	< 1
Melting Point/Range	-35 °C / -31 °F
Boiling Point/Range	57 °C / 135 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	125 mbar @ 20 °C
Vapor Density	1.27 (Air = 1.0)
Relative Density	1.18
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	1.8 mPa.s @ 15°C
Molecular Formula	HCl.H2O
Molecular Weight	36.46

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Metals, Strong oxidizing agents, sodium hypochlorite, Amines, Bases, Fluorine, Cyanides, alkaline

Hazardous Decomposition Products Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions Contact with metals may evolve flammable hydrogen gas.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrochloric acid	238 - 277 mg/kg (Rat)	5010 mg/kg (Rabbit)	1.68 mg/L (Rat) 1 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Hydrochloric acid	7647-01-0	Group 3	Not listed	Not listed	Not listed	Not listed

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

Mutagenic Effects Mutagenic effects have occurred in experimental animals.

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity Teratogenic effects have occurred in experimental animals.

STOT - single exposure Respiratory system

STOT - repeated exposure Kidney Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

Other Adverse Effects See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Hydrochloric acid	-	282 mg/L LC50 96 h	-	-

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1789
Proper Shipping Name HYDROCHLORIC ACID
Hazard Class 8
Packing Group II

TDG

UN-No UN1789
Proper Shipping Name HYDROCHLORIC ACID
Hazard Class 8
Packing Group II

IATA

UN-No UN1789
Proper Shipping Name Hydrochloric acid
Hazard Class 8
Packing Group II

IMDG/IMO

UN-No UN1789
Proper Shipping Name Hydrochloric acid
Hazard Class 8
Packing Group II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Water	X	X	-	231-791-2	-		X	-	X	X	X
Hydrochloric acid	X	X	-	231-595-7	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Hydrochloric acid	7647-01-0	35-38	1.0

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Hydrochloric acid	X	5000 lb	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Hydrochloric acid	X		-

OSHA Occupational Safety and Health Administration
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Hydrochloric acid	-	TQ: 5000 lb

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Hydrochloric acid	5000 lb	5000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Hydrochloric acid	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Hydrochloric acid	0 lb STQ (anhydrous); 11250 lb STQ (37% concentration or greater)

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class

D1A Very toxic materials
D2B Toxic materials
E Corrosive material

16. Other information

Prepared By

Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 24-Aug-2009
Revision Date 28-Oct-2014
Print Date 28-Oct-2014
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

Material Safety Data Sheet

1. Chemical product and company identification

Product name GLUE 2

MSDS # 463236

Historic MSDS #: 16028-AE

Code 463236-US03

Manufacturer Castrol Industrial North America, Inc.
150 W. Warrenville Road
Naperville, IL 60563

Supplier Castrol Industrial North America, Inc.
150 W. Warrenville Road
Naperville, IL 60563
Product Information: 1-800-621-2661

EMERGENCY SPILL INFORMATION: 1 (800) 424-9300 CHEMTREC (USA)

2. Composition/information on ingredients

Ingredient name	CAS #	% by weight
Gas oil - unspecified	64742-46-7	20 - 25

3. Hazards identification

Physical state Liquid.

Color Clear. Amber. (Light.)

Emergency overview CAUTION!

MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.

Avoid contact with eyes, skin and clothing. In accordance with good industrial hygiene and safety work practices, airborne exposures should be controlled to the lowest extent practicable. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

Routes of entry Dermal contact. Eye contact. Inhalation. Ingestion.

Potential health effects

Eyes May cause eye irritation.

Skin May cause skin irritation.

Inhalation May cause respiratory tract irritation.

Ingestion No significant health hazards identified.

Medical conditions aggravated by over-exposure None identified.

See toxicological Information (section 11).

4. First aid measures

Eye contact In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops.

Skin contact Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.

Inhalation If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if irritation develops.

Ingestion Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately.

5. Fire-fighting measures

Flammability of the product May be combustible at high temperature.

Flash point >230 °C (Open cup) Cleveland.

Products of combustion These products are carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide).

Unusual fire/explosion hazards This material is not explosive as defined by established regulatory criteria.

Fire-fighting media and instructions In case of fire, use water fog, foam, dry chemicals, or carbon dioxide.

Protective clothing (fire) Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

6. Accidental release measures

Personal precautions Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (See Section: "Exposure controls/personal protection"). Follow all fire fighting procedures (See Section: "Fire-fighting measures").

Environmental precautions and clean-up methods If emergency personnel are unavailable, contain spilled material. For small spills add absorbent (soil may be used in the absence of other suitable materials) scoop up material and place in a sealed, liquid-proof container for disposal. For large spills dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal. Avoid contact of spilled material with soil and prevent runoff entering surface waterways. See Section 13 for Waste Disposal Information.

Personal protection in case of a large spill Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

7. Handling and storage

Handling Avoid contact with skin and clothing. Avoid contact with eyes. Use only with adequate ventilation. In accordance with good industrial hygiene and safety work practices, airborne exposures should be controlled to the lowest extent practicable. Wash thoroughly after handling.

Storage Keep container tightly closed. Keep container in a cool, well-ventilated area. Empty containers may contain harmful, flammable/combustible or explosive residue or vapors. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Gas oil - unspecified	**ACGIH (United States).** STEL: 10 mg/m^3 15 minute(s). Form: Oil mist, mineral TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral **OSHA (United States).** TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral

Control Measures Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits.

Hygiene measures Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.

Personal protection

Eyes Avoid contact with eyes. Chemical splash goggles.

Skin and body Avoid contact with skin and clothing. Wear suitable protective clothing.

Respiratory Use only with adequate ventilation. In accordance with good industrial hygiene and safety work practices, airborne exposures should be controlled to the lowest extent practicable.

Hands Wear suitable gloves.

Not available.

Consult local authorities for acceptable exposure limits.

9. Physical and chemical properties

Physical state Liquid.

Odor Slight.

Color Clear. Amber. (Light.)

Heat of combustion Not available.

Specific gravity 0.88 to 0.9

Density 890 kg/m^3 (0.89 g/cm^3) at 15.6°C

Solubility Insoluble in cold water.

10. Stability and reactivity

Stability and reactivity The product is stable.

Conditions to avoid Not available.

Incompatibility with various substances Reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products Not available.

Hazardous polymerization Not available.

11. Toxicological information

Chronic toxicity

Carcinogenic effects

No component of this product at levels greater than 0.1% is identified as a carcinogen by ACGIH or the International Agency for Research on Cancer (IARC). No component of this product present at levels greater than 0.1% is identified as a carcinogen by the U.S. National Toxicology Program (NTP) or the U.S. Occupational Safety and Health Act (OSHA).

Mutagenic effects

No component of this product at levels greater than 0.1% is classified by established regulatory criteria as a mutagen.

Reproductive effects

No component of this product at levels greater than 0.1% is classified by established regulatory criteria as a reproductive toxin.

Teratogenic effects

No component of this product at levels greater than 0.1% is classified by established regulatory criteria as teratogenic or embryotoxic.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

13. Disposal considerations

Waste information

Avoid contact of spilled material and runoff with soil and surface waterways. Consult an environmental professional to determine if local, regional or national regulations would classify spilled or contaminated materials as hazardous waste. Use only approved transporters, recyclers, treatment, storage or disposal facilities. Dispose of in accordance with all applicable local and national regulations.

Consult your local or regional authorities.

14. Transport information

Not classified as hazardous for transport (DOT, TDG, IMO/IMDG, IATA/ICAO)

15. Regulatory information

U.S. Federal regulations

US INVENTORY (TSCA): In compliance.

TSCA 12(b) one-time export notification:: Diphenylamine

This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA 311/312 MSDS distribution - chemical inventory - hazard identification: GLUE 2

SARA 313

Form R - Reporting requirements

This product does not contain any hazardous ingredients at or above regulated thresholds.

Supplier notification

This product does not contain any hazardous ingredients at or above regulated thresholds.

CERCLA Sections 102a/103 Hazardous Substances (40 CFR Part 302.4):: This material is not regulated under CERCLA Sections 103 and 107.

State regulations

Pennsylvania RTK:oleic acid (generic environmental hazard)

California Prop 65: No products were found

Inventories

AUSTRALIAN INVENTORY (AICS): In compliance.

CANADA INVENTORY (DSL): In compliance.

CHINA INVENTORY (IECS): In compliance.

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (ENCS): In compliance.

KOREA INVENTORY (ECL): In compliance.

PHILIPPINE INVENTORY (PICCS): In compliance.

16. Other information

Label requirements

CAUTION!

MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.

HMIS® Rating :

Health	**1**	**-**
Flammability	**1**	
Physical Hazard	**0**	
Personal protection	**B**	

National Fire Protection Association (U.S.A.)

Other special considerations

PETROLEUM OIL: STEL = 10 mg/m³. Using terminology of the International Agency for Research on Cancer (IARC), the petroleum distillates listed in Section II are classified by the supplier as severely processed. Not all those listed in Section II may be present. The supplier has stated that these distillates do not require a carcinogen label as defined by OSHA 29 CFR 1910.1200.

History

Date of issue 07/13/2006.

Date of previous issue 08/15/2005.

Prepared by Product Stewardship

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from us.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)

Section 1: Identification

Product Identifier: **Jet A**

Other means of identification: Aviation Fuel; Aviation Fuel – Jet; Aviation Turbine Fuel; Jet 51 Grade; Jet 54 Grade; Jet 56 Grade; JAA with Additives; JAA without Additives; JAA with CI Additive; Jet A 1; Jet A LS; Jet Buckeye 182; Jet FTZ; Jet Fuel; Jet Low Aromatic; Jet Raw; Turbine Fuel

SDS Number: **001975**

MARPOL Annex I Category: Kerosenes

Intended Use: Aviation Turbine Fuel

Uses Advised Against: All others

Emergency Health and Safety Number: CHEMTREC 800-424-9300 (24 Hours)
CANUTEC 613-996-6666
CHEMTREC Mexico 01-800-681-9531

Manufacturer:
66 Aviation Products
A Division of Phillips 66 Company
600 N. Dairy Ashford
Houston, Texas 77079-1175

SDS Information:
Phone: 800-762-0942
Email: SDS@P66.com

Customer Service:
800-234-6603
Technical Information: 918-977-4224

Section 2: Hazards Identification

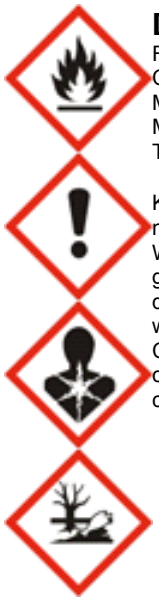
Classified Hazards

H226 -- Flammable liquids -- Category 3
H315 -- Skin corrosion/irritation -- Category 2
H304 -- Aspiration Hazard -- Category 1
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Other Hazards

Electrostatic charge may be generated during pumping and other operations

Label Elements



DANGER

Flammable liquid and vapor
Causes skin irritation
May be fatal if swallowed and enters airways
May cause drowsiness or dizziness
Toxic to aquatic life with long lasting effects

Keep away from heat/sparks/open flames/hot surfaces. - No smoking; Ground/bond container and receiving equipment; Use only non-sparking tools; Take precautionary measures against static discharge; Avoid breathing dust/fume/gas/mist/vapours/spray; Wash thoroughly after handling; Use only outdoors or in a well-ventilated area; Avoid release to the environment; Wear protective gloves / protective clothing / eye protection / face protection; IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician; Do NOT induce vomiting; IF ON SKIN: Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower; IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing; Call a POISON CENTER or doctor/physician if you feel unwell; Take off contaminated clothing and wash before reuse; In case of fire: Use dry chemical, carbon dioxide, or foam for extinction; Store in a well-ventilated place. Keep container tightly closed; Dispose of contents/container to approved disposal facility

Section 3: Composition / Information on Ingredients

Chemical Name	CASRN	Concentration[1]
Petroleum distillates, hydrotreated light	64742-47-8	0-100
Kerosine, petroleum, hydrodesulfurized	64742-81-0	0-100
Kerosine, petroleum	8008-20-6	0-100
Naphthalene	91-20-3	<1

Total Sulfur: < 0.4 wt%

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If breathing is difficult, oxygen or artificial respiration should be administered by qualified personnel. If symptoms persist, seek medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Most important symptoms and effects, both acute and delayed: While significant vapor concentrations are not likely, high concentrations can cause minor respiratory irritation, headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Ingestion can cause irritation of the digestive tract, nausea, diarrhea, and vomiting. Dry skin and possible irritation with repeated or prolonged exposure.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 2 **Instability:** 0

0 (Minimal)
1 (Slight)
2 (Moderate)
3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: Flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

Special protective actions for firefighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of incomplete combustion products (e.g. carbon monoxide, oxides of sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

Static Accumulation Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Chemical Name	ACGIH	OSHA	Other
Petroleum distillates, hydrotreated light	TWA: 200 mg/m³ Skin	---	200 mg/m³ TWA8hr 100 mg/m³ TWA12hr 28 ppm TWA8hr 14 ppm TWA12hr (Phillips 66 Guidelines)
Kerosine, petroleum, hydrodesulfurized	TWA: 200 mg/m³ Skin	---	200 mg/m³ TWA8hr 100 mg/m³ TWA12hr 28 ppm TWA8hr 14 ppm TWA12hr (Phillips 66 Guidelines)
Kerosine, petroleum	TWA: 200 mg/m³ Skin	---	200 mg/m³ TWA8hr 100 mg/m³ TWA12hr 28 ppm TWA8hr 14 ppm TWA12hr (Phillips 66 Guidelines)
Naphthalene	STEL: 15 ppm TWA: 10 ppm 10 ppm TWA; skin; A3 - confirmed animal carcinogen with unknown relevance to humans; TLV basis: upper respiratory tract irritation Skin	TWA: 10 ppm : 50 mg/m³	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: clear, light yellow or light green
Physical Form: Liquid
Odor: Kerosene
Odor Threshold: No data
pH: Not applicable
Vapor Density (air=1): > 4.5
Upper Explosive Limits (vol % in air): 4.7
Lower Explosive Limits (vol % in air): 0.6
Evaporation Rate (nBuAc=1): <1
Particle Size: Not applicable
Percent Volatile: 98-100% @ 545ºF (285ºC)
Flammability (solid, gas): Not applicable

Flash Point: 100-150 °F / 38-66 °C
Test Method: Tag Closed Cup (TCC), ASTM D56
Initial Boiling Point/Range: 300 - 572 °F / 149 - 300 °C
Vapor Pressure: 0.40 mmHg
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: < -40 °F / < -40 °C
Auto-ignition Temperature: 410 °F / 210 °C
Decomposition Temperature: No data
Specific Gravity (water=1): 0.775-0.840 @ 68ºF (20ºC)
Bulk Density: 6.73 lbs/gal
Viscosity: 1.5-2.5 cSt typical @ 68ºF (20ºC) / 8 max cSt @ -4°F (-20°C)
Solubility in Water: <0.1%

Section 10: Stability and Reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Expected to have a low degree of toxicity by inhalation		>5.2 mg/L (mist)
Dermal	Unlikely to be harmful		> 2 g/kg
Oral	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.

Carcinogenicity: Not expected to cause cancer. Petroleum middle distillates have been shown to cause skin tumors in mice following repeated and prolonged skin contact. Follow-up studies have shown that these tumors are produced through a non-genotoxic mechanism associated with frequent cell damage and repair, and that they are not likely to cause tumors in the absence of prolonged skin irritation.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: Not expected to cause reproductive toxicity. Hydrodesulfurized kerosene applied to the skin of female rats at 494, 330, or 165 mg/kg daily for 7 consecutive weeks (premating, mating, and gestation), or for 8 consecutive weeks in males did not result in systemic, reproductive, or developmental toxicity.

Information on Toxicological Effects of Components

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Section 12: Ecological Information

GHS Classification:
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2
Toxic to aquatic life with long lasting effects.

Toxicity: Acute aquatic toxicity studies on samples of jet fuel and kerosine streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition. Kerosines should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable but are regarded as inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.

Persistence per IOPC Fund definition: Non-Persistent

Bioaccumulative Potential: Hydrocarbon constituents of kerosine show measured or predicted Log Kow values ranging from 3 to 6 and above and therefore would be regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. It is possible that some of the higher molecular weight hydrocarbons will be adsorbed on sediment. Biodegradation in water is a minor loss process. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 0.1 to 0.7 days.

Other adverse effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)
• D001 - Ignitability characteristic

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	*Aquatic toxicity studies indicate this material may be classified as a Marine Pollutant under IMDG Code. It is not currently regulated as a marine pollutant by the USDOT. If there is not a Shipping Description or other DOT marking, labeling, placarding and packaging references shown in this section, it is not regulated as a hazardous material by the USDOT.* UN1863, Fuel, aviation, turbine engine, Combustible liquid *or* 3, III
Non-Bulk Package Marking:	None *or* Fuel, aviation, turbine engine, UN1863
Non-Bulk Package Labeling:	none *or* Flammable liquid
Bulk Package/Placard Marking:	Combustible *or* Flammable/1863
Packaging - References:	None; None; 49 CFR 173.241 *or* 49 CFR 173.150; 173.203; 173.241 *(Exceptions; Non-bulk; Bulk)*
Hazardous Substance:	See Section 15 for RQ`s
Emergency Response Guide:	128
Note:	*This product may be classified as a Combustible Liquid for domestic land transportation under 49 CFR 173.150(f).Combustible liquids are not regulated by DOT in non-bulk quantities shipped by land.* *If this material is determined to be a Marine Pollutant, it CANNOT be reclassified as a Combustible Liquid.* *Container(s) greater than 5 liters (liquids) or 5 kilograms (solids), shipped by water mode and ALL bulk shipments may require the shipping description to contain the "Marine Pollutant" notation [49 CFR 172.203(l)] and the container(s) to display the [Marine Pollutant Mark] [49 CFR 172.322].*

International Maritime Dangerous Goods (IMDG)

Shipping Description:	UN1863, Fuel, aviation, turbine engine, 3, III, (FP° C cc), *[where FP is the material's flash point in degrees Celsius closed cup]*
Non-Bulk Package Marking:	Fuel, aviation, turbine engine, UN1863
Labels:	Flammable liquid
Placards/Marking (Bulk):	Flammable/1863
Packaging - Non-Bulk:	P001
EMS:	F-E, S-E

Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25. If container(s) is greater than 5 liters (liquids) or 5 kilograms (solids), shipment may require the shipping description to contain the "Marine Pollutant" description [IMDG 5.4.1.4.3.5] and the container(s) to display the Marine Pollutant mark [IMDG 5.2.1.6]. If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.*

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:
Not applicable

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: UN1863
Proper Shipping Name: Fuel, aviation, turbine engine
Hazard Class/Division: 3
Subsidiary risk: none
Packing Group: III
Non-Bulk Package Marking: Fuel, aviation, turbine engine, UN1863
Labels: Flammable liquid
ERG Code: 3L
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24. If container(s) is greater than 5 liters (liquids) or 5 kilograms (solids), shipment may require the container to display the "Environmentally hazardous substance" mark [IATA 7.1.6.3].*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	Y344	355	366
Max. Net Qty. Per Package:	10 L	60 L	220 L

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health Hazard: Yes
Chronic Health Hazard: Yes
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Chemical Name	Concentration[1]	de minimis
Naphthalene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Chemical Name	Type of Toxicity
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

Naphthalene	Cancer

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

WHMIS Hazard Class:
B3 - Combustible liquid
D2B - Toxic materials

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

Section 16: Other Information

Date of Issue:	Previous Issue Date:	SDS Number:	Status:
10-Apr-2014	04-Apr-2014	001975	FINAL

Revised Sections or Basis for Revision:
Exposure limits (Section 8)

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Material Safety Data Sheet

EMERGENCY NUMBERS:

(USA) CHEMTREC : 1(800) 424-9300 (24hrs)
(CAN) CANUTEC : 1(613) 996-6666 (24hrs)
(USA) Anachemia : 1(518) 297-4444
(CAN) Anachemia : 1(514) 489-5711

WHMIS	Protective Clothing	TDG Road/Rail
WHMIS CLASS: C D-1A D-2A		TDG CLASS: 5.1 6.1 PIN: UN1469 PG: II

Section I. Product Identification and Uses

Product name	**LEAD NITRATE**
Chemical formula	Pb(NO3)2
Synonyms	Lead dinitrate, Lead(II) nitrate, AC-5394, AC-5394P, AC-5394T, 51014, 51026, 51034
Supplier	Anachemia Canada. 255 Norman. Lachine (Montreal), Que H8R 1A3
Material uses	For laboratory use only.

CI#	Not available.
CAS#	10099-74-8
Code	AC-5394
Formula weight	331.20
Supersedes	

Section II. Ingredients

Name	CAS #	%	TLV
1) LEAD NITRATE	10099-74-8	95-100	Exposure limits: ACGIH (Lead, elemental and inorganic compounds (as Pb)) TWA 0.05 mg(Pb)/m3

Toxicity values of the hazardous ingredients

LEAD NITRATE:
INTRAPERITONEAL (LD50): Acute: 74 mg/kg (Mouse).
INTRAVENOUS (LD50): Acute: 93 mg/kg (Rat).

Section III. Physical Data

Physical state and appearance / Odor	White odorless crystals.
pH (1% soln/water)	<7
Odor threshold	Not available.
Percent volatile	0% at 21°C
Freezing point	Decomposes at 470°C.
Boiling point	Not applicable.
Specific gravity	4.53 (Water = 1)
Vapor density	11 (Air = 1)
Vapor pressure	Not applicable.
Water/oil dist. coeff.	Not available.
Evaporation rate	Not applicable.
Solubility	Easily soluble in cold water.

Section IV. Fire and Explosion Data

Flash point	Not available.
Flammable limits	Not available.
Auto-ignition temperature	Not available.
Fire degradation products	Oxides of nitrogen and lead. Lead.
Fire extinguishing procedures	Use flooding quantities of water. Wear adequate personal protection to prevent contact with material or its combustion products. Self contained breathing apparatus with a full facepiece operated in a pressure demand or other positive pressure mode. Cool containing vessels with flooding quantities of water until well after fire is out.
Fire and Explosion Hazards	Powerful oxidizing agent; may ignite oxidizable materials. Contributes to combustion of other materials. Container explosion may occur under fire conditions or when heated. Contact with other material may cause fire and/or explosion. When contaminated, it is very sensitive. Contact with other material may form shock, heat or friction sensitive mixtures. May react violently with shock, friction or if heated. Toxic gases are evolved on heating lead nitrate above 205°C.

Section V. Toxicological Properties

Routes of entry	Inhalation and ingestion. Eye contact. Skin contact. Skin absorption.
Effects of Acute Exposure	May be fatal by ingestion, inhalation or skin absorption. Neurotoxin. Acute lead exposure causes reversible kidney damage and anemia. May impair the reproductive systems of both men and women. Damage may also be caused to the unborn fetus. Lead is a cumulative poison and even exposures to small amounts can raise the body's content to toxic levels. Target organs: blood, central nervous system, liver, kidneys, gastrointestinal system, male and female reproductive system, peripheral nervous system, skeletal muscle, brain, thyroid, testis.
Eye	Dust may cause irritation, redness and possible damage due to abrasiveness.
Skin	Contact over short periods of time may cause severe local irritation or burns. Readily absorbed through skin.
Inhalation	Highly toxic! Material is destructive to tissue of the mucous membranes and upper respiratory tract. Local irritation of the bronchi and lungs can occur, in case of acute exposure, symptoms such as metallic taste, chest and abdominal pain, nausea, vomiting, central nervous system depression, numbness, aching muscles, weakness, dyspnea, and increased blood levels may follow. Prolonged exposure or repeated exposure can lead to lead poisoning and death (see ingestion).
Ingestion	Highly toxic. Lead salts may cause fatigue, disturbance of sleep, abdominal pain, nausea, headache, anorexia, metallic taste in mouth, muscle and joint pain, dizziness, colic, paralysis, hypertension, thirst, vomiting, constipation or diarrhea, muscle weakness, irritability, encephalopathy, parasthesia, convulsions, coma and death. Prolonged overexposure can severely damage red blood cell formation, central and peripheral nervous system, lung, liver and kidney damage with oliguria, hematuria, albuminuria, hemoglobinuria. See chronic overexposure. Estimated lethal dose is 0.5 g lead. Nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptomes of nitrite poisoning include methemoglobinemia with cyanosis, nausea, dizziness, increased heart rate and respiratory paralysis.

Section V. Toxicological Properties

Effects of Chronic Overexposure	Symptoms of chronic exposure are like those for ingestion. Lead is a cumulative poison and even exposure to small amounts can raise the body's content to toxic levels. Tiredness, loss of weight, insomnia, blue line on gums, gastrointestinal disorder (constipation and colic), muscle weakness, hypertension with bradycardia, polyneuropathy, nephropathy, anemia, nephritis, encephalopathy, eye, lung, central and peripheral nervous system, liver, kidney, blood, thyroid damage. Reproductive toxin, teratogen, embryotoxic, and carcinogen. Lead compounds may cause testicular damage, sterility, sperm abnormalities, menstrual disorders, adverse effects on general reproductive performance in human. Passes through the placental barrier (can cause birth defects, postnatal development injury, increased foetal lethality and delayed foetal development.). Excreted in maternal milk in animal. To the best of our knowledge, the chemical, physical, and toxicity of this substance has not been fully investigated.

Section VI. First Aid Measures

Eye contact	Immediately flush eyes with copious quantities of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Seek immediate medical attention.
Skin contact	Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek immediate medical attention. Wash contaminated clothing before reusing. Discard contaminated leather articles such as shoes and belt.
Inhalation	Remove patient to fresh air. Administer approved oxygen supply if breathing is difficult. Administer artificial respiration or CPR if breathing has ceased. Seek immediate medical attention.
Ingestion	If victim is alert and not convulsing, rinse out mouth and give 1/2 to 1 glass of water to dilute. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Immediately transport victim to an emergency facility. Never give anything by mouth to an unconscious or convulsing person.

Section VII. Reactivity Data

Stability	Stable. Conditions to avoid: High temperatures, sparks, open flames and all other sources of ignition, contamination.
Hazardous decomp. products	Not available.
Incompatibility	May react violently with reducing agents, organic materials, flammable/combustible materials. Because of explosive reaction or explosive compound formation, lead nitrate must not be mixed with ammonium thiocyanate, potassium acetate, lead hypophosphate, metal powders (e.g., aluminum, iron, copper, copper alloys), carbon, boron phosphide, cyanides, esters, phospham, phosphorus, sodium cyanide, hypophosphites, stannous chloride, thiocyanates, isothiocyanates, sulfur, easily oxidizable materials, citric acid, nitrites, phosphinates.
Reaction Products	Contact with other material may cause fire and/or explosion. Avoid contamination with reactive substances. Contact with other material may form shock, heat or friction sensitive mixtures. Hazardous polymerization will not occur.

Section VIII. Preventive Measures

Protective Clothing in case of spill and leak

Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves. Wear disposable coveralls and discard them after use.

Spill and leak

Evacuate the area. Eliminate all sources of ignition. Cover with dry soda ash or lime. Sweep up and place in container for disposal. Avoid raising dust. Use non-sparking tools. Ventilate area and wash spill site after material pick up is complete. DO NOT empty into drains. DO NOT touch damaged container or spilled material. Avoid contact with a combustible material (wood, paper, oil, clothing...). Spills of lead nitrate must be promptly removed.

Waste disposal

Dispose of waste material at an approved (hazardous) waste treatment/ disposal facility in accordance with applicable local, provincial and federal regulations. Harmful to aquatic life at low concentrations. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Storage and Handling

Do not store near flammable or organic substances. Keep at temperature not exceeding 30°C. Store in a cool place away from heated areas, sparks, and flame. Store in a well ventilated area. Store away from incompatible materials. Do not add any other material to the container. Do not wash down the drain. Do not breathe dust. Keep away from direct sunlight or strong incandescent light. Keep container tightly closed and dry. Manipulate under an adequate fume hood. Avoid raising dust. Empty containers may contain a hazardous residue. Handle and open container with care. Minimize dust generation and exposure - use dust mask or appropriate protection. Take off immediately all contaminated clothing. Avoid contact with a combustible material (wood, paper, oil, clothing...). This product must be manipulated by qualified personnel. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking and food consumption while handling. In case of accident or if you feel unwell, seek medical advice immediately (show the label when possible.). Since the product is unstable, avoid sudden shocks like dropping or rolling. Do not drop, roll or skid container. Do not store on wood floors.

Section IX. Protective Measures

Protective clothing

Splash goggles. Impervious gloves (rubber or plastic), apron, coveralls, and/or other resistant protective clothing. Prior to use, user should confirm impermeability. Sufficient to protect skin. Have available and use as appropriate: face shields, rubber suits, aprons, and boots. A OSHA/MSHA jointly approved respirator is advised in the absence of proper environmental controls. If more than TLV, do not breathe vapor. Wear self-contained breathing apparatus. Do not wear contact lenses. Make eye bath and emergency shower available. Ensure that eyewash station and safety shower is proximal to the work-station location.

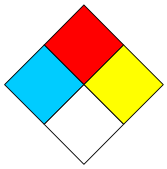
Engineering controls

Use in a chemical fume hood to keep airborne levels below recommended exposure limits. Do not use in unventilated spaces. Adequate ventilation and clean up must be maintained to minimize dust accumulation. Dust layers should not be permitted to accumulate.

Section X. Other Information

Special Precautions or comments

Powerful oxidizing agent; may ignite oxidizable materials. Highly toxic! Carcinogen! Mutagen! Reproductive toxin! Teratogen! Embryotoxic! Neurotoxic! Nephrotoxic! Severe irritant! Possible risks of irreversible effects. Danger of cumulative effects. Do not breathe dust. Avoid all contact with the product. Avoid prolonged or repeated exposure. Use in a chemical fume hood. Keep away from heat, sparks and flame. Avoid shock and friction. When contaminated, it is very sensitive. Contact with other material may cause fire and/or explosion. Risk of explosion by shock, friction, fire or other sources of ignition. Handle and open container with care. Container should be opened only by a technically qualified person.
RTECS NO: OG2100000 (Lead nitrate).



NFPA

Prepared by MSDS Department/Département de F.S..

Validated 07-Jan-2013

Telephone# (514) 489-5711

While the company believes the data set forth herein are accurate as of the date hereof, the company makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)

Section 1: Identification

Product Identifier: **T5X® Heavy Duty Motor Oil**

Other means of identification: T5X® Heavy Duty Motor Oil, SAE 30
T5X® Heavy Duty Motor Oil, SAE 40
T5X® Heavy Duty Motor Oil, SAE 50

SDS Number: **817732**

Intended Use: Heavy Duty Diesel Engine Oil

Uses Advised Against: All others

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

Manufacturer:
Phillips 66 Lubricants
P.O. Box 4428
Houston, TX 77210

SDS Information:
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

Customer Service:
U.S.: 1-800-822-6457 or International: +1-83-2486-3363
Technical Information: 1-877-445-9198

Section 2: Hazards Identification

Classified Hazards
This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Other Hazards
None Known

Label Elements

No classified hazards

Section 3: Composition / Information on Ingredients

Chemical Name	CASRN	Concentration[1]
Residual oils, petroleum, solvent-dewaxed	64742-62-7	0 - 90
Distillates, petroleum, hydrotreated heavy paraffinic	64742-54-7	0 - 90
Non-Hazardous Materials	VARIOUS	<15

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: Inhalation of oil mists or vapors generated at elevated temperatures may cause respiratory irritation. Accidental ingestion can result in minor irritation of the digestive tract, nausea and diarrhea. Dry skin and possible irritation with repeated or prolonged exposure.

Notes to Physician: Acute aspirations of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 0 **Flammability:** 1 **Instability:** 0

0 (Minimal)
1 (Slight)
2 (Moderate)
3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

Special protective actions for firefighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from flames and hot surfaces. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Spills will produce very slippery surfaces. Used motor oils have been shown to cause skin cancer in mice after repeated application to the skin without washing. Brief or intermittent skin contact with used motor oil is not expected to cause harm if the oil is thoroughly removed by washing with soap and water. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Chemical Name	ACGIH	OSHA	Other
Residual oils, petroleum, solvent-dewaxed	TWA: 5 mg/m^3 STEL:10 mg/m^3 as Oil Mist, if Generated	TWA: 5 mg/m^3 (as Oil Mist, if generated)	---
Distillates, petroleum, hydrotreated heavy paraffinic	TWA: 5 mg/m^3 STEL:10 mg/m^3 as Oil Mist, if Generated	TWA: 5 mg/m^3 (as Oil Mist, if generated)	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: brown, Transparent
Physical Form: Liquid
Odor: Petroleum

Flash Point: Minimum 392 °F / 200 °C
Test Method: Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Initial Boiling Point/Range: No data

Odor Threshold: No data
pH: Not applicable
Vapor Density (air=1): >1
Upper Explosive Limits (vol % in air): No data
Lower Explosive Limits (vol % in air): No data
Evaporation Rate (nBuAc=1): No data
Particle Size: N/A
Percent Volatile: Negligible
Flammability (solid, gas): N/A
Solubility in Water: Negligible

Vapor Pressure: <1 mm Hg
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: No data <
Auto-ignition Temperature: No data
Decomposition Temperature: No data
Specific Gravity (water=1): 0.878 - 0.889 @ 60ºF (15.6ºC)
Bulk Density: 7.33 - 7.45 lbs/gal
Viscosity: 11 - 20 cSt @ 100°C; 88 - 224 cSt @ 40°C
Pour Point: < -4 °F / < -20 °C

Section 10: Stability and Reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Extended exposure to high temperatures can cause decomposition. Avoid all possible sources of ignition.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use, During use in engines, contamination of oil with low levels of hazardous fuel combustion by-products (e.g. polycyclic aromatic hydrocarbons) may occur. Repeated and prolonged skin contact can cause drying and cracking.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		> 5 mg/L (estimate)
Dermal	Unlikely to be harmful		> 2 g/kg (estimate)
Oral	Unlikely to be harmful		> 5 g/kg (estimate)

Aspiration Hazard: Not expected to be an aspiration hazard.

Skin Corrosion/Irritation: Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitization: No information available on the mixture, however none of the components have been classified for skin sensitization (or are below the concentration threshold for classification).

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Repeated Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Carcinogenicity: No information available on the mixture, however none of the components have been classified for carcinogenicity (or are below the concentration threshold for classification).

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

Information on Toxicological Effects of Components

Lubricant Base Oil (Petroleum)

Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including severe hydrocracking/hydroprocessing to reduce aromatics and improve performance characteristics. All of the oils meet the IP-346 criteria of less than 3 percent PAH's and are not considered carcinogens by NTP, IARC, or OSHA.

Phenol, (tetrapropenyl) derivatives

Reproductive Toxicity: This product contains low levels of phenol, (tetrapropenyl) derivatives. Rats given high, repeated daily doses of phenol, (tetrapropenyl) derivatives by oral intubation experienced adverse reproductive effects. Pregnant rats given high, repeated daily doses of phenol, (tetrapropenyl) derivatives by oral intubation gave birth to pups with cleft palate and skeletal malformations at dose levels that caused maternal toxicity. Follow-up studies of phenol, (tetrapropenyl) derivatives in finished lubricating fluids demonstrated a no-observed effect level of 1.78 wt%.

Section 12: Ecological Information

GHS Classification:
No classified hazards

Toxicity: All acute aquatic toxicity studies on samples of lubricant base oils show acute toxicity values greater than 100 mg/L for invertebrates, algae and fish. These tests were carried out on water accommodated fractions and the results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material are greater than 5.3, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of the hydrocarbon constituents in soil and sediment.

Other adverse effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle used oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

Section 14: Transport Information

U.S. Department of Transportation (DOT)
Shipping Description: *Not regulated*

Note: *If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)*

International Maritime Dangerous Goods (IMDG)
Shipping Description: *Not regulated*
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.*

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)
UN/ID #: *Not regulated*
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)
Acute Health Hazard: No
Chronic Health Hazard: No
Fire Hazard: No
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Chemical Name	Concentration[1]	de minimis
Zinc Compound(s)	<1.4	1.0%

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Hazard Classification

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

WHMIS Hazard Class:
none

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA

All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

Section 16: Other Information

Date of Issue:	Previous Issue Date:	SDS Number:	Status:
14-Aug-2013	06-Dec-2012	817732	FINAL

Revised Sections or Basis for Revision:
Format change; Product Name / Synonyms (Section 1); Composition (Section 3); Physical Properties (Section 9)

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

SANFORD BRANDS

A Newell Rubbermaid Company

MATERIAL SAFETY DATA SHEET

MSDS # 35201

Section One: Identification

Sanford, L.P.
2707 Butterfield Road
Oak Brook, IL 60523 USA
800-323-0749 or 630-481-2000

EMERGENCY MEDICAL NUMBER:

888-786-0972

Product Name: Sharpie Oil-Based Paint Marker, Bold

Colors: Black, Red, Blue, Yellow, White

Sanford is a member of The Art and Creative Materials Institute, Inc. This product is certified by the Institute to be labeled in accordance with the voluntary chronic hazard labeling standard ASTM D-4236 and is labeled with the AP Non Toxic Seal. Products bearing the AP Approved Product Seal of The Art and Creative Materials Institute, Inc. are certified in a program of toxicological evaluation by a medical expert, subject to review by the Institute Toxicology Advisory Board, to contain no materials in sufficient quantities to be toxic or injurious to humans, or to cause acute toxicity or chronic health problems.

Section Two: Hazard Identification

This product is considered safe under normal use conditions.

Section Three: Composition

Ethanol (64-17-5), methoxy propanol (107-98-2), resins, colorants

Section Four: First Aid Measures

Inhalation: This product is considered safe under normal use conditions.

Skin Contact: This product is considered safe under normal use conditions.

Eye Contact: This product is considered safe under normal use conditions.

Ingestion: This product is considered safe under normal use conditions.

Section Five: Fire Fighting Measures

Flash Point: 55F CC (Ethanol)

Flammability Limits (% by volume): Lower: 3.3% (ethanol) Upper: 19% (ethanol)

Extinguishing Media: Dry chemical, carbon dioxide, water, regular foam.

Special Fire Fighting Measures: For large fires, use regular foam or flood with fine spray.

Unusual Fire and Explosion Hazards: Stay upwind and keep out of low areas.

Section Six: Accidental Release Measures

In Case of Spill or Accidental Release: Wipe up with absorbent material.

Section Seven: Handling and Storage

Handling: Np special handling requirements.

Storage: Keep cap on marker when not in use.

Section Eight: Exposure Controls and Personal Protection

Eye Protection: None under normal use conditions.

Clothing: None under normal use conditions.

Respirator: None under normal use conditions.

Ventilation: None under normal use conditions.

Section Nine: Physical and Chemical Properties

For ink unless otherwise specified:

Boiling Point:	172F (ethanol)
Specific Gravity:	Approximately 1.0
Vapor Pressure:	Not determined
Solubility in Water:	Miscible
Evaporation Rate:	Not determined
Appearance/Odor:	Colored liquid; alcohol odor

Section Ten: Stability and Reactivity

Stability:	Stable
Conditions to Avoid:	Avoid heat, flames, sparks, and other sources of ignition.
Chemical Incompatibility:	Strong oxidizers
Hazardous Decomposition:	Oxides of carbon in a fire situation.
Hazardous Polymerization:	Will not occur

Section Eleven: Toxicological Information

See Section Two: Hazard Identification for any hazards

Section Twelve: Ecological Information

Not available

Section Thirteen: Disposal Considerations

Dispose in accordance with Federal, State, and Local Regulations.

Section Fourteen: Transport Information

DOT:	ORM-D Consumer Commodity;
IATA:	Consumer Commodity, 9, ID8000, packing instruction 910
IMO:	Flammable Liquid, n.o.s. (ethanol), 3, UN1993, PGII (55 F CC), Ltd Qtys, EmS# 3-07;

Section Fifteen: Regulatory Information

TSCA: The product listed on this Material Safety Data Sheet is not listed on the Toxic Substances Control Act Inventory. All ingredients used to manufacture this product are listed on the TSCA Inventory

Section Sixteen: Other Information

HMIS Code	
Health	1
Flammability	3
Reactivity	0
Personal Protection	N/A

0=Minimal / 4 = Severe

Sanford has been advised by Counsel that the OSHA Hazard Communication Standard does not apply to the Sanford Product described in this Material Safety Data Sheet. The reason for the exemption is contained in 29 CFR 1910.1200(b)(6)(ix) as amended July 1, 2006 per the Code of Federal Regulations. The information contained in this MSDS is forwarded to you for your information, but is not meant to imply that the product is covered by the Hazard Communication Standard nor is this MSDS meant to comply with all requirements of the Hazard Communication Standard.

Paint Thinner

SECTION 1. IDENTIFICATION

Product Identifier	Paint Thinner
Other Means of Identification	13-311QC, 13-314QC, 13-318QC, 23-318-1000, 23-319QC, 33-311RONA, 33-314BMR, 33-314RONA
Recommended Use	Please refer to Product label.
Restrictions on Use	None known.
Manufacturer / Supplier	Recochem Inc., 850 Montee de Liesse, Montreal, QC, H4T 1P4, Compliance and Regulatory Department, 905-878-5544, www.recochem.com
Emergency Phone No.	CANUTEC, 613-996-6666, 24 Hours
SDS No.	1612

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Flammable liquid - Category 3; Acute toxicity (Inhalation) - Category 3; Skin corrosion/irritation - Category 2; Serious eye damage/eye irritation - Category 2A; Germ cell mutagenicity - Category 1B; Carcinogenicity - Category 1B; Specific target organ toxicity (single exposure) - Category 3; Aspiration hazard - Category 1; Aquatic hazard (Chronic) - Category 2

GHS Label Elements

Signal Word:
Danger

Hazard Statement(s):

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H340	May cause genetic defects.
H350	May cause cancer.
H411	Toxic to aquatic life with long lasting effects.

Precautionary Statement(s):
Prevention:

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat, sparks, open flames, and hot surfaces. – No smoking.

P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical, ventilating, lighting, and other equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P261 Avoid breathing fume, mist, vapours, spray.
P264 Wash hands and skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P280 Wear protective gloves/eye protection/face protection.

Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTRE/doctor.
P331 Do NOT induce vomiting.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P312 Call a POISON CENTRE/doctor if you feel unwell.
P362 + P364 Take off contaminated clothing and wash it before reuse.
P332 + P313 If skin irritation occurs: Get medical advice/attention.
P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312 Call a POISON CENTRE/doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 Call a POISON CENTRE/doctor if you feel unwell.
P337 + P313 If eye irritation persists: Get medical advice/attention.
P308 + P313 IF exposed or concerned: Get medical advice/attention.
P370 + P378 In case of fire: Use appropriate foam, carbon dioxide, water spray or fog, dry chemical powder to extinguish.
P391 Collect spillage.

Storage:
Store in a well ventilated place. Keep cool. Keep container tightly closed. Store locked up.

Disposal:
Dispose of contents/container in accordance with applicable regional, national and local laws and regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture:

Chemical Name	CAS No.	%	Other Identifiers
Hydrotreated kerosene	64742-47-8	60-100	
Stoddard solvent	8052-41-3	15-40	
n-Nonane	111-84-2	1-5	
1,2,4-Trimethylbenzene	95-63-6	1-5	
Naphthalene	91-20-3	0.1-1	

Notes

The specific chemical identity and/or exact percentage of composition (concentration) has been withheld as a trade secret.

SECTION 4. FIRST-AID MEASURES

First-aid Measures

Inhalation

Take precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). Remove source of exposure or move to fresh air. Keep at rest in a position comfortable for breathing. Call a Poison Centre or doctor if you feel unwell or are concerned.

Skin Contact

Avoid direct contact. Wear chemical protective clothing if necessary. Take off contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Wash gently and thoroughly with lukewarm, gently flowing water and mild soap for 5 minutes. Call a Poison Centre or doctor if you feel unwell or are concerned. If skin irritation occurs get medical advice/attention. Thoroughly clean clothing, shoes and leather goods before reuse or dispose of safely.

Eye Contact

Avoid direct contact. Wear chemical protective gloves if necessary. Quickly and gently blot or brush chemical off the face. Immediately rinse the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. Remove contact lenses, if present and easy to do. Take care not to rinse contaminated water into the unaffected eye or onto the face. If eye irritation persists, get medical advice/attention.

Ingestion

Do not induce vomiting. Rinse mouth with water. Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Do not induce vomiting. If vomiting occurs naturally, lie on your side in the recovery position. Rinse mouth with water again. If breathing has stopped, trained personnel should immediately begin rescue breathing. Immediately call a Poison Centre or doctor.

Most Important Symptoms and Effects, Acute and Delayed

No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Immediate Medical Attention and Special Treatment

Target Organs

Eyes, skin, respiratory system.

Special Instructions

No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Medical Conditions Aggravated by Exposure

Dermatitis.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media

Carbon dioxide, dry chemical powder, appropriate foam, water spray or fog.

Unsuitable Extinguishing Media

None known.

Specific Hazards Arising from the Chemical

Flammable liquid and vapour. Can ignite at room temperature. Releases vapour that can form explosive mixture with air. Can be ignited by static discharge. Can accumulate static charge by flow, splashing or agitation. Liquid can float on water and may travel to distant locations and/or spread fire. See Section 9 (Physical and Chemical Properties) for flash point and explosive limits. Closed containers may rupture violently when heated releasing contents.
In a fire, the following hazardous materials may be generated: irritating chemicals; toxic chemicals; very toxic carbon monoxide, carbon dioxide.

Special Protective Equipment and Precautions for Fire-fighters

Review Section 6 (Accidental Release Measures) for important information on responding to leaks/spills.
See Skin Protection in Section 8 (Exposure Controls/Personal Protection) for advice on suitable chemical protective materials.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures

No special precautions are necessary. Evacuate downwind locations. Use the personal protective equipment recommended in Section 8 of this safety data sheet. Increase ventilation to area or move leaking container to a well-ventilated and secure area. Eliminate all ignition sources. Use grounded, explosion-proof equipment.

Environmental Precautions

Do not allow into any sewer, on the ground or into any waterway.

Methods and Materials for Containment and Cleaning Up

Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling

Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Conditions for Safe Storage

Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

	ACGIH TLV®		OSHA PEL		AIHA WEEL	
Chemical Name	TWA	STEL	TWA	Ceiling	8-hr TWA	TWA
Stoddard solvent	100 ppm	Not established	100 ppm	Not established		
Naphthalene	10 ppm A3	Not established	10 ppm	15 ppm		
n-Nonane	200 ppm	Not established	200 ppm	Not established		
1,2,4-Trimethylbenzene	25 ppm	Not established	25 ppm	Not established		
Hydrotreated kerosene	200 mg/m3 A3	Not established	Not established	Not established		

Appropriate Engineering Controls

General ventilation is usually adequate. For large scale use of this product: use local exhaust ventilation, if general ventilation is not adequate to control amount in the air. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored. Control static electricity discharges which includes bonding of equipment to ground. Use only non-combustible, compatible materials for walls, floors, ventilation system, air cleaning devices, pallets, shelving. Provide eyewash and safety shower if contact or splash hazard exists.

Individual Protection Measures

Eye/Face Protection

Wear chemical safety goggles.

Skin Protection

Wear chemical protective clothing e.g. gloves, aprons, boots.

Respiratory Protection

Not normally required if product is used as directed. For non-routine or emergency situations: wear a NIOSH approved air-purifying respirator with an appropriate cartridge.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Basic Physical and Chemical Properties

Appearance	Clear liquid.
Odour	Hydrocarbon
Odour Threshold	Not available
pH	Not available
Melting Point/Freezing Point	-77 ºC (-107 ºF) (melting); -77 ºC (-107 ºF) (freezing)
Initial Boiling Point/Range	159 - 195 ºC (318 - 383 ºF)
Flash Point	42 ºC (108 ºF) (closed cup)
Evaporation Rate	0.19 (n-butyl acetate = 1)
Flammability (solid, gas)	Not applicable
Upper/Lower Flammability or Explosive Limit	5.6% (upper); 0.8% (lower)
Vapour Pressure	1.965 mm Hg (0.262 kPa) at 20 ºC
Vapour Density (air = 1)	4.9
Relative Density (water = 1)	0.779 at 15 ºC
Solubility	Insoluble in water; Not available (in other liquids)
Partition Coefficient, n-Octanol/Water (Log Kow)	Not available
Auto-ignition Temperature	260 ºC (500 ºF)
Decomposition Temperature	Not available
Viscosity	1.27 centistokes at 25 ºC (kinematic); Not available (dynamic)

Other Information

Physical State	Liquid
Molecular Weight	Not applicable

SECTION 10. STABILITY AND REACTIVITY

Reactivity

None known.

Chemical Stability

Normally stable.

Possibility of Hazardous Reactions

None known.

Conditions to Avoid

Open flames, sparks, static discharge, heat and other ignition sources. Temperatures above 43.0 ºC (109.4 ºF)

Incompatible Materials

Reacts explosively with: strong oxidizing agents (e.g. perchloric acid).
Not corrosive to metals.

Hazardous Decomposition Products

None known.

SECTION 11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure

Skin contact; eye contact; inhalation.

Acute Toxicity

Chemical Name	LC50	LD50 (oral)	LD50 (dermal)
Stoddard solvent	> 5500 mg/m3 (rat) (4-hour exposure)	5000 mg/kg (rat)	> 3000 mg/kg (rabbit)
Naphthalene	739.2 mg/m3 (rat) (4-hour exposure)	316 mg/kg (mouse)	> 20000 mg/kg (rabbit)
n-Nonane	3200 ppm (rat) (4-hour exposure)	15 g/kg (rat)	Not available
1,2,4-Trimethylbenzene	18000 mg/m3 (rat)	5000 mg/kg (rat)	Not available
Hydrotreated kerosene	> 5 mg/L (rat) (4-hour exposure)	> 5000 mg/kg (rat)	> 2000 mg/kg (rabbit)

LC50: Not applicable.

LD50 (oral): Not applicable.

LD50 (dermal): Not applicable.

Skin Corrosion/Irritation

Animal tests show moderate or severe irritation.

Serious Eye Damage/Irritation

Human experience shows mild irritation. The vapour also irritates the eyes.

STOT (Specific Target Organ Toxicity) - Single Exposure

Inhalation

May cause depression of the central nervous system. Symptoms may include headache, nausea, dizziness, drowsiness and confusion. Nose and throat irritation. At high concentrations.

Skin Absorption

No information was located.

Ingestion

Not harmful based on animal tests.

Aspiration Hazard

Can cause lung damage if aspirated based on human experience. Death can result.

STOT (Specific Target Organ Toxicity) - Repeated Exposure

Causes damage to organs based on studies in people. If inhaled: effects similar to STOT (Specific Target Organ Toxicity) - Single Exposure, as described above, effects on the central nervous system, "organic solvent syndrome". Causes Following skin contact: dermatitis. Symptoms may include dry, red, cracked skin (dermatitis). effects similar to STOT (Specific Target Organ Toxicity) - Single Exposure, as described above.
May cause damage to organs based on limited evidence. If inhaled and/or following skin contact: at high concentrations harmful effects on the kidneys, harmful effects on the liver.
May cause damage to organs based on limited evidence. If inhaled and/or following skin contact: blood tests may show

abnormal results.

Respiratory and/or Skin Sensitization

No information was located. No information was located.

Carcinogenicity

Chemical Name	IARC	ACGIH®	NTP	OSHA
Stoddard solvent	Group 3	Not designated	Not Listed	Not Listed
Naphthalene	Group 2B	A3	Reasonably anticipated	Not Listed
n-Nonane	Not Listed	Not designated	Not Listed	Not Listed
1,2,4-Trimethylbenzene	Not Listed	Not designated	Not Listed	Not Listed
Hydrotreated kerosene	Group 3	A3	Not Listed	Listed

Reproductive Toxicity

Development of Offspring

Conclusions cannot be drawn from the limited studies available.

Sexual Function and Fertility

No information was located.

Effects on or via Lactation

No information was located.

Germ Cell Mutagenicity

May be mutagenic based on limited evidence. (Stoddard solvent)

Interactive Effects

No information was located.

SECTION 12. ECOLOGICAL INFORMATION

Toxicity

Acute Aquatic Toxicity

Chemical Name	LC50 Fish	EC50 Crustacea	ErC50 Aquatic Plants	ErC50 Algae
Stoddard solvent	Not available	Not available		
Naphthalene	0.9-9.8 mg/L (Oncorhynchus mykiss (rainbow trout); 96-hour; fresh water)	Not available		
n-Nonane	Not available	Not available		
1,2,4-Trimethylbenzene	7.72 mg/L (Pimephales promelas (fathead minnow); 96-hour)	Not available		
Hydrotreated kerosene	2.2 mg/L (Lepomis macrochirus (bluegill); 96-hour)	Not available		

Chronic Aquatic Toxicity

Chemical Name	NOEC Fish	EC50 Fish	NOEC Crustacea	EC50 Crustacea
Stoddard solvent	Not available		Not available	
Naphthalene	1.8 mg/L		Not available	

	(Oncorhynchus mykiss (rainbow trout); 3 days; fresh water)			
n-Nonane	Not available		Not available	
1,2,4-Trimethylbenzene	Not available		Not available	
Hydrotreated kerosene	Not available		Not available	

Persistence and Degradability

No information was located.

Bioaccumulative Potential

No information was located.

Mobility in Soil

No information was located.

Other Adverse Effects

There is no information available.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal Methods

The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14. TRANSPORT INFORMATION

Regulation	UN No.	Proper Shipping Name	Transport Hazard Class(es)	Packing Group
Canadian TDG	1268	PETROLEUM DISTILLATES	3	III
US DOT	1268	PETROLEUM DISTILLATES	3	III

Environmental Hazards: Potential Marine Pollutant (1,2,4-Trimethylbenzene)

Special Precautions for User: Please note: In containers of 450 L or less this product is not classified as a Dangerous Good according to TDG Exemption 1.33
In containers of 450L of less, this product meets the requirements of DOT exemption as per 49 CFR, section 173.150 (f).

Transport in Bulk According to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15. REGULATORY INFORMATION

Safety, Health and Environmental Regulations

Canada

Domestic Substances List (DSL) / Non-Domestic Substances List (NDSL)

All ingredients are listed on the DSL/NDSL.

USA

Toxic Substances Control Act (TSCA) Section 8(b)

All ingredients are listed on the TSCA Inventory.

Additional USA Regulatory Lists

California Proposition 65: WARNING: This product contains chemicals known to the State of California to cause cancer.

SECTION 16. OTHER INFORMATION

SDS Prepared By	Compliance and Regulatory Department
Phone No.	905-878-5544
Date of Preparation	November 16, 2015
Additional Information	We are committed to uphold the Industry Consumer Ingredient Communication Voluntary Initiative. Please send us your request by visiting our website at www.recochem.com. Ingredients present (intentionally added ingredients) at a concentration of greater than one percent (1%) shall be listed in descending order of predominance. Ingredients present at a concentration of not more than one percent shall be listed but may be disclosed without respect to order of predominance.
Disclaimer	Notice to reader: To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 19-Nov-2010 **Revision Date** 03-Jul-2014 **Revision Number** 1

1. Identification

Product Name **Sodium cyanide**

Cat No. : **S284I-100, S284I-500**

Synonyms Hydrocyanic acid, sodium salt; Prussiate of soda; Cyanide of sodium

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Acute oral toxicity	Category 1
Acute dermal toxicity	Category 1
Acute Inhalation Toxicity - Dusts and Mists	Category 1
Specific target organ toxicity (single exposure)	Category 1
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
May be corrosive to metals

Fatal if swallowed
Fatal in contact with skin
Fatal if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
Causes damage to organs
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not get in eyes, on skin, or on clothing
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear respiratory protection
Keep only in original container
Response
IF exposed: Call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
Immediately call a POISON CENTER or doctor/physician
IF ON SKIN: Gently wash with plenty of soap and water
Remove/Take off immediately all contaminated clothing
Wash contaminated clothing before reuse
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
Contact with acids liberates very toxic gas
Other hazards
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Sodium cyanide	143-33-9	>95

4. First-aid measures

General Advice Immediately call a POISON CENTER or doctor/physician. Show this safety data sheet to the doctor in attendance. Take off contaminated clothing and shoes immediately.

Eye Contact Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Immediate medical attention is required. Wash off immediately with plenty of water for at least 15 minutes.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms/effects Breathing difficulties. Systemic Toxicity: Respiratory disorders: Symptoms may include tightness in the chest, flushing, headache, nausea, vomiting, respiratory depression, weakness, irregular heartbeat, abdominal pain, convulsions, and shock: May cause cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood): Exposure may result in death

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Dry powder.

Unsuitable Extinguishing Media No information available

Flash Point	No information available
Method -	No information available
Autoignition Temperature	Not applicable
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Non-combustible. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Nitrogen oxides (NOx) Hydrogen cyanide (hydrocyanic acid)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions Evacuate personnel to safe areas. Ensure adequate ventilation. Use personal protective equipment. Avoid contact with skin, eyes and clothing. Do not touch or walk through spilled material. If spilled, take caution, as material can cause surfaces to become very slippery.

Environmental Precautions

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up

Provide adequate ventilation. Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal. Do not expose spill to water.

7. Handling and storage

Handling

Use only under a chemical fume hood. Wear personal protective equipment. Do not breathe dust. Do not get in eyes, on skin, or on clothing. Do not eat, drink or smoke when using this product. Handle in accordance with good industrial hygiene and safety practice. Keep container tightly closed.

Storage

Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep locked-up. Keep away from acids. Keep away from combustible material. Do not store in aluminum containers.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Sodium cyanide	Ceiling: 5 mg/m³ Skin	(Vacated) TWA: 5 mg/m³	IDLH: 25 mg/m³ Ceiling: 4.7 ppm Ceiling: 5 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Sodium cyanide	Ceiling: 10 ppm Ceiling: 11 mg/m³ Skin	TWA: 5 mg/m³ Ceiling: 5 mg/m³	CEV: 5 mg/m³ Skin

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	White
Odor	bitter almond
Odor Threshold	No information available
pH	11-12 20 g/l aq. sol
Melting Point/Range	562 °C / 1043.6 °F
Boiling Point/Range	1497 °C / 2726.6 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available

Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 hPa @ 817 °C
Vapor Density	Not applicable
Relative Density	1.6000
Bulk Density	750 - 950 kg/m^3
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition temperature	No information available
Viscosity	Not applicable
Molecular Formula	C N Na
Molecular Weight	49

10. Stability and reactivity

Reactive Hazard Yes

Stability Stable under normal conditions. Hygroscopic.

Conditions to Avoid Incompatible products. Exposure to moist air or water.

Incompatible Materials Acids, Strong oxidizing agents, Carbon dioxide (CO2), Metals

Hazardous Decomposition Products Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Sodium cyanide	143-33-9	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)

STOT - repeated exposure Blood

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Systemic Toxicity: Respiratory disorders: Symptoms may include tightness in the chest, flushing, headache, nausea, vomiting, respiratory depression, weakness, irregular heartbeat, abdominal pain, convulsions, and shock: May cause cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood): Exposure may result in death

Endocrine Disruptor Information No information available

Component	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Sodium cyanide	Group III Chemical	Not applicable	Not applicable

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Sodium cyanide	Not listed	0.17 mg/L LC50 96 h 0.0712 - 0.0936 mg/L LC50 96 h 0.0558 - 0.0586 mg/L LC50 96 h 0.0391 - 0.0548 mg/L LC50 96 h 0.15 mg/L LC50 96 h 0.066 - 0.0852 mg/L LC50 96 h	Not listed	0.17 mg/L EC50 = 96 h

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Sodium cyanide - 143-33-9	-	not otherwise specified

14. Transport information

DOT

UN-No UN1689
Proper Shipping Name SODIUM CYANIDE, SOLID
Hazard Class 6.1
Packing Group I

TDG

UN-No UN1689
Proper Shipping Name SODIUM CYANIDE, SOLID
Hazard Class 6.1
Packing Group I

IATA

UN-No 1689
Proper Shipping Name SODIUM CYANIDE, SOLID
Hazard Class 6.1
Packing Group I

IMDG/IMO

UN-No 1689

Proper Shipping Name	SODIUM CYANIDE, SOLID
Hazard Class	6.1
Packing Group	I

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Sodium cyanide	X	X	-	205-599-4	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Sodium cyanide	143-33-9	>95	1.0

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Sodium cyanide	X	10 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Sodium cyanide	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Sodium cyanide	10 lb	10 lb

California Proposition 65 This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Sodium cyanide	143-33-9	Carcinogen Male Reproductive	-	Carcinogen

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sodium cyanide	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Sodium cyanide	2000 lb STQ

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
D1A Very toxic materials
E Corrosive material
D2A Very toxic materials
F Dangerously reactive material

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 19-Nov-2010
Revision Date 03-Jul-2014
Print Date 03-Jul-2014
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

Creation Date 16-Jun-2009 **Revision Date** 07-Aug-2015 **Revision Number** 2

1. Identification

Product Name **Sodium hydroxide**

Cat No. : **AC206060000; AC206060010; AC206060025; AC206060250; AC206060100**

Synonyms Caustic soda

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

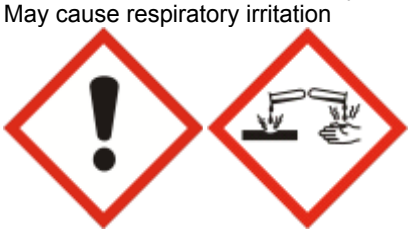
Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation



Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Sodium hydroxide	1310-73-2	100

4. First-aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Keep eye wide open while rinsing.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Call a physician immediately.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Call a physician or Poison Control Center immediately.

Ingestion Do not induce vomiting. Immediate medical attention is required. Never give anything by mouth to an unconscious person. Drink plenty of water.

Most important symptoms/effects Causes burns by all exposure routes. . Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam.

Unsuitable Extinguishing Media Carbon dioxide (CO2), Water

Flash Point No information available
Method - No information available

Autoignition Temperature
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
The product causes burns of eyes, skin and mucous membranes.

Hazardous Combustion Products
Sodium oxides Hydrogen
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	1	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Evacuate personnel to safe areas. Avoid contact with skin, eyes and clothing.

Environmental Precautions Do not allow material to contaminate ground water system. Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Use only under a chemical fume hood. Do not get in eyes, on skin, or on clothing. Do not breathe dust. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Sodium hydroxide	Ceiling: 2 mg/m³	(Vacated) Ceiling: 2 mg/m³ TWA: 2 mg/m³	IDLH: 10 mg/m³ Ceiling: 2 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Sodium hydroxide	Ceiling: 2 mg/m³	Ceiling: 2 mg/m³	CEV: 2 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles. Face-shield.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	White
Odor	Odorless
Odor Threshold	No information available
pH	14 (5 %)
Melting Point/Range	318 °C / 604.4 °F
Boiling Point/Range	1390 °C / 2534 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	Not flammable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mbar @ 700 °C
Vapor Density	Not applicable
Specific Gravity	No information available
Bulk Density	2.13 g/cm3
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	H Na O
Molecular Weight	40

10. Stability and reactivity

Reactive Hazard Yes

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Acids, Metals, Water,

Hazardous Decomposition Products Sodium oxides, Hydrogen

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	Not listed	1350 mg/kg (Rabbit)	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Sodium hydroxide	1310-73-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Mutagenic effects have occurred in experimental animals.

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

Other Adverse Effects See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains. Contains a substance which is:. Harmful to aquatic organisms. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Sodium hydroxide	Not listed	45.4 mg/L LC50 96 h	Not listed	Not listed

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1823
Proper Shipping Name	SODIUM HYDROXIDE, SOLID
Hazard Class	8
Packing Group	II

TDG

UN-No	UN1823
Proper Shipping Name	SODIUM HYDROXIDE, SOLID
Hazard Class	8
Packing Group	II

IATA

UN-No	UN1823
Proper Shipping Name	Sodium hydroxide, solid
Hazard Class	8
Packing Group	II

IMDG/IMO

UN-No	UN1823
Proper Shipping Name	Sodium hydroxide, solid
Hazard Class	8
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Sodium hydroxide	X	X	-	215-185-5	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants

Sodium hydroxide	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Sodium hydroxide	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sodium hydroxide	X	X	X	-	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class E Corrosive material
D2B Toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 16-Jun-2009
Revision Date 07-Aug-2015
Print Date 07-Aug-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the

date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

Material Safety Data Sheet

LA1638
Sodium Metabisulphite

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Id: LA1638
Product Name: Sodium Metabisulphite
Synonyms: Anhydrous sodium bisulfite, ABS, sodium pyrosulfite.
Chemical Family: None Known
Application: Bleaching and disinfectant agent in textile, laundering, paper and fermentation industries. Water treatment. Photographical agent. Chemical processing. Drug manufacturing. Food additive. Only NF grade is for use in drug formulation. Only Food Grade (FG) material is for use as a food additive.

Distributed By:
Univar Canada Ltd.
9800 Van Horne Way
Richmond, BC
V6X 1W5

Prepared By: The Environment, Health and Safety Department of Univar Canada Ltd.
Preparation date of MSDS: 04/Feb/2016
Telephone number of preparer: 1-866-686-4827

24-Hour Emergency Telephone Number (CANUTEC): (613) 996-6666

2. HAZARDS IDENTIFICATION

Potential Acute Health Effects:
Eye Contact: Dust or mist may irritate or burn eyes. Solutions can cause severe eye irritation with tearing, redness, or a stinging or burning feeling. May cause permanent eye damage.
Skin Contact: Repeated or prolonged contact may cause irritation. Solutions are more irritating and may cause burns if not removed from skin promptly.
Inhalation: Contact with acids liberates irritating and potentially fatal sulphur dioxide gas. May cause severe or deadly allergic reactions in some asthmatics and sulfite sensitive individuals. May cause irritation of the respiratory tract. Possible signs and symptoms of allergic reaction include bronchoconstriction, sweating, flushing, hives, rapid heart rate, decreased blood pressure and anaphylaxis.
Ingestion: May result in irritation of the mouth and gastrointestinal tract. Large doses may cause violent colic and diarrhea, circulatory disturbances, central nervous system depression. Sulfite sensitive individuals may experience an allergic reaction with nausea, diarrhea, itching, swelling, hives, acute asthma attack, loss of consciousness or anaphylactic shock.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredients	Percentage (W/W)	LD50s and LC50s Route & Species:
Sodium Metabisulfite 7681-57-4	60-100	Oral LD50 Rat = 1131 mg/kg

Note: Remainder of the ingredients are non-hazardous.

4. FIRST AID MEASURES

Eye Contact: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. Remove contact lenses, if present, after the first five minutes, then continue rinsing. Seek immediate medical attention.
Skin Contact: Flush with large amounts of soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if irritation persists.
Inhalation: Move person to fresh air. If irritation persists, seek medical attention.
Ingestion: If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Seek medical attention immediately.
Notes to Physician: Treatment based on sound judgment of physician and individual reactions of patient.Note potential for anaphylactic shock with allergic individuals.

5. FIRE FIGHTING MEASURES

Flash Point: None.
Flash Point Method: Not applicable.
Autoignition Temperature: Not available.
Flammable Limits in Air (%): Not Available.
Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Exposure Hazards: Emits toxic fumes under fire conditions.
Hazardous Decomposition/Combustion Materials (under fire conditions): Toxic fumes. Sulphur dioxide.
Special Protective Equipment: Fire fighters should wear full protective clothing, including self-contained breathing equipment.
NFPA RATINGS FOR THIS PRODUCT ARE: Not Available.
HMIS RATINGS FOR THIS PRODUCT ARE: Not Available.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures: Wear appropriate protective equipment. Ventilate spill area if possible.
Environmental Precautionary Measures: Prevent entry into sewers or streams, dike if needed.
Procedure for Clean Up: Ventilate area. Pick up solids and put in an appropriate sealed container for later disposal. Cautiously spray residue with plenty of water.

7. HANDLING AND STORAGE

Handling: Avoid contact with eyes, skin and clothing. Avoid breathing in dust. Wash thoroughly after handling. For Food Grade product see following precautions regarding on-board use in preserving shrimp and fish.
On-board ship use of Food Grade material to preserve shrimp and fish:
NEVER apply dry material to shrimp or fish.
ALWAYS prepare and use a solution in a well-ventilation area.
NEVER use below deck or in any confined space such as a hold or cooler. Injury or death may occur. ALWAYS use on deck with plenty of ventilation. Follow mixing and use directions printed on bag.
Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Protect against moisture, water and physical damage. Dry to avoid tendency of product to cake.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:

Localized ventilation should be used to control dust levels. Use in a well ventilated area. Do not use in unventilated spaces, e.g. the holds of fishing boats, walk-in coolers or confined spaces.
Respiratory Protection: For dusty or misty conditions, wear NIOSH-approved dust or mist respirator. Use self-contained breathing apparatus in high vapor concentrations.
Gloves:

Impervious gloves.
Skin Protection: For handling dry material, wear cotton gloves and full work clothing, including long-sleeved shirt and trousers. When handling solutions, wear impervious gloves and an apron. Impervious boots.
Eyes: Safety glasses (with side shields). Do NOT wear contact lenses.
Other Personal Protection Data: Ensure that eyewash stations and safety showers are proximal to the work-station location.

Ingredients	Exposure Limit - ACGIH	Exposure Limit - OSHA	Immediately Dangerous to Life or Health - IDLH
Sodium Metabisulfite	5 mg/m^3 TLV-TWA	5 mg/m^3 TWA	Not Available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid Fine Granular
Color: White
Odor: Pungent Sulphur dioxide.
pH 4.3 (1% solution)
Specific Gravity: 1.48
Boiling Point: Not Available.
Freezing/Melting Point: Decomposes at >150°C
Vapor Pressure: Not Available.
Vapor Density: Not Available.
% Volatile by Volume: Not Available.
Evaporation Rate: Not Available.
Solubility: 39% @ 16°C
VOCs: Not Available.
Viscosity: Not Available.
Molecular Weight: 190.11
Other: Not Available.

10. STABILITY AND REACTIVITY

Chemical Stability: Stable.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Temperatures above 150°C. Cause evolution of toxic and corrosive gas - sulphur dioxide. Heat.
Materials to Avoid: Oxidizing agents. Acids. Water.
Hazardous Decomposition Products: Sulphur dioxide. Sodium sulfide residue.
Additional Information:

Oxidizers may cause strong exothermic reactions. Acids, water and ice yield sulfur dioxide gas, which is toxic and corrosive and potentially deadly.

11. TOXICOLOGICAL INFORMATION

Principle Routes of Exposure

Ingestion: May result in irritation of the mouth and gastrointestinal tract. Large doses may cause violent colic and diarrhea, circulatory disturbances, central nervous system depression. Sulfite sensitive individuals may experience an allergic reaction with nausea, diarrhea, itching, swelling, hives, acute asthma attack, loss of consciousness or anaphylactic shock.
Skin Contact: Repeated or prolonged contact may cause irritation. Solutions are more irritating and may cause burns if not removed from skin promptly.

11. TOXICOLOGICAL INFORMATION

Inhalation: Contact with acids liberates irritating and potentially fatal sulphur dioxide gas. May cause severe or deadly allergic reactions in some asthmatics and sulfite sensitive individuals. May cause irritation of the respiratory tract. Possible signs and symptoms of allergic reaction include bronchoconstriction, sweating, flushing, hives, rapid heart rate, decreased blood pressure and anaphylaxis.
Eye Contact: Dust or mist may irritate or burn eyes. Solutions can cause severe eye irritation with tearing, redness, or a stinging or burning feeling. May cause permanent eye damage.

Additional Information:
Acute Test of Product:
Acute Oral LD50: Not Available.
Acute Dermal LD50: Not Available.
Acute Inhalation LC50: Not Available.

Carcinogenicity:

Ingredients	IARC - Carcinogens	ACGIH - Carcinogens
Sodium Metabisulfite	Group 3	A4

Carcinogenicity Comment: No additional information available.

Reproductive Toxicity/ Teratogenicity/ Embryotoxicity/ Mutagenicity: Not Available.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:

Ingredients	Ecotoxicity - Fish Species Data	Acute Crustaceans Toxicity:	Ecotoxicity - Freshwater Algae Data
Sodium Metabisulfite	32 mg/L LC50 (Lepomis macrochirus) 96 h static	Not Available.	40 mg/L EC50 Desmodesmus subspicatus 96 h 48 mg/L EC50 Desmodesmus subspicatus 72 h

Other Information:
No additional remark.

13. DISPOSAL CONSIDERATIONS

Disposal of Waste Method: Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations.
Contaminated Packaging: Empty containers should be recycled or disposed of through an approved waste management facility.

14. TRANSPORT INFORMATION

DOT (U.S.):
DOT Shipping Name: Not Regulated.
DOT Hazardous Class Not Applicable.
DOT UN Number: Not Applicable.
DOT Packing Group: Not Applicable.
DOT Reportable Quantity (lbs): Not Available.
Note: No additional remark.
Marine Pollutant: No.

TDG (Canada):
TDG Shipping Name: Not Regulated.
Hazard Class: Not Applicable.
UN Number: Not Applicable.
Packing Group: Not Applicable.

14. TRANSPORT INFORMATION

Note: No additional remark.
Marine Pollutant: No.

15. REGULATORY INFORMATION

U.S. TSCA Inventory Status: All components of this product are either on the Toxic Substances Control Act (TSCA) Inventory List or exempt.

Canadian DSL Inventory Status: All components of this product are either on the Domestic Substances List (DSL), the Non-Domestic Substances List (NDSL) or exempt.

U.S. Regulatory Rules

Ingredients	CERCLA/SARA - Section 302:	SARA (311, 312) Hazard Class:	CERCLA/SARA - Section 313:
Sodium Metabisulfite	Not Listed.	Not Listed.	Not Listed.

California Proposition 65: Not Listed.
MA Right to Know List: Listed.
New Jersey Right-to-Know List: Listed.
Pennsylvania Right to Know List: Listed.

Additional Notes: Not Available.

WHMIS Hazardous Class:
D2B TOXIC MATERIALS

16. OTHER INFORMATION

Additional Information: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

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*****END OF MSDS*****

SAFETY DATA SHEET

SOLVENT

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Solvent

PRODUCT DESCRIPTION: Aliphatic hydrocarbon-Mineral Spirits

SUPPLIER: Commercial Oil Company
P (905) 560-3244
F (905) 560-2961
35 Burford Road
Hamilton, Ontario
L8E 3C6

Product and MSDS Information: 1-800-463-1976

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the
Hazardous Products Act

Light distillate-Hydro treated	100%	CAS-64742-47-8	LD50: >5 g/kg oral rat >3 g/kg skin rabbit

SECTION 3. HAZARDS IDENTIFICATION

WHMIS: Class B, Division B: Combustible Liquids
PIN Number: UN 1268

Packing Group III

Primary TDG: Class 3.3

Signal word Warning
Hazard statement Combustible liquid. May cause an allergic skin reaction.

INHALATION: High vapour concentrations are irritating to the eyes, nose, throat and lungs; may cause headaches and dizziness; may be anesthetic and may cause other central nervous system effects. Avoid breathing vapours or mists.
EYE CONTACT: Slightly irritating but will not injure eye tissue.
SKIN CONTACT: Low Toxicity. Frequent or prolonged contact may irritate the skin and cause a skin rash (dermatitis).
INGESTION: Minimal Toxicity. Small amounts of this liquid drawn into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC: Prolonged and repeated exposures of male rats to inhalation of light hydrocarbon vapours in the same boiling range as this material produced kidney disorders and/or damage. These effects were not observed in similar studies with female rats and male and female mice and in limited studies with other animal species and are believed to be unique to the male rat. A number of human studies have not shown clinical evidence of an association between light hydrocarbons exposure and disease. It is highly unlikely that the kidney effects observed in male rats have significant implications for humans exposed at or below the occupational exposure limits.
OCCUPATIONAL EXPOSURE LIMITS: ACGIH Recommends: For Trimethylbenzene, 25ppm (125mg/m3) Manufacturer recommends: 100 ppm based on composition

SECTION 4. FIRST AID MEASURES

INHALATION: In emergency situations use proper respiratory protection to immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.
EYE CONTACT: Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.
SKIN CONTACT: Flush with large amounts of water. Use soap if it is available. Remove severely contaminated clothing (including shoes) and launder before reuse. If irritation persists, seek medical attention.
INGESTION: If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention

SECTION 5. FIRE-FIGHTING MEASURES

Flashpoint and method: 42 deg C TCC
Auto ignition: 229 deg C **Flammable Limits:** 1.1 to 6 % by volume
GENERAL HAZARDS: Combustible Liquid; may form combustible mixtures at or above the flash point. Toxic gases will form upon combustion.
FIRE FIGHTING: Use water spray to cool fire exposed surfaces and to protect personnel. Shut off fuel to fire. Use foam, dry chemical or water spray to extinguish fire. Respiratory and eye protection required for fire fighting personnel. Avoid spraying water directly into storage containers due to danger of boil over. A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.
HAZARDOUS COMBUSTIBLE PRODUCTS: Fumes, smoke and carbon monoxide.

SECTION 6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate Provincial and Federal authorities. In particular, immediate reporting is required for all spills that could reach any waterway, including wetlands and intermittent dry creeks.
LAND SPILL: Eliminate source of ignition. Keep public away. Prevent additional discharge of material; if possible do
so without hazard. Prevent spills from entering sewer watercourses or low areas. Contain spilled liquid with sand or earth. Recover by pumping or using a suitable absorbent. Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse affects of the spill.
WATER SPILL: Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters. Consult an expert on
disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all action necessary to prevent and
remedy the adverse affects of the spill.

PERSONAL PRECAUTIONS: See Section 8

SECTION 7. HANDLING AND STORAGE

HANDLING STORAGE AND SHIPPING: Keep containers closed. Handle and open containers with care. Store in a cool, well-ventilated place away from incompatible materials. Do not handle or store near an open flame, sources of heat, or sources of ignition.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

PERSONAL PROTECTION: The selection of personal protective equipment varies depending upon conditions of use. Where prolonged and/or repeated skin and eye contact is likely to occur, wear safety glasses with side shields, long sleeves, and chemical resistant gloves. Where eye contact is unlikely, but may occur as a result of short and/or periodic exposures, wear safety glasses with side shields. Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.
ENGINEERING CONTROLS: The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumed. Provide mechanical ventilation of confined spaces
SKIN PROTECTION: No special equipment required. However, good personal hygiene practices should always be followed.
EXPOSURE LIMITS: This product does not contain any components which have recognized exposure limits.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Viscosity: 1.18 cST at 25°C
Vapour Pressure: 1.3 kPa at 38°C
Vapour Density (air=1): 4.9
Evaporation Rate: 0.11
Freezing/Melting Point: <-18°C
%Volatile: 100
Appearance: Clear, colourless liquid

SECTION 10. STABILITY AND REACTIVITY

STABILITY: This product is stable. Hazardous polymerization will not occur.
INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID: Strong oxidizing agents.
HAZARDOUS DECOMPOSITION: N/A.

SECTION 11. TOXICOLOGICAL DATA

ORAL TOXICITY
Low Toxicity
DERMAL TOXICITY
Low Toxicity
Frequent or prolonged contact may irritate the skin and cause a skin rash (dermatitis).
INHALATION TOXICITY
Negligible hazard at normal temperatures (up to 38 deg C). Elevated temperatures or mechanical action may form vapours, mists or fumes, which may be irritating to the eyes, nose, throat and lungs. Avoid breathing vapours or mists.
EYE IRRITATION
Slightly irritating but will not injure eye tissue
SKIN IRRITATION
Practically non-irritating. (Primary Irritation index: greater than 0.5 but less than 3). Based on testing of similar products and/or the components.

SECTION 12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: Not established.

SECTION 13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: The product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

SECTION 14. TRANSPORT INFORMATION

PRODUCT LABEL ...Solvent
SHIPPING NAME..... Aliphatic hydrocarbon-Mineral Spirits

SECTION 15. REGULATORY INFORMATION

No information available.

SECTION 16. PREPARATION

USE: CLEANING AND DEGREASING

COMMERCIAL OIL COMPANY
Hamilton, Ontario

Date: Feb. 16, 2016
Prepared by: Operations

The information presented herein has been compiled from sources considered to be dependable and is accurate to the best of Commercial Oil Company's knowledge; however, the Commercial Oil Company makes no warranty whatsoever, expressed or implied, and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.

MATERIAL SAFETY DATA SHEET

SULPHUR

PRODUCT IDENTIFICATION

Chemical Name and Synonyms: Sulphur. Flowers of sulphur.
Chemical Family: Inorganic
Chemical Formula: S
Product Use: Laboratory reagent
Manufacturers Name and Address: Caledon Laboratories Ltd. 40 Armstrong Avenue Georgetown, Ontario L7G 4R9
Telephone No: (905) 877-0101
Fax No: (905) 877-6666
Emergency Telephone No: CANUTEC (613) 996-6666

HAZARDOUS INGREDIENTS OF MATERIALS

Ingredients, %, TLV Units, CAS No: Sulphur, > 99, (TWA) 10 mg/m³ total dust 5 mg/m³ (respirable dust) 10 ppm (H_2S), 7704-34-9

PHYSICAL DATA

Physical State: Solid
Odour and Appearance: Yellow-coloured powder, lumps or crystals. Odourless when pure, but may contain trace amounts of hydrogen sulphide and exude typical rotten egg odour.
Odour Threshold (ppm): Not applicable.
Vapour Pressure (mm Hg): < 0.0001 mm Hg at 20 °C
Vapour Density (Air = 1): Not applicable.
Evaporation Rate: Not available.
Boiling Point (degrees C): 444 °C
Melting Point (degrees C): 117 °C - 121 °C
pH: Not applicable.
Specific Gravity: 1.803 (liquid), 2.040-2.070
Coefficient of Water/Oil distribution: Not available.

SHIPPING DESCRIPTION

UN: 1350
T.D.G. Class: 4.1
Pkg. Group: III

REACTIVITY DATA

Incompatibility with other substances: Will form explosive mixture with oxidizing agents or carbon. Reacts violently with alkalis, chlorates, halogens, carbides, mineral acids. Extremely corrosive to metals when moist. At temperatures > 100 °C, may release hydrogen sulphide.
Reactivity: Avoid excessive heat, sparks, flames and all sources of igntion, all incompatible materials, moisture.

FIRE AND EXPLOSION DATA

Flammability: Combustible. Dust or vapour suspended in air ignites easily and can result in an explosion in confined areas. Flammable/toxic gases form at elevated temperatures.
Extinguishing Media: Dry chemical, CO_2, foam. Water spray or fog. Water or foam may cause frothing, which will blanket and smother the fire. Small fires may be smothered by covering with inert material such as earth, sand. Firefighters should wear self-contained breathing apparatus and protective clothing sufficient to prevent contact. Bunker gear will not be adequate.
Flash Point (Method Used): 207 °C (CC)
Autoignition Temperature: 190 °C (dust in air)
Upper Flammable Limit (% by volume): 1400 g/m³ (for dust)
Lower Flammable Limit (% by volume): 35 g/m³ (for dust)
Hazardous Combustion Products: H_2S, SOx
Sensitivity to Impact: None identified.

TOXICOLOGICAL PROPERTIES AND HEALTH DATA

Toxicological Data:
LD50: (oral, rat) 8,437 mg/kg; (dermal, rabbit) > 2 g/kg; (oral, human) 12 g
LDLO: (oral, human) 500 mg/kg; (oral, rabbit) 175 mg/kg
LCLO: 1000 ppm/10 min (S_2O); 600 ppm/30 min (H_2S) (species not given)
Effects of Acute Exposure to Product:
Inhaled: Low toxicity. Dust may be irritating to upper respiratory tract. Pre-existing respiratory disorders may be aggravated by exposure. H_2S or SO_2, which may be released by heat or chemical reactions, are both very toxic and may cause irritation, respiratory failure, coma and death without any warning odour being sensed.
In contact with skin: Low toxicity. Dust may cause irritation. Pre-existing skin disorders may be aggravated by exposure. Possible skin sensitization. Liquid sulphur causes burns.
In contact with eyes: Dust is an irritant. May cause injury to eye tissue if not promptly removed. Persons with pre-existing sulphur allergies may have more severe reactions to exposure to dust.
Ingested: Low toxicity. Not a normal route of exposure. Lethal dose > 12 g (human). Ingestion would likely cause gastrointestinal irritation, nausea, vomiting.
Carcinogenicity: Not listed by IARC, ACGIH, NTP.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: Not mutagenic in salmonella typhimurium.
Synergistic Products: None known.

PREVENTIVE MEASURES

Engineering Controls: Local exhaust ventilation required.
Respiratory Protection: Dust mask. NIOSH/OSHA approved air-purifying respirator or self-contained breathing apparatus for high or unknown concentrations of sulphur dust, or for fire or spill conditions.
Skin Protection: Impervious gloves (rubber or neoprene). Other protective clothing, sleeves, apron, boots, or coveralls, sufficient to prevent contact.
Other Personal Protective Equipment: Safety shower and eye wash fountain readily available in work area.
Leak and Spill Procedure: Evacuate area. Eliminate all sources of ignition. Cleanup personnel must be thoroughly trained in the handling of hazardous materials, and must wear protective equipment and clothing sufficient to prevent any contact or inhalation. Use proper grounding procedures to avoid static charge buildup. Gather up carefully using a natural fiber broom and/or aluminum shovel to reduce sparking. Be careful not to create dust as an explosion could result. Transfer carefully into container and arrange removal by disposal company. Wash site of spillage thoroughly with detergent and large amounts of water.
Waste Disposal: Dispose of in compliance with local, provincial and federal regulations.

Caledon Laboratories, Ltd. believes that the information contained herein is reliable and accurate. Caledon makes no warranty thereto, and expressly disclaims all liability for reliance thereon. Such information is solely for your consideration, investigation, and verification.

Handling Procedures and Equipment: Combustible. Workers using this chemical must be properly trained in its hazards and its safe use. Wear appropriate protective clothing and equipment. Use approved combustible solid storage containers in the work area. Ground and bond equipment and containers to prevent a static charge buildup. Use non-sparking tools. Keep away from combustible materials, excessive heat, and ignition sources. Post NO SMOKING signs. Avoid generating dust or vapours. Avoid contact. Avoid inhalation. Use the smallest amount possible for the purpose in an area with adequate ventilation. Maintain good housekeeping procedures to avoid accumulation of dust. Keep well away from combustible and incompatible materials. Keep containers tightly closed. Empty containers may contain hazardous residues; treat with caution.

Storage Requirements: Store in cool, dry, well-ventilated area, out of direct sunlight, and away from heat or ignition sources and incompatible materials. Store away from incompatible materials and sources of ignition. Use grounded, non-sparking ventilation systems and electrical equipment. Keep containers tightly closed. Protect from damage.

FIRST AID MEASURES

Specific Measures:

Eyes: Flush eyes thoroughly with gently running water for at least fifteen (15) minutes, holding eyelids open while flushing. Do not allow victim to rub eyes. Avoid flushing contaminated water into unaffected eye. Get medical attention.

Skin: Remove contaminated clothing. Wash affected areas with soap and running water for at least fifteen (15) minutes. If irritation persists, get medical attention. Launder clothing before reuse, or discard.

Inhalation: Remove to fresh air. Give oxygen and get medical attention for any breathing difficulty. If breathing has stopped, give artificial respiration. If breathing and pulse are absent begin CPR. Get medical attention immediately.

Ingestion: Not a normal route of exposure. If large amounts are ingested, and if victim is alert and not convulsing, give 1 to 2 glasses of water to drink and get medical attention.

REFERENCES USED

Budavari: The Merck Index, 12th ed., 1997

Royal Society of Chemistry: Chemical Safety Data Sheets, Vol. 5, 1992

Sax, Lewis: Hawleys Condensed Chemical Dictionary, 11th ed., 1987

Suppliers Material Safety Data Sheets:

ADDITIONAL INFORMATION

Date Issued: 25-Nov-91

Revision: Apr 2015

Proposed WHMIS Designation: B4; D2B

Prepared by: Caledon Laboratories Ltd. (905) 877-0101

Caledon Laboratories, Ltd. believes that the information contained herein is reliable and accurate. Caledon makes no warranty thereto, and expressly disclaims all liability for reliance thereon. Such information is solely for your consideration, investigation, and verification.

Appendix B. Expected Hazardous Materials Transported, Stored and Used On-site

Hazardous Material Types, Source, Quantities Generated, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies

Type	Source	Estimated Quantity Used/Generated by Project Phase	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Fuels and both new and used Petroleum Products (oils / lubricants / greases / hydraulic fluids)	Vehicles and equipment including generators and pumps	Construction 167 t/a Operations 627 t/a Closure 63 t/a	Goose Property and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake hydrocarbons in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Spill Response Procedures (safety procedures, initial assessment, spill report, containment, storage, and disposal) will be employed. When possible waste oil will be used in incinerators or designated used-oil heaters. Waste oil may be collected and stored in empty bulk lubricant cubes to be stored in the designated hazardous waste section of the waste storage facility with secondary containment. Contaminated snow/water will be stored in clearly-marked, sound, sealed containers in the laydown yard and may be shipped off-site to an appropriate facility. Bioremediation may be considered for contaminated soil.
Used Oil and Fuel Filters	Vehicles and equipment	Construction 13 t/a Operations 39 t/a Closure 4 t/a	Goose Property and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Waste oil and fuel filters will be drained in a heated and ventilated section of the maintenance shop. Filters will then be crushed to minimize volume and release any additional oil. This area of the maintenance shop will adhere to Sabina's Spill contingency plan and have a liner or tray to catch any spills or splashes. The filters will be placed in sealed containers and labelled and stored at the waste management facility. These containers may be shipped off-site to a registered hazardous waste receiver. Bioremediation of contaminated soils and treatment of contaminated water, snow and ice (see LWMP).
Used Sorbents and Rags	Used in the maintenance of vehicles, equipment and spill control	Construction 2 t/a Operations 6 t/a Closure <1 t/a	Goose Property and MLA	Petroleum products can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Where possible, used rags and sorbents will be incinerated on-site. If incineration is not practical, used sorbents and rags will be stored in clearly-marked, sound, sealed containers in the laydown yard and then shipped off-site to a registered hazardous waste receiver.
Empty Petroleum Hydrocarbon Containers and Drums	Packaging for oils, solvents and penetrating oils	Construction 8 t/a Operations 28 t/a Closure 3 t/a	Goose Property and MLA	Petroleum products may accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once in the environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Micro-organisms in soil degrade hydrocarbons, sometimes at the expense of plant nutrition. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Sabina and its contractors will purchase these items in bulk to minimize the amount of packaging. Empty containers will be backhauled to the original supplier or a licensed recycling facility.
Glycol	Used as a coolant, capturing waste heat from generators, and antifreeze in equipment	Construction 9 t/a Operations 33 t/a Closure 3 t/a	Goose Property and MLA	Glycol's odour is a known wildlife attractant. Glycol can have toxic effects on aquatic organisms and wildlife.	Environmentally benign glycols will be used where practical. Equipment will be regularly maintained to prevent spills from ruptured glycol lines. Waste glycol will be stored within secondary containment within the waste storage facility in clearly marked, sound, sealed containers. These containers may be shipped off-site to a registered hazardous waste receiver. Unused glycol in the original containers may be returned to the manufacture for disposal or reuse at closure.

(continued)

Hazardous Material Types, Source, Quantities Generated, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies (continued)

Type	Source	Estimated Quantity Used/Generated by Project Phase	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Ammonium nitrate	Stored in 207 ISO containers	Construction and Operations 3,900 t/a (consumed)	Goose Property and MLA	If mixed with water, the resultant runoff may be acutely toxic to fish. Will also cause harm to vegetation if spilled.	**Transport** Certified and authorized Sabina employees or contractors will mix AN with FO at the on-site AN Facility or on a bulk ANFO truck at the blast hole. All explosives will be transported to site in dedicated containers; secondary containment will be used as required. Only qualified personnel holding valid blasting certificates shall handle these materials. Spills will be contained, cleaned up, and placed in suitable containers for use or disposal. All reportable spills will be reported to the spill response coordinator. Containers and equipment shall be inspected prior to use transporting explosives products on or between Project sites **Storage** All explosives will be stored only at safe distances from facilities or personnel. Explosives will be stored in a designated location within the explosives storage area and away from the explosive caps / detonator storage magazines. The magazines will be dedicated to storing high energy explosives and blasting caps. Explosives will be handled and managed only by suitably qualified employees trained in safe handling procedures and applicable legislation and regulations. Mine personnel involved in explosives spill response will have explosives training. Explosives stored in magazines will be clearly labelled. Spills shall be contained and placed in suitable containers for use or disposal. All reportable spills will be reported to a spill response coordinator. Access will be controlled to the AN Facility and explosives storage locations. Access to the explosives plant will be restricted to authorized personnel and log books shall be kept in each magazine for tracking purposes. **Blasting** Only certified and authorized mine employees or contractors will charge the holes, place the detonators and boosters, and tie-in the patterns. All blasting will follow applicable legislation such as DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (DFO 1998). The Air Quality Monitoring and Management Plan will be followed to reduce or eliminate impacts from air. Wet blast holes will be lined with plastic liners prior to being loaded with ANFO. Packaged explosives will used as a backup to ANFO for situations when blast holes cannot be lined. Sleep time in loaded blastholes will be limited to minimize contact between ANFO and water Spills shall be contained, cleaned up, and placed in suitable containers for use or disposal. All spills will be reported to a spill response coordinator. The mine shall record daily use of explosives. Records will be checked and reconciled on a regular basis. Explosives identified as deteriorated or damaged will be destroyed or disposed of; the supplier shall be consulted on the appropriate handling and disposal. Contact water will be managed in accordance with the Site Water Monitoring and Management Plan. **Disposal** All explosives will be removed from site or disposed of at closure. Explosives will be secured and stored safely or disposed of in case of temporary closure. All explosives will be disposed of according to the SDS or manufacture. Spills will be contained, cleaned up, and placed in suitable containers for use or disposal. All spills will be reported to the spill response coordinator.

(continued)

Hazardous Material Types, Source, Quantities Generated, Potential Environment Effects, and Waste Management and Pollution Prevention Strategies (completed)

Type	Source	Estimated Quantity Used/Generated by Project Phase	Project Location Generated	Potential Environmental Effects	Waste Management and Pollution Prevention Strategies
Reagents	Additives required for mine processing and laboratory testing	Operations ~9,700 t/a (consumed) Closure <100 kg/a	Goose Property and MLA	Lab and processing reagents (hydrated lime, sodium cyanide, activated carbon, sodium hydroxide, hydrochloric acid, sulphur, copper sulphate, MBS, flocculant, and antiscalant) may enter the environment from spills and leaks from containers, process equipment or from improper storage. Once in the environment, some may cause harm to the terrestrial and aquatic ecosystem by entry of deleterious and other polluting substances (e.g., cyanide).	Spill prevention procedures will be developed. Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal). Spent reagents will be collected and stored in clearly-marked, sound, sealed empty bulk containers. Containers will be stored in the designated hazardous waste section of the waste storage facility. Reagents may be shipped off-site to a registered hazardous waste receiver Unused reagents will be sent back to the manufacture as required in original containers at closure. Management of cyanide-containing materials (sodium cyanide reagent, residual cyanide in process water) described in stand-alone management plan, presented as Appendix A of the HMMP.
Solvents	Used to degrease machinery in the maintenance shop	2000 L/a Construction / Operations / Closure	Goose Property and MLA	Petroleum fuels can accumulate on the surface of waterbodies or may sink to the bottom. Fish can uptake petroleum hydrocarbons once it is in their environment. Feeding and reproduction of aquatic life (e.g., fish, plants, and insects) may be affected. Petroleum products can damage the respiratory system if aspirated and be toxic if ingested.	Low toxicity solvents and physical cleaning (e.g., steam jet) will be used where practical. Petroleum-based solvents will not be allowed into the environment and will be subject to the spill response plan. Waste or excess solvents will be stored in the waste storage facility in clearly marked, sound, sealed containers. These containers may be shipped off-site to a registered hazardous waste receiver. Unused solvents in the original containers may be returned to the manufacturer for disposal or reuse at closure.
Paints		100 L/a Construction /Operations /Closure	Goose Property and MLA		When feasible, latex paints will be used on site. Latex paints should be collected in a covered area and opened to dry. Unused full containers of paint will be returned to the manufacturer, if possible. Paint containing hazardous materials, that cannot be used will be sealed and shipped off site to a registered hazardous waste receiver.
Fluorescent Light Tubes	Indoor lighting	<1 t/a Construction / Operations /Closure	Goose Property and MLA	Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium.	Lights should be equipped with motion sensors to reduce usage where practical. Discarded fluorescent lights will be consolidated together and stored indoors in the waste storage facility in their original packaging. Fluorescent light tubes may be shipped off-site to a registered hazardous waste receiver.
Electronics and Electrical Materials	Electrical devices that cannot be repaired and cannot be recycled	<1 t/a Construction /Operations /Closure	Goose Property and MLA	Electrical waste and devices may or may not contain polluting substances (such as mercury, lead, arsenic, cadmium, and polyvinyl chloride (PVC) that could enter the ecosystem.	Sabina's environment staff will determine the risk of electronic devices and classify them as hazardous or non-hazardous waste and determine the appropriate method of recycling/ disposal.
Equipment Batteries	Equipment batteries	4 t/a Construction/ Operations /Closure	Goose Property and MLA	Lead batteries (i.e., vehicle batteries) contain sulphuric acid and lead harmful to environmental receptors. Rechargeable batteries (i.e., industrial forklift, radio and transmitter batteries) usually contain either potassium hydroxide or nickel cadmium with toxic effects.	Protect and service batteries to prevent damage and loss of charge. Test batteries prior to disposal to confirm the battery is spent. All batteries will be shipped off-site to a recycling facility or a registered hazardous waste receiver.
Biomedical Waste	Small amounts of medical waste from First Aid (e.g., syringes, used medical supplies)	<100 kg/a Construction /Operations /Closure	Goose Property and MLA	May be sharp or may contain bacteria and viruses which can be a risk to human or wildlife health.	Written procedures will be developed and implemented regarding the handling, storage, transport and disposal of biomedical waste, consistent with the Nunavut guideline (GN, 2014). Pollution prevention strategies include training staff in the adopted procedures for handling of biomedical waste; permitting only trained workers to handle biomedical waste; appropriate segregation and disposal of biomedical wastes separate from generate garbage and according to the type of biomedical waste; using appropriate containers for safe storage of biomedical wastes (e.g., sharps containers for used needles and other sharps); appropriately labelling biomedical waste in accordance with WHMIS requirements; record keeping; use of appropriate personal protective equipment (PPE); waste transport in accordance with applicable regulations; and final disposal at a registered hazardous biological waste receiver. Medical waste will not be incinerated on-site as it poses a handling risk from sharps for the incinerator operator and workers collecting waste.
Aerosol Cans		<100 kg/a Construction /Operations /Closure	Goose Property and MLA		Pressurized aerosol cans will be punctured on site and landfilled.
Kitchen grease	Camp kitchens	40 t/a Construction /Operations /Closure	Goose Property and MLA		Collected in sealed containers and incinerated or shipped offsite for disposal.

Notes: Goose = Goose Property, MLA = Marine Laydown Area

Appendix C. Sabina Internal Report Form

SABINA INTERNAL SPILL REPORT FORM

This form is to be used for internal documentation of spills of any petroleum product, chemical, ethylene glycol (antifreeze), or other hazardous material. See recent Spill Contingency Plan for reporting thresholds and structure. Once complete file with the Operations Superintendent.

***Report Date and Time*:**	***Spill Date and Time*:** ☐ Spill occurred ☐ Spill observed
***Spill Location*:** ☐ Goose ☐ Marine Laydown Area ☐ George ☐ Other (e.g. Drill, Boulder Pond)	***Describe Location*:**
***Coordinates (Lat/Long or UTM)*:**	

***Product(s) Spilled*:**	Jet fuel	Diesel (P50)	Gasoline	AvGas	Oil (type)	Antifreeze	Other (describe)
***Quantity (L or kg)*:**							

Personnel Involved:	☐ Sabina	☐ Contractor	☐ Visitor	☐ Other

***Cause of Spill*:**
***Containment/Cleanup Measures Taken*:**
***Factors Affecting Spill or Recovery (weather, snow, ground conditions, etc.)*:**
***Additional Action Required*:**
***Additional Comments*:**

	Name	***Employer***	***Signature***
***Reported by*:**			
***Reported to*:**			

Appendix D. NWT-NU Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-_____
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS

F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION	
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION	
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

6. OIL POLLUTION EMERGENCY PLAN (REVISED)

BACK RIVER PROJECT
Oil Pollution Emergency Plan

July 2016

BACK RIVER PROJECT
OIL POLLUTION EMERGENCY PLAN

Table of Contents

Table of Contents i
List of Figures iii
List of Tables iii
List of Annexes iv

Acronyms v

Oil Handling Facility Declaration vii

Preamble ix

Sustainable Development Policy xi

1. Introduction 1-1

2. Scope and Objectives 2-1
2.1 Related Plans and documents 2-1

3. Applicable Legislation and Guidelines 3-1

4. Planning Standards 4-1
4.1 Facility Category 4-1
4.2 General Planning Guidelines 4-1
4.2.1 Response Time Standards 4-2
4.2.2 On-water Recovery 4-2
4.2.3 Dedicated Facility Spill Response Equipment 4-2

5. Marine Laydown Area – Oil Handling Facility 5-1
5.1 General Overview and Site Description 5-1
5.2 Oil Handling Facility and Infrastructure 5-1
5.3 Bathurst Inlet Physical Environment and Sensitivities 5-2
5.3.1 Inlet and Approaches 5-2
5.3.2 Marine Laydown Area-Oil Handling Facility Area 5-2
5.3.3 Bathymetric and Marine Data 5-2
5.3.4 Meteorological Data 5-3
5.3.5 Ice Conditions 5-3
5.3.6 Sensitivities 5-4
5.3.6.1 Marine Birds 5-5

5.3.6.2 Marine Mammals 5-5
5.3.6.3 Marine Fish 5-6
5.3.6.4 Summary of Sensitivities 5-7

6. Site Activities 6-1
6.1 Bulk Oil Transfer, Ship to Shore 6-1
6.2 Other Marine Laydown Area-Oil Handling Facility Operations 6-1

7. General Response to Marine Spill Emergencies 7-1
7.1 Levels of Emergency 7-1
7.2 Response Management Structure 7-1
7.3 Emergency Response Team 7-3
7.4 Equipment and Personal Protection 7-3
7.5 Communication 7-3
7.5.1 Hand-held Radio Communication 7-3
7.5.2 Telephone Communication 7-3
7.6 Communication with the Public 7-4
7.7 Multiple Emergency Events 7-4

8. Roles and Responsibilities 8-1
8.1 Emergency Response Coordinator 8-1
8.2 Environment Superintendent 8-1
8.3 Incident Commander 8-2
8.4 Emergency Medical Personnel 8-3
8.5 Security 8-3
8.6 Environmental Coordinator 8-4
8.7 Safety Coordinator 8-4
8.8 Team Leaders - Emergency Response Team 8-4

9. General Spill Procedures 9-1
9.1 Health and Safety 9-2
9.1.1 Personal Protective Equipment – Requirements 9-3
9.2 Coordination with Canadian Coast Guard and other Governmental agencies 9-3
9.2.1 Canadian Coast Guard 9-3
9.2.2 Environnent Canada – National Environnemental Emergencies Centre 9-4
9.2.3 Other Governmental Agencies 9-4
9.3 Reporting Requirements 9-4
9.3.1 Canadian Coast Guard Reporting Requirements 9-4
9.3.2 Reporting to Transport Canada 9-5
9.3.3 Government of Nunavut Reporting Requirements 9-5
9.4 Wildlife Protection Procedures 9-6
9.5 Treatment and Disposal 9-7

10. Spill Scenarios and Response Strategies 10-1

10.1 Response Strategies – Large Spills 10-5

11. Preventive Measures 11-1

11.1 Training - General 11-1

11.1.1 Training Content 11-1

11.1.2 Short Notice Training 11-2

11.2 Exercises 11-2

11.3 Spill Prevention Measures 11-3

11.3.1 Oil Handling Facility 11-3

11.3.2 Bulk Fuel Transfer 11-3

11.4 Response Equipment Auditing 11-3

11.5 Oil Pollution Response Plan Updates 11-4

11.5.1 Update Registry 11-4

11.5.2 Plan Distribution 11-4

12. References 12-1

List of Figures

FIGURE **PAGE**

Figure 7.2-1. Marine Spill Response Organizational Chart 7-2

List of Tables

TABLE **PAGE**

Contact Information of Sabina Personnel with Authority to Implement the OPEP viii

Table 3-1. Legislation Applicable to the Oil Pollution Emergency Planning 3-1

Table 7.2-1. Sabina Gold & Silver Corp. Emergency Management Team Contacts 7-1

Table 9.4-1. Emergency Contacts in Case of Spills Affecting Wildlife 9-7

Table 10-1. Ship to Shore Fuel Spill Response Scenario Actions and Resources Required 10-3

Table 10-2. Oil Handling Facility Spill Response Scenario Actions and Resources Required 10-5

List of Annexes

Annex 1. Site Overview Plan

Annex 2. Oil Handling Facility Overview

Annex 3. Sensitivity Zones

Annex 4. Resident Spill Response Equipment

Annex 5. Bulk Cargo Transfer Procedures

Annex 6. Spill Response Equipment - Onboard Ship

Annex 7. Training Register and Exercise Documentation

Annex 8. Material Safety Data Sheets

Annex 9. Transport Canada – TP-9834E – "Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants"

Acronyms

CSA	Canada Shipping Act
CCME	Canadian Council of Ministers of the Environment
ECCC	Environment Climate Change Canada
ERC	Emergency Response Coordinator
ERT	Emergency Response Team
INAC	Indigenous and Northern Affairs Canada
KIA	Kitikmeot Inuit Association
MLA	Marine Laydown Area
OHF	Oil Handling Facility
OPEP or Plan	Oil Pollution Emergency Plan
PPE	Personal Protective Equipment
Project	Back River Project
Sabina	Sabina Gold & Silver Corp.
SCP	Spill Contingency Plan
UTM	Universal Transverse Mercator
WHMIS	Workplace Hazardous Materials Information System

Oil Handling Facility Declaration

Pursuant to paragraph 168(1) (b) of the *Canada Shipping Act, 2001*, Sabina Gold & Silver Corp. declares that:

(a) to comply with the regulations made under paragraph 182(a) of the *Canada Shipping Act, 2001*, on the detection of an oil pollution incident that arises out of the loading or unloading of oil to or from a ship, the measures as outlined in the Back River Project, Marine Laydown Area - Oil Handling Facility, Oil Pollution Emergency Plan shall be implemented.

(b) ~~in accordance with paragraph 168(1)(a) of the *Canada Shipping Act, 2001*, I have an arrangement with the certified response organization known as *~~

~~(Name of response organization)~~

~~The arrangement is with respect to _____ tonnes of oil~~
~~(Number of tonnes)~~

~~and in respect of _____~~
~~(Geographic location of the oil handling facility)~~

*** NOTE: In accordance with paragraph 168(2) of the *Canada Shipping Act, 2001*, the requirements under paragraph 168(1)(a) and 168(1)(b)(ii) do not apply.**

(c) ~~the persons listed below are authorized to implement the arrangement described in paragraph (b):**~~

**** NOTE: In accordance with paragraph 168(2) of the *Canada Shipping Act, 2001*, the requirements under paragraph 168(1)(b)(iii) do not apply in respect to the arrangement described in paragraph (b).**

(d) the persons listed below are authorized to implement the oil pollution emergency plan required by paragraph 168(1)(d) of the *Canada Shipping Act, 2001*:

Date: October 31, 2015

Sabina Gold & Silver Corp. _____ Matthew Pickard, Vice President, Environment & Sustainability

Contact Information of Sabina Personnel with Authority to Implement the OPEP

Role	Primary	Alternate
Emergency Response Coordinator		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Incident Commander		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Environmental Superintendent		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Safety Superintendent		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Environmental Coordinator		
Phone:	TBA	TBA
Alternate Phone:		
Email:		

** Will be completed once a construction decision is made.*

Preamble

This Oil Handling Facility, Oil Pollution Emergency Plan for the Back River Project Marine Laydown Area - Oil Handling Facility shall be in effect at the commencement of operations of the Oil Handling Facility currently planned for Q3 of Year -3.

Formal distribution of the Plan shall be made to:

Transport Canada
Box 8550
344 Edmonton Street (RMW)
Winnipeg, Manitoba, R3C 0P6

Additional copies and updates of this Plan may be obtained from:

Sabina Gold & Silver Corp.
202 - 930 West First Street
North Vancouver, BC, V7P 3N4
Tel: 604-998-4186

Or:

Navenco Marine Inc.
Attn: Todd Mitchell
350 boul. Ford, Suite 130
Chateauguay, QC, J6J 4Z2
Tel: (450) 698-2810
info@navenco.com

Sustainable Development Policy

Sabina Gold & Silver Corp. regards itself as a responsible explorer and mineral developer. We are committed to fostering sustainable development throughout all stages of our activities. We constantly strive to conduct our operations in a manner that balances the social, economic, cultural and environmental needs of the communities in which we operate. To build on this commitment Sabina will:

- Meet or strive to exceed all relevant legislated sustainable development requirements in the regions where we work.
- Ensure appropriate personnel, resources and training is made available to implement our sustainable development objectives.
- Establish clear lines of responsibility and accountability throughout the Company to meet these objectives.
- Implement proven management systems and procedures to facilitate our sustainable development objectives. A priority will be placed on developing and implementing management structures related to the environment, health and safety, emergency response and stakeholder engagement.
- Act as responsible stewards of the environment for both current and future generations. We will make use of appropriate assessment methodologies, technologies and controls to minimize environmental risks throughout all stages of mineral development.
- Work closely with local communities and project stakeholders to understand their needs, address their concerns and provide project-related benefits to create win-win relationships. Our goal is to earn and maintain a social licence to operate at all our operations while building partnerships.
- Pursue economically feasible projects in order to generate shareholder profitability and support long-term positive socio-economic development in the regions where we work.
- Utilize a precautionary approach as it applies to potential effects from our activities. Work with employees, contractors and stakeholders to promote a culture of open and meaningful dialogue to ensure that any known or suspected departures from established protocols are reported to management in a timely manner.
- Regularly review this policy to ensure it is consistent with Sabina's current activities and the most recent legislation.
- Continually improve our performance and contributions to sustainable development including pollution prevention, waste minimization and resource consumption.
- Implement programs at each of our operations to monitor and report compliance and proactively address potential deficiencies in our policies and procedures.

The objectives of our sustainable development policy cannot be accomplished without the active involvement and commitment of many dedicated individuals. As such, we will regularly communicate this policy and its outcomes to our employees, contractors and relevant stakeholders. Together, we can foster a culture of sustainable development at Sabina.

1. Introduction

Sabina Gold & Silver Corp. (Sabina) is proposing two main areas of development as part of the Back River Project (the Project). These two main areas will be interconnected with winter ice roads: Goose Property and the Marine Laydown Area (MLA) situated along the western shore of southern Bathurst Inlet. Refer to base Figures 1 to 5 for general site layout and locations. A detailed project description is provided in the Main Application Document. This Oil Pollution Emergency Plan (OPEP or Plan) applies to the Project and specifically the Oil Handling Facility (MLA-OHF).

The OPEP was developed to specifically assist in implementing measures to protect the marine environment and minimize impacts from potential spill events.

The Plan was prepared following Transport Canada Oil Handling Facilities Standards TP12402 consistent with the legislative requirements of the Response Organizations and Oil Handling Facilities Regulations enabled by the *Canada Shipping Act*.

This Plan is a living document to be updated upon changes in related regulatory requirements, management reviews, incident investigations, changes to facility operation or maintenance, and environmental monitoring results, best practice updates or other Project specific protocols once construction starts through to Project closure activities. Any updates will be filed with the Annual Report submitted under the Type A Water Licence.

The information presented herein is current as of July 2016. At this stage, certain aspects of the OPEP remain conceptual. The next update will likely be based on detailed engineering design prior to the start of construction, incorporating construction engineering drawings of facilities and associated fuel management infrastructure. The Plan will be reviewed as needed for changes in operation and technology and as directed by Transport Canada or other regulatory authorization where appropriate. Completion of the updated Plan will be documented through signatures of the personnel responsible for reviewing, updating, and approving the Plan.

A record will document all significant changes that have been incorporated in the Plan subsequent to the latest review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Sabina will maintain a distribution list providing contact details for all parties to receive the Plan including key personnel, contractors, organizations, and external agencies.

2. Scope and Objectives

The Oil Pollution Emergency Plan is one of the documents that forms part of Sabina's overall Emergency Response Program for the Project. This Plan has been written to meet requirements of a Type A Water Licence and applies to all Sabina projects in the Kitikmeot region.

The OPEP outlines potential spill scenarios, and provides specific procedures for responding to spills while minimizing potential health and safety hazards and environmental damage. It provides instructions to guide all personnel in emergency spill response situations, defines the roles and responsibilities of management and responders and outlines the measures taken to prevent spills, the related exercise and evaluation programme, and the mechanism for regular updates to the Plan.

This Plan is divided into the following components:

- Applicable Legislation and Guidelines (Section 3);
- Planning Standards (Section 4);
- Marine Laydown Area- Oil Handling Facility (Section 5);
- Site Activities (Section 6);
- General Response to Marine Spill Emergencies (Section 7);
- Roles and Responsibilities (Section 8);
- General Spill Procedures (Section 9);
- Spill Scenarios and Response Strategies (Section 10); and
- Preventative Measures (Section 11).

2.1 RELATED PLANS AND DOCUMENTS

Documents within the Application for the Type A Water Licence, which support this Plan include the following:

- Risk Management and Emergency Response Plan;
- Spill Contingency Plan;
- Fuel Management Plan;
- Landfarm Management Plan;
- Hazardous Materials Management Plan;
- Explosives Management Plan (FEIS Volume 10, Chapter 13);
- Occupational Health and Safety Plan (FEIS Volume 10, Chapter 15);
- Shipping Management Plan (FEIS Volume 10, Chapter 15); and
- Shipboard Oil Pollution Emergency Plan (to be provided in the future by Shipping Company).

Spills of all types, both marine and land based are addressed in the Project Spill Contingency Plan (SCP) which is a separate document. The SCP addresses a wider scope of operations and includes storage areas

other than the MLA-OHF. The SCP also addresses other materials including soluble solids such as ammonium nitrate prill, liquids such as glycols and paints, corrosive liquids including sulphuric acid and sodium cyanide, compressed (inert and flammable) gas, and other hazardous substances.

The MLA-OHF OPEP has been designed specifically to compliment the Project, SCP document. The Plan is not to be construed as to supersede existing emergency response plans, rather it is conceived to address the specifics of the fuel storage facility, the bulk incoming transfer of fuel and spill scenarios directly relating to this operation.

3. Applicable Legislation and Guidelines

The *Canada Shipping Act*, 2001*,* stipulates that operators of designated oil handling facilities must have an on-site oil pollution emergency plan.

Additional legislation, regulations and guidelines applicable to oil pollution and emergency planning in Canada, and specifically within Nunavut, are summarized in Table 3-1.

Table 3-1. Legislation Applicable to the Oil Pollution Emergency Planning

Acts	Regulations	Guidelines
Federal		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c.A-12)	Arctic Shipping Pollution Prevention Regulations (C.R.C., c. 353)	
Canada Shipping Act(2001)*	Response Organizations and Oil Handling Facilities Regulations (SOR/95-405) Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69)	Oil Handling Facilities Standards (TP12402)
Canadian Environmental Protection Act (R.S.C.1999 c.33)	Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197) Environmental Emergency Regulations (SOR/2003-307) Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301) Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149)	Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (Canadian Council of the Ministers of Environment (CCME) 2003) Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (CCME 2008)
Fisheries Act (1985, c.F-14)		
Explosives Act (1985, c.E-17)	Ammonium Nitrate and Fuel Oil Order (C.R.C., c.598) Explosives Regulations (C.R.C., c.1516)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002)	Nunavut Water Regulations (2013)	
National Fire Code of Canada (2010)		
Transportation of Dangerous Goods Act (1992, C.34)	Transportation of Dangerous Goods Regulations (SOR/2001-286)	2016 Emergency Response Guidebook (Transport Canada and U.S. Department of Transportation 2016)
Territorial Lands Act (R. S. 1985, c.T-7)	Northwest Territories and Nunavut Mining Regulations (C.R.C., c.1516)	

(continued)

Table 3-1. Legislation Applicable to the Oil Pollution Emergency Planning (completed)

Acts	Regulations	Guidelines
Hazardous Products Act *Nunavut Act* (1993 c.28)	*Controlled Products Regulations*	*Workplace Hazardous Materials Information System (WHMIS)*
Territorial – Nunavut		
Environmental Protection Act	Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93) Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003) The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment (DOE) as a waste generator as well as carrier (if applicable) prior to transport	Government of Nunavut (GN) Environmental Guidelines for the Management of: o General Management of Hazardous Waste in Nunavut (GN 2010a) Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil (CCME 2008)
Mine Health and Safety Act (SNWT (Nu) 1994, c.25)	Mine Health and Safety Regulations (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1998, c.W-6)	Workers' Compensation General Regulations (Nu Reg 017-2010)	
Explosives Use Act (RSNWT (Nu) 1988, c.E-10)	Explosives Regulations (RRNWT (Nu) 1990, c.E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c.F-6)	Fire Prevention Regulations (RRNWT (Nu) 1990, c.F-12)	
Safety Act (RSNWT 1988, c.S-1)	General Safety Regulations (RRNWT (Nu) 1990, c.P-16) Work Site Hazardous Materials Information System Regulations (RSNWT 1988, c.81 (Supp))	
Transportation of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c.81 (Supp))	Transportation of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91)	

** The MLA-OHF, OPEP takes into account the requirements of the Canada Shipping Act, 2001, part 8, subsections 168. (1), 168. (2) and 168. (3). Although the subsection 168 (2) is applicable, as the MLA-OHF site is located North of 60', therefore the subsections 168. (1) (a), 168. (1) (b) (ii), and 168. (1) (b) (iii) do not apply.*

4. Planning Standards

In the preparation of the OPEP, the standards as outlined in the Oil Handling Facility standards, TP 12402 have been employed.

4.1 FACILITY CATEGORY

Based on the expected upper ship to shore pumping rate of up to 450 cubic metres per hour (m^3/hr), the MLA-OHF is classified as a Level 2 facility. Spill scenarios have been developed and are outlined in Section 10 of this Plan. As a scenario addressing a possible 5 cubic metres (m^3) spill exists, the minimum size of an oil pollution incident for which a response is described in this OPEP is 5 m^3.

4.2 GENERAL PLANNING GUIDELINES

Beyond the requirements of the *Canadian Shipping Act* (CSA) and the Oil Handling Facilities Standards, Sabina recognizes the unique nature of the geographical location and the challenges inherent in mounting a response to a pollution incident.

All spill contingencies for Bathurst Inlet must take into consideration the diverse elements that might define, simplify or even reduce the possibility of taking action. The harsh climate, the remoteness, transportation difficulties (for personnel and goods), limited availability of manpower in case of oil spills, and the lack of infrastructure in case of a fire are all elements that can limit the response to take in this type of situation. Air transportation is the only transportation on a regular basis but weather conditions may not be favourable, rendering a quick response difficult.

In the preparation of this Plan, existing documents relating to the site specifications (physical, natural and social conditions) have been utilized. In the preparation of the final Plan and related SCP, extensive consultations with local authorities shall be undertaken, with the goal of a cooperative response as an important part of an incident.

To specifically address the CSA and Oil Handling Facilities Standards, spill scenarios have been developed, taking into consideration among various factors the following:

1. The nature of the oil product in respect of which the scenario is developed.
2. The types of ships that are unloaded at the facility.
3. The tides and currents that prevail at the facility.
4. The meteorological conditions that prevail at the facility.
5. The surrounding areas of environmental sensitivities that would likely be affected by an oil spill.
6. The measures that will be implemented to minimize an oil pollution incident.
7. The time within which an effective response to an oil pollution incident can be carried out.

Several priorities have also been identified among which include:

1. The safety of the facility's personnel.
2. The safety of the facility.

3. The safety of the communities living adjacent to the facility.
4. The prevention of fire and explosion.
5. The minimization of the oil pollution incident.
6. The notification and reporting of the oil pollution incident.
7. The environmental impact of the oil pollution incident.
8. The requirements for cleaning up the oil pollution incident.

4.2.1 Response Time Standards

The operations and response structure at the MLA-OHF have been designed so that a rapid response to a spill incident can be carried out. All equipment and resources are strategically placed near the beach front, directly at the MLA. Responders, workboats, and other support equipment are on standby during all facility operations. The deployment of equipment and resources required to contain and control the oil, or where the oil cannot be contained, to control the quantity of oil involved in the incident, up to the required minimum spill size of 5 m^3 as determined in accordance with Section 2 of the Oil Handling Facilities Standards, shall be on site and deployed on scene within 1 hour after the discovery of the oil pollution incident, unless deployment would be unsafe.

The equipment and resources required to recover and clean up the oil involved in the incident, up to the required minimum spill size of 5 m^3 as determined in accordance with Section 2 of the Oil Handling Facilities Standards shall be deployed on scene as soon as practical and effective, within 6 hours of the oil pollution incident.

4.2.2 On-water Recovery

On-water recovery of spilled product shall be initiated immediately upon containment of free floating product. The skimming capacity projected for the MLA-OHF is capable of recovery of several times the required spill volume within the time standards after derating formula are applied.

4.2.3 Dedicated Facility Spill Response Equipment

The MLA-OHF shall be equipped with appropriate spill response equipment that provides *resident capability* for the response to spills in accordance with the scenarios that have been developed under this OPEP. Containment and recovery equipment inventories exceed the facility category planning standards and are especially appropriate for the potential spill volumes as outlined in the scenarios contained in the OPEP. A list of the equipment can be found in Annex 4.

5. Marine Laydown Area – Oil Handling Facility

5.1 GENERAL OVERVIEW AND SITE DESCRIPTION

The proposed MLA-OHF is situated on the western shore of southern Bathurst Inlet at approximately 66°38.59' N and 107°42.69' W. A site overview plan showing its location is presented in Annex 1.

This OPEP applies to the Construction and Operations phases. It is currently planned that the last fuel delivery to the MLA-OHF will occur in Year 8, approximately two years before the end of Operations and the beginning of Closure phases. The SCP which covered spills of all kinds including fuel outside of the MLA-OHF will apply through all phases of the project from Construction through to Post-Closure monitoring.

5.2 OIL HANDLING FACILITY AND INFRASTRUCTURE

Construction activities at the MLA will provide for a new steel construction bulk fuel storage facility consisting of 4 steel tanks of 15 ML. A preliminary site plan of the projected MLA-OHF configuration is provided in Annex 2. The MLA has been designed to annually handle the off-loading and storage of 60 ML of diesel during Operations, ramping up from 15 ML of diesel during initial Construction.

The bulk fuel storage facility located at the MLA shall be constructed in an impermeable secondary containment structure (lined and bermed containment area). The construction is in compliance with CCME's Environmental Code of Practice (CCME 2003; 2008), the bulk fuel storage facility will be designed to have bermed spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks OR 110 % volume of the largest tank, whichever is greater.

The above basis is consistent with the document entitled "Design Rationale for Fuel Storage and Distribution Facilities" published by the Department of Public Works of the Northwest Territories (refer to Section 4.6 of those guidelines). The lining within the bermed area is an impervious HDPE liner membrane. The design of these facilities will be based on industry standards for installation, jointing, etc., the membrane to ensure its integrity.

The bulk fuel storage facility is connected to a shore receiving manifold by a 6-inch diameter steel pipeline. The pipeline is of welded construction. The pipeline is supported on appropriate stands and blocking. The pipeline is fully pressure tested and inspected each year prior to annual bulk cargo transfer operations.

Lighting is provided at the shore receiving manifold meeting the regulatory requirements of the Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69). The bulk fuel storage facility is also equipped with lighting meeting the standards as set forth in the same regulation.

It is anticipated that a single ice-class fuel tanker will be used to deliver fuel to the MLA on an annual basis. Anchors will be used to secure the tanker offshore during off-loading. The MLA will have a Level 2 OHF classification. An oil transfer rate of 450 m^3/hr is anticipated.

5.3 BATHURST INLET PHYSICAL ENVIRONMENT AND SENSITIVITIES

5.3.1 Inlet and Approaches

Bathurst Inlet is a deep fjord-type inlet along the northern coast of the Canadian mainland, within the territory of Nunavut. The entrance to the inlet is through Coronation Gulf between Cape Barrow (68°01' N, 110° 06' W) and Cape Flinders (68° 17' N, 108° 35' W), and the body extends over 200 km southwest into the mainland past the Arctic Circle. It has a large network of irregular shores, and is littered with numerous islands, islets and rocks, most of which are described in greater detail by the Canadian Hydrographic Service (1994). Melville Sound extends eastward from northern Bathurst Inlet into Elu Inlet.

The main channel of Bathurst Inlet is relatively narrow (~2 to 15 km) and deep, with depths generally between 100 and 200 m depth, and maximum depths over 300 m in the northern basin near Omingmaktok (Bay Chimo). The most characteristic oceanographic features of the channel are several sills spread along the inlet which result in rapid shoaling of the bathymetry to depths shallower than 50 m. The largest sill is near Manning Point at the centre of Bathurst Inlet, and the shallow bathymetry is accompanied by a narrowing of the channel width to less than 1.5 km between Quadyuk Island and the Tinney Hills. This sill approximately divides Bathurst Inlet in two major basins: the outer inlet that comprises all regions north of Manning Channel and contains the deeper, more complex bathymetry; and the inner inlet that runs landward from near Kingaok and has few islands and relatively simple structure with shallower depths between 100 and 150 m.

5.3.2 Marine Laydown Area-Oil Handling Facility Area

The MLA-OHF is proposed for the western shore of southern Bathurst Inlet. The deeply indented rocky shorelines in the region lead to steep bathymetry with narrow near-shore areas, a consequence of the inlet cutting through the massive granite rocks that characterize the surrounding Bathurst Hills Ecoregion. Hence, the MLA site consists of a long cobble/sand beach with a steep shoreline consisting of limited shallow areas (i.e., < 10 m) and follows a general 120 - 125° WSW heading. The water shelf extends orthogonally from the shore at a steep slope of approximately 20% to depths below 50 m about 240 m offshore. Beyond this distance, the seabed slopes more gently to depths below 150 m in the main inlet channel.

5.3.3 Bathymetric and Marine Data

Bathymetric and marine data is available for the Bathurst Inlet site. Charts 7791, 7792 and 7793 cover most of the area. Risk mitigation will be achieved by ensuring adequate distance between ship and shore and ensuring safe anchoring by accounting for vessel swing related to water depths. Sabina will align on methodologies for any additional bathymetric surveys of the areas with Canadian Hydrographic Service.

The measured tidal heights for the inlet are small, with a maximum tidal range for spring tides (new and full moon) of around 0.4 m, and between 0.1 and 0.3 m for neap tides (first and third quarter moons).

Bathurst Inlet water circulation during open-water season is influenced by winds rather than by tides, with tidal currents likely significantly weaker than the down-slope density flows originating from freshwater discharge at the inlet surface.

The marine environment at the proposed Bathurst Inlet OHF is characterized as a sheltered waters environment. As has been noted at the site, the prevailing winds generally provide sea conditions of onshore waves, varying in height from flat calm to less than 0.65 metre in average winds of less than 30 km/hr. Bulk transfer procedures established jointly by the OHF and the charterer preclude the

transfer of bulk product when conditions become excessive (i.e., wave heights greater than approximately 0.7 m). This enhances the possibility of deploying pollution gear should an incident occur.

5.3.4 Meteorological Data

The Project Atmospheric Environment Study (FEIS Volume 4) baseline data has been used to help in project design, for assessing potential effects on air quality, and for understanding trends in climate change.

The climate in the Project area is characterized by extremes and is primarily subject to cold, dry Arctic air masses, and American continental air masses from the south.

Long-term meteorological data are collected at Environment Canada – Meteorological Service of Canada (EC-MSC) meteorological stations. The closest currently operating stations are Lupin CS and Kugluktuk A and CS meteorological stations. Climate normal data (arithmetic averages of climate elements over a prescribed 30-year interval) have been used from these EC-MSC stations. The most updated climate normals and extremes currently offered by EC are based on Canadian climate stations with at least 15 years of data between 1982 and 2010.

Project-specific meteorological baseline data collection commenced in August 2004 at the Goose meteorological station that is located within the Goose property. This station continues to be operational. Meteorological data are also available from the Bathurst Inlet Port and Road Project meteorological station, which has been located near the MLA in Bathurst Inlet since 2001.

The climate at the MLA consists of a winter period (October to May) of extremely cold mean monthly temperatures ranging from -33.0ºC to -1.3ºC and a cool spring, summer and fall period (June to September) with mean monthly temperatures ranging from -0.3ºC to 14.5ºC.

Precipitation climate normals in the regional area range from 249.4 to 299.2 mm per year. Project meteorological station precipitation was measured as rainfall during the summer period only (June, July, August, and September), when temperatures were above freezing. During the 2006 to 2011 monitoring period, summer monthly rainfall ranged from 0 mm (September 2006) to 102 mm (August 2008). The summer total rainfall between June and September ranged from 4 mm (2006) to 211 mm (2008).

Wind speed data was collected during the measurement period (2006 to September 2012) specifically at the Bathurst Inlet Port and Road meteorological station. For the open shipping season, during the summer season (June to September), winds predominantly came from the north and northwest, 17% and 15% of the time respectively, more than 5 m/s 45% of the time but less than 9 m/s approximately 86% of the time. On average, wind speeds during the summer were slightly slower than winter wind speeds.

5.3.5 Ice Conditions

Historically, consolidated first-year ice covers Bathurst Inlet from mid-October to June. Ice break-up usually occurs in the first few weeks of July, after which open waters prevail until thin new ice forms around mid-October.

Environment Canada data documents the average sea ice freeze-up and break-up dates within the Canadian Arctic for the past 30 years. There has been significant temporal and spatial variation in the timing of break-up and freeze-up in southern Bathurst Inlet, as well as in the amount of ice present year-to-year. Environment Canada data is well documented for the area and includes the areas of Barrow Strait, Franklin Strait, and the area between Queen Maud and Coronation Gulfs. Ice data indicates an open shipping season of more than 60 days in the area of the MLA.

Observational evidence from the last few decades indicates that sea ice in the Arctic has been thinning and retreating earlier than historical reports (Stroeve et al. 2012). Most ice concentration records in the last 8 years have been lower than historical averages. The strongest changes occurred in the summer for the more northern straits, with several ice-free periods recently recorded where ice used to be present year-round. In 2012, Arctic sea ice was at the lowest recorded levels since ice monitoring by satellite began three decades ago (NSIDC 2012).

In the event of severe deterioration in ice or visibility conditions, bulk fuel transfer activities will be stopped. Shipping is only carried out during the ice free season. Should ice be encountered, the vessel will either sail around it at a reduced speed or proceed slowly through the ice. Currently there is no plan for barges, fuel vessels or tugs to remain at Bathurst Inlet over the winter. Should it become necessary, all regulations for overwintering will be met.

Ships sailing to Bathurst Inlet from eastern Canada must transit Transport Canada Zone 6, which has the most restricted entry season of any of the sixteen Arctic waters zones, except for the High Arctic. Passage from the western approaches transit zones 11 and 12. Bulk fuel deliveries at the MLA-OHF shall be limited to the period of open water only, and by ships of appropriate ice class for the shipping zones transited.

5.3.6 Sensitivities

As noted in Section 5.3.2 above, the MLA consists of a long cobble/sand beach with a steep shoreline consisting of limited shallow areas (i.e., < 10 m) and follows a general 120 - 125° WSW heading. The water shelf extends orthogonally from the shore at a steep slope of approximately 20% to depths below 50 m about 240 m offshore. Beyond this distance, the seabed slopes more gently to depths below 150 m in the main inlet channel.

The 2013 Bathurst Inlet Marine Diesel Fuel Spill Modeling Report (Updated June 2015) (Rescan 2015) was completed to predict the fate of potential diesel fuel spills near the MLA in Bathurst Inlet during the open-water season (i.e., ~July to October). The spills were assumed to originate near the MLA. The fuel spill modeling undertaken also addresses the potential for environmental damage from diesel spills resulting from transportation and storage of fuel near the proposed Back River MLA. The subsections present predicted effects on marine birds, marine mammals, and marine fish.

In open-water diesel spills, a fraction of the diesel fuel becomes entrained into the upper water column immediately under slicks by direct solution or by entrainment of small oil droplets through current and wave action (Mackay et al. 1980; Kuiper and Van den Brink 1987; ITOPF 2011). Diesel fuel concentrations in this cloud of oil-contaminated water depend on the oil properties and the level of mixing energy (winds/waves). In theory, these concentrations may initially exceed the toxic thresholds of marine species present in the spill area. As the diesel fuel spreads under the influence of water currents, turbulent diffusion and weathering processes, the hydrocarbon concentrations within it are reduced. In time, these diesel fuel concentrations will fall below the threshold levels that cause toxicity to living organisms and ultimately decline to background levels.

The diesel volume scenarios presented in the study were modeled under hundreds of different wind conditions, from which spill probability distribution figures were drawn. Most of the diesel deposits were limited to the southern portion of the modeled inlet, and over two-thirds of the diesel quickly weathered out within the first 10 days of all simulations. In the detailed simulations prepared for the study, the diesel high probability distributions and spread resulting from a 20 kL diesel spill were only recorded directly near the MLA; diesel very rarely spread in the areas outside of the MLA.

5.3.6.1 Marine Birds

Marine birds are one of the more vulnerable and sensitive of marine organisms to all types of oil spills.

However, unlike cruder distillates, diesel spills (particularly small ones ≤ 20,000 L) usually have limited impacts on marine bird wildlife due to the oil's high volatility (NOAA 2013). While diesel is highly toxic when in direct contact with marine birds, the number of birds affected is usually small due to the short residence times on surface waters.

Numerous marine bird species have been documented in southern Bathurst Inlet (Rescan 2012b, 2013b). Ordered from commonly (i.e., over >200 individuals counted) to rarely (i.e., less than 30 individuals) observed, these are: Canadian goose; red-breasted merganser; greater scaup; black, white-winged and surf scoters; herring and glaucous gulls; long-tailed duck; pacific, red-throated and yellow-billed loons; and the common eider. Amongst these populations, the glaucous gull, long-tailed duck and common eider are all listed as sensitive species in Nunavut (CESCC 2010).

In the assessments, the most apparent feature of Figure 5.3-1 contained in Annex 3 of the Spill Modelling Report is the lack of bird populations located near the MLA, which has by far the highest spill probabilities. Only a medium flock of geese and a brief observation of an unidentified fowl have been recorded within 4 km of the on land MLA infrastructure. Conversely, the highest proportion of bird observations in the inlet is located in the small cove just south the MLA, which is seasonally inhabited by large groups of ducks and geese. Diesel particles appear to reach the cove only in <10% of simulations, and the results of the simulations indicate it would take several hours before a spill would reach the area. It is logical that birds would favour the southern cove relative to the MLA shoreline for nesting grounds, as the cove is relatively sheltered from the main currents driving the circulation in the main Bathurst Inlet channel. The alongshore currents near the MLA will disperse spills northwards.

Two other bird areas could potentially interact with diesel fuel spills: the northern shores directly across the main channel from the MLA, and the shores surrounding the peninsula to the south of the MLA. The former is largely inhabited by duck populations that span over 10 km of the coast. The diesel residual probabilities there still remain relatively low with respect to the MLA coast, some small areas can have probabilities as high as 30%, but on average most of the coast probabilities are <10%. The peninsula to the south, on the other hand, is far enough south to receive little diesel fuel overall, with only a few patches of <5% probabilities present.

5.3.6.2 Marine Mammals

Two species of marine mammals occur within the Back River Project marine wildlife Regional Study Area in Bathurst Inlet – the ringed seal (*Phoca hispida*), and in less number, the bearded seal (*Erignathus barbatus*). True seals in the family Phocidae are susceptible to diesel spills due to their life history traits. Seals are frequently at the water's surface to breath, and so may come into contact with spilled fuel. Seals also use a combination of blubber and fur to insulate themselves and their fur can become ineffective when coated in fuel. Seals regularly go ashore at particular haul-out locations, where they may become fouled with fuel. Seal pups are particularly at risk of oil-related effects on fur if the fuel spill has reached a haul out location. In addition, because seals breathe at the water's surface, they can inhale and ingest spilled diesel, resulting in acute or long-term health effects. Ringed and bearded seals can also accumulate diesel through their diets of benthic crustaceans, fish, amphipods, and squid. Aerial surveys were conducted in the Marine Regional Study Area during spring (June) 2007, 2012 and 2013 to examine the use of Bathurst Inlet by seals during the sea ice period. Ringed seals were reported in Bathurst Inlet, at an overall density of approximately 2.05 seals/km^2 in 2012. The density was higher north of Kingaok (Bathurst Inlet Seasonal Community and Lodge) where the ice had a greater number of fractures and pressure ridges that afforded seals access through the ice.

In the 20 kL scenario, the spilled diesel would occur to the north of the Marine Laydown Area with small areas of 1-5% probability of fuel occurring to the north of the MLA as far north as Young Point. This shoreline between the MLA and Young Point was not identified as supporting a ringed or bearded seal haul out, and supported few animals during aerial surveys. Few effects are predicted for the 20 kL scenario.

5.3.6.3 Marine Fish

A variety of fish inhabit the waters of Bathurst Inlet. A fuel spill could result in impacts to marine fish by direct mortality as direct contact with fuel could damage or kill eggs, larvae, and/or adult fish. Marine fish can also accumulate diesel through their diets of lower trophic level organisms and other fish species.

Unlike cruder distillates, diesel spills (particularly small ones ≤ 20,000 L) in open water usually have limited impacts on pelagic and deepwater marine fish; the oil's low density means that it remains at the surface and its high volatility means that it evaporates quickly (NOAA 2013). Section 3.3 of this report indicates that the majority of the diesel spill would weather primarily through evaporation, and by the 10th simulation day almost all of the volatile oil mass will have dissipated; only the "residual" heavy diesel fraction (27% of the total) would remain. This fraction could typically take weeks to months to weather naturally, although in practice most of the material would eventually disperse or end up beached.

However, if currents transport diesel fuel into shallow, confined coastal areas before it is weathered it can impact fish populations. Diesel is acutely toxic when it comes into direct contact with all life stages of fish, so species that spawn or live in shallow and intertidal areas are more vulnerable to spills than deepwater residents. As residual diesel will persist longer along shorelines than in the open ocean, these areas will also experience prolonged exposure. Thus, shore-locked or beached fuel material is surmised to be of a greater concern to marine fish than diesel fuel slicks primarily located in open waters.

The following fish species found in Bathurst Inlet use nearshore, shallow water for some or all of their life cycles: Arctic Flounder (*Liopsetta glacialis*), Fourhorn Sculpin (*Myoxocephalus quadricornis*), Ninespine Stickleback (*Pungitius pungitius*), and Starry Flounder (*Platichthys stellatus*) regularly utilize shallow and intertidal areas for all stages of their life cycle (Rescan 2013a). Other species including Capelin (*Mallotus villosus*) and Pacific Herring (*Clupea pallasii*) are generally associated with offshore habitats, but they migrate to intertidal and shallow subtidal beaches to spawn (Rescan 2013a).

A traditional knowledge report identified marine areas within Bathurst Inlet known to be important fishing grounds for Inuit (KIA 2014). In the marine environment, three Arctic Cod (*Arctogadus glacialis*) fishing grounds were identified; one was 17 km north of the MLA off the end of Young Point on the western shore of the inlet, a second was identified adjacent to Quadyuk Island 30 km north of the MLA, and a third was located 17 km south of the MLA on the western shore of the inlet off a small point of land. Several freshwater fishing grounds were identified in waterbodies that flow into Bathurst Inlet, where Inuit fish for Arctic Char, Lake Trout (*Salvelinus namaycush*), and Arctic Grayling (*Thymallus arcticus*).

In the 20 kL scenario, the spilled diesel would remain in a very localized area near the Marine Laydown Area and move slightly to the north along the coastline. The small localized spill is not predicted to interact with the identified Inuit Fishing Areas presented in the Kitikmeot Inuit Association (KIA) 2014 report.

5.3.6.4 Summary of Sensitivities

The spill modelling report summarizes that the wind conditions, current regime, and overall spill volume play a critical role in determining the fate of diesel spills within southern Bathurst Inlet. Regardless of diesel amounts, spills occurring in mild to moderate wind conditions generally did not progress past a few kilometres from the source location. Sabina has conducted a shipping sensitivity analysis (Appendix V7-6A) that commits to adhering to various setback distances for key marine species. Sabina remains committed to including the proposed setbacks from sensitive areas in all future shipping contracts. This will include the expectation the vessel companies and captains follow these setbacks except under emergency of unforeseen circumstances. With these setbacks in place and the low residual spill probabilities provided, a tactical response plan showing fuel spill dispersion modelling results relative to local sensitivities was not deemed a requirement at this time.

Preventive measures, such as strict criteria for acceptable conditions for discharge, are outlined in cargo transfer procedures and in Section 11 of this Plan. Preventive booming following any spill to protect sensitive areas of significant bird populations will be considered as outlined in the scenarios presented in Section 11 of this Plan. The hazing techniques and wildlife protection procedures as outlined in Section 9.4 of this Plan are of utmost importance.

As long as vessels met or exceed the requirements of a Shipboard Oil Pollution Emergency Plan that no third party contracts would be required. Sabina is still considering options around the necessarily of third party response, however, due to the fact that our shipping frequency is so low and our shipping route is so long, we are unsure if the contract would make logistical and financial sense.

6. Site Activities

6.1 BULK OIL TRANSFER, SHIP TO SHORE

Bulk fuel deliveries will take place during the open shipping season and volumes and frequency of deliveries will depend on a number of factors including but not limited to: size of ships, fuel consumption rates, operational constraints, etc. Annual bulk fuel transfers from ship to shore are anticipated during the open-water seasons of Construction and Operations. No bulk oil transfers are expected during Closure.

It is anticipated that the total annual volume of the bulk fuel transfers shall be 60 ML and will take place between the months of late August through early October. The fuel transfers shall take place by means of either a single or double 4-inch floating hose deployed between the vessel and the connecting flange on the shore. The products are then transferred through the pipeline to the above mentioned OHF. A steel pipeline of 6" diameter connects between the shore manifold and the tank farm.

The tides are not a major risk factor at this location. Wind force and direction are the dictating environmental factors during bulk transfer and criteria for acceptable conditions for discharge are outlined in cargo transfer procedures.

The ship to shore transfer operation at Bathurst Inlet is largely similar to other cargo discharge operations in the North and involves bulk transfer by floating hose of two types of fuel (Jet A and Ultra Low Sulphur Diesel – ULSD). It is expected that once cargo operations are underway, the ship will discharge at a rate of up to 450 m^3/hour depending on the number of hoses used and also final obtainable pumping rate.

The tanks shall take varying times to fill, depending on which tank is filled and also the final pumping rates obtained. Accurate reconciliation of discharge & fill volumes through regular communication between ship and shore personnel is required to ensure the safe transfer of fuel and prevent any overfilling that could result in a spill.

The bulk transfer procedures are fully detailed in the standard operating procedure in Annex 5.

6.2 OTHER MARINE LAYDOWN AREA-OIL HANDLING FACILITY OPERATIONS

Other than the planned bulk fuel and transfers, no other port operations involving fuel are anticipated at the MLA-OHF under normal operations during any Project phase.

Dry cargo sealift operations are anticipated to occur at the MLA, however these will be separate from the operations of the OHF and are not considered in this OPEP.

7. General Response to Marine Spill Emergencies

To effectively manage emergency response, Sabina has implemented a detailed emergency response structure that is applicable to all emergencies.

7.1 LEVELS OF EMERGENCY

Escalating levels of emergency are described in the SCP, which is a separate document. The SCP addresses a wider scope of operations and includes storage areas other than the MLA-OHF. The management of emergencies throughout the project requires varying degrees of response, effort and support. The impact on normal business operations will also differ as will the requirements for investigation and reporting.

Irrespective of reporting thresholds or usual escalating response levels to varying spill volumes dictated elsewhere in Sabina plans, all marine spills at the OHF regardless of volumes shall be managed at the highest level of response as outlined in the Sabina emergency response system. The usual regulatory reporting requirements are to be strictly adhered to as outlined in Section 3 of this Plan.

7.2 RESPONSE MANAGEMENT STRUCTURE

All spill procedures and response functions are to be implemented through the Emergency Response Management Team. Table 7.2-1 presents the management team responsible for overseeing emergency spill response operations and their contact information.

Table 7.2-1. Sabina Gold & Silver Corp. Emergency Management Team Contacts

Role	Primary	Alternate
Emergency Response Coordinator		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Incident Commander		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Environmental Superintendent		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Safety Superintendent		
Phone:	TBA	TBA
Alternate Phone:		
Email:		
Environmental Coordinator		
Phone:	TBA	TBA
Alternate Phone:		
Email:		

Note: The Table will be completed once a construction decision is made.

Once a spill event is reported, the Incident Commander establishes a specific strategy for containing and controlling the spill and to initiate the clean-up activities. Other site personnel may act as technical advisers before and during the intervention. The trained Emergency Response Team (ERT) will conduct all emergency spill response operations under the direction of the Incident Commander. During the clean-up phase of the intervention other site personnel (e.g., heavy equipment operators, labourers) could be involved in the intervention.

The Emergency Response Organizational Chart is provided as Figure 7.2-1.

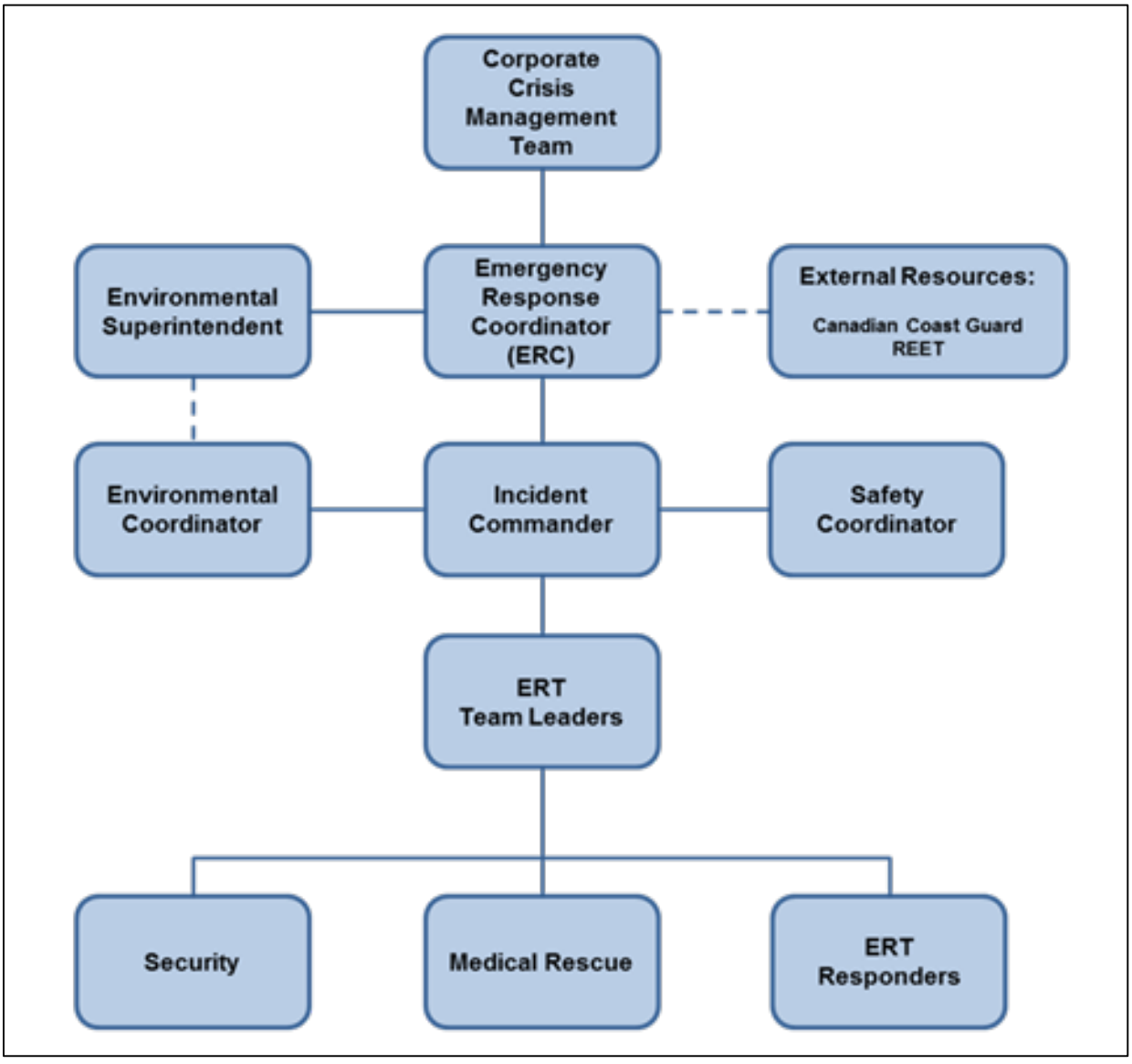

Figure 7.2-1. Marine Spill Response Organizational Chart

7.3 EMERGENCY RESPONSE TEAM

The ERT will be structured from a worker volunteer base at site. With different work schedules, it will be necessary to have enough team members to maintain sufficient numbers of responders at site at all times.

7.4 EQUIPMENT AND PERSONAL PROTECTION

To provide adequate response in case of spill events, Sabina maintains the appropriate type and quantity of response equipment and materials onsite.

Spill kits are strategically placed primarily in areas of fuel handling to facilitate immediate first response in the event of a hydrocarbon release to land. A complete list of spill response equipment is found in Annex 4 of this Plan.

In addition to the spill response material, a variety of mobile heavy equipment including excavators, front-end loaders, bulldozers, haul trucks, small workboat for in land water use, and marine support boat are available to aid in spill response and recovery efforts.

7.5 COMMUNICATION

Effective communication systems are critical to the success of emergency responses. Personnel involved, from first person on scene to the ER Coordinator rely on the ability to quickly relay accurate information.

Communications available at the Project site during an emergency are listed below.

- Hand-held radios;
- Telephone;
- Satellite Phone; and
- Internet.

7.5.1 Hand-held Radio Communication

During an emergency, the primary communications link between all emergency response personnel is through radio communication. Additionally, other individuals involved in emergency response will also carry hand-held radios as part of their regular work requirement.

During an emergency, radio communications should be kept to a minimum. If radio silence is requested, security personnel, upon receiving instruction by the Emergency Response Coordinator (ERC) or Incident Commander, will announce this. This ensures open and free communications among personnel involved in the actual response.

7.5.2 Telephone Communication

During an emergency, telephone communications will be used to:

- Notify internal personnel and resources.
- Notify external personnel and resources.

To supplement radio communications, the site telephone system may be used to alert site personnel during an emergency response.

Communications links with Corporate Sabina office may also be required during some emergency situations. Constant communications links will be established by telephone where offsite assistance is required (from Sabina, or external resources such as medical practitioners or SAR/Coast Guards).

7.6 COMMUNICATION WITH THE PUBLIC

Only authorized Sabina Senior Management shall provide external communication to the public during emergencies.

Local residents, community leaders, other stakeholders, and non-governmental agencies will be contacted as appropriate. The designated officer(s) will coordinate dissemination of information to the media whenever necessary.

7.7 MULTIPLE EMERGENCY EVENTS

The potential exists for multiple emergencies to occur simultaneously, or for one emergency to lead to other emergency events occurring. Examples of this could include an extreme precipitation event resulting in an unplanned discharge, slope failure, etc. or a major storm resulting in a vehicle or aircraft collision.

A key emergency response measure that minimizes the potential for multiple emergency events from occurring is to immediately communicate an emergency site-wide, and to order cease work orders if appropriate.

In the event of multiple emergencies, all emergency response activities will continue to be coordinated through the ERC, who will designate multiple incident commanders to oversee the response to each individual emergency. Operations will be shut down and all personnel not assisting with response will be on standby, awaiting instructions to assist if necessary.

8. Roles and Responsibilities

The initial stage of any emergency is critical. An effective and timely response is essential to prevent an emergency situation from escalating to a higher level. Therefore, all personnel must be fully aware of their individual duties and responsibilities as they are presented in this Plan.

Specific responsibilities and duties of the personnel involved in emergency response are outlined below.

8.1 EMERGENCY RESPONSE COORDINATOR

For the purpose of this response plan, the ERC will be the General Manager or his designate if absent. ERC duties during an emergency are detailed as follows:

- The ERC will ensure coordination of ERT support systems.
- Upon being notified of an emergency, the ERC will initiate response activities and assess the situation based on current information from the Incident Commander.
- Activate the emergency response process and escalate according to the severity of incident.
- The ERC will coordinate all activities. In the event the ERC leaves his post, the ERC will designate an individual to coordinate in his absence.
- Ensure that the appropriate area manager/s has been notified.
- Provide internal notification as applicable based on the level of emergency.
- Provide instruction to ensure that appropriate external resources are notified.
- Receive information from the Incident Commander and ensure appropriate resources are made available.
- Provide support for the acquirement of additional supplies and resources as requested by the Incident Commander.
- Contact departmental resources via radio as required during the emergency response.
- Provide internal notification of the “all clear.”
- Ensure the coordination and establishment of an emergency debriefing session.
- Review incident log and post response incident report.
- Post incident debrief with Incident Commander.
- Provide necessary information to Public Relations for a media statement release if required.
- Complete a report on the events surrounding the incident.
- Coordinate collection of all incident notes, reports, statements and log of events.
- End the event in ER System.

8.2 ENVIRONMENT SUPERINTENDENT

The duties of the Environment Superintendent during an emergency are detailed as follows:

- For major spills contact the ERC and report to the command center.

- Assist the ERC in evaluating the initial situation and assessing the magnitude of the spill.
- Report the spill to NWT-NU 24-hour Spill Report Line depending on whether threshold volume is triggered.
- Assist in developing an overall plan of action.
- Document all actions and decisions.
- Complete Government Agency notification processes.
- Act as the spokesperson with government agencies as appropriate.
- Collect photographic records of the spill event and cleanup efforts.
- Report to the ERC and provide recommendations on resource requirements (additional manpower, equipment, material) to complete the cleanup effort.
- Provide liaison with management to keep them informed of cleanup activities.
- Ensure that the spill is cleaned up and follow-up communication and reports are filed with the Indigenous and Northern Affairs Canada (INAC) and KIA.
- Assist in the accident/incident investigation process.
- Participate in post-emergency debriefing.
- Ensure that all involved departments complete reporting process.
- Ensure that spill reports submitted to INAC and KIA include photographic records and an updated map showing Universal Transverse Mercator (UTM) coordinates, date, and amount and nature of the spill.
- Implement a sampling procedure for the collection and analysis of samples to identify and monitor possible contaminant levels resulting from the spill.
- Document the cause of the spill and effectiveness of the cleanup effort, and recommend the appropriate measures to prevent a recurrence of the spill.
- Prepare and submit follow-up documentation required by appropriate regulators.

For marine spills at the OHF, the Sabina Environment Superintendent will be accessible to the Canadian Coast Guard during the entire incident.

8.3 INCIDENT COMMANDER

The Incident Commander is the site lead administrator for the ERT, responsible for ensuring the necessary emergency response equipment and adequate level of training for ERT members. The Incident Commander directs the ERT at the scene as ERT Leader. In the absence of the Incident Commander, a senior team member will be designated in his place. The following duties during an emergency are performed by the Incident Commander:

- Muster accordingly and brief team members.
- Report to the scene of the emergency.
- Take charge of the scene.
- Evaluate the details of the emergency as presented by those on scene. Assess the immediate situation, confirm the level of emergency and notify the ERC.
- Maintain contact with the ERC and provide support in coordination of the response.

- Direct ERT members in their respective tasks as required
- Contact departmental resources via radio as required during the emergency response.
- Request internal/external resources as required.
- Advise ERT on aspects of internal/external support as they are received.
- Develop a written log of events indicating instructions given, action taken and outcomes achieved.
- Announce the 'all clear' to the ERC when the emergency has ended.
- Lead the emergency debriefing session.
- Ensure that all ERT equipment is returned to original order and/or replaced to ensure future rapid response.
- Provide assistance with ongoing investigation.
- Prepare a written report on response activities.

8.4 EMERGENCY MEDICAL PERSONNEL

Duties during an emergency are as follows:

- Respond when required as directed by the Incident Commander.
- Responsible for all decisions of medical-related situations on-site.
- Responsible for assessing, administering and delegating emergency medical care.
- Advise the Incident Commander of the number and condition of any ill/injured personnel.
- Advise the ER Coordinator of off-site resources required.
- Maintain a log of events, actions and outcomes.
- Participate in an emergency debriefing session.

8.5 SECURITY

Security personnel, or their designates, are key in an emergency response in that they will receive an initial notification of an emergency and provide first communications to essential personnel and secure the area.

Duties during an emergency are as follows:

- Security will report muster and evacuation status to the Incident Commander and await further instruction.
- Provide traffic and personnel control at scene as directed by the Incident Commander.
- Assist in controlling access to the emergency area.
- Maintain open radio communication (via radio or telephone intercom system).
- Keep a written record of events throughout incident.
- Relay notification of 'all clear" order when directed by Incident Commander.
- Maintain Security of the scene as directed by the ER Coordinator or Incident Commander.

- Direct all off-site inquiries regarding the emergency to the ER Coordinator or designate.
- Participate in a debriefing session for the emergency response.

8.6 ENVIRONMENTAL COORDINATOR

The Environmental Coordinator shall liaise with Incident Commander to advise on direction of environmental response efforts once the scene has been assessed by the Incident Commander and any medical and/or fire emergencies are under control.

The Environmental Coordinator will:

- Immediately proceed to the scene of the incident.
- Make recommendations for response methods and resources based on area sensitivities and incident severity through the Incident Commander as necessary.
- Make recommendations for additional resources through the Incident Commander as necessary.
- Participate in post-emergency debriefing.
- Maintain a log of events, actions, and outcomes.

8.7 SAFETY COORDINATOR

The duties of the Safety Coordinator during an emergency are detailed as follows:

- Contact the ERC.
- Respond to the scene and make direct contact with the Incident Commander.
- Establish perimeters around the area of the emergency and direct appropriate resource personnel responsible for traffic flow.
- Assist with identifying and assessment of potential hazards of the ERT response and notify the Incident Commander.
- Ensure appropriate personal protective equipment for involved ERT and non-ERT personnel.
- Note pertinent information that may be relative to the investigation.
- Secure the area in coordination with site security.
- Participate in post-emergency debriefing.
- Assist in the accident/incident investigation and complete report.

8.8 TEAM LEADERS - EMERGENCY RESPONSE TEAM

All ERT members shall receive training to ensure that they have the required skills to provide an appropriate, safe and adequate response minimizing the impact of a spill on the environment.

9. General Spill Procedures

The response to spills begins immediately when the spill has been detected. In all cases immediately upon detection of a spill, all transfer operations are to be shut down and not restarted in any manner that would interfere with the immediate, effective and sustained response to the oil pollution incident.

This Plan clearly outlines the notification procedure and the roles and responsibilities of the management and spill response team. All emergency telephone numbers are clearly listed and the persons are contacted as needed and according to the priority of the incident. The contact list is included in Table 7.2-1.

The response team, following a spill, must ensure that personnel safety is their first priority. First and foremost, evaluate the risks as quickly as possible to guarantee that appropriate measures are taken to prevent or reduce the risk of injury to personnel, to avoid fire or explosion, to protect property and to minimize the damage to the environment. It is important to contain the spill or to start cleaning up as quickly as possible to stop the spill from contaminating a greater area.

Full details of the properties and hazards associated with potential spills of all products are found on the Material Safety Data Sheets in Annex 8 of this Plan.

When responding to spills, all procedures and safety methods in handling the products must be observed. The following specific measures must be followed with spills on water or on land:

Take personal protective safety measures. Personal protective equipment must be worn at all times during response operations.

Close all electrical sources.

Take all appropriate measures to ensure personnel safety and the safety of the facility.

Request help to control personnel access, and close the area. Never enter inside and/or within the radius of the contaminated area. Have a fire extinguisher close by. If a fire starts, extinguish the fire only if it is safe for you and that you were trained to do so without exposing yourself to unnecessary risks.

Through the spill training initiative, all spill response personnel will be fully briefed on the procedures to be followed to report a spill and initiate spill response. The first person to notice a spill will take the following steps:

1. Immediately warn other personnel working near the spill area.
2. Evacuate the area if the health and safety of personnel is threatened.
3. Notify an appropriate supervisor, who will initiate the spill response operations.
4. In the absence of danger and before the spill response team arrives at the scene, take any safe and reasonable measure to stop, contain and identify the nature of the spill.

All spill response actions carried out by the spill response team will follow these general procedures:

- **Cease Transfer Operations -** In all cases immediately upon detection of a spill, all transfer operations are to be shut down and not restarted in any manner that would interfere with the immediate, effective and sustained response to the oil pollution incident.
- **Source Control** - Reduce or stop the flow of product without endangering anyone. This may involve very simple actions such as closing shore valves, sealing a puncture hole with almost anything handy (e.g., a rag, a piece of wood, tape, etc.), raising a leaky or discharging hose at a level higher than the product level inside the tank.
- **Control of Free Product** - Prevent or limit the spread of the spilled material. Accumulate/concentrate spilled product in an area to facilitate recovery. Barriers positioned down-gradient of the spill will slow or stop the progression of the spill. Barriers can consist of absorbent booms, dykes, berms, or trenches (dug in the ground). Deployment of floating booms to contain a marine spill should be carried out by the spill response team as soon as safe and practical.
- **Protection** - Evaluate the potential dangers of the spill in order to protect sensitive ecosystems and natural resources. Block or divert the spilled material away from sensitive areas where possible.
- **Clean up the Spill** – Recover and containerize as much free product as possible. Recover contaminated soil, and water. Pressure-wash contaminated bedrock surfaces, shorelines, ice and recover as much as possible oily water for containerization and/or treatment.
- **Report the Spill** - Provide basic information such as date and time of the spill, type and amount of product discharged, location and approximate size of the spill, actions already taken to stop and contain the spill, meteorological conditions and any perceived threat to human health or the environment. Reporting requirements are presented in Section 7.3 of this Plan.

9.1 HEALTH AND SAFETY

Sabina and its senior management are committed to ensuring the health, safety and welfare of its employees, contractors and visitors. As a consequence of this, Sabina requires all personnel to regard accident prevention and working safely as a collective individual responsibility.

Sabina conducts all site activities in accordance with all applicable Federal and Territorial health and safety regulations. The following applicable health and safety regulations apply to the activities described in this Oil Pollution Emergency Plan:

- *Northwest Territories, Nunavut Worker's Compensation Act* - Provides the territorial legislation covering the health and safety of workers in Nunavut.
- *Mine Health and Safety Act and Regulations (Nunavut)* - Provides specific health and safety guidelines for mines operating in Nunavut: Section 2(1) Duties and Responsibilities (the Owner).
- *Canada Labour Code Part II* – Provides federal regulations for the health and safety of workers involved in shipping and marine port operations.

Sabina requires and provides WHMIS training for all employees and contractors throughout the Back River Project: *Mine Health and Safety Act* and Regulations, Part VI Regs. Training 6.03.

It is also a requirement for supervisory personnel to hold level 1 or level 2 certification as required by the *Mine Health and Safety Act*: *Mine Health and Safety Act* and Regulations, Part V Regs. Supervision.

Comprehensive general training is provided to spill responders throughout the project in relation to inland spills. In addition, specific training with relation to safety during response to marine spills is provided to all responders through Sabina's marine spill training program. All responders who are involved in marine operations shall participate in the training as outlined in Section 11 of this Plan.

9.1.1 Personal Protective Equipment – Requirements

For all responders, personal protective equipment requirements (PPE) shall be as follows:

- MLA Site Services (non-water operations, no contact with spilled product):
  - Hard hat.
  - CSA-approved work boots.
  - Safety glasses.
  - Leather work gloves.
  - Orange/yellow retro reflective vests.
- MLA Site Services (non-water operations, possible contact with spilled product):
  - Hard hat.
  - CSA-approved work boots.
  - Safety glasses.
  - Orange/yellow retro reflective vests or rain wear.
  - PVC rain suit.
  - Nitrile work gloves.
- Workboat and shoreline responders (beach or on-water operations, possible contact with spilled product):
  - Safety vest
  - Hard hat.
  - CSA-approved work boots.
  - Safety glasses.
  - PVC rain suit.
  - Nitrile work gloves.
  - Approved personal flotation device.

9.2 COORDINATION WITH CANADIAN COAST GUARD AND OTHER GOVERNMENTAL AGENCIES

9.2.1 Canadian Coast Guard

The response to spills at the MLA-OHF shall be managed in coordination with the Canadian Coast Guard whom are the lead response agency north of 60°.

The *Central & Arctic Regional Response Plan (2008)* and the *Kitikmeot Region, Nunavut Area Plan* outline the Canadian Coast Guard's response capability for the region. This Plan is a component of the *Canadian Coast Guard National Response Plan, which* is the responsibility of the Director of Safety and Environmental Response Systems, Ottawa. It establishes the framework and the procedures, by which Central & Arctic Region will prepare for, assess, respond to and document actions taken in response to

pollution incidents in this Region. This capability and the information contained in the Coast Guard plans are considered a valuable resource in the planning and response to spills at the MLA-OHF.

In 2007, the CCG undertook an evaluation of risk and requirements for additional Arctic pollution response equipment, in consultation with key partners and clients, purchased and placed Arctic Response Packs in 19 communities throughout the Arctic. These Arctic Response Packs provide communities with on-site equipment to use in the event of a small scale pollution incident in their waters. Arctic Response Packs are located in Cambridge Bay, Kugluktuk and Gjoa Haven. Each of the new Arctic Community Packs contains surface booms and accessories, shoreline cleanup kits, small vessels and outboard motors and trailers, and in select communities, beach flushing kits.

Along with the deployment of the Arctic Response Packs, the Canadian Coast Guard was to provide training where the Arctic Community Packs are located (Transport Canada 2014). Community residents can therefore play a role in helping the lead response agency, the Canadian Coast Guard, should a marine spill occur.

9.2.2 Environnent Canada – National Environnemental Emergencies Centre

The Canadian Coast Guard (lead agency) with primary jurisdiction for the spill oversees and monitors response and recovery efforts by the responsible party and further, may request that Environment Canada provide scientific and technical advice to inform response actions that will reduce the environmental impact of the spill. Additionally, Environment Canada has legislative responsibility to address pollution incidents that impact federally managed resources such as fish and wildlife under the *Fisheries Act* and the Migratory Birds Convention Act, as well as hazardous substances regulated by the Environmental Emergency Regulations. Environment Canada may issue directions under its legislative mandate if the environment is not being adequately protected and, when warranted take over the lead agency role.

In the event of a polluting incident that requires Environment Canada's involvement, the National Environmental Emergencies Centre (NEEC) is Environment Canada's focal point for the provision of scientific advice, such as weather forecast, contaminant dispersion and trajectory modeling, fate and behaviour of hazardous substances, the establishment of clean-up priorities and techniques, as well as the protection of sensitive ecosystems and wildlife such as migratory birds and fish. Environment Canada's Emergency officers have Hazardous Materials (HAZMAT) expertise that enables response in the event of spills involving hazardous materials.

9.2.3 Other Governmental Agencies

At all times, the response to spill incidents shall be coordinated with the various agencies as listed in Figure 7.2-1.

9.3 REPORTING REQUIREMENTS

Three individual reporting requirements are applicable in the case of all marine spills. Procedures for each are outlined herewith.

9.3.1 Canadian Coast Guard Reporting Requirements

All spills of a marine nature will be reported to the Canadian Coast Guard (Central and Arctic region) 1-800-265-0237 (24-hour). The fax number for transmission of the written report is (519) 337-2498.

Reporting of marine spills shall be in accordance with Transport Canada Guideline TP-9834E, "Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants."

Detailed harmful substances report requirements are outlined in Appendix A-2 of the guideline, a copy of which is included in Annex 9 of this Plan.

9.3.2 Reporting to Transport Canada

The Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69) require that any spills be reported to the nearest office of Transport Canada as follows:

Jaideep Johar
Manager, Technical services
Transport Canada, Marine Safety
Prairie and Northern Region
Tel: (204) 984-8618
Cell: (204) 880-0754
Email:joharj@tc.gc.ca

Craig D. Miller
Manager, Marine Safety (PNR)
Transport Canada
PO Box 8550, 344 Edmonton Street, Winnipeg, MB, R3C 0P6
Email: craig.miller@tc.gc.ca
Tel: (204) 984-0397
Fax: (204) 984-8417

Reporting of marine spills shall be in accordance with Transport Canada Guideline TP-9834E, "Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants." Detailed harmful substances report requirements are outlined in Appendix A-2 of the guideline, a copy of which is included in Annex 9 of this Plan.

9.3.3 Government of Nunavut Reporting Requirements

Quantities of hazardous substances spilled that require reporting are listed in Schedule B of the Nunavut Spill Contingency and Reporting Regulation.

After the initial field emergency response to the spill event, spills are reported to the 24-hour Spill Report Line:

24-Hour Spill Report Line
spills@gov.nt.ca
Tel: (867) 920-8130
Fax: (867) 873 6924

Failure to report a spill can lead to fines. The KIA Lands Administrator will also be promptly notified at (867) 983-2458 or via e-mail. Similarly, the INAC Water Resources Officer will be promptly notified of the spill event at (867) 982-4308 or via e-mail.

It is the responsibility of the Environmental Supervisor on behalf of the Operations Manager to prepare the proper reports and transmit them to regulatory authorities.

The spill event is reported in writing using the standard NWT-NU Spill Report Form.

In the event of a spill involving the marine carrier delivering bulk fuel, Sabina will ensure that the subcontractor reports any spill event under its responsibility.

9.4 WILDLIFE PROTECTION PROCEDURES

In response to a spill event, techniques used to prevent wildlife from becoming oiled or contaminated, by preventing animals from entering the contaminated area, will consist of hazing and other deterrents. This will be accomplished using a combination of both audible and visual devices, including but not limited to:

- Pyrotechnics, i.e., shell crackers, screamers, propane cannons for shore based spills.
- Visual scare tactics, i.e., helicopters, emergency response vessels or other water vessels.
- Broadcast sounds, i.e., Breco Bird Scarer designed to float with an oil spill.
- Exclusion, i.e., netting applied in smaller contaminated areas

These techniques need to be set in place immediately after a spill occurrence so as to minimize environmental impact.

The size of the spill and location in relation to sensitive wildlife areas must be assessed at the time of the event as to correctly apply the appropriate level of deterrence. Only workers trained in the safe and proper use of certain hazing equipment will be permitted to haze wildlife. Personal Protective Equipment will be worn by all personnel using equipment, as per manufactures instructions, and that the minimum will include the use of eye and ear protection. Other workers in the vicinity of such devices should also use ear protection or remain a safe distance away. Hazing through the use of pyrotechnics should not be used too close to dry vegetation or flammable spill materials due to fire hazard.

Hazing should be equal and continuous in all contaminated areas to prevent wildlife from being hazed into an area where they may be in danger. It is also important to ensure that hazing efforts do not cause already contaminated animals to scatter and techniques are applied as soon as possible to prevent wildlife from contacting spills off the surface of waters (if applicable).

All emergency response vessels shall be equipped with deterrent devices to ensure timely response in case of a spill occurrence off-shore. To prevent habituation, variation of hazing techniques will be used such as changing the location, appearance and types of hazing or using a combination of hazing techniques.

Efforts shall be made to collect alive or dead oiled wildlife. In the event of a spill occurring in or around a water body, shorelines and beaches shall be inspected for contaminated wildlife to be collected. Emergency Response vessels shall be equipped with dip-nets, large plastic collecting bags for dead wildlife, and cardboard boxes or cloth bags for live oiled wildlife. To ensure alive oiled wildlife be dealt with humanely, capture and handling of wildlife shall only be done by trained and permitted individuals. Gloves shall be worn when handling contaminated wildlife (leather gloves for raptors and mammals, latex/rubber gloves for ducks and small shorebirds). Wildlife will be kept individually within cloth bags or ventilated cardboard boxes and label the date and time animal was found, name of finder, location and name of species, if known. Wildlife treatment facilities will then be contacted for advisement on treatment. All contaminated wildlife will be held in a warm quiet place until treatment. The Canadian Wildlife Services (CWS) will be consulted to determine the most humane treatment strategy to be implemented for live oiled wildlife, whether rehabilitation or euthanization.

For wildlife mortalities each carcass shall be bagged and labeled individually. The date and time animal was found, name of finder, location and name of species, if known shall be documented. CWS shall be consulted and approval obtained prior to disposing of any dead wildlife. Contact information for experts in bird hazing and bird exclusion, oiled bird rehabilitation, and, permits needed to haze, salvage, hold and clean, or euthanize birds, are shown in Table 9.4-1.

Table 9.4-1. Emergency Contacts in Case of Spills Affecting Wildlife

Name	Location	Phone Number	Purpose
Canadian Wildlife Services (CWS)	TBA	TBA	Knowing and providing information on the migratory bird resource and species at risk (under CWS jurisdiction) in the area of a spill (this includes damage assessment and restoration planning after the event) Minimizing the damage to birds by deterring unoiled birds from becoming oiled Ensuring the humane treatment of captured migratory birds and species at risk by determining the appropriate response and treatment strategies that may include euthanization or cleaning and rehabilitation.
Cobequid Wildlife Rehabilitation Centre	Brookfield, NS	1-902-893-0253	Provide veterinary care and rehabilitation for wildlife
Nunavut Emergency Management	PO Box 1000, Station 700 Iqaluit, NU X0A 0H0	1-800-693-1666	Nunavut Emergency Management is responsible for developing the territorial emergency response plans, coordinating general emergency operations at the territorial and regional levels, and supporting community emergency response operations.
International Bird Rescue	International	1-888-447-7143	Wildlife rehabilitation specialists, can manage all aspects of wildlife response

9.5 TREATMENT AND DISPOSAL

Plastic sacks, steel drums, or other appropriate containers as approved by the Environmental Supervisor are used to contain and transport contaminated soil for treatment. Depending on the nature of the spilled contaminant, the soil may be treated for remediation on site, or shipped to a licensed facility for treatment and disposal. Contaminated soil resulting from the spill of hazardous chemicals will be treated as a hazardous waste and shipped to a licensed facility for treatment and disposal. Temporary storage of contaminated materials is within lined berms.

10. Spill Scenarios and Response Strategies

Sabina is committed to planning for spills at the MLA-OHF using an analysis of possible spill scenarios. The potential incident analysis is based on real projected operations, and potential quantities spilled are based on pumping rates and estimated times to halt pumping operations.

In the development of the scenarios the following constant factors have been applied:

- The type of ship that is employed for the bulk fuel delivery is a conventional double hulled, multi-compartment petroleum tanker, between 120 to 135 metres in length. The tanker is anchored at a safe distance from the MLA-OHF beach head and floating hose is deployed between ship and shore.
- As outlined in Section 5.2 of this Plan, two products are received at the facility. Both products, JET A1 and Ultra Low Sulphur Diesel (ULSD) are classified as non-persistent combustible hydrocarbons and will behave in a similar fashion if spilled. The response to a spill of either of these products shall be carried out in the same fashion. Full details of the properties and hazards associated with these products are found on the Material Safety Data Sheets in Annex 8 at the end of this Plan.
- Both products are of relative low viscosity, are clear to yellow in color and will float readily when spilled. It should be anticipated that any spillage will rapidly spread when spilled and a high rate of evaporation will occur. Wind will be the most important factor in promoting the spread of the product on the water surface.
- Where environmental sensitivities are mentioned in the scenarios, these relate to the area sensitivities as outlined in Annex 3 of this Plan.
- Local topography plays an important part in wind direction and force, but it is generally noted at the MLA that the most common wind direction is from the north and northwest, 17% and 15% of the time respectively, more than 5 m/s 45% of the time but less than 9 m/s approximately 86% of the time. On average, wind speeds during the summer were slightly slower than winter wind speeds.
- As is indicated in the Plan, upon discovery of spillage, any manner of pumping operations are ceased.

General response time limits should be observed for each action as follows:

- Deployment of containment boom: 0-1 hours following the spillage event; and
- Deployment of skimming equipment: 0-6 hours following the spillage event.

During ship to shore discharge of the product, the floating hose is inspected on a regular basis by boat. Stoppers and absorbents are available in case they are needed. The ship has a Shipboard Oil Pollution Emergency Plan, appropriate response gear on board and the crew is fully trained in its use.

There is a person on watch at the shore manifold at all times during discharge and in direct radio communication with the vessel. Furthermore, there is a pressure alarm installed on the pipeline during discharge to validate the system. Any leak or malfunction and resulting drop in line pressure would trigger the alarm. In addition, a visual gauge is installed at the manifold and the manifold watchman will perform regular pressure monitoring. The pipeline will be inspected visually and regularly by walking alongside of it. All discharge hoses are hydrostatically tested annually, clearly marked and identified and certificates are submitted to the OHF prior to discharge.

All spills within the OHF zone would be retained within the bermed area. During the filling of the tanks (unloading of the vessel) continuous monitoring takes place. At all times there is a person on watch during discharge and in contact with the vessel.

In the presentation of the spill scenarios in this section, it is implied that the initial spill response actions outlined in section 7 above have first and foremost been addressed. The scenarios are designed moreover for the purpose of identifying the appropriate specific actions and therefore the related resources required for a given incident.

Detailed spill response scenarios related to ship to shore fuel transfer, and the appropriate actions and resources required, are outlined in Table 10-1.

Table 10-1. Ship to Shore Fuel Spill Response Scenario Actions and Resources Required

Source of Discharge	Potential Loss	Appropriate Actions	Resources Required
Coupling or hose break / malfunction at the ship's manifold	20 – 1,200 litres	1. Deploy containment boom as required to control migration of spill. Consideration of protection booming of beach front, or sensitive areas as defined in Annex 3 of the OPEP depending on wind direction, tides and marine conditions present. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained. 5. Notifications of local authorities.	Boat – Sabina near shore workboat - 3 responders Boom – 100 metres and accessories, additional booms if necessary to provide shoreline protection Shore crew to deploy from container – 3 responders
Coupling leaking or hose rupture along length of hose between ship and shore manifold	20 – 5,000 litres	1. Deploy containment boom to control migration of spill. Consideration of protection booming of beach front, or sensitive areas as defined in Annex 3 of the OPEP depending on wind direction, tides and marine conditions present. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained. 5. Notifications of local authorities.	Boat – Sabina near shore workboat - 3 responders Boom – 100 metres and accessories, additional booms if necessary to provide shoreline protection Shore crew to deploy from container – 3 responders
Leak at shore manifold connection	20 - 1,200 litres	1. Deploy containment boom to control migration of spill. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained 5. 5: Notifications of local authorities.	Same marine response, shore based response deploy berms and sorbents 3 additional shore responders MLA site services

(continued)

Table 10-1. Ship to Shore Fuel Spill Response Scenario Actions and Resources Required (completed)

Source of Discharge	Potential Loss	Appropriate Actions	Resources Required
Failure of flange or coupling Vehicle Accident involving pipeline or shore based hose length	20-5,000 litres	Land spill only: 1. Immediately install portable berms under leaking or damaged line where possible. 2. If portable berms are not feasible, contain and recover oil spill using dykes or trenches. 3. Prevent the oil from reaching natural drainage paths leading to the ocean. 4. Collect free-product for temporary storage. Excavate contaminated soil, store and manage appropriately. Marine response if necessary: 1. Deploy containment boom to control migration of spill. Consideration of protection booming of beach front, or sensitive areas as defined in Annex 3 of the OPEP depending on wind direction, tides and marine conditions present. Typical deployment lengths of 50 metres are anticipated for this task. (Multiple lengths should be used when required). 2. Deploy skimmer and recover spill. 3. Final recovery of spill using sorbents if necessary. 4. Monitor any free floating oil that is unable to be contained. 5. Notifications of local authorities.	Land spill only: Response by MLA site services Recover free products with sorbents, pumps within temporary berms Earth moving equipment available for berming, etc. Boat – Sabina near shore workboat - 3 responders Boom – 100 metres and accessories, additional booms if necessary to provide shoreline protection Shore crew to deploy from container – 3 responders MLA site services

Oil Handling Facility

The OHF located at the MLA shall be constructed in an impermeable secondary containment structure (lined and bermed containment area). The construction is in compliance with CCME's Environmental Code of Practice (CCME 2003; 2008), the bulk fuel storage facility will be designed to have bermed spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks OR 110 % volume of the largest tank, whichever is greater.

The above basis is consistent with the document entitled "Design Rationale for Fuel Storage and Distribution Facilities" published by the Department of Public Works of the Northwest Territories (refer to Section 4.6 of those guidelines). The lining within the bermed area is an impervious HDPE liner membrane. The design of these facilities will be based on industry standards for installation, jointing, etc., the membrane to ensure its integrity.

Detailed spill response scenarios related to OHF, and the appropriate actions and resources required, are outlined in Table 10-2.

Table 10-2. Oil Handling Facility Spill Response Scenario Actions and Resources Required

Source of Discharge	Potential Loss	Appropriate Actions	Resources Required
Leaking Tank or piping/valves	20-500 litres	Isolate and patch accordingly, berm or portable berms	Patch kits/ portable berms Response by MLA site services Recover free products with sorbents Berm designed with fuel recovery to sump and engineered oil water separator

** Potential loss estimated based on pumping rate and anticipated response time to shut down pumping operations*

10.1 RESPONSE STRATEGIES – LARGE SPILLS

For the purposes of this Plan, spills less than 5 m^3 are to be handled by MLA-OHF response operations. MLA personnel shall deploy the resident on-site equipment as outlined in the Plan.

If the spill is larger than 5 m^3 and depending on the specific circumstances, the ERC shall determine if it is necessary to increase the response capability by requesting third party assistance. Where this support is deemed necessary, the ERC shall immediately request this assistance while ensuring ongoing mitigation of spill impact to the extent possible while awaiting additional resources and assistance from the third party responder.

The choice of third party responder and any contractual arrangements (if required) is a commercial element of the project and shall be determined at a future date prior to commencement of operations. The choice of a third party responder shall be commensurate with the required capabilities under the regulations.

11. Preventive Measures

It is Sabina policy to prevent any accidental spillage and all prior efforts shall be made to minimize the risk of incidents and impact to the environment. Sabina shall constantly update the facility, shall have adequate safety equipment at the site and provide comprehensive training to its employees, contractors and visitors with the goal of avoiding spills and to minimize their impact if they should occur.

Sabina shall contract the entire fuel delivery and transfer operation to the ship operator. The ship operator has established transfer procedures meeting all of the required regulations for Arctic bulk fuel transfers. All ship personnel involved in the transfer shall possess appropriate Supervision of an Oil Transfer Operation certifications. The ships maintain pollution response equipment onboard and are trained in its use.

Furthermore, Sabina has established standard operating procedure in relation to the bulk fuel transfer – (Annex 5), that provides safeguards and immediate alarm in the event of failures during the operation.

11.1 TRAINING - GENERAL

Every person working at or visiting the Marine Laydown Area will receive an orientation upon arrival and, as such, will be apprised of, and required to, follow the ERP policies and procedures set forth in this Plan. As a contractual condition with penalties, Contractors will be obliged to comply with Sabina's approvals and environmental management plans, including this Plan. Sabina staff will monitor contractor performance and adherence to legislation and the commitments in the environmental management plans. Sabina ensures that personnel involved during a response receive training for their own safety, public safety, and that they have the required skills to minimize the impact of a spill on the environment.

The personnel and contractors directly linked to spill response operations will receive training to familiarize themselves with the environmental emergency plan. These personnel will also re-examine the manual of the OPEP on a yearly basis according to their duties and responsibilities. All training is recorded in the training register and kept up to date in the OPEP binder.

The personnel directly linked to spill response operations, contract employees and the other responders identified in the environmental emergency plan should take part in the yearly training program. It shall be ensured that training is carried out to ensure adequate numbers of responders at all levels are available on both work shifts.

All workboat operators and crews shall possess a Pleasure Craft Operator Competency Card.

11.1.1 Training Content

Spill training shall be provided on site prior to transfer operations for all personnel to be involved in the management and response to possible spills.

Sabina Emergency Response Coordinator shall possess spill management training to a level commensurate to the duties required of the position.

Responder training is to be of a combined theoretical presentation (classroom) and also of hands on nature (equipment deployment exercise).

The major components of this training program shall include:

- Classroom Training:
  - Introduction and overview of marine spill response.
  - Review of Sabina general spill response plan and integration of it to marine response.
  - Review of Marine Oil Pollution Emergency Plan elements.
  - Short review of oil spill behaviour and operational parameters / limitations for marine spill response operations.
  - Spill assessment.
  - Basic safety for spill responders to marine oil spills, presentation of video – small craft safety practices.
  - Basic oil boom deployment, presentation of video and booming techniques / guidelines.
  - Marine and shoreline recovery operations.

- Hands-on Training and Deployments:
  - Hands on review with participants of Sabina inventory of spill equipment.
  - Hands on instruction - boom connections, tow bridles, rope handling, basic knots and attachment of deployment accessories.
  - Simulated deployment of booms and related gear on water using appropriate vessels.
  - Debriefing and lessons learned.

11.1.2 Short Notice Training

In the event of a large spill the personnel requirements may exceed those that have received the specific responder training as outlined in Section 11.1.1 above. Due to the remoteness of the site, volunteers are not anticipated. MLA site services personnel shall be employed as additional responders.

Although all site services personnel possess WHMIS training, additional short notice training shall be carried out for these new responders on an as needed basis. Certain modules of the responder training shall be delivered on site to these personnel selected specifically from the training outlined in Section 11.1.1 above. The Incident Commander shall determine which modules are pertinent to each group of additional responders and shall be responsible for assuring adequate training for each group.

11.2 EXERCISES

Following the annual delivery of the spill training as outlined in Section 11.1 a comprehensive spill exercise shall be undertaken. The exercise is structured to test the readiness of management, responders and to practice and validate the logistics of the deployment of spill gear. The exercise content shall be different from year to year so that it can validate the various elements of the Plan and the response over a three-year period. Some of the factors that shall be evaluated include but are not limited to:

- Activation of the emergency plan.
- Management response.
- Internal and external notifications.
- Site safety.
- Communications.
- Equipment deployment to a specific scenario.

- Reporting and co-ordination with outside agencies.
- Exercise coordination with Canadian Coast Guard.
- Exercise coordination with ship.

11.3 SPILL PREVENTION MEASURES

11.3.1 Oil Handling Facility

Normal operation procedures of Sabina include many inspections that are performed regularly and kept on records. Any discrepancies noted are documented and investigated. Corrective measures are then applied.

11.3.2 Bulk Fuel Transfer

Several preventive measures are in place to minimize risk of spills during bulk fuel transfer including:

- The bulk fuel storage facility, pipeline and all related equipment and infrastructures are inspected prior to the bulk cargo transfer and the inspection methods are documented as a Standard Operating Procedure.
- Complete bulk cargo transfer procedures have been established, a copy of which is found in Annex 5 of this OPEP.
- As required by the applicable legislation the ship has a comprehensive Shipboard Oil Pollution Emergency Plan and a copy of this plan has been reviewed by Sabina.
- In addition to the legislative requirements, the charterer has implemented a shipboard spill response training program and performs routine exercises in spill response operations.
- The ship carries a compliment of spill response equipment as listed in Annex 6 of the OPEP and this equipment is ready at the ship's rail at all times for deployment during cargo operations.
- Sabina oil spill response equipment is on the beach, ready for immediate deployment at all times during cargo operations.
- The workboats and trained responders are available at all times during cargo operations for spill equipment deployment.
- Standard transfer procedures include hourly inspections by workboat of the floating hose for leaks or defects.
- During transfer operations the shore manifold is manned at all times.
- A low pressure alarm is installed at the shore manifold that is highly sensitive to differences in pressure during pumping. Any loss in the system will cause a drop in manifold pressure and results in an audible alarm, which is immediately reported by the manifold personnel.
- The bulk fuel storage facility is monitored at all times by Sabina personnel during the transfer.
- The pipeline is inspected hourly on foot during the transfer operation.

11.4 RESPONSE EQUIPMENT AUDITING

As part of the annual exercise program, a scenario based deployment of spill gear is carried out. Prior to the exercise, all gear is inspected, its condition is evaluated and any defects or missing equipment is replaced. The equipment audit is documented in the training register in Annex 7.

11.5 OIL POLLUTION RESPONSE PLAN UPDATES

The OPEP will be scrutinized at least once a year to take into consideration any amendments of the legislation, new characteristics of the site, the equipment on site, new policies of the company, environmental issues and also new staff and particulars of team members. Furthermore, following an exercise or an incident, the OPEP will be evaluated and modified accordingly.

Even if there is no change to be brought to the OPEP it will be updated at least once a year. The corrected version of the Plan will then be sent to the responsible person on site to ensure that the team at the site always has an updated version of the Plan in case their intervention is needed.

11.5.1 Update Registry

The OPEP shall be updated, reprinted, and redistributed when changes are made as noted above. The Plan carries the latest version identified by date. If Plan amendments result in a reprinting, all old versions of the Plan shall be recalled and destroyed accordingly.

11.5.2 Plan Distribution

In addition to distribution within Sabina all modified versions of the Plan shall be submitted to Transport Canada accordingly.

12. References

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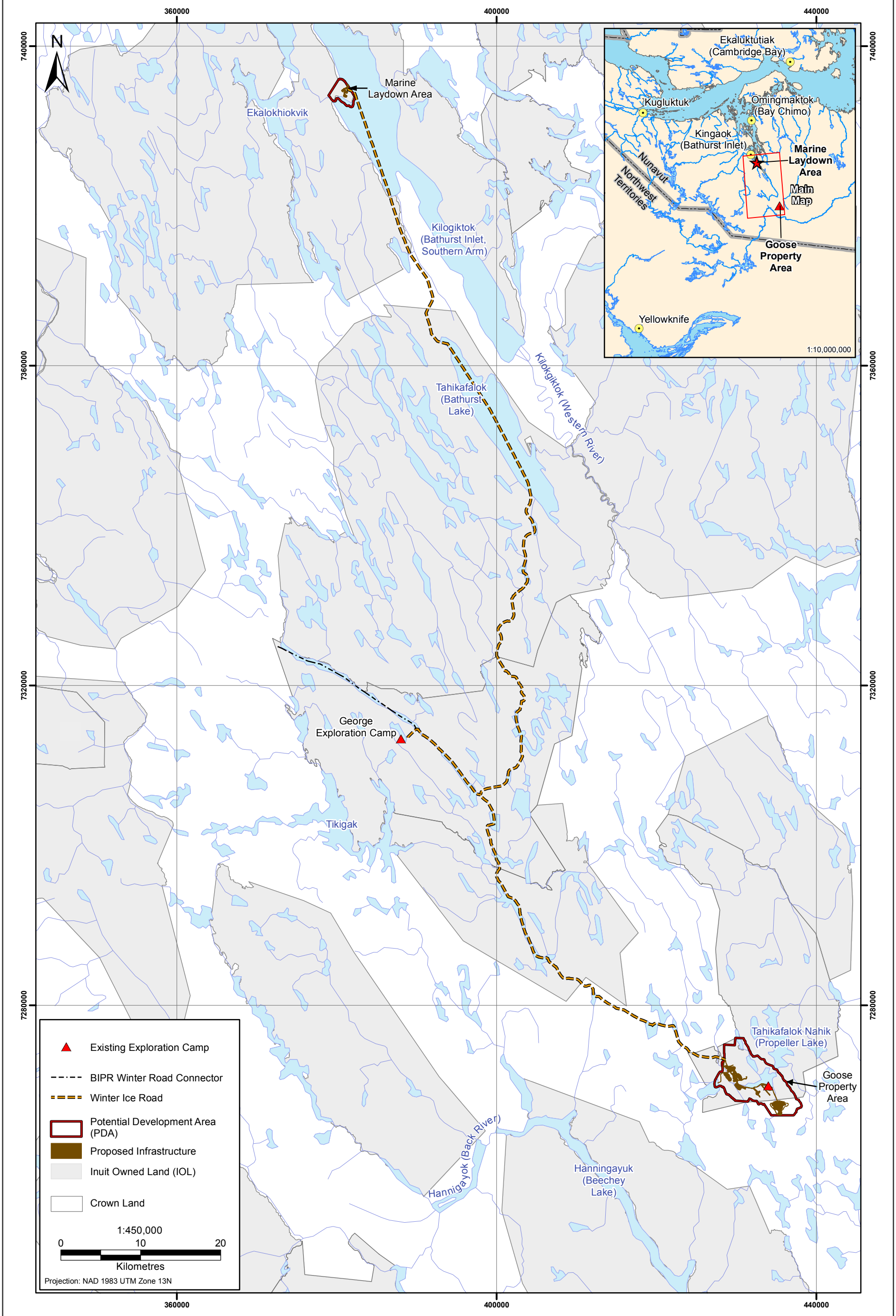
Annexes

ANNEX 1

Site Overview Plan

GIS # BR_FEIS_NA_tab_WinterIceRoadCorridor_WaterPermitting

April 07 2016



ANNEX 1

Sabina
GOLD & SILVER CORP.

Winter Ice Road Corridor Overview
Type A Water Licence

ANNEX 2

Oil Handling Facility Overview

GIS # BR_NA_tab_MLASiteLayoutERT_WL_A

May 30 2016

381000

381750

7395000

7394000

N

FUEL SHIP

FLOATING HOSE

WATER INTAKE PIPELINE

LIGHTERING BARGE

BARGE TIE DOWN

LIGHTER BARGE TERMINAL

WATER DISCHARGE PIPELINE (DESAL.)

TREATED EFFLUENT WATER DISCHARGE

LINED HAZARDOUS MATERIALS MGMT. AREA (5000 m²)

LANDFARM (2500 m²)

FREIGHT STORAGE AREA

FRESH/FIRE WATER STORAGE TANK

DESALINATION PLANT

ERT BUILDING

LAYDOWN AREA

MOBILE EQUIPMENT PARKING

INCINERATOR

CAMP AREA

FUEL STORAGE AREA
4 x 15,000,000 L TANKS

Main Map

Marine Laydown Area

Kilogiktok (Bathurst Inlet, Southern Arm)

BIPR Winter Road Connector

Goose Property Area

1:1,810,000

Kilogiktok (Bathurst Inlet, Southern Arm)

Marine Laydown Area

TO GOOSE PROPERTY

1:120,000

Marine Laydown Area PDA = 653 ha
Marine Laydown Area Infrastructure Footprint = 20 ha

- Spill Kits
- Existing Exploration Camp
- Treated Effluent Water Discharge
- Floating Hose
- Winter Ice Road
- Water Intake Pipeline
- Water Discharge Pipeline
- Camp/Maintenance Facilities
- Storage Facilities
- Helipad
- Desalination plant
- Potential Development Area (PDA)
- Contours 5 m
- Inuit Owned Land (IOL)
- Crown Land

1:7,500

0 200 400

Metres

Projection: NAD 1983 UTM Zone 13N

NOTE: All roads at the MLA are service roads

ANNEX 2

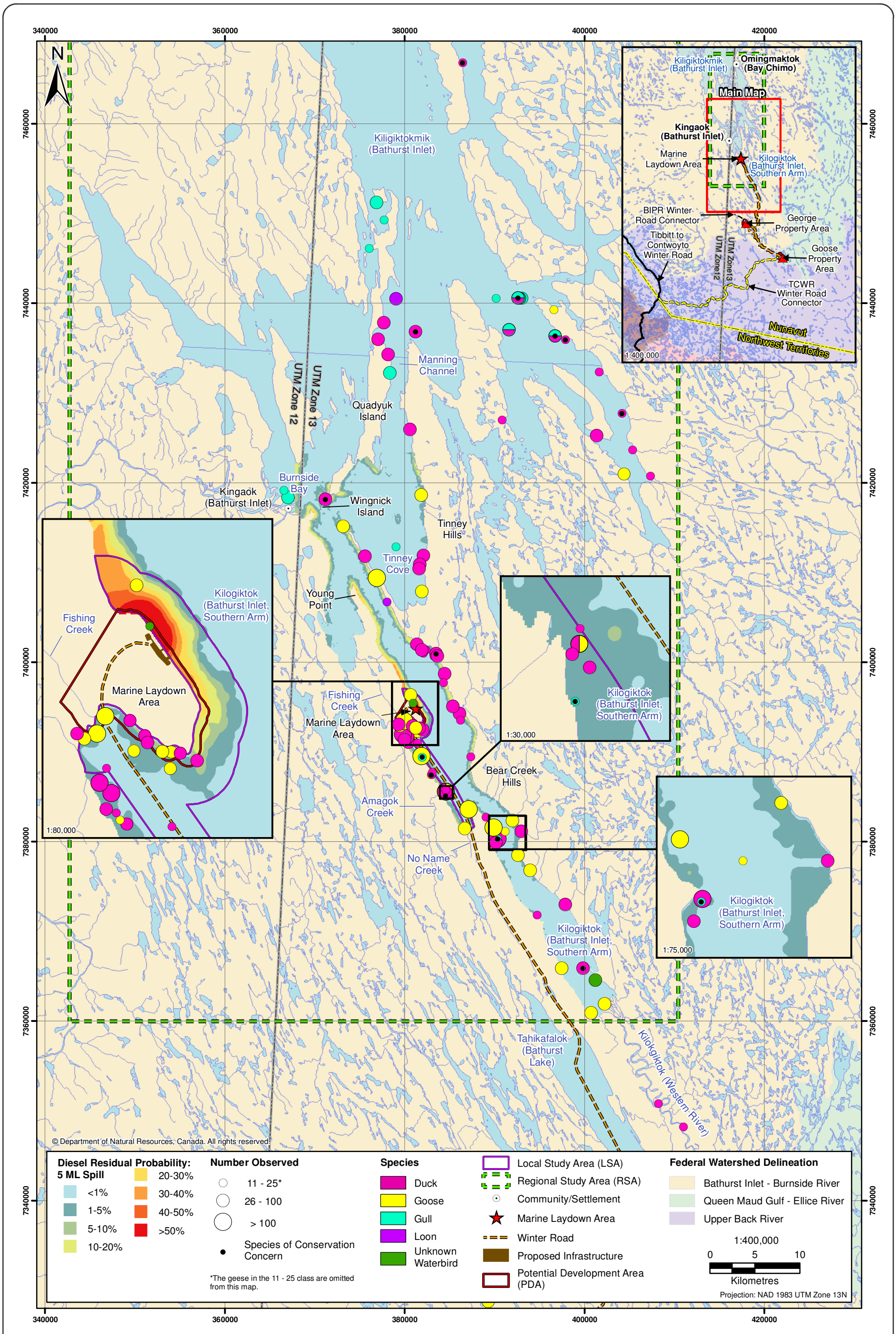
Sabina GOLD & SILVER CORP.

Marine Laydown Area
General Arrangement Plan with Emergency Response Site Locations

ANNEX 3

Sensitivity Zones

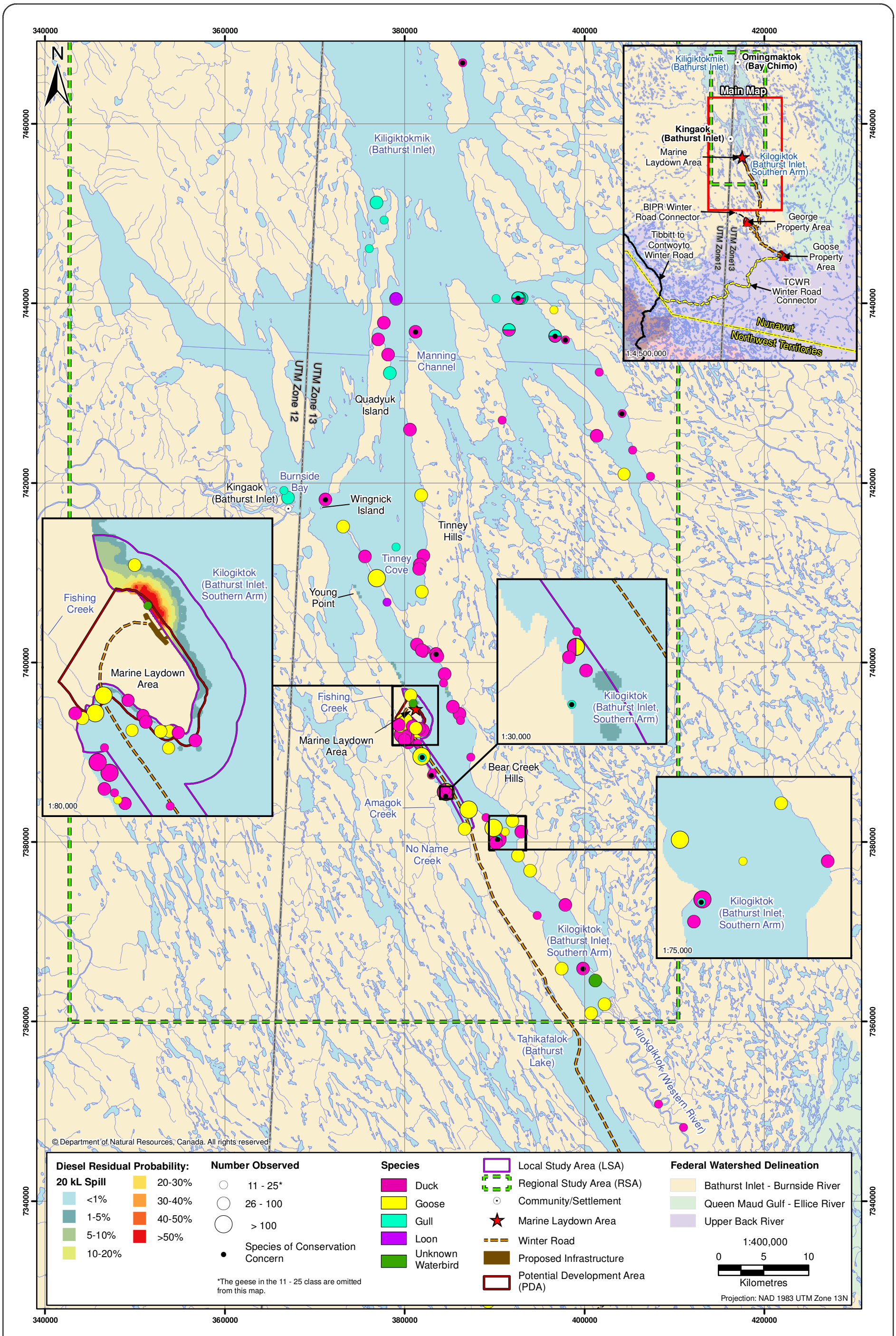
PROJECT # 0194096-0040 GIS # BAC-23-224 January 03 2014



Sabina GOLD & SILVER CORP.

5 ML Spill Sensitivity in Relation to Migratory Bird Staging Areas in Bathurst Inlet

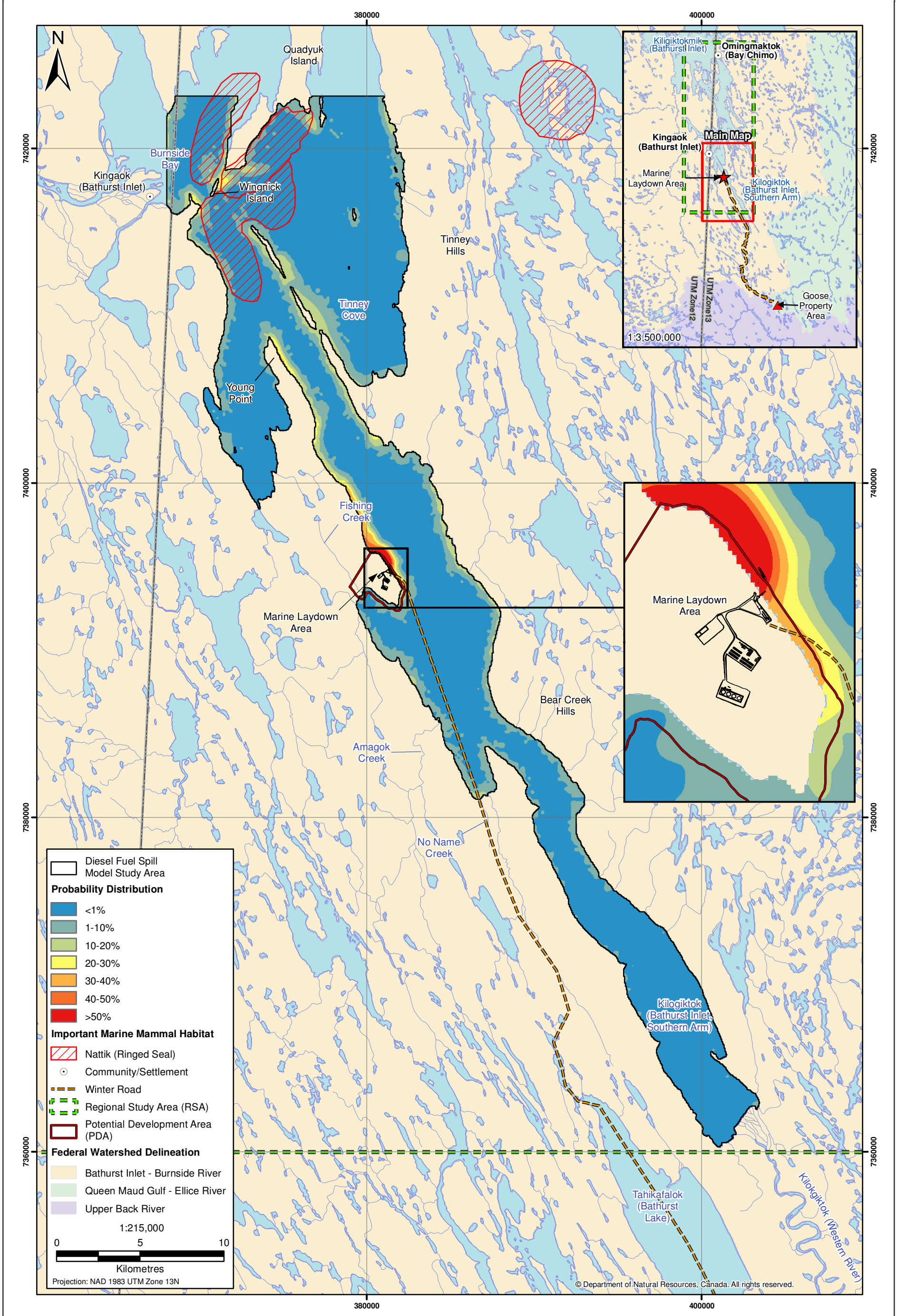
PROJECT # 0194096-0040 GIS # BAC-23-237 June 18 2015



Sabina GOLD & SILVER CORP.

20 kL Spill Sensitivity in Relation to Migratory Bird Staging Areas in Bathurst Inlet

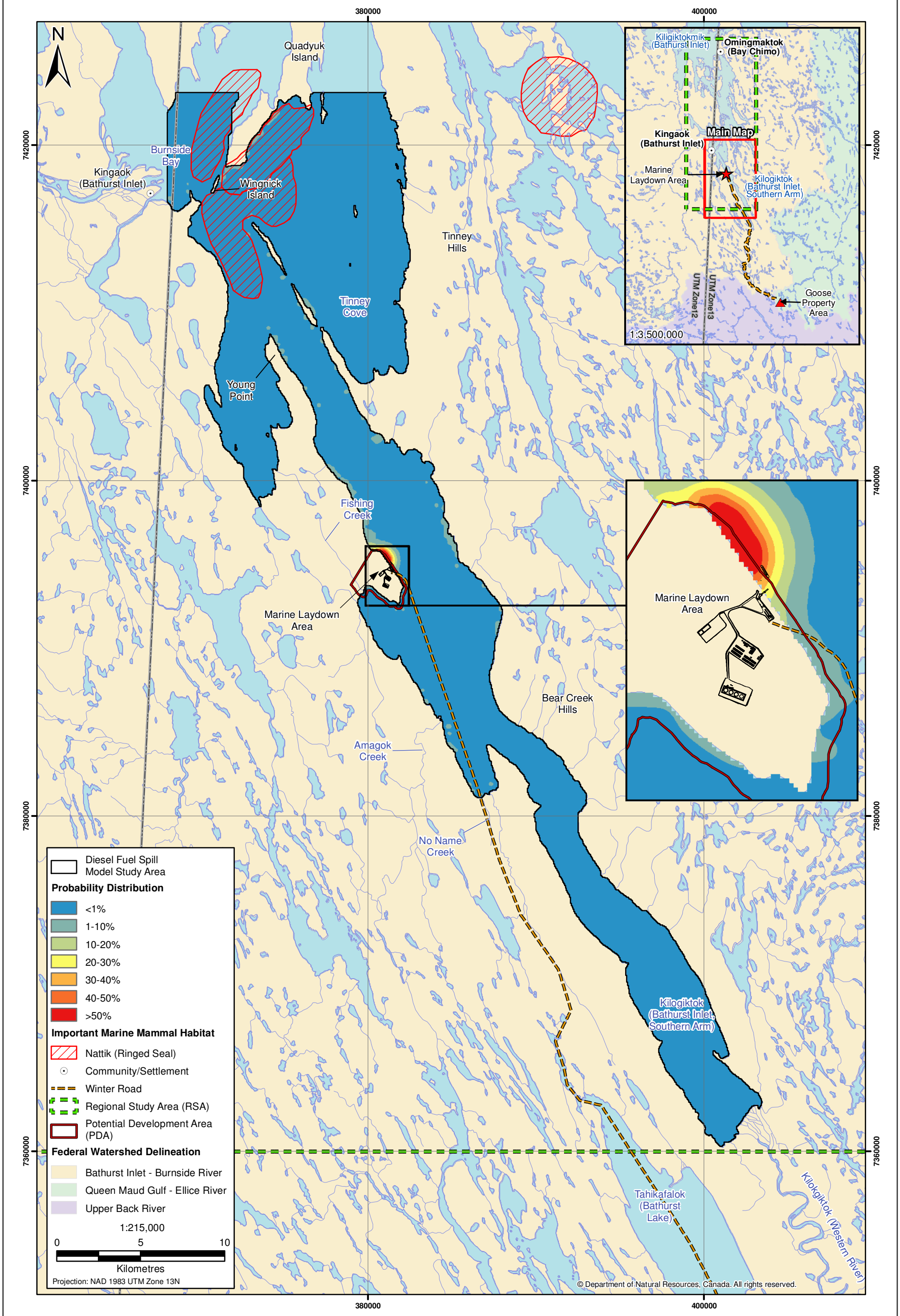
PROJECT # 0194096-0040 GIS # BAC-23-336b July 08 2015



Sabina GOLD & SILVER CORP.

5 ML Diesel Fuel Spill Shore Residual Probability Distribution after Ten Days in Relation to Marine Mammal Habitat in Bathurst Inlet (New as of June 2015)

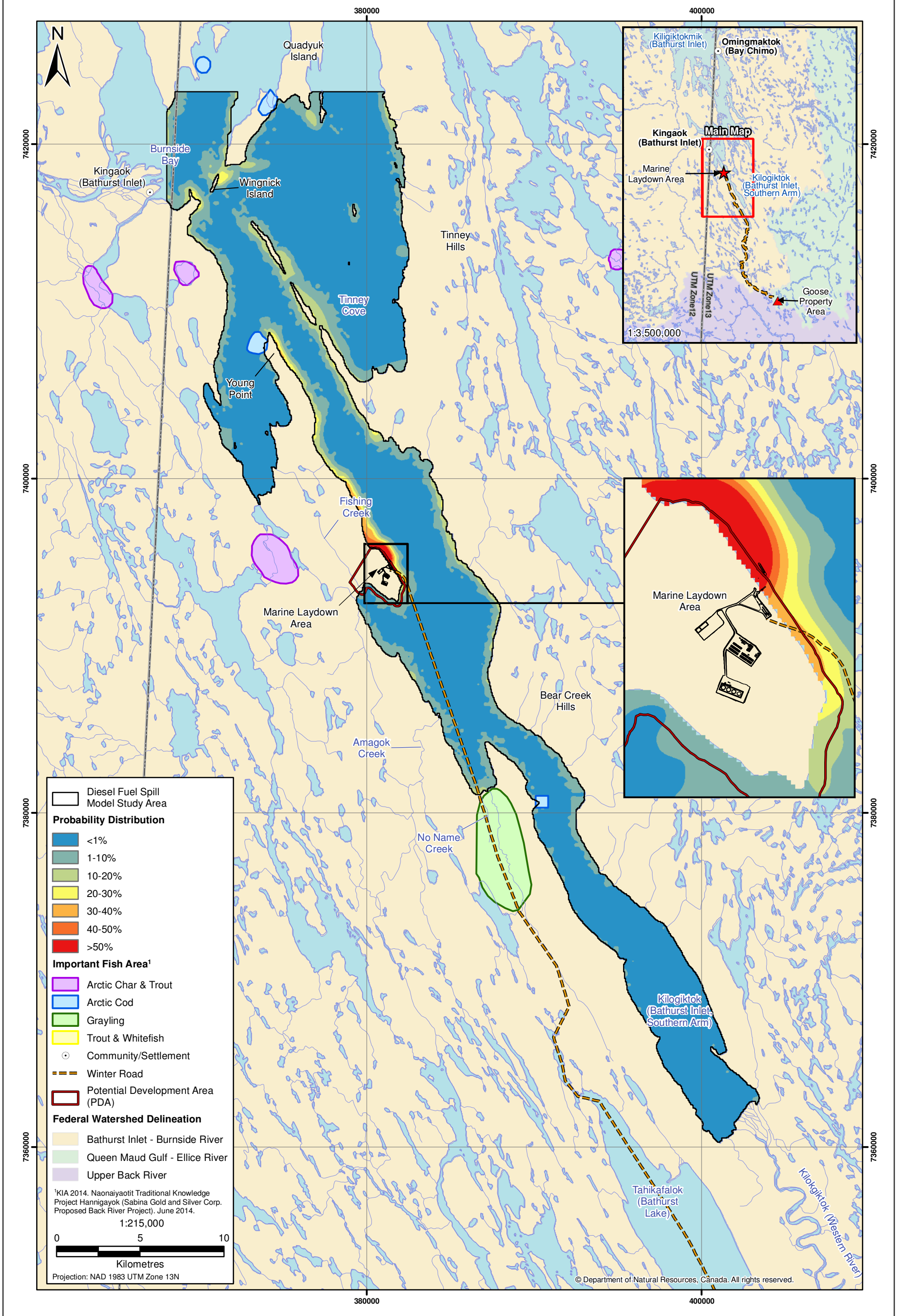
PROJECT # 0194096-0040 GIS # BAC-23-336d July 08 2015



Sabina GOLD & SILVER CORP.

20 kL Diesel Fuel Spill Shore Residual Probability Distribution after Ten Days in Relation to Marine Mammal Habitat in Bathurst Inlet (New as of June 2015)

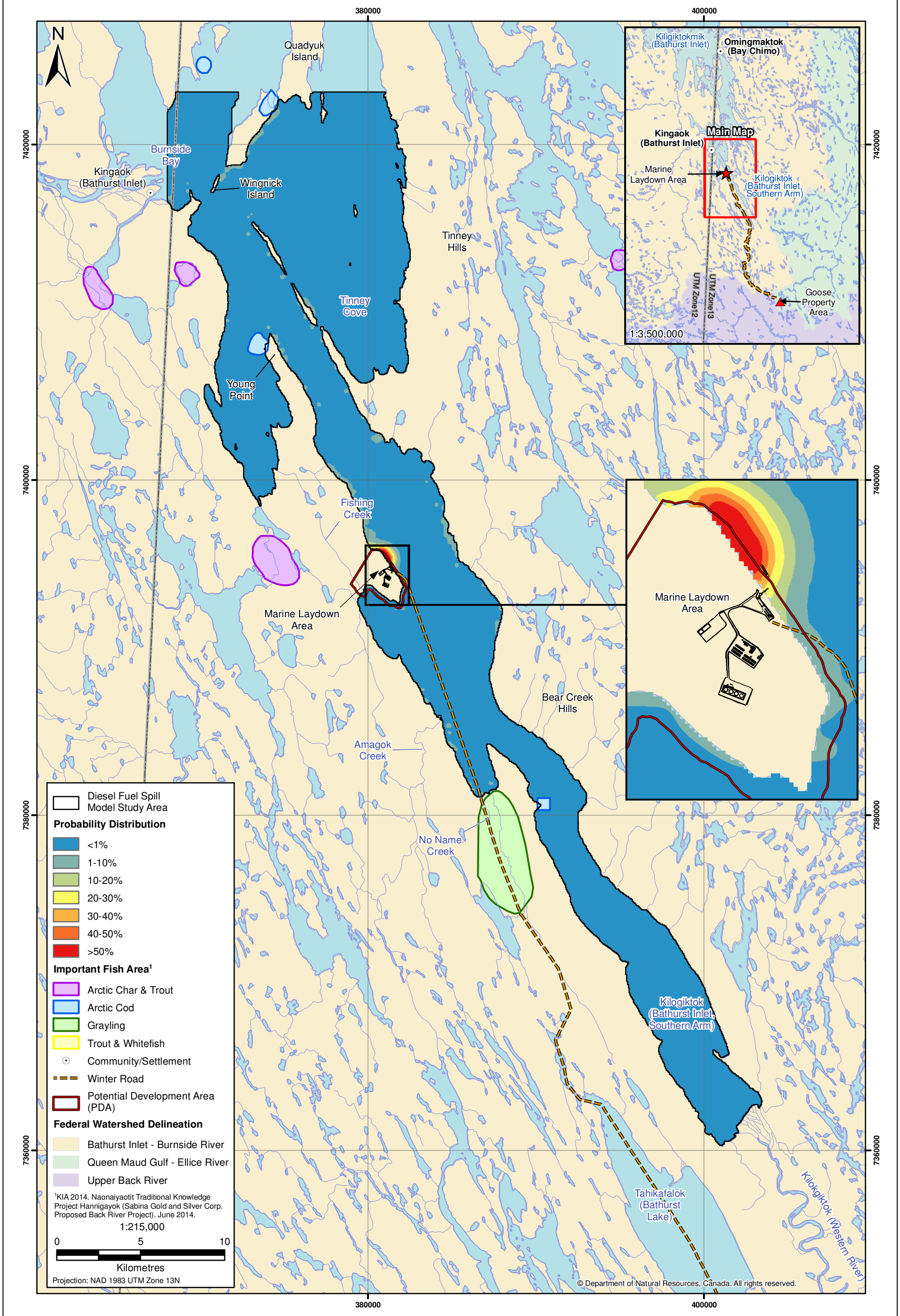
PROJECT # 0194096-0040 GIS # BAC-06-243b July 08 2015



Sabina GOLD & SILVER CORP.

5 ML Diesel Fuel Spill Shore Residual Probability Distribution after Ten Days in Relation to Important Inuit Fishing Areas in Bathurst Inlet (New as of June 2015)

PROJECT # 0194096-0040 GIS # BAC-06-243d July 08 2015



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20 kL Diesel Fuel Spill Shore Residual Probability Distribution after Ten Days in Relation to Important Inuit Fishing Areas in Bathurst Inlet (New as of June 2015)

ANNEX 4

Resident Spill Response Equipment

RESIDENT OIL SPILL RESPONSE EQUIPMENT
MARINE LAYDOWN AREA – OIL HANDLING FACILITY

Quantity	Description
1	Oil containment boom 300 meters – 24 Inch Fence type
4	Anchor kits for anchoring boom in place
4	Towing bridal for oil boom
4	Spill response unit – X Large Land
4	Overpack spill kit
50	12 kg. Bags granular absorbant
6	0.5m X 0.5m x 15 cm Arctic mini berm for under fittings
6	1m x 1m x 15 cm Arctic mini berm for under fittings
1	1500 Gallon Portable Tank
25	Bales Sorbent Pads
25	Bales Absorbant booms
1	Aluminium workboat with outboard engine, equipped with towing post and related equipment for boom deployment
1	Skimmer and diesel driven power pack, suitable for recovery of distillates – Capacity 7.5 tonnes per hour
12	Rakes for beach cleaning
12	Perforated shovels for sorbent recovery
12	Pitch forks with screens for sorbent and debris recovery
12	Approved flotation devices
1	Minimum 10 ton sand stockpile for spill berming operations

Additional Response Equipment Available from Project Stockpiles:

Mobile Equipment	
Grader	Winch Trucks
Cranes	Pickup Trucks
Snowmobiles	Generator Sets
Vacuum Truck	Fire Truck
Loaders	Aluminium Boats
Backhoes	Fuel Trucks
Bulldozers	Bobcats
Forklifts	Haul Trucks
Water Trucks	Snow Cats
Excavators	
Temporary Containment Systems	
Booms	Spill Kits
Drums	Spill Absorbent Material
Tanks	Silt Fencing
Tailings Management Area	
Emergency Transportation	
Aircraft (helicopter)	Snowmobiles
4-Wheel Drive Vehicles (ex. Pickup trucks)	Boats
ATVs	
Communication Equipment	
Radios	Fax
Telephone	Wireless Communication Systems

Mobile Spill Kit Equipment	
Spill Pump	White oil spill pads
Pump accessories	Universal booms
Vacuum ends	Cell U-Sorb
Tubing or pipes for vacuum or pumping	Sphagsorb
45 gallon top	Wedge wood
Diesel fuel jerry can	Plug patties
Spill kit accessory	Quattrex bags
Drums opener	Hand shovel
Wescot (to open empty drum screw)	Ice breaker chisel
Empty drums	Sledge hammer
Drums berms	Rod bars
Tarps	

ANNEX 5

Bulk Cargo Transfer Procedures

MARINE LAYDOWN AREA – OIL HANDLING FACILITY - PROCEDURES

Procedure:	**Bulk Ship to Shore Fuel Transfer**			**Procedure No:**	
Revision:		**Effective:**	October 2013	**Replaces:**	
Issued By:					
Project:	Back River Project				

PURPOSE AND SCOPE

To establish a standard procedure for the safe transfer of fuel from bulk fuel tanker ships to the Marine Laydown Area – Oil Handling Facility (MLA-OHF).

GENERAL:

The safe transfer of fuel is made in compliance with various regulatory laws, guidelines & organizational standards. This procedure outlines the operational scope of fuel transfers at the facility, details the various standards to be followed and outlines specific roles & accountabilities to ensure a safe transfer of fuel and to prevent cargo/fuel spillage, and any resulting environmental damage.

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GENERAL SAFETY

Wear approved P.P.E. - Safety glasses; hard hat; safety boots;

Key Safety Requirements:

- Ignition sources: Fuels are highly flammable. Smoking or open ignition sources are not permitted within 10 meters of ship to shore connections, fuel manifolds or within the fuel farm berm.

- High pressure piping: The pressurization of fuel transfer lines, manifolds and fuel farm piping can reach pressures of 700 kPa (100 psi). No person is permitted to create a break in a pipe or open any part of the pressurized system without the written consent of the Sabina Fuel Transfer Master once the Pre-Transfer Operation (Section 4.0) has been initiated.

- Environmental spill response: Prompt and correct local response are required in the event of a spill to safeguard life and property; and lessen the environmental impact of the spill.

- Communication: Good communication between all parties involved in the fuel transfer is essential for a smooth transfer, and are vital in the event of an incident.

Summary of Operation.

The ship to shore transfer operation at Bathurst Inlet is similar to other cargo discharge operations in the North, however, there are some unique aspects that require specific procedures be followed and understood by all personnel involved in the discharge operation.

Construction activities at Bathurst Inlet will provide for a new steel construction bulk fuel storage facility consisting of 4 steel tanks at 10 ML and one at 5 ML

The MLA-OHF shall be constructed in an impermeable secondary containment structure (lined and bermed containment area). The construction is in compliance with CCME's Environmental Code of Practice (CCME 2003; 2008), the fuel bulk fuel storage facility will be designed to have bermed spill containment with capacity equal to the volume of the largest tank plus 10% of the volume of the remaining tanks OR 110 % volume of the largest tank, whichever is greater.

The above basis is consistent with the document entitled "Design Rationale for Fuel Storage and Distribution Facilities" published by the Department of Public Works of the North West Territories (refer to section 4.6 of those guidelines). The lining within the bermed area is an impervious HDPE liner membrane. The design of these facilities will be based on industry standards for installation, jointing, etc., the membrane to ensure its integrity.

The MLA-OHF is connected to a shore receiving manifold by a 6 inch diameter steel pipeline. The pipeline is of welded construction. The pipeline is supported on appropriate stands and blocking. The pipeline is fully pressure tested and inspected each year prior to annual bulk cargo transfer operations.

Lighting is provided at the shore receiving manifold meeting the regulatory requirements of the Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69). The bulk fuel storage facility is also equipped with lighting meeting the standards as set forth in the same regulation.

Bulk fuel deliveries will take place during the open shipping season and volumes and frequency of deliveries will depend on a number of factors including but not limited to: size of ships, fuel consumption rates, operational constraints etc. Multiple bulk fuel transfers therefore from ship to shore annually are anticipated.

It is anticipated that the total annual volume of the bulk fuel transfers shall be in the order of approximately 30- 45 ML and will take place between the months of late August through early October. The fuel transfers shall take place by means of either a single or double 4 inch floating hose with an approximate length of approximately 1000 meters deployed between the vessel and the connecting flange on the shore. The products are then transferred through the pipeline to the above mentioned bulk storage facility through a 6 inch steel pipeline.

Accurate reconciliation of discharge & fill volumes through regular communication between ship & shore personnel is required to ensure the safe transfer of fuel & prevent overfilling within the tank farm that could result in a spill.

There are a number of work groups involved in the transfer of fuel. The workgroups and applicable procedures are listed below:

Work Group	Description of Applicable Regulation, Guideline or Procedure
Sabina / Shipper	MLA-OHF - Procedures
Sabina	Sabina Gold & Silver Corp. - Spill Contingency Plan (SCP) Sabina Gold & Silver Corp. - Oil Pollution Emergency Plan (OPEP)
Shipper	Cargo Operations at Bathurst Inlet Guidelines
Shipper	Arctic, General Port Operation Guidelines
Sabina / Shipper	Transport Canada – Arctic Waters Oil Transfer Guidelines.
Shipper	Arctic Shipping Pollution Prevention Regulations (ASPPR), under the Arctic Waters Pollution Prevention Act (AWPPA). This covers ship standards and activities in waters north of the 60th parallel.
Shipper	Arctic Waters Pollution Prevention Regulations (AWPPR) under the AWPPA. This covers the ship owner's liability provisions regarding spillage of waste
Shipper	Oil Pollution Prevention Regulations (OPPR), under the Canada Shipping Act.
Shipper	Vessel Pollution and Dangerous Chemical Regulations, (SOR 2012-69)
Shipper	Shipboard Oil Pollution Emergency Plan (SOPEP)

RESPONSIBILITY

Role	Accountability	By When	Comments
Sabina - Operations Manager or Designate	Complete PHA on Draft Procedure	In advance of annual Bulk Fuel Sealift	
Sabina Fuel Transfer Master	Implementation of all supplier accountabilities as described in this procedure, all regulatory requirements and organization procedures	As specified	
Sabina Fuel Transfer Master	Inspection of shore fuel transfer system piping	Every 4 hours upon start of fuel transfer	
Supplier Oil Transfer Supervisor	Notify Prairie & Northern Region, Maritime in Ottawa, via NORDREG of the plans for oil transfer operations in arctic waters	In advance of Bulk Fuel Sealift	
	Implementation of all supplier accountabilities as described in this procedure, all regulatory requirements and organization procedures	As specified	
All personnel involved in Bulk Fuel Transfer	Initiate Stop Transfer or Emergency Stop Transfer upon identification of conditions listed in this procedure	As required immediately	

DEFINITIONS

Shipper: The owner and the operations personnel of the bulk fuel tanker ship engaged under contract to Sabina Gold & Silver Corp. to ship & transfer fuel to the Bathurst Inlet fuel farm shore manifold

Receiver: Sabina Gold & Silver Corp

1.0 PROCEDURE

GENERAL

1.1 A Process Hazard Analysis (PHA) will be conducted annually on this procedure by all parties involved in the Bulk Fuel Transfer Procedure in advance of the Bulk Fuel Sealift. The purpose of the PHA is to identify potential hazards not already covered in this procedure or with the methodology and to implement the appropriate controls commensurate with the level of risk associated with the hazard.

1.2 Upon arrival of the bulk tanker at Bathurst Inlet and prior to commencement of any operation including supplier equipment mobilization, all organizations & work groups involved in the Bulk Tanker Fuel Transfer to the MLA-OHF will meet to:

- Identify the supplier fuel transfer supervisor and Sabina fuel transfer master to all personnel involved in the operations
- Review this procedure.
- Inform each party involved of the dimensions of the other's key facilities, such as manifold/fuelling station location, maximum & minimum draught, shore manifold connections, and jetty/shore characteristics such as tides, bollards, mooring and positioning aids, hidden hazards
- Inform all participating personnel of their duties and responsibilities during the transfer, and ensure they are versed in emergency procedures, and know the fuel spill contingency plan to be followed in the event of an incident.
- Upon completion of the meeting, the ship Captain and/or 1st mate will come ashore to inspect the installation.

1.3 Communication: Reliable, clear and consistent communication is essential for a smooth transfer operation, and is vital in a crisis situation. The following communication standards are to be followed:

- The language of the workplace at the facility is English. All communication is to be in English.
- A dedicated radio frequency will be used by personnel directly involved in the transfer. The supplier will provide radio's on the ship's dedicated frequency to the receiver's shore personnel.
- The radio is only to be used for fuel transfer communication
- All cargo volumes are to communicated in cubes or cubic meters
- The following standard signals should be used in all transfer operations

- STANDBY TO START TRANSFER
- START TRANSFER
- SLOW DOWN TRANSFER
- STAND BY TO STOP TRANSFER
- STOP TRANSFER
- EMERGENCY STOP OF TRANSFER
- EMERGENCY SHUTDOWN OF TRANSFER
-

If any of the following conditions occur, the transfer should be stopped immediately:

- LOST COMMUNICATIONS
- LOSS OF ABILITY TO MONITOR HOSE TO SHORE
- SIGN OF SPILLAGE, OR DAMAGE TO HOSES AND COUPLINGS
- ANY DETECTION OF ACCUMULATED GASES
- MAJOR INCREASE IN WIND AND/OR SWELLS (SUPPLIER)
- WHEN AN ELECTRICAL STORM IS PRESENT OR PREDICTED
- SEVERE DETERIORATION IN ICE OR VISIBILITY CONDITIONS (SUPPLIER)
- HELICOPTER LANDINGS OR TAKE OFFS WITHIN 500 METERS
- ANY OTHER SITUATION DEEMED DANGEROUS BY THE FUEL TRANSFER SUPERVISOR OR SABINA FUEL TRANSFER MASTER.

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2.0 LAND / SHORE - SAFETY AND ENVIRONMENTAL CONTROLS

2.1 The receiver will ensure the following safety controls are in place prior to and during fuel transfer:

- "No smoking/no naked lights or flames" warning signs will be posted at all the shore manifolds and at the entrance to and around the perimeter of the MLA-OHF berm.
- Fire extinguishers will be prepared for rapid deployment in the area of the shore manifold and the fuel farm before commencing transfer
- The shore hose landing, handling and manifold area is free of obstructions and hazards
- Road access to the beach area will be restricted to prevent vehicles from crossing the hose
- Manifolds, bollards and deadmen are adequate and clearly marked for visibility
- All personnel involved in the fuel transfer using radios will be on the same channel or frequency
- Ensure that all personnel know they have the right to suspend operations at any time, if they decide it is necessary.
- Fuel Transfer Piping Isolation: The pressurization of fuel transfer lines, manifolds and fuel farm piping can reach pressures of 700 kPa (100 psi). No person is permitted to create a break in a pipe or open any part of the pressurized system without the written consent of the Sabina fuel transfer Master.
    - Each time the fuel transfer system requires a break in the line, flange to be opened, a component to be removed or any other service that requires the opening of a line even downstream of a valve, a non-routine JSA must be

conducted by the SABINA Fuel Transfer Master and the workgroups doing the work.

- The work may only proceed upon written confirmation by the SABINA Fuel Transfer Master.

- Burning & Welding is not permitted on any component associated with shore manifold, pipeline, or fuel farm equipment without the written consent of the Sabina fuel transfer Master. A non-routine JSA must be conducted by the Sabina fuel transfer master and the personnel involved in the hot work.

2.2 The receiver will ensure the following environmental controls will be in place prior to and during fuel transfer:

- Ensure that all personnel know they have the right to suspend operations at any time in the event of a spill or, any loss of control or potential loss of control that may result in a spill
- Fuel transfer will be stopped immediately in the event of any drip, flow, leak or seep in to soil or water during fuel transfer. Fuel transfer operations will cease until leaks to soil or water have been eliminated.
- Emergency spill response kits will be positioned at the shore manifold, along the pipeline and at the fuel berm
- The SABINA emergency spill response equipment will be positioned in close proximity to the shore manifold at the beach area with boom (and towing bridle attached) ready to deploy.
- As an additional contingency, a front end loader, excavator or other appropriate earth moving equipment will be readily available to the SABINA transfer master at Bathurst Inlet during the fuel transfer.
- All personnel directly engaged in the fuel transfer are familiar with the Sabina emergency spill response protocol.
- Sabina will initiate & implement all land based spill response plans.
- A drip tray or lined berm will be place under the shore manifold connection.

3.0 SEA / SHIP - SAFETY & ENVIRONMENTAL CONTROLS

3.1 The supplier will implement all safety controls as are required under the applicable regulation, guideline or supplier procedure documented in the “Summary of Operation” above.

3.2 Land / shore – safety & environmental controls (Section 2.0) will be reviewed with the supplier’s oil transfer supervisor and shore crew.

3.3 The supplier is accountable under the following circumstances for the implementation of their fuel spill contingency plan (including containment and remediation) during the bulk fuel sealift:

- All spills to salt water
- The salt water component of all spills that originate from land and make their way to salt water.

3.4 The supplier shall demonstrate that they have previously carried out adequate shipboard emergency spill response simulation/training exercises

3.5 The supplier is accountable for completing the Arctic Oil Transfer Guideline Checklist and will provide a copy to Sabina Iron upon completion of the fuel transfer to the MLA-OHF.

4.0 PRE-TRANSFER PREPARATION & OPERATIONS

4.1 Pre-transfer preparation may commence at any time during the day – However, cargo transfer operation may only start during daylight hours.

4.2 Prior to the supplier connecting the hose to the shore manifold, the supplier oil transfer supervisor and SABINA fuel transfer master will complete and sign off on the appropriate pre-transfer preparation & operations checklist to confirming all requirements are completed.

4.3 Once the ship hose is connected to the shore manifold the following tasks can be completed:

- The supplier will complete and certify a pressurized air test of the transfer hose.
- The receiver may request the supplier to conduct an air pressure test on the shore manifold, piping and distribution piping within the berm. **It is critical that all tank isolation valves be closed prior to pressurizing the line.** The shore lines must hold pressure for 1 minute. If pressure cannot be held, an inspection of the entire line must be made to determine the location of the leak prior to discharging cargo. The receiver will certify that an air pressure test was completed.

5.0 TRANSFER OPERATIONS

5.1 The cargo transfer operation may only start during daylight hours.

5.2 Sabina fuel transfer master will announce impending fuel transfer on ship to shore communication and to other personnel at Bathurst Inlet

5.3 The Sabina fuel transfer master shall ensure that:

(a) the supervisor of the transfer operation on board the vessel has reported readiness for the transfer operation to begin;

(b) continuous communication is maintained with the supervisor on board the vessel; and

(c) the manifold valves and the tank valves within the fuel farm are not closed until the relevant pumps are stopped, if the closing of the valves would cause dangerous over-pressurization of the pumping system.

- **Cargo hose/shore line pigging procedures**

    - Great care must be taken to ensure that NO air be allowed to blow unrestricted into the shore cargo tanks. When pigging the cargo hose and clearing it of product, all stations must be coordinated to determine when the pig reaches the shore manifold and when the pig reaches the tank farm.

    - Drain the air pressure off the cargo hose back into a dry drip pan (it is the preferred method). In order to prevent air being splashed onto personnel a canvas or plywood screen can be set up. Where it is impracticable to drain into a manifold drip tray or an empty drum, we may then drain the air pressure off the cargo hose back into an empty cargo tank or slop tank onboard ship. Under no circumstances shall air be bled off in any great quantity into the shore tanks.

    - Normal operations would have the Jet-A discharged ashore first. The hose will then be blown with a 4 inch pig from ship to shore manifold, and again blown with a 6 inch pig until it reaches the tank farm. (This point is determined by prior arrangement with the ship and shore personnel). The hose will then be bled off and the hose will then be cleared.

    - This procedure will ensure that the hose/shore line has been cleared of all traces of Jet-A. The diesel will then be discharged ashore as the last cargo.

    - Upon completion of discharge of a cargo the pigging of the hose/shore line should be done in two steps as follows:

Ship to Shore Manifold – 4 inch floating hose:

1. Cargo pump stop
2. Cargo manifold close
3. Squeeze the cargo hose about 3ft from the manifold
4. Drain that section of the cargo hose
5. Ensure the hose is well secure
6. Disconnect the hose, insert the pig, reconnect the hose
7. Notify the shore manifold that you are ready to launch the pig
8. When the shore manifold is ready to receive the pig, open the air
9. When the air pressure is at 70psi, release the pig by opening the hose squeezer
10. The air pressure should be maintained at approximately 70psi
11. If the pig gets stuck, notified the shore manifold then increase the air pressure by 10psi and wait 2 to 5 minutes
12. If the pig is still stuck repeat the above but do not exceed 100psi

13. Once the pig is at the shore manifold pig catcher shut the air immediately, close the valve to the 6 inch shore pipeline isolating any remaining product between shore manifold and tank farm in the 6 inch shore pipeline.

14. Bleed the air from the hose.

Shore Manifold to Tank farm – 6 inch steel pipeline

15. Open the 6 inch pig launcher at the shore manifold and insert a pig.

16. Notify the shore manifold that you are ready to launch the pig

17. When the shore manifold is ready to receive the pig, open the air

18. When the air pressure is at 70 psi, release the pig by opening the 6 inch valve at the shore manifold

19. The air pressure should be maintained at approximately 70psi

20. If the pig gets stuck, notify the tank farm then increase the air pressure by 10 psi and wait 2 to 5 minutes

21. If the pig is still stuck repeat the above but do not exceed 100psi

22. Once the pig is at the tank farm pig catcher shut the air immediately, close the valve to the tank

23. Bled the air from the hose.

5.4 Fuel transfer rates should initially start off low in the 30-40m3/hr range and then ramp up slowly as the fill methodology advances. The maximum fuel transfer rate allowed the MLA-OHF is 149 m3/hr

5.5 Upon commencement of fuel discharge to the fuel farm tanks, the entire length of the MLA-OHF fuel transfer piping system from the shore manifold to the fuel berm will be inspected for leaks, and every hour thereafter so long as the fuel transfer system is charged. The Fuel Transfer Piping System Inspection Log will be submitted to the SABINA fuel transfer master at the end of each shift.

5.6 Jet A fuel will be transferred first to prevent contamination with diesel

5.7 The fuel transfer hose and shore pipe will be cleared of Jet A by pigging following the completion of Jet A fuel transfer

5.8 Diesel fuel will be transferred to the fuel farm.

5.9 Upon completion of the fuel transfer operations, the entire hose and pipeline shall be cleared of product by the pigging procedure outlined in 5.2 above

6.0 POST-TRANSFER OPERATIONS

6.1 The shore manifold open end will be capped to prevent any accidental discharge of fuel.

6.2 Upon completion of the fuel transfer operation, the hard pipe line will be isolated from the fuel farm at a point inside the fuel farm through the installation of a spade or by physically breaking & installing a blank flange or cap on both ends

6.3 The hard piped transfer line will be opened at the shore manifold to drain any remaining fuel that may have accumulated.

6.4 The SABINA fuel transfer master will sign off the MLA-OHF Fuel Transfer Checklist indicating that this procedure has been completed and the bulk fuel transfer to the MLA-OHF is complete

6.5 The supplier will provide Sabina Iron with a copy of the Suppliers statement of facts (record of ship activities) from the fuel transfer process.

7.0 REFERENCES AND RELATED DOCUMENTS

7.1 PHR Forms

7.2 Non-Routine JSA

7.3 Fuel Transfer Checklists

7.4 MLA-OHF plans and layout

ARCTIC WATERS OIL TRANSFER **CHECKLIST FOR BARGE TRANSFERS**

	BARGE - PROCEEDURE	CHECK	SUPPLIER		RECIPIENT		COMMENTS
		YES	INITIAL	DATE	INITIAL	DATE	
1.	Has the General Checklist for All Transfers been completed?						
2.	Is the dis charge pump as close as possible to suction pipe of the discharge tank?						
3.	Check hard line hose between pump and tank (if fitted)?						
4.	Check couplings on discharge between pump and recipient?						
5.	Do not exceed the following: a) maximum list (P & S) b) maximum trim (FWD & AFT)						
6.	Are barge tank diagrams and pipe schematics available?						
7.	Are fenders between the barge and other vessel?						
8.	Is barge equipment bonded to barge structure?						
9.	Are fire screens installed in ullage openings?						
10.	Are all valves closed and hoses stowed after completion of transfer?						

ARCTIC WATERS OIL TRANSFER

TRANSFER PARTICULARS

VESSEL / STATION INFORMATION			Location:	
	Supplier	Recipient	Start Date	
Vessel / Station Name			Start Time	
Officer in Charge			Finish Date	
Title			Finish Time	

OPERATIONS	
Transfer Type:	Connection Type (eg 2/4 bands):
Total Length of Hose (m):	Number of Hose Sections:
Diameter (m):	Test Pressure (kPa):
Purge Method: Nitrogen / Air	Pig Used: Yes / No
Boom deployed before transfer: Yes / No	If yes, type:
Work Boat used: Yes / No	
Hose Strain Relief System used: Yes / No	

PRODUCT INFORMATION				WEATHER CONDITIONS
Type	Quantity	Start Time	Finish time	Ice:
				Wind Force (knots):
				Wind Direction:
				Sea State:
				Visibility:
				Light Conditions:

COMMUNICATIONS	
Primary Method:	(VHF/UHF CHAN/FREQ)
Backup Method:	(PHONE, RADIO, ETC)
Language Used:	

ARCTIC WATERS OIL TRANSFER **GENERAL CHECKLIST FOR ALL TRANSFERS**

GENERAL PROCEEDURE	CHECK	SUPPLIER		RECIPIENT		COMMENTS
	YES	INITIAL	DATE	INITIAL	DATE	
1. Pre-transfer P.A. Announcement made?						
2. All personnel involved are informed & adequately trained? A designated person in charge on duty at all times during the transfer operation?						
3. Language agreed to?						
4. All communications including Backup System tested?						
5. Is fire fighting equipment tested, available & are fire screens in place?						
6. Are all regulations for transfer unders tood and observed and "NO SMOKING, NAKED LIGHTS or FLAMES" signs posted?						
7. Are flashlights "intrinsically safe" and approved?						
8. Are window type A.C. units switched off?						
9. Are exterior doors and ports leading to main deck closed?						
10. Is equipment, tools & material required for transfer available at hand?						
11. Is containment equipment and absorbent material available?						
12. Has Transfer Emergency Shutdown been tested?						
13. Hoses to be used have been checked for:						
a) correct diameter & length to reach other station,						
b) chafing, cracks or other deformation,						
c) damaged fittings,						
d) blanking of hoses,						
e) continuity.						
14. All repair work at either station stopped. (if dangerous for transfer)						
15. Inert gas system is fully operational (if fitted).						

GENERAL PROCEEDURE	CHECK	SUPPLIER		RECIPIENT		COMMENTS
	YES	INITIAL	DATE	INITIAL	DATE	
16. Main transmitting aerials and radar scanners are used with due care .						

GENERAL PROCEEDURE	CHECK	SUPPLIER		RECIPIENT		COMMENTS
	YES	INITIAL	DATE	INITIAL	DATE	
17. All craft alongside are authorised and following hazard warnings, etc.						
18. Is hose test certificate or records available for inspection?						
19. Have weather and ice report s been determined?						
20. Are gas concentration accumulations in still air conditions monitored?						
21. Are all scuppers plugs in place?						
22. Are main decks free of standing water?						
23. Were manifolds drained before removing blanks?						
24. Are pressure gauges ready and in place?						
25. All sea valves on cargo systems closed?						
26. Are drip cans and trays in place, and empty?						
27. Is lighting adequate for all transfer requirements?						
28. Is mooring watch being monitored?						
29. Are spill reporting procedures understood?						
30. Are all tank vents free of blockage?						
31. Have Pressure/Vacuum Relief (PVR) valves been checked?						
32. Has a post-transfer PA announcement been made?						
33. Are International signals being displayed? (if required)						
34. Has a written procedure and the sequence of the transfer been agreed upon?						
35. Is there a clear understanding of the watch and shift arrangement?						
36. Will there be sufficient personnel a vailable at all times to monitor the transfer operation, tend cargo hose and mooring lines and take appropriate action in an emergency?						

ANNEX 6

Spill Response Equipment Onboard Ship

Certificate / License	Qty min.	Island Tdr		ITB Rel		ITB Res		ITB Sup		ITB Vcr	
		Qty	Loc	Qty	Loc	Qty	Loc	Qty	Loc	Qty	Loc
Containment Boom	1000’	-	PC	-	PC	-	PC	-	PC	-	PC
Boom Towing Bridles	2	-	PC	-	PC	-	PC	-	PC	-	PC
Absorbent Boom 4" x 10'	10	-	PC	-	PC	-	PC	-	PC	-	PC
Absorbent Pads (100 per Bale)	6	-	PC	-	PC	-	PC	-	PC	-	PC
Absorbent Pads (Bales)	4	-	ER	-	ER	-	ER	-	ER	-	ER
Absorbent Pads (Bales)	1	-	CMR	-	CMR	-	CMR	-	CMR	-	CMR
Open Headed Barrels (empty)	4	-	PC	-	PC	-	PC	-	PC	-	PC
Pad/Barrel Ringer	1	-	PC	-	PC	-	PC	-	PC	-	PC
Aluminum Shovels	3	-	PC	-	PC	-	PC	-	PC	-	PC
Aluminum Pitch Fork	2	-	PC	-	PC	-	PC	-	PC	-	PC
Heavy Duty Plastic Bags	200	-	PC	-	PC	-	PC	-	PC	-	PC
Anchor Assemblies	4	-	PC	-	PC	-	PC	-	PC	-	PC
Garbage Pails 100 ltr.	4	-	PC	-	PC	-	PC	-	PC	-	PC

ER – Engine Room
CMR – Cargo Monitoring Room
PC – Pollution Container

TYPICAL ARCTIC SHIPBOARD POLLUTION CONTROL GEAR

Quantity	Description
1200 Feet	Oil Pollution boom, 24 inch
4	Towing kits for oil pollution boom
1	Oil skimmer, suction or oleophillic type complete with pumps and hoses
2	Workboats for boom deployment and skimmer operations
10	Bales sorbent Booms (40 ft per bale)
10	Bales sorbet pads
2	Anchor kits for booms
1	Assorted drums or portable storage for recovered product on workboats

ANNEX 7

Training Register and Exercise Documentation

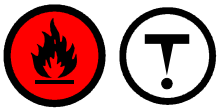
OIL HANDLING FACILITY - OIL POLLUTION EMERGENCY PLAN TRAINING REGISTRY

Course Title	Participant Name	Organization	Date	Completion Y/N	Comments

ANNEX 8

Material Safety Data Sheets

Material Safety Data Sheet

WHMIS	Product name	TDG Road/Rail
	Diesel / Furnace oil	

Section 1. Identification

Chemical name : Fuel oil, No 2

Other means of identification : Gasoil - unspecified

Code : 0101

CAS number : Not applicable.

Relevant identified uses of the substance or mixture and uses advised against

Supplier's details : ÉNERGIE VALERO INC
1801Avenue McGill College
13è étage
Montréal, Québec
H3A 2N4

Emergency telephone number with hours of operation. : **Canutec (24 heures)**
613-996-6666

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 4
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2B
CARCINOGENICITY - Category 2

Percentage of the mixture consisting of ingredient(s) of unknown toxicity: 15%

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Combustible liquid.
Causes skin and eye irritation.
Suspected of causing cancer.

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Wear protective gloves. Wear eye or face protection. Keep away from flames and hot surfaces. - No smoking. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : IF exposed or concerned: Get medical attention. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture Mixture

Ingredient name	%	CAS number
Fuel oil, No 2 Fuel oil, No 2	100 100	68476-30-2 68476-30-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

Peut contenir du sulfure d'hydrogène

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Section 4. First aid measures

Ingestion : Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
sulfur oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Section 6. Accidental release measures

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

United States

Occupational exposure limits

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Fuel oil, No 2	**ACGIH TLV (United States, 6/2013). Absorbed through skin.** TWA: 100 mg/m³, (measured as total hydrocarbons) 8 hours. Form: Inhalable fraction and vapor
Fuel oil, No 2	**ACGIH TLV (United States, 6/2013). Absorbed through skin.** TWA: 100 mg/m³, (measured as total hydrocarbons) 8 hours. Form: Inhalable fraction and vapor
Fuel oil, No 2	**ACGIH TLV (United States, 6/2013). Absorbed through skin.** TWA: 100 mg/m³, (measured as total hydrocarbons) 8 hours. Form: Inhalable fraction and vapor

Canada

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredient	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Fuel oil, No 2, measured as total hydrocarbons	US ACGIH 6/2013	-	100	-	-	-	-	-	-	-	[1] [a]
Fuel oil, No 2, as total hydrocarbons	AB 4/2009	-	100	-	-	-	-	-	-	-	
	BC 7/2013	-	100	-	-	-	-	-	-	-	[1] [b]
Fuel oil, No 2, measured as total hydrocarbons	ON 1/2013	-	100	-	-	-	-	-	-	-	[1] [c]
Fuel oil, No 2, measured as total hydrocarbons	US ACGIH 6/2013	-	100	-	-	-	-	-	-	-	[1] [a]
Fuel oil, No 2, as total hydrocarbons	AB 4/2009	-	100	-	-	-	-	-	-	-	
		-	100	-	-	-	-	-	-	-	[1] [b]
Fuel oil, No 2, measured as total hydrocarbons	ON 1/2013	-	100	-	-	-	-	-	-	-	[1] [c]
Fuel oil, No 2, measured as total hydrocarbons	US ACGIH 6/2013	-	100	-	-	-	-	-	-	-	[1] [a]
Fuel oil, No 2, as total hydrocarbons	AB 4/2009	-	100	-	-	-	-	-	-	-	
		-	100	-	-	-	-	-	-	-	[1] [b]
Fuel oil, No 2, measured as total hydrocarbons	ON 1/2013	-	100	-	-	-	-	-	-	-	[1] [c]

[1]Absorbed through skin.
Form: [a]Inhalable fraction and vapor [b]Inhalable vapour and aerosol [c]Total hydrocarbons

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Not available.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : -40 to 6°C (-40 to 42,8°F)

Boiling point : 141 to 462°C (285,8 to 863,6°F)

Flash point : Closed cup: >56°C (>132,8°F)

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 0,5%
Upper: 5%

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : 0,879

Solubility : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 225°C (437°F)

Decomposition temperature : Not available.

Viscosity : Kinematic (40°C (104°F)): 0,015 cm^2/s (1,5 cSt)

Aerosol product

Heat of combustion : -42,8 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Section 10. Stability and reactivity

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Fuel oil, No 2	LD50 Oral	Rat	12 g/kg	-
Fuel oil, No 2	LD50 Oral	Rat	12 g/kg	-
Fuel oil, No 2	LD50 Oral	Rat	12 g/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Fuel oil, No 2	Eyes - Mild irritant	Rabbit	-	0,5 minutes 100 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
Fuel oil, No 2	Eyes - Mild irritant	Rabbit	-	0,5 minutes 100 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
Fuel oil, No 2	Eyes - Mild irritant	Rabbit	-	0,5 minutes 100 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Ingestion : Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Section 12. Ecological information

Bioaccumulative potential

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	ADR/RID	IMDG	IATA
UN number	UN1202	UN1202	UN1202	UN1202	UN1202	UN1202
UN proper shipping name	Diésel	Diésel	Diésel	Diésel	Diésel	Diésel
Transport hazard class(es)	3	3	3	3	3	3
Packing group	III	III	III	III	III	III
Environmental hazards	No.	No.	No.	No.	No.	No.
Additional information	This product may be re-classified as "Combustible Liquid," unless transported by vessel or aircraft. Non-bulk packages (less than or equal to 119 gal) of combustible liquids are not	-	-	**Special provisions** 640 (E)	-	-

Section 14. Transport information

	regulated as hazardous materials.					

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not applicable.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: All components are listed or exempted.
United States inventory (TSCA 8b): All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Fuel oil, No 2	100	Yes.	No.	No.	Yes.	Yes.
Fuel oil, No 2	100	Yes.	No.	No.	Yes.	Yes.

State regulations

Massachusetts : None of the components are listed.

New York : None of the components are listed.

New Jersey : None of the components are listed.

Pennsylvania : The following components are listed: FUEL OIL

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2B: Material causing other toxic effects (Toxic).

Section 15. Regulatory information

Canadian lists

Canadian NPRI : None of the components are listed.

CEPA Toxic substances : None of the components are listed.

Canada inventory : All components are listed or exempted.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

International lists

Canada : All components are listed or exempted.

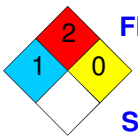
Europe : All components are listed or exempted.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health *	1
Flammability	2
Physical hazards	0

National Fire Protection Association (U.S.A.)



Flammability

Health

Instability/Reactivity

Special

History

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Version : 5

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Section 16. Other information

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

ANNEX 9

Transport Canada – TP9834E

“Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants”

Transport Canada Transports Canada

TP 9834E
(07/2009)

Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants

2ND EDITION
JULY 2009

TC-1003421

Canada

Responsible Authority	Approval
The Director Operations and Environmental Programs is responsible for this document, including any change, correction, or update.	Director Operations and Environmental Programs Marine Safety

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TP 9834E
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REVISIONS

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Next Review **May 2010**

Revision No.	Date of Issue	Affected Pages	Author(s)	Brief Description of Change
1	**July 2009**	**All**	**T. Morris**	Updated to reflect the *Canada Shipping Act, 2001* and the amendments to IMO Resolution A.851(20) in Resolution MEPC.138(53).

TABLE OF CONTENTS

INTRODUCTION **1**

1. ABBREVIATIONS **1**

2. DEFINITIONS **1**

3. HOW TO MAKE A REPORT **2**

4. CONTENT OF REPORT **2**

5. SUPPLEMENTARY REPORT **3**

6. PROBABILITY OF DISCHARGE **3**

7. REPORT ON ASSISTANCE OR SALVAGE **3**

APPENDIX **4**

A1. PROCEDURES **4**

A2. STANDARD REPORTING FORMAT AND PROCEDURES **4**

A3. DETAILED REPORTING REQUIREMENTS **7**

A3.1 Dangerous Goods Reports - Packaged Form (DG) 7

A3.2 Harmful Substances Reports - In Bulk (HS) 8

A3.3 Harmful Substance Reports - Packaged Form (MP) 10

A4. PRIMARY REPORT FORMS **11**

A4.1 Dangerous Goods Report - Packaged Form (DG) 11

A4.2 Harmful Substances Report - In Bulk (HS) 12

A4.3 Harmful Substances Report - Packaged Form (MP) 13

INTRODUCTION

These Guidelines comply as far as practicable with the general principles and standard reporting format procedures described in Resolution A.851(20) of the 20th Session of the Assembly of the International Maritime Organization (IMO), adopted 27 November 1997, as amended by Resolution MEPC.138(53).

The intent of these Guidelines is to enable the proper authorities to be informed without delay so that appropriate action may be taken when:

1. any incident occurs involving the loss, or likely loss, overboard of packaged dangerous goods in the sea; or
2. any incident occurs giving rise to pollution, or threat of pollution to the marine environment, as well as of assistance and salvage measures; or
3. any oil pollution incident occurs involving the loading or unloading of oil to or from a vessel at an oil handling facility.

The *Pollutant Discharge Reporting Regulations, 1995* stipulate that a vessel's master or owner must make reports required under the Regulations in the manner described in these Guidelines or IMO Resolution A.851(20). The Regulations also stipulate that the operator of an oil handling facility must make reports in a manner described in these Guidelines. These Guidelines should then be used in conjunction with the *Pollutant Discharge Reporting Regulations, 1995* when harmful substances and/or marine pollutants are involved. Where any discrepancy exists between the regulations and the Guidelines, the requirements of the regulations shall prevail.

1. ABBREVIATIONS

HF	High Frequency
IMO	International Maritime Organization
MARPOL	*The International Convention for the Prevention of Pollution from Ships*, 1973, and the *Protocols* of 1978 and 1997, as amended from time to time
MF	Medium Frequency
UN	United Nations
UTC	Coordinated Universal Time
VHF	Very High Frequency

2. DEFINITIONS

2.1 In these Guidelines,

"dangerous goods" means goods that by reason of their nature, quantity or mode of stowage are either singly or collectively liable to endanger the lives of the passengers or imperil the vessel and includes all substances determined by the Governor in Council, in regulations made by him, including the *Cargo, Fumigation and Tackle Regulations*, to be dangerous goods; *(marchandises dangereuses)*

"harmful substance in packaged form" means any substance which is identified as a marine pollutant in the International Maritimes Dangerous Goods Code (IMDG Code); *(substance nuisible en colis)*

"in bulk" means in a hold or tank that is part of the structure of the vessel, without any intermediate form of containment; *(en vrac)*

"incident" includes the discharge of a pollutant, a dangerous good or a harmful substance in packaged form or their anticipated discharge; (*incident)*

"marine safety inspector" means a person appointed as a marine safety inspector under section 11 of the *Canada Shipping Act, 2001; (inspecteur de la sécurité maritime)*

"marine communications and traffic services officer" means a person designated as a marine communications and traffic services officer by the Minister of Fisheries and Oceans under subsection 126(2) of the *Canada Shipping Act, 2001; (fonctionnaire chargé des services de communications et de trafic maritimes)*

"packaged form" means the forms of containment specified for harmful substances or dangerous goods in the International Maritimes Dangerous Goods Code (IMDG Code); *(en colis)*

"pollution prevention officer" means a person designated as a pollution prevention officer pursuant to section 14 of the *Arctic Waters Pollution Prevention Act*; *(fonctionnaire chargé de la prévention de la pollution)*

"waters under Canadian jurisdiction" means the internal waters of Canada as described in section 6 of the *Oceans Act*, the territorial sea of Canada as described in section 4 of the *Oceans Act* and the exclusive economic zone of Canada as described in section 13 of the *Oceans Act*, , and includes the shipping safety control zones prescribed pursuant to section 11 of the *Arctic Waters Pollution Prevention Act*. *(eaux de compétence canadienne)*

3. HOW TO MAKE A REPORT

3.1 The report should be transmitted in the following manner:

1. when an incident occurs involving a vessel in waters under Canadian jurisdiction, the report shall be made with the highest possible priority and using the quickest means available to a marine safety inspector, or for incidents occurring in a shipping safety control zone, to a pollution prevention officer;
2. when the vessel referred to in paragraph 3.1.1 is in a radio telecommunications area that is covered by Canadian Coast Guard Marine Communications and Traffic Services, the report should, where expedient, be routed through that system to a marine communications and traffic services officer;
3. when an incident occurs involving a Canadian vessel outside waters under Canadian jurisdiction, the report should be made to the nearest coastal State through an appropriate coast station, preceded by the safety signal (if the incident affects the safety of navigation), or by the urgency signal (if the incident affects the safety of the vessel or persons);
4. on appropriate frequencies (in the bands 405-525 kHz, 1605-2850 kHz or 156-174 MHz);
5. when the vessel is not within reach of a MF or VHF coast station, to the most appropriate HF coast station or on the relevant maritime satellite communication system;
6. when the vessel is within or near an area for which a vessel reporting system has been established, to the designated shore establishment responsible for operation of that system;
7. the format and procedures should, when practicable, comply with the relevant requirements of Section A2 in the Appendix, *Standard Reporting Format and Procedures*; and
8. in addition to any report referred to in paragraph 3.1.1, when an oil pollution incident occurs involving a vessel at a designated oil handling facility, the operator of the oil handling facility shall:
    1. report with the highest possible priority and using the quickest means available, to the federal emergency telephone number identified in the facility's oil pollution emergency plan;
    2. report in writing any incident involving oil to the Transport Canada Marine Safety office nearest to the facility; and
    3. report, when practicable, in compliance with the relevant requirements of Section A2 of the Appendix, *Standard Reporting Format and Procedures*.

4. CONTENT OF REPORT

4.1 Reports should contain the specific information listed in Section A3 of the Appendix, *Detailed Reporting Requirements*.

5. SUPPLEMENTARY REPORT

5.1 Particulars not immediately available should be inserted in a supplementary message or messages.

5.2 When harmful substances and/or marine pollutants are involved, a supplementary message should follow immediately or as soon as possible after the initial report. Information that is essential for the protection of the marine environment, as appropriate to the incident, should be included. That information should include Items P, Q, R, S and X, as listed in Section A2 of the Appendix.

6. PROBABILITY OF DISCHARGE

6.1 The probability of a discharge resulting from damage to the vessel or its equipment is a reason for making a report. In judging whether there is such a probability and whether a report should be made, the following factors, among others, should be taken into account:

1. the nature of the damage, failure or breakdown of the vessel, machinery or equipment; and
2. sea and wind state and also traffic density in the area at the time and place of the incident.

6.2 It is recognized that it would be impracticable to lay down precise definitions of all types of incidents involving probable discharge which would warrant an obligation to report. Nevertheless as a general guideline, the master of the vessel should make reports in cases of:

1. damage, failure or breakdown which affects the safety of vessels. Examples of such incidents are collision, grounding, fire, explosion, structural failure, flooding, cargo shifting; and
2. failure or breakdown of machinery or equipment which results in the impairment of the safety of navigation. Examples of such incidents are failure or breakdown of steering gear, propulsion plant, electrical generating system, essential shipborne navigational aids.

7. REPORT ON ASSISTANCE OR SALVAGE

7.1 The master of any vessel engaged in or requested to engage in an operation to render assistance or undertake salvage should report, as far as practicable, Items A, B, C (or D), E, F, L, M, N, P, Q, R, S, T, U, X of the *Standard Reporting Format* (Appendix). The Master should ensure that the coastal State is kept informed of developments.

APPENDIX

A1. PROCEDURES

A1.1 Reports should be sent as follows:

Dangerous Goods Report - Packaged form (DG)	When an incident takes place involving loss, or likely loss overboard of packaged dangerous goods, including those in freight containers, portable tanks, road and rail vehicles and shipborne barges, into the sea.
Harmful Substances Report in Bulk (HS)	When an incident takes place involving the discharge or probable discharge of oil (Annex I of MARPOL) or noxious liquid substances in bulk (Annex II of MARPOL).
Harmful Substances Report - packaged form (MP)	In the case of loss or likely loss overboard of harmful substances in packaged form, including those in freight containers, portable tanks, road and rail vehicles and shipborne barges, identified in the *International Maritime Dangerous Goods Code* as marine pollutants (Annex III of MARPOL).

A2. STANDARD REPORTING FORMAT AND PROCEDURES

A2.1 Sections of the reporting format which are inappropriate should be omitted from the report.

A2.2 Where language difficulties may exist, the languages used should include English, using where possible the *Standard Marine Navigational Vocabulary.*

A2.3 Alternatively, the *International Code of Signals* may be used to send detailed information. When the International Code is used, the appropriate indicator should be inserted in the text, after the alphabetical index.

A2.4 For route information, latitude and longitude should be given for each turn point, expressed as in Item C below, together with type of intended track between these points, for example “RL” (rhumb line), “GC” (great circle) or “coastal”, in the case of coastal sailing the estimated date and time of passing significant points expressed by a 6 digit group as in Item B below.

Telegraphy	**Telephone (alternative)**	**Function**	**Information Required**
Name of system (e.g., AMVER/ MAREP/ ECAREG/ NORDREG/ WESTREG)	Name of system (e.g., AMVER/ MAREP/ ECAREG/ NORDREG/ WESTREG)	System Identifier	Ship Reporting system or nearest appropriate coast radio station
DG	Dangerous goods report – packaged form	Type of report	Dangerous goods report – packaged form

Telegraphy	Telephone (alternative)	Function	Information Required
HS	Harmful substances report - in bulk	Type of report	Harmful substances report - in bulk
MP	Harmful substances report - packaged from	Type of report	Harmful substances report - packaged from
A	Vessel (alpha)	Vessel identity	Name, call sign or ship station identity, and flag
B	Time (bravo)	Date and time of event	A 6 digit group giving day of month (first two digits), hours and minutes (last four digits). If other than UTC state time zone used
C	Position (charlie)	Position	A 4 digit group giving latitude in degrees and minutes suffixed with N (north) or S (south) and a 5 digit group giving longitude in degrees and minutes suffixed with E (east) or W (west); or
D	Position (delta)	Position	True bearing (first 3 digits) and distance (state distance) in nautical miles form a clearly identified landmark (state landmark)
E	Course (echo)	True course	A 3 digit group
F	Speed (foxtrot)	Speed in knots & tenths of knots	A 3 digit group
G	Departed (golf)	Port of departure	Name of last port of call
H	Entry (hotel)	Date, time and point of entry into System	Entry time expressed as in (B) and entry position expressed as in (C) or (D)
I	Destination and ETA (india)	Destination and estimated time of arrival	Name of port and date time group expressed as in (B)
J	Pilot (juliet)	Pilot	State whether a deep sea or local Pilot is on board
K	Exit (kilo)	Date, time and point of exit from system or arrival at the vessel's destination	Exit time expressed as in (B) and exit position expressed as in (C) or (D)
L	Route (lima)	Route information	Intended track
M	Radio communications (mike)	Radio communications	State in full names of stations/frequencies guarded

Telegraphy	**Telephone (alternative)**	**Function**	**Information Required**
N	Next report (november)	Time of next report	Date time group expressed as in (B)
O	Draught (oscar)	Maximum present static drought in metres	4 digit group giving metres and centimetres
P	Cargo (papa)	Cargo on board	Cargo and brief details of any dangerous cargoes as well as harmful substances and gases that could endanger persons or the environment (See *Detailed Reporting Requirements*)
Q	Defect, damage, deficiency, limitations (quebec)	Defects/damage deficiencies/ other limitations	Brief details of defects, damage, deficiencies or other limitations (See *Detailed Reporting Requirements*)
R	Pollution/ dangerous goods lost overboard (romeo)	Description of pollutant or dangerous goods lost overboard	Brief details of type of pollution (oil, chemicals, etc.) or dangerous goods lost overboard; position expressed as in (C) or (D) (See *Detailed Reporting Requirements*)
S	Weather (sierra)	Weather conditions	Brief details of weather and sea conditions prevailing
T	Agent (tango)	Vessel's representative and/or owner	Details of name and particulars of vessel's representative or owner or both for provision of information (See *Detailed Reporting Requirements*)
U	Size and type (uniform)	Vessel size and type	Details of length, breadth, tonnage, and type etc. as required
V	Medic (victor)	Medical personnel	Doctor, physician's assistant, nurse, no-medic
W	Persons (whiskey)	Total number of persons on board	State number
X	Remarks (x-ray)	Miscellaneous	Any other information - including as appropriate brief details of incident and of other vessels involved either in incident, assistance or salvage (See *Detailed Reporting Requirements*)

Telegraphy	Telephone (alternative)	Function	Information Required
Y	Relay (yankee)	Request to relay report to another system e.g., AMVER, AUSREP, JASREP, MAREP etc.	Content of report
Z	End of report (zulu)	End of report	No further information required

A3. DETAILED REPORTING REQUIREMENTS

A3.1 Dangerous Goods Reports - Packaged Form (DG)

A3.1.1 Primary report should contain Items, A, B, C (or D), M, Q, R, S, T, U, X of the *Standard Reporting Format*; details for Item R should be as follows:

R

1. Correct technical name or names of goods.
2. UN number or numbers.
3. IMO Hazard class or classes.
4. Names of manufacturers of goods when known, or consignee or consignor.
5. Types of packages including identification marks. Specify whether portable tank or tank vehicle, or whether vehicle or freight container or other cargo transport unit containing packages. Include official registration marks and numbers assigned to the unit.
6. An estimate of the quantity and likely condition of the goods.
7. Whether loss floated or sank.
8. Whether loss is continuing.
9. Cause of loss.

A3.1.2 If the condition of the vessel is such that there is danger of further loss of packaged dangerous goods into the sea, items P and Q of the *Standard Reporting Format* should be reported; details for P should be as follows:

P

1. Correct technical name or names of goods.
2. UN number or numbers.
3. IMO Hazard class or classes.
4. Names of manufacturers of goods when known, or consignee or consignor.
5. Types of packages including identification marks. Specify whether portable tank or tank vehicle, or whether vehicle or freight container or other cargo transport unit containing packages. Include official registration marks and numbers assigned to the unit.
6. An estimate of the quantity and likely condition of the goods.

A3.1.3 Particulars not immediately available should be inserted in a supplementary message or messages.

A3.2 Harmful Substances Reports - In Bulk (HS)

A3.2.1 In the case of actual discharge, primary HS reports should contain Items A, B, C (or D), E, F, L, M, N, Q, R, S, T, U, X of the *Standard Reporting Format*. In the case of probable discharge, item P should also be included. Details for P, Q, R, T and X should be as follows:

P

1. Type of oil or the correct technical name of the noxious liquid substances on board.
2. UN number or numbers if available.
3. Pollution category (X, Y or Z), for noxious liquid substances.
4. Names of manufacturers of substances if appropriate and known, or consignee or consignor.
5. Quantity.

Q

1. Condition of the vessel as relevant.
2. Ability to transfer cargo/ballast/fuel.

R

1. Type of oil or the correct technical name of the noxious liquid substances discharged into the sea.
2. UN number or numbers if available.
3. Pollution category (X, Y or Z), for noxious liquid substances.
4. Names of manufacturers of substances if appropriate and known, or consignee or consignor.
5. An estimate of the quantity of the substances.
6. Whether loss floated or sank.
7. Whether loss is continuing.
8. Cause of loss.
9. Estimate of the movement of the discharge or loss, giving current conditions if known.
10. Estimate of the surface area of the spill if possible.

T

1. Name, address, telex and telephone number of the vessel's owner and representative (charterer, manager or operator of the vessel or their agent).

X

1. Action being taken with regard to the discharge and the movement of the vessel.
2. Assistance or salvage efforts which have been requested or which have been provided by others.
3. The master of an assisting or salvaging vessel should report the particulars of the action undertaken or planned.

A3.2.2 Particulars not immediately available should be inserted in a supplementary message or messages.

A3.3 Harmful Substance Reports - Packaged Form (MP)

A3.3.1 In the case of actual discharges, primary MP reports should contain Items A, B, C (or D), M, Q, R, S, T, U, X of the *Standard Reporting Format*. In the case of probable discharge, Item P should also be included. Details of P, Q, R, T and X should be as follows:

P

1. Correct technical name or names of goods.
2. UN number or numbers.
3. IMO Hazard class or classes.
4. Names of manufacturers of goods when known, or consignee or consignor.
5. Types of packages including identification marks. Specify whether portable tank or tank vehicle, or whether vehicle or freight container or other cargo transport unit containing packages. Include official registration marks and numbers assigned to the unit.
6. An estimate of the quantity and likely condition of the goods.

Q

1. Condition of the vessel as relevant.
2. Ability to transfer cargo/ballast/fuel.

R

1. Correct technical name or names of goods.
2. UN number or numbers.
3. IMO Hazard class or classes.
4. Names of manufacturers of goods when known, or consignee or consignor.
5. Types of packages including identification marks. Specify whether portable tank or tank vehicle, or whether vehicle or freight container or other cargo transport unit containing packages. Include official registration marks and numbers assigned to the unit.
6. An estimate of the quantity and likely condition of the goods.
7. Whether lost goods floated or sank.
8. Whether loss is continuing.
9. Cause of loss.

T

1. Name, address, telex and telephone number of the vessel's owner and representative (charterer, manager or operator of the vessel or their agent).

X

1. Actions being taken with regard to the discharge and movement of the vessel.
2. Assistance or salvage efforts which have been requested or which have been provided by others.
3. The master of an assisting or salvaging vessel should report the particulars of the action undertaken or planned.

A3.3.2 Particulars not immediately available should be inserted in a supplementary message or messages.

A4. PRIMARY REPORT FORMS

A4.1 Dangerous Goods Report - Packaged Form (DG)

Function		**Report**
DG	Type of report	/DG//
A	Vessel identity	A/ /__ __ __ __//
B	Date and time of event	B/ __ __ __ __ __ __ Z //
C	Position	C/__ __ __ __N S __ __ __ __ __ E W//
D*	Position	D/ //
M	Radio communications	M/ //
P**	Cargo on board	P/*** //
Q**	Defect, damage, deficiency, other limitations	Q/ //
R	Description of dangerous goods lost overboard	R/*** //
S	Weather conditions	S/ //
T	Agent	T/ //
U	Vessel size and type	U/ //
X	Remarks	X/ //

* Report either Item C or D.

** Include if the condition of the vessel is such that there is danger of further loss of packaged dangerous goods into the sea.

*** See *Detailed Reporting Requirements* (Appendix A3.1).

A4.2 Harmful Substances Report - In Bulk (HS)

Function		**Report**
HS	Type of report	/HS//
A	Vessel identity	A/ /__ __ __ __//
B	Date and time of event	B/ __ __ __ __ __ __ Z //
C	Position	C/__ __ __ __N S __ __ __ __ __ E W//
D*	Position	D/ //
E	True course	E/ __ __ __ //
F	Speed in knots and tenths of knots	F/ __ __ __ //
L	Route information	L/ //
M	Radio communications	M/ //
N	Next report	N/__ __ __ __ __ __ Z//
P**	Cargo on board	P/*** //
Q	Defect, damage, deficiency, other limitations	Q/*** //
R	Description of dangerous goods lost overboard	R/*** //
S	Weather conditions	S/ //
T	Agent	T/*** //
U	Vessel size and type	U/ //
X	Remarks	X/*** //

* Report either Item C or D.

** Include in the case of a probable discharge.

*** See *Detailed Reporting Requirements* (Appendix A3.2).

A4.3 Harmful Substances Report - Packaged Form (MP)

Function		**Report**
MP	Type of report	/MP//
A	Vessel identity	A/ /__ __ __ __//
B	Date and time of event	B/ __ __ __ __ __ __ Z //
C	Position	C/__ __ __ __N S __ __ __ __ __ E W//
D*	Position	D/ //
M	Radio communications	M/ //
P**	Cargo on board	P/*** //
Q	Defect, damage, deficiency, other limitations	Q/*** //
R	Description of dangerous goods lost overboard	R/*** //
S	Weather conditions	S/ //
T	Agent	T/*** //
U	Vessel size and type	U/ //
X	Remarks	X/*** //

* Report either Item C or D.

** Include in the case of a probable discharge.

*** See *Detailed Reporting Requirements* (Appendix A3.3).

19. AQUATIC EFFECTS MANAGEMENT PLAN (SIGNIFICANTLY REVISED)

BACK RIVER PROJECT
Aquatic Effects Management Plan

February 2017

REVISION G.2

BACK RIVER PROJECT
AQUATIC EFFECTS MANAGEMENT PLAN

Table of Contents

Table of Contents i
List of Figures ii
List of Tables iii

Acronyms v

1. Introduction 1-1
   1.1 Background 1-1
   1.2 Scope and Objectives 1-1
   1.3 Applicable Standards, Guidelines, and Regulations 1-2

2. Mine Overview 2-1
   2.1 Project Phases 2-1
   2.2 Water Management Plan 2-2

3. Conceptual Site Model 3-1
   3.1 Introduction 3-1
   3.2 Stressors of Concern and Transport Pathways 3-1
   3.3 Exposure Media and Ecological REceptors 3-2
   3.4 Impact Hypotheses 3-3

4. Aquatic Effects Management Plan Overview 4-1
   4.1 Outline 4-1
   4.2 Key objectives and Questions 4-1
   4.3 Study Design Overview 4-2
   4.4 Incorporation of Traditional Knowledge/Inuit Qaujimajatuqangit 4-9

5. AEMP Study Design Details 5-1
   5.1 Water Quality 5-1
      5.1.1 Objectives 5-1
      5.1.2 Study Design and Schedule 5-1
      5.1.3 Field Methods 5-2
      5.1.4 Data Analysis and Interpretation 5-3
      5.1.5 Quality Assurance and Quality Control 5-3
   5.2 Sediment Quality 5-3
      5.2.1 Objectives 5-3
      5.2.2 Study Design and Schedule 5-3

5.2.3 Field Methods 5-4
5.2.4 Data Analysis and Interpretation 5-4
5.2.5 Quality Assurance and Quality Control 5-5
5.2.6 Sediment and Erosion Control 5-5
5.3 Benthic Invertebrate Community 5-6
5.3.1 Objectives 5-6
5.3.2 Study Design and Schedule 5-6
5.3.3 Field Methods 5-7
5.3.4 Data Analysis and Interpretation 5-7
5.3.5 Quality Assurance and Quality Control 5-8
5.4 Fish 5-9
5.4.1 Objectives 5-9
5.4.2 Study Design and Schedule 5-9
5.4.3 Field Methods 5-9
5.4.4 Data Analysis and Interpretation 5-10
5.4.5 Quality Assurance and Quality Control 5-12
5.4.6 Fish and Fish Habitat Protection from Blasting 5-12
6. Response Framework and Corrective Action 6-1
6.1 Introduction 6-1
6.2 Approach 6-1
6.3 Action Levels and Significance Thresholds 6-3
6.4 Plan Effectiveness 6-5
7. Environmental Reporting 7-1
7.1 Annual AEMP Report 7-1
7.2 Reports Under MMER 7-1
8. References 8-1

List of Figures

FIGURE **PAGE**

Figure 4.3-1. Proposed AEMP Sampling Areas in the Goose Property Area, Back River Project 4-4

List of Tables

TABLE **PAGE**

Table 3.2-1. Matrix of Project Activities, Interaction Pathways, and Residual Effects to Water Quality 3-1

Table 3.3-1. Measurement and Assessment Endpoints 3-3

Table 4.3-1. Overview of the Waterbodies and Sampling Areas Included in the Aquatic Effects Management Plan 4-2

Table 4.3-2. Aquatic Effects Management Plan Monitoring Schedule 4-6

Table 4.3-3. Overview of the Aquatic Effects Management Plan Sampling Design by Component and Season 4-7

Table 4.3-4. Overview of the Aquatic Effects Management Plan Sampling Design by Component, Stations, and Samples per Station 4-8

Table 5.1-1. Water Quality Parameters 5-2

Table 5.2-1. Sediment Quality Parameters 5-4

Table 5.4-1. Fish Tissue Parameters 5-10

Table 5.4-2. Fish Biological Variables and Effects Endpoints 5-11

Table 6.2-1. Examples of Action Levels and Responses 6-2

Table 6.3-1. Proposed Action Levels for Toxicological Impairment and Nutrient Enrichment Hypotheses 6-4

Acronyms

AEMP	Aquatic Effects Management Plan
ANOVA	Analysis of Variance
EEM	Environmental Effects Monitoring
FEIS	Final Environmental Impact Statement
KIA	Kitikmeot Inuit Association
MLA	Marine Laydown Area
MMER	Metal Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
the Project	Back River Project
Sabina	Sabina Gold & Silver Corp.
TK	Traditional Knowledge

1. Introduction

1.1 BACKGROUND

The Back River Project (the Project) is a proposed gold project owned by Sabina Gold & Silver Corp. (Sabina) within the West Kitikmeot region of southwestern Nunavut, near the watershed boundaries of the Ellice River, Back River, and Western River. It is situated approximately 400 kilometres (km) southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories.

The Project is comprised of two main areas with interconnecting winter ice roads: the Goose Property and a Marine Laydown Area (MLA) situated along the western shore of southern Bathurst Inlet. The Aquatic Effects Management Plan (AEMP) applies to the Goose Property area.

The life of the Project, from mobilization to post closure, is 27 years: 4 years of mobilization and Construction Phase (Year -4 to Year -1), 10 years of Operations (Year 1 to Year 10), 8 years of reclamation (Year 10 to Year 18), and 5 years of Post-Closure monitoring (Year 18 to Year 23). The proposed AEMP applies to the Construction Phase and will be updated as necessary to accommodate future phases. In the event that the Back River Mine goes into Temporary Closure and/or care and maintenance, the AEMP will be updated to reflect required monitoring.

The overall purpose of the AEMP is to monitor the aquatic environment for Mine-related effects, to assess and update predictions, and to provide the basis for informed management decisions by the Project has been designed to minimize, mitigate, and/or manage potential adverse effects on the environment.

The AEMP is a comprehensive program that considers Project related effects on the aquatic environment and is harmonized to meet the requirements of the Metal Mining Effluent Regulations (MMER) and the Environmental Effects Monitoring (EEM) requirements. It is expected that the Back River site will become subject to the MMER when lakes are dewatered in the Construction Phase.

Earlier versions of the AEMP included a marine sampling component. The marine component has been removed from this version of the AEMP document as the AEMP is intended to focus on the Project area under the jurisdiction of the Nunavut Water Board (NWB). Marine related water monitoring can be found in the Environmental Management and Protection Plan.

1.2 SCOPE AND OBJECTIVES

The AEMP has been designed to comply with existing regulations and follows those guidelines provided by the federal government and the government of Nunavut, including the *Fisheries Act* (Government of Canada 1985), the *Metal Mining Effluent Regulations* (Government of Canada 2002), the Nunavut *Environmental Protection Act* (Government of Northwest Territories 1988), and the *Nunavut Land Claim Agreement Act* (Government of Canada 1993). The overall objective of the AEMP is to monitor for potential mine-related effects on the aquatic environment as per regulatory requirements.

The core components of the AEMP include water quality, sediment quality, benthic invertebrate community, and fish (health and tissue chemistry). The AEMP will operate through the life of the mine; however, this iteration of the design is focussed on the construction phase. This version of the AEMP was developed in consideration of commitments made during the regulatory review process (refer to Appendix B-2 of the Main Application Document).

The AEMP is a "living document" and it will be updated as necessary, based on regulatory changes, Project-related changes, incident investigations, the need for changes to existing mitigation measures, and input from regulators and the Kitikmeot Inuit Association (KIA). The AEMP includes a response framework, which is central to the effective implementation of the AEMP, as it serves to identify changes in early warning indicators and trigger additional monitoring or the implementation of additional mitigation measures.

Environmental monitoring outside of the AEMP can be found in the Environmental Management and Protection Plan and the Water Management Plan.

1.3 APPLICABLE STANDARDS, GUIDELINES, AND REGULATIONS

This Aquatic Effects Management Plan has been designed to comply with existing regulations and follow the available guidelines provided by the federal government and the government of Nunavut. Applicable regulations include:

- Arctic Waters Pollution Prevention Act (1985a);
- Canada Shipping Act (2001);
- Fisheries Act (1985b), including the Metal Mining Effluent Regulations (SOR/2002-222);
- Nunavut Environmental Protection Act (1988);
- Nunavut Land Claim Agreement Act (1993); and
- Oceans Act (1996).

Mitigation and management measures have been drawn from knowledge and experience contained in guidelines and research documents. Project infrastructure and activities would follow the relevant guidelines, and the adaptive management strategy includes seeking new knowledge and strategies to minimize Project effects on the aquatic environment. Relevant guidelines for the monitoring, mitigation, and management plans presented in this Aquatic Effects Monitoring Plan include:

- A Guide to Canada's Ballast Water Control and Management Regulations (Transport Canada 2007).
- Acid Mine Drainage in Permafrost Regions: Issues, Control Strategies and Research Requirements (MEND 1996).
- Canadian Council of Ministers of the Environment Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2013a).
- Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (CCME 2013b).
- DFO Nunavut Operational Statement: Culvert Maintenance (Fisheries and Oceans Canada 2009).
- DFO Nunavut Operational Statement: Timing Windows (Fisheries and Oceans Canada 2009).
- DFO Nunavut Operational Statement: Clear Span Bridges (Fisheries and Oceans Canada 2009).
- DFO Nunavut Operational Statement: Temporary Stream Crossing (Fisheries and Oceans Canada 2009).
- DFO Nunavut Operational Statement: Ice Bridges and Snow Fills (Fisheries and Oceans Canada 2009).
- DFO Nunavut Operational Statement: Mineral Exploration Activities (Fisheries and Oceans Canada 2009).

- Environmental Code of Practice for Metal Mines (Environment Canada 2012a).
- Environmental Guideline for Dust Suppression (Environmental Protection Service 2002).
- Environmental Guideline for the Burning and Incineration of Solid Waste (Government of Nunavut 2012).
- Good Environmental Practices for Northern Mining and Necessary Infrastructure Task 2 Report (Nunavut Regional Adaptation Collaborative 2012).
- Guidelines for Development and Management of Transportation Infrastructure in Permafrost Regions (Transportation Association of Canada 2010).
- Guidelines for the Operation of Tankers and Barges in Canadian Arctic Waters (Transport Canada 1997).
- Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998).
- Metal Mining Effluent Regulations (SOR/2002-222).

2. Mine Overview

The Project involves the Construction, Operations, and Closure of open pit and underground mines at the Goose Property. A MLA will be established at Bathurst Inlet to deliver supplies, via a 160 km winter ice road connecting the MLA to the Goose Property.

The Project life is described in Phases as follows:

- Phase 1 – Mobilization and Construction (4 years; Years -4 to -1);
- Phase 2 – Operations (10 years; Years 1 to 10);
- Phase 3 – Closure (8 years; Years 11 to 18); and
- Phase 4 – Post-Closure (5 years; Years 19 to 23).

The mine plan consists of open pit mining plus underground mining at four deposits, supporting a 6,000 tonnes per day (t/d) milling operation over an estimated 10 year mine life. The four deposits are as follows:

- Umwelt (Umwelt open pit mine and Umwelt underground mine);
- Llama (Llama open pit mine and Llama underground mine);
- Goose Main (Goose Main open pit mine and Goose Main underground mine); and
- Echo (Echo open pit mine and Echo underground mine).

2.1 PROJECT PHASES

The AEMP has been designed to consider all phases of mine development, with emphasis placed on the early phases of development in the current version. Updates are anticipated to the AEMP design plan as the mine progresses through the four phases of development: Mobilization and Construction, Operations, and Closure, with additional monitoring and mitigation continuing into Post-Closure. Mobilization and Construction activities may be preceded by Pre-development work.

Construction is defined as any activities undertaken for the purposes of establishing or constructing components, infrastructure, and facilities required for development of a mine. Full mine site construction will commence following receipt of a Type A Water Licence from the NWB and Land Use Permit from the KIA. Construction will occur during Phase 1 (Year -4 to Year -1).

Operations is defined as the period that the Process Plant is operating and producing a commodity (i.e., gold). During the mine start-up, this will include a 12-month commissioning period planned for Q4 of Year -1 to Q4 of Year 1. Operations at the Project (Years 1 to 10) focus on the economic recovery of gold and delivery to market. Other activities during Operations will include ongoing exploration supported by the Project Infrastructure and ongoing progressive reclamation. Operations is divided into three Stages defined by the active tailings management facility within Phase 2 and will occur from Year 1 to Year 10.

Closure (Abandonment, Reclamation, and Closure) **and Post-Closure** are defined as an Operator ceasing operations at a facility without the intent of resuming mining activities. The site will be reclaimed and Post-Closure monitoring will continue until it can be demonstrated that the mine site is both chemically

and physically stable. Closure is expected to take eight years and consist of two stages: Active Closure and Passive Closure.

A minimum of five years of Post-Closure monitoring will follow the above phases of mine closure during which confirmation monitoring will occur. Detailed descriptions of Project phases can be found in Section 6.2 of the Main Application Document.

2.2 WATER MANAGEMENT PLAN

All water on the Project is categorized into three types: contact water (i.e., impacted by mine workings), non-contact water (i.e., undisturbed areas runoff), and saline water (i.e., groundwater). Only non-contact water will be diverted off-site without treatment.

Each type of water will be managed separately throughout each Project phase.

Detailed descriptions of Project water management can be found in Section 5.3.4 of the Main Application Document and the Water Management Plan.

3. Conceptual Site Model

3.1 INTRODUCTION

The AEMP is focussed on monitoring to detect potential effects of the mine on the aquatic environment. The AEMP is designed with consideration of the direct and indirect stressors identified in the Final Environmental Impact Statement (FEIS) (i.e., exposure pathways), transport pathways, exposure media, ecological receptors in the aquatic receiving environment, and the Project timeline. These pathways are considered together in the conceptual site model.

The conceptual site model for the Back River AEMP considers the linkages between the stressors, changes to water and sediment quality from those stressors, the response by the receptors from changes in water and sediment quality, and changes in aquatic ecosystem function from changes in aquatic interactions.

3.2 STRESSORS OF CONCERN AND TRANSPORT PATHWAYS

As part of the FEIS, the residual effects of project activities on valued ecosystem components were identified. Residual effects of the Project, after mitigation, were identified for water (FEIS Volume 6, Chapter 4, Section 4.5.4) and sediment quality (FEIS Volume 6, Chapter 5, Section 5.5.4); there were no residual effects identified for fish (FEIS Volume 6, Chapter 6, Section 6.5.5). A summary of the Project activities and interaction pathways with water quality with the potential for residual effects are summarized in Table 3.2-1; the same interactions and residual effects were identified for sediment quality.

Table 3.2-1. Matrix of Project Activities, Interaction Pathways, and Residual Effects to Water Quality

Project Activity	Interaction Pathway and Project Phase															
	Runoff				Water Withdrawal				Discharge				Aerial Deposition			
	Construction	Operations	Closure	Post-closure	Construction	Operations	Closure	Post-closure	Construction	Operations	Closure	Post-closure	Construction	Operations	Closure	Post-closure
Construction and Decommissioning	yes	-	-	yes	-	-	-	-	yes				-	-	-	-
Winter Ice Roads	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Contact Water	yes	yes	yes	yes	-	-	-	-	-	-	-	-	-	-	-	-
Mine Contact Water	yes	-	-	yes	-	-	-	-	yes				-	-	-	-
Water Use	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quarries and Borrow Pits	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Explosives	yes	yes	yes	yes	-	-	-	-	-	-	-	-	yes	yes	-	-
Fuels, Oils, and PAH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Treated Sewage Discharge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dust Deposition	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Yes = project activities with potential residual effects; - = no residual effects; PAH = polycyclic aromatic hydrocarbon.

Four Project activities with potential for residual effects were defined, as follows:

- Construction and Decommissioning Activities - Project activities that include the clearing of overburden, dewatering, earthworks, and construction activities for pads and infrastructure.
- Site Contact Water - the runoff from Project infrastructure including pad areas, laydown areas, roads, and airstrips.
- Mine Contact Water - water that contacts mine surfaces and operations, including runoff from waste rock storage areas and ore storage areas, water management structures (e.g., Saline Water Pond), drilling water from exploration, and open pit and underground water.
- Explosives - Project activities related to the transport, manufacture, storage, and use of explosives.

Three pathways with linkages between the Project activities and surface water were defined, as follows:

- Runoff (all four Project phases) – the transport of material or compounds from the terrestrial environment into the freshwater environment by precipitation or snowmelt.
- Discharge (Construction) - the direct input of Project water into freshwater waterbodies.
- Aerial deposition (Construction and Operations) - the direct input of material and chemical compounds from the air into the freshwater environment.

As a result of the above noted Project activities and linkages with surface water, the following predictions were made regarding residual effects of the Project to water quality:

- Negative, low to moderate magnitude;
- Short to medium term in duration;
- Sporadic and local in extent; and
- Reversible.

The overall significance of these residual effects were rated as not significant.

Mitigation and management measures have been proposed with consideration of relevant and available guidance (e.g., Water Management Plan, Section 8). The residual effects matrix of Project activities and pathways to water quality, and the identified mitigation to date forms the basis for the conceptual site model and the AEMP design.

3.3 EXPOSURE MEDIA AND ECOLOGICAL RECEPTORS

The aquatic monitoring components of the AEMP include exposure media (i.e., water quality, sediment quality, and fish tissue) and ecological receptors (i.e., benthic invertebrate community, and fish). Biological responses of the ecological receptors to changes in water and sediment quality are considered through the AEMP. For example, changes in water quality or sediment quality may influence the benthic invertebrate community, which in turn may influence small fish and young fish upon which larger fish feed. The inclusion of exposure media and ecological receptors in the AEMP design plan enables effective monitoring of the aquatic environment for changes as a result of Project operations.

Data will be collected through the AEMP to quantify, describe and monitor for changes in assessment and measurement endpoints (Table 3.3-1). Assessment endpoints, as identified in the FEIS, reflect the overarching valued ecosystem components in the study area. Measurement endpoints are the quantifiable

and measurable metrics included in the AEMP, such as concentrations of metals or nutrients in water, or the density of benthic invertebrate species (Table 3.3-1).

Table 3.3-1. Measurement and Assessment Endpoints

Aquatic Monitoring Component	Measurement Endpoint	Supporting Evidence	Assessment Endpoint
Water Quality	Concentrations of metals and nutrients in effluent discharge and surface water	Concentrations of toxicity-modifying parameters (e.g., pH, hardness) Sediment chemistry Concentrations of other parameters (e.g., chlorophyll *a*)	Suitability of water to support an aquatic ecosystem Suitability of water as a drinking source for people and wildlife Suitability of water for traditional and downstream uses
	Chronic toxicity response of an algal and invertebrate species	Water chemistry Sediment chemistry	
Sediment Quality	Concentrations of nutrients and metals in surficial sediments	Water chemistry Sediment particle size and total organic carbon	
Benthic Invertebrate Community	Total invertebrate density and densities of dominant invertebrate groups	Water chemistry Sediment chemistry Physical habitat characteristics	Maintenance of a functional benthic invertebrate community
	Taxonomic richness		
	Benthic community composition		
	Benthic community similarity between exposure and reference areas		
Fish Health	Reproduction (energy use)	Site characterization Water chemistry Sediment chemistry Benthic invertebrate community	Maintenance of fish health
	Condition (energy storage)	Target species abundance (catch per unit effort)	
	Survival (age)	Fish tissue chemistry	
Fish Tissue	Fish tissue chemistry (small bodied fish, all metals; large bodied fish, mercury only)	Water chemistry Sediment chemistry	Maintenance of fish tissue metal concentrations that do not pose a risk to wildlife or human health

3.4 IMPACT HYPOTHESES

The pathways and stressors of the conceptual site model were identified and developed with consideration of the residual effects identified in the FEIS (Table 3.2-1) and the measurement and assessment endpoints (Table 3.3-1). From the FEIS, the main stressors and pathways of concern are summarized as follows:

- Construction
  - discharge from lake dewatering;
  - runoff from Project infrastructure (e.g., pad areas, laydown areas, roads, airstrip); and
  - aerial deposition from blasting and use of explosives.
- Operations
  - runoff from Project infrastructure (e.g., waste rock storage pad areas, laydown areas, roads, tailings storage facility, airstrip); and
  - aerial deposition from blasting and use of explosives.
- Closure
  - runoff from Project infrastructure (e.g., waste rock storage pad areas, laydown areas, roads, airstrip); and
  - aerial deposition from blasting and use of explosives.
- Post-Closure
  - runoff from Project infrastructure (e.g., waste rock storage pad areas, laydown areas, roads, airstrip); and
  - release of pit water to downstream environments.

Two impact hypotheses have been proposed to examine the pathway of effects, as follows:

- Toxicological Impairment Hypothesis - toxicity to aquatic organisms due to release of substances of toxicological concern; and
- Nutrient Enrichment Hypothesis – increased productivity from the release of nitrogen.

Data collected and analyzed through the AEMP will be used to address these hypotheses.

4. Aquatic Effects Management Plan Overview

4.1 OUTLINE

The overall purpose of the AEMP is to monitor the aquatic receiving environment around Project infrastructure and activities. Conclusions and recommendations from the monitoring program will be used to confirm predictions, and determine if existing management and mitigation measures are adequate, and provide an opportunity for ongoing adaptive management.

The AEMP has also been designed to meet the requirements of the metal mining EEM program, as required by the MMER (Government of Canada 2002). The main objective of EEM monitoring is to evaluate the effects of mining effluents on fish, fish habitat, and the use of fisheries resources. The MMER EEM requirements are triggered when:

- effluent discharge rates exceed 50 cubic metres per day (m^3/d); and/or
- deleterious substances are discharged into any waterbody as per subsection 36(3) of the *Fisheries Act* (Government of Canada 1985).

It is anticipated that the MMER will be triggered during the Construction Phase due to dewatering of lakes.

Results of the AEMP will be evaluated annually and will be considered relative to the two impact hypotheses (Section 3.4; toxicological impairment and nutrient enrichment), key objectives (Section 4.2), and the adaptive management Response Framework (Section 6). Additional on-site water quality monitoring will occur (e.g., streams that will be monitored as part of the Environmental Management and Protection Plan or the Water Management Plan) that will not be considered directly within the AEMP; however, these additional monitoring programs will be aligned, where possible, with the AEMP monitoring, and if necessary, results from the other monitoring programs will be used to aid in interpretation of the AEMP data.

4.2 KEY OBJECTIVES AND QUESTIONS

The impact hypotheses for the Project focus on toxicological impairment and nutrient enrichment. The hypotheses will be addressed through five objectives of the AEMP:

1. determine the short and long-term effects of the Project on the aquatic environment;
2. evaluate the accuracy of the Project effect predictions;
3. assess the effectiveness of proposed mitigation and management measures;
4. identify additional mitigation measures to avert or reduce environmental effects due to Project activities; and
5. comply with MMER requirements.

These objectives will be addressed within the AEMP by considering the following key questions (as appropriate to all monitoring components):

- How do the data compare to benchmarks as applicable (e.g., water quality guidelines, water licence limits, AEMP benchmarks)?

- Are there changes in measurement endpoints in the exposure area relative to baseline conditions, and are the changes due to mining activities?
- Are trends in the exposure area data consistent with trends in the reference area?

4.3 STUDY DESIGN OVERVIEW

The AEMP was designed to collect samples from exposure and reference areas with coordinated collection of water, sediments, and benthic invertebrates at key stations. Fish will be collected from the exposure and reference areas, but from habitat appropriate to the sentinel species. The summary of waterbodies and areas within the waterbodies targeted for sample collection are provided in Table 4.3-1.

Table 4.3-1. Overview of the Waterbodies and Sampling Areas Included in the Aquatic Effects Management Plan

Waterbody	Sampling Area	Sampling Area ID	Purpose	Description
Reference Lake	Lake	BRP-38	Comparison to the Exposure Area	Reference Lake B located approximately 15 km to the southeast of the Goose Property
	Outlet	BRP-39		
Goose Lake	West Bay; Near-field Area	BRP-31	Potential exposure lake due to proximity to Project infrastructure and activities, including: water withdrawals, downstream of Llama/Umwelt area (WRSAs, open pits, saline pond storage), downstream of Echo Pit and activities, downstream of Gander Pond area (airstrip, infrastructure), downstream of Tailings Storage Facility, Goose Main Pit, and closed/overflow from Goose Main Pit.	Large lake adjacent to Project activities; potential source of potable water. Receiving environment for all Project activities including runoff from WRSAs, saline pond, closed pits, tailings facility
	Centre Basin; Mid-field Area A	BRP-32		
	Southeast Basin; Mid-field Area B	BRP-33		
	Outlet	BRP-34[1]		
Propeller Lake	South Basin; Far-field Area A	BRP-35	Potential exposure lake due to location downstream of all Goose Property Area activities.	Large lake downstream of catchments with the majority of Project activities.
	North Basin; Far-field Area B	BRP-36		
	Outlet	BRP-37[1]		

1 These are similar to the locations modelled in the Water Quality Model and can be used as compliance points.

The core of the AEMP was designed to be consistent with the regulatory requirements of the MMER as specified in the EEM guidance (Environment Canada 2012) with respect to effluent characterization and water quality monitoring (i.e., annual program), and biological monitoring (i.e., surveys every three years for benthic invertebrates and fish). Additional monitoring is included where necessary to meet the needs of the Type A Water Licence and FEIS commitments (i.e., additional water quality and biological sampling).

Effluent characterization and water quality monitoring as proposed will meet the requirements of the MMER and the Type A Water Licence, but will also support the interpretation of biological data for the EEM study. Effluent characterization involves collection of effluent samples at the last point of control before discharge; these effluent samples are analyzed for concentrations of deleterious substances, other parameters, and tested for acute and chronic toxicity. Water quality monitoring involves collection of samples from exposure and reference areas which are analyzed for the same suite of parameters as

in the effluent samples. Sediment and benthic samples are collected from the same exposure and reference areas as water quality samples. The exposure and reference areas are defined as follows:

- Exposure Area
  - The exposure area includes those waterbodies downstream and adjacent to the Project infrastructure, including Goose Lake and Propeller Lake, and areas downstream of the discharge point (Table 4.3-1; Figure 4.3-1).
    - Goose Lake, adjacent to most of the Project infrastructure, is the closest receiving environment.
    - Propeller Lake is downstream of Goose Lake and is considered a far-field exposure area.
  - For purposes of MMER, the exposure area (for water and biological sampling) is the area surrounding the point of entry of effluent from the final discharge point (Government of Canada 2002).
    - During the Construction Phase, Llama and Umwelt lakes will be dewatered with discharge directed to Goose Lake (upstream of "Goose Neck").
    - During the Operations and Closure phases, all site contact water will be stored on-site in the pits and ponds.
    - During the Post-Closure Phase (and after reclamation and filling of the pits), the pits will overflow, and there will be runoff from the reclaimed facilities (e.g., stockpiles) to the downstream receiving environment.
    - As stated previously, this version of the AEMP (and thus alignment with MMER) is focussed on the construction phase with dewatering discharge into Goose Lake.
- Reference Area
  - The reference area includes a waterbody with physical and chemical features similar to the exposure area, and has been identified as Reference B Lake (Table 4.3-1; Figure 4.3-1) and is considered a suitable reference area to support the statistical design of the AEMP.
    - Reference B Lake is approximately 15 km southeast of the Goose Property Area and is topographically and bathymetrically similar to Goose Lake and Propeller Lake.
    - Additional information on the suitability of Reference B Lake as a reference area was provided in response to information request 38 from the Kitikmeot Inuit Association during the FEIS stage.
  - For purposes of MMER, a reference area (for water and biological sampling) is a waterbody that is similar to the exposure area (Government of Canada 2002) and is a waterbody that can easily be sampled on a regular schedule. This also meets the needs of the AEMP and the Water Licence.

Goose PDA = 5,358 ha
Goose Infrastructure Footprint = 560 ha

- AEMP Sampling Location
- Existing Exploration Camp
- Treated Effluent Water Discharge
  ** Construction Phase Only*
- Underground Portal
- 10 m Contour Interval
- Service Road
- Haul Road
- Water Diversion Structure
- Winter Ice Road
- Water Intake Pipeline
- Effluent Discharge Pipeline
- Airstrip
- Laydown Area
- Other Infrastructure
- Open Pit
- Camp/Plant Site
- Ore Stockpile
- TSF Containment Dam
- TSF South Dyke
- Tailings Storage Facility/ Waste Rock Storage Area
- Water Management Structure
- Flow Direction
- Potential Development Area (PDA)
- Inuit Owned Land (IOL)
- IOL and Crown Land Border
- Crown Land

1:65,000
0 0.5 1
Kilometres

Projection: NAD 1983 UTM Zone 13N

420050 425050 430050 435050 440050 445050

7275500 7270500

BRP-37 Propellor Outflow
BRP-36
BRP-35
BRP-34
BRP-32
BRP-31
BRP-33
BRP-38
BRP-39

Chair Watershed
Giraffe Watershed
Propeller Watershed
Tahikafalok Nahik (Propeller Lake)
Pond E
Pond D
Pond B
Pond C
Chair Lake
Wasp Lake
Leaf Lake
Mam Lake
Llama Pit
Llama WRSA
Llama Lake
Primary Pond
Giraffe Lake
Giraffe Outflow
Attituq (Goose Lake)
Goose Outflow
Umwelt WRSA
Umwelt Pit
AN Storage and AN Facility
Saline Pond
Tahikyuak (Big Lake)
Goose Plant Site
Treated Effluent Water Discharge *
Gander Pond
Airstrip
Goose Main Pit
Echo Pit
Echo Lake
IOL
CROWN LAND
TSF WRSA
Pond
TSF/TSF WRSA
Rascal Lake
Fox Lake
Goose Watershed
Big Watershed
Llama Watershed
Wolf Watershed

Kingaok (Bathurst Inlet)
Kilogiktok (Bathurst Inlet Southern Arm)
Marine Laydown Area
Main Map
Goose Property Area
1:1,500,000
Reference B Inset

440000 442500
7261000 7258800
Ref Lake B
Reference
Ref B OP
1:50,000
Reference B Inset

Figure 4.3-1

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Proposed AEMP Sampling Areas in Goose Property Area, Back River Project

The AEMP has been designed as a multiple Before-After/Control-Impact design for water quality, sediment quality, and benthic invertebrate communities and Control-Impact (C-I) for fish. The proposed number of replicate samples follows Environment and Climate Change Canada recommendations for a one factor analysis of variance (ANOVA) EEM design for benthic invertebrates (Environment Canada 2012).

The preliminary study design under consideration involves monitoring five areas for water quality, sediment quality, and the benthic invertebrate community: a near-field area and two mid-field study areas in Goose Lake, a far-field area in Propeller Lake, and a reference area in Reference B Lake (Tables 4.3-1 to 4.3-4; Figure 4.3-1); water quality will also be monitored at a second far-field area in Propeller Lake. Fish will be monitored in the three lakes (i.e., Goose, Propeller, and Reference B), in habitat appropriate to the sentinel species (Slimy Sculpin [*Cottus cognatus*] and Lake Trout [*Salvelinus namaycush*]). Collection locations for all fish catches will be recorded to document fish metal collection by lake, location, and species.

The study design has been revised to include five independent stations for water quality (including chlorophyll *a*), sediment quality, and benthic invertebrates within each of the lake sampling areas (Tables 4.3-2 to 4.3-4). Five stations per sampling area is consistent with Metal Mining Technical Guidance for EEM (Environment Canada 2012). The five stations (exact coordinates to be determined) will be located within a small area and separated by at least 20 m (Environment Canada 2012) such that the data will be representative of variability within one area. Slimy Sculpin will be collected from four areas: the near-field exposure area (Goose Lake), two far-field exposure areas (both in Propeller Lake), and a reference area (Reference Lake B). Lake Trout will be collected from three areas: the near-field exposure area (Goose Lake), one far-field exposure area (Propeller Lake), and a reference area (Reference Lake B).

Water quality will also be monitored at the outlets of Goose Lake, Propeller Lake, and Reference B Lake; up to three samples will be collected at the outlets (Tables 4.3-1 to 4.3-4; Figure 4.3-1). Water quality data from the outlets will be used to provide additional confidence around tracking of and extent of potential changes.

The proposed study design is intended to facilitate the characterization of spatial and temporal variation, as part of an AEMP designed to fulfil both EEM/MMER (as required) and AEMP requirements.

An overview of the AEMP within waterbodies and sampling areas is provided in Table 4.3-1.

The current proposed program frequency during the Construction Phase of development is every year for water quality and every three years for sediment quality, benthic invertebrates, and fish (Table 4.3-2). The timing for collection of sediment quality, benthic invertebrates, and fish will be aligned with when MMER is triggered for this site and when the first EEM biological study is required. Since there will be no discharge during Operations (about 10 years) and Closure (about 8 years), the program frequency should be reconsidered for these future phases.

The current proposed program includes under-ice and open-water sampling for water quality (Table 4.3-3). As based on the Water Management Plan for the Project, the water quality monitoring schedule could be reduced to just open-water only, in the near-field and reference areas, during periods of time where there is no direct discharge to surface water (i.e., Operations to Closure phases).

For the lake stations, one to two water quality samples are proposed to be collected (Table 4.3-4); the number of samples at each lake station will depend upon the total water depth and the presence of stratification. If the depth of water is more than 4 m, and the water is stratified, discrete and independent top and bottom samples will be collected at each station (i.e., n=2 at each station). If the depth of water is less than 4 m, one sample from the middle of the water column will be collected at each station (i.e., n=1 at each station).

Table 4.3-2. Aquatic Effects Management Plan Monitoring Schedule

Waterbody	Sampling Area	Sampling Area ID	Monitoring Component and Program Frequency[1]						
			Water Quality		Sediment Quality	Benthic Invertebrate Community	Fish Health		Fish Tissue
			Full Chemistry	Chlorophyll *a*			Slimy Sculpin (Lethal Survey)	Lake Trout (Non-lethal Survey)	
Reference lake	Lake	BRP-38	Annual	Annual	Every three years	Every three years	Every three years	Every three years	Every three years
	Outlet	BRP-39	Annual	-	-	-	-	-	-
Goose Lake	West Bay; Near-field Area	BRP-31	Annual	Annual	Every three years	Every three years	Every three years	Every three years	Every three years
	Centre Basin; Mid-field Area A	BRP-32	Annual	Annual	Every three years	Every three years	-	-	-
	Southeast Basin; Mid-field Area B	BRP-33	Annual	Annual	Every three years	Every three years	-	-	-
	Outlet	BRP-34	Annual	-	-	-	-	-	-
Propeller Lake	South Basin; Far-field Area A	BRP-35	Annual	Annual	Every three years	Every three years	Every three years	Every three years	Every three years
	North Basin; Far-field Area B	BRP-36	Annual	Annual	-	-	Every three years	-	Every three years
	Outlet	BRP-37	Annual	-	-	-	-	-	-

Note: - area not sampled for monitoring component.

1 Program frequency and sampling areas may be re-adjusted after the Construction Phase (i.e., during the phases where there is no discharge to Goose Lake).

Table 4.3-3. Overview of the Aquatic Effects Management Plan Sampling Design by Component and Season

Waterbody	Sampling Area	Sampling Area ID	Sampling Season						
			Water Quality[2]		Sediment Quality	Benthic Invertebrate Community	Fish Health		Fish Tissue
			Full Chemistry	Chlorophyll a			Slimy Sculpin (Lethal Survey)	Lake Trout (Non-lethal Survey)	
Reference lake	Lake	BRP-38	Four times per year[1]	April, August	August	August	August	July	August
	Outlet	BRP-39	June, August	-	-	-	-	-	-
Goose Lake	West Bay; Near-field Area	BRP-31	Four times per year[1]	April, August	August	August	August	-	August
	Centre Basin; Mid-field Area A	BRP-32	April, August	April, August	August	August	-	July	-
	Southeast Basin; Mid-field Area B	BRP-33	April, August	April, August	August	August	-	-	-
	Outlet	BRP-34	June, August	-	-	-	-	-	-
Propeller Lake	South Basin; Far-field Area A	BRP-35	April, August	April, August	August	August	August	-	August
	North Basin; Far-field Area B	BRP-36	April, August	April, August	-	-	August	July	August
	Outlet	BRP-37	June, August	-	-	-	-	-	-

Note: - area not sampled for monitoring component.
1 The defined MMER reference and exposure stations to be sampled four times per year and not less than one month apart; therefore these stations (or others to be determined) will be sampled more frequently than the other stations.
2 April sampling may be omitted during phases of the Project when there is no under-ice discharge or discharge during the previous open-water season.

Table 4.3-4. Overview of the Aquatic Effects Management Plan Sampling Design by Component, Stations, and Samples per Station

Waterbody	Sampling Area	Sampling Area ID	Number of Stations[1]	Number of Samples per Station or Area						
				Water Quality		Sediment Quality	Benthic Invertebrate Community	Fish Health		Fish Tissue
				Full Chemistry	Chlorophyll *a*			Slimy Sculpin (Lethal Survey)	Lake Trout (Non-lethal Survey)	
Reference lake	Lake	BRP-38	5	1 to 2[2]	3	1	1	60 per area	100 per area	8 male and 8 female per species per area
	Outlet	BRP-39	1	3	-	-	-	-	-	-
Goose Lake	West Bay; Near-field Area	BRP-31	5	1 to 2[2]	3	1	1	60 per area	100 per area	8 male and 8 female per species per area
	Centre Basin; Mid-field Area A	BRP-32	5	1 to 2[2]	3	1	1	-	-	-
	Southeast Basin; Mid-field Area B	BRP-33	5	1 to 2[2]	3	1	1	-	-	-
	Outlet	BRP-34	1	3	-	-	-	-	-	-
Propeller Lake	South Basin; Far-field Area A	BRP-35	5	1 to 2[2]	3	1	1	60 per area	100 per area	8 male and 8 female per species per area
	North Basin; Far-field Area B	BRP-36	5	1 to 2[2]	3	-	-	60 per area	-	8 male and 8 female per species per area
	Outlet	BRP-37	1	3	-	-	-	-	-	-

Note: - area not sampled for monitoring component.
1 Stations are for water quality, sediment quality, and benthic invertebrate community; fish will be sampled in the areas but from habitat appropriate to the sentinel species.
2 If the depth of water is more than 4 m, and the water is stratified, discrete and independent top and bottom samples will be collected (n=2 samples). If the depth of water is less than 4 m, one sample from the middle of the water column will be collected (n=1 sample).

4.4 INCORPORATION OF TRADITIONAL KNOWLEDGE/INUIT QAUJIMAJATUQANGIT

Traditional Knowledge (TK) can be defined as a "cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission" (NIRB 2007). TK studies provide a valuable way of documenting spatial and temporal patterns of hunting, harvesting, fishing, habitation and travel in a given area. They can also provide detailed information on local ecological processes, socio-cultural patterns and institutions, spirituality, ethical, and other matters.

Sabina recognizes the inherent value of TK and the importance local communities place on its use in the environmental assessment of proposed developments. As such, Sabina has made significant efforts to engage local communities through incorporation of their TK into the Project's planning and design. Volume 3 of the FEIS describes Sabina's approach to TK and the methods used to collect and interpret it. Specific details as to how TK has been incorporated into these activities are summarized in Volume 3, Section 3.1, Table 3.1-1 "Uses of Traditional Knowledge in Sabina's Final Environmental Impact Statement for the Back River Project", and are described in further detail in relevant volumes of the FEIS.

Sabina has utilized six primary sources of TK:

- a Naonaiyaotit Traditional Knowledge Project database report for the Project;
- theme-based TK workshops;
- a report on existing and publically available Northwest Territories TK;
- the results of public consultation and engagement activities;
- a TK study on the Bernard Harbour Arctic Char fishery; and
- other sources.

Likewise, Inuit Qaujimajatuqangit values have helped guide Sabina's decision making for the Project and have been incorporated into the design of the Company's overall Project management approach. It is also important to highlight that Sabina partnered with the KIA in two key elements of its TK work – preparation of the Naonaiyaotit Traditional Knowledge Project database report and execution of the theme-based TK workshops. The basis of this partnership was a TK Agreement signed between Sabina and the KIA in May 2012. Signing of this agreement provided Sabina with access to TK held by the KIA in the Naonaiyaotit Traditional Knowledge Project database. The agreement also outlines the terms and conditions pertaining to Sabina's use of the TK. Sabina and the KIA additionally cooperated in the collection and reporting of new (or otherwise unrecorded) TK in the Project area.

The AEMP considered TK and Inuit Qaujimajatuqangit collected through the FEIS process. The AEMP will continue to integrate TK and Inuit Qaujimajatuqangit where possible in updates to the design and in analysis of the results. For example, Lake Trout was identified as a preferred species (FEIS, Volume 3, Section 3.1, Table 3.1-1) and this species has been carried forward as one of the sentinel species for use in the AEMP. Linkages between water quality and wildlife and fish are recognized by the Inuit, and thus monitoring for water quality, and detecting of changes to water quality, is a key component to the AEMP; water quality monitoring is considered an early warning to potential changes or effects to biological and human receptors.

5. AEMP Study Design Details

5.1 WATER QUALITY

5.1.1 Objectives

The water quality program was designed to meet the Type A Water Licence requirements and the MMER effluent characterization and water quality monitoring requirements with objectives as follows:

- Evaluate the accuracy of the FEIS predictions and measure the effects of Project activities on water quality;
- Characterize and interpret water quality for the purpose of meeting Part 1, Section 7 of the MMER requirements (Government of Canada 2002);
- Characterize effluent quantity and quality to meet Part 1, Section 4 of the MMER requirements (Government of Canada 2002);
- Assess the effectiveness of mitigation and management;
- Identify additional mitigation measures; and
- Provide input into the adaptive management process.

5.1.2 Study Design and Schedule

Effluent characterization samples will be collected from the discharge location at the last point of control. During the Construction Phase, there will be one discharge point to upstream of "Goose Neck" (Figure 4.3-1); discharge will be from the dewatering of Llama and Umwelt lakes. Samples will be collected from dewatering of lakes during the Construction Phase. Future discharge locations (if any) will also be sampled in a similar manner. Samples will be collected weekly to multiple times per year as per the MMER schedule (i.e., weekly for deleterious samples, four times per year for detailed characterization, once per month for acute toxicity testing, and two times per year for sublethal toxicity testing). Toxicity Testing will be conducted using the methodologies detailed in the EEM Guidance document.

Water quality samples from the MMER exposure area and reference area stations will be collected four times per year, and not less than one month apart (Tables 4.3-2 to 4.3-4). Water quality samples from the remaining lake stations will be collected twice annually, once during ice-covered conditions (late April, when under-ice water quality may be most strongly affected by seasonal changes), and once during open-water conditions (August). The annual and seasonal sampling schedule may be reduced during other Project phases when there are no discharges to surface water.

Stream water quality samples will be collected twice per year between June and September, depending on the duration of ice-free conditions. The first annual samples will be collected one to two weeks after freshet, which often occurs in mid to late-June, with subsequent samples collected in August.

The study design for water quality sampling in the lakes considers the requirements of MMER while aligning with other components, when possible. The sampling effort (lakes and outlets) is consistent with other monitoring programs in Nunavut and the Northwest Territories, and is reflective of discharge schedule for the Project, and sampling effort to provide appropriate statistical power.

5.1.3 Field Methods

Field measurements will be recorded when samples are collected. To support the effluent characterization samples, in situ measurements of specific conductivity, pH, and temperature will be recorded. At the lake stations field profiles (measured every 1 m) of specific conductivity, pH, temperature, and dissolved oxygen will be recorded, along with measurements of total water depth, sample collection depth, ice thickness (in winter), and Secchi depth (in open-water). At the stream stations, measurements of specific conductivity, pH, temperature, and dissolved oxygen will be recorded, along with total water depth and sample collection depth. A multi-meter (e.g., YSI 6-Series Multimeter) will be used to record measurements of specific conductivity, pH, temperature, and dissolved oxygen with separate meters for the effluent sampling and the receiving environment sampling.

In the lakes, water quality samples will be collected from specific sampling stations (coordinates still to be confirmed) from specific depths in the water column. If the water is stratified at the lakes stations, separate and discrete samples will be collected from the top (i.e., 1 m below the surface) and the bottom (i.e., 1 m above the sediments). If the water is not stratified, a single sample will be collected from the middle of the water column. In the lake outlets (i.e., streams), water samples will be collected from the centre of the flow channel. Lake samples will be collected with a Kemmerer (or similar), while stream samples will be collected as surface grabs.

Samples will be collected in bottles provided by an accredited analytical laboratory. The suite of parameters to be analyzed in the samples is listed in Table 5.1-1. Water quality samples will be analyzed by an accredited laboratory at detection limits less than aquatic life and drinking water quality guidelines. The specific limits will be provided once the analytical laboratory has been selected.

Table 5.1-1. Water Quality Parameters

Group	Effluent Characterization	Receiving Environment
Field	Field pH, specific conductivity, and temperature	Field pH, specific conductivity, dissolved oxygen, and temperature, Secchi depth (open-water), total depth, ice thickness (winter)
Conventional Parameters	turbidity, conductivity, hardness, total alkalinity, total dissolved solids, total suspended solids	turbidity, conductivity, hardness, total alkalinity, total dissolved solids, total suspended solids
Major Ions	chloride, calcium, potassium, magnesium, sodium, sulphate, total alkalinity	chloride, calcium, potassium, magnesium, sodium, sulphate, total alkalinity
Cyanide	total cyanide, free cyanide, and weak acid dissociable cyanide	total cyanide, free cyanide, and weak acid dissociable cyanide
Nutrients	ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, total phosphorus, total dissolved phosphorus, dissolved organic carbon	ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, ortho-phosphate, total dissolved phosphorus, total phosphorus, dissolved organic carbon, and reactive silica.
Biological	-	chlorophyll *a*
Total and dissolved metals[1]	aluminum, antimony, arsenic, barium, beryllium, boron cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc.	aluminum, antimony, arsenic, barium, beryllium, boron cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc.
Other	Radium-226, acute toxicity, sub-lethal toxicity	Radium-226

1 The term metals as used includes non-metals (i.e., selenium) and metalloids (i.e., arsenic).

5.1.4 Data Analysis and Interpretation

Effluent Characterization

Samples collected for effluent characterization will be analyzed to determine annual trends in concentrations and loads and to compare against the MMER limits for deleterious substances. Results of the acute and sublethal toxicity tests will be evaluated for toxicity response and growth and development effects.

Lakes and Streams

Samples collected from the lakes and streams will be compared to aquatic life guidelines (CCME 1999), drinking water quality guidelines (Health Canada 2014), and the site-specific water quality objective for arsenic (Golder 2016), and analyzed for spatial and temporal trends to determine if parameters are increasing over time, if parameters are increasing above guidelines, and if there are differences between the exposure and reference areas. Where guidelines are not available, data will be compared to baseline data and reference area data; if necessary, site-specific guidelines will be developed.

Results will be analyzed and compared to the benchmarks (e.g., guidelines, 75th percentile of a guideline, 90th percentile of baseline statistic) developed for the Project (to be developed).

Descriptive summary statistics will be reported for all collected water quality parameters. Quantitative (i.e., statistical) and qualitative (i.e., visual) methods will be used to evaluate potential differences in water quality between reference and exposure areas. All statistical assumptions will be considered and met before accepting the results of statistical inference.

5.1.5 Quality Assurance and Quality Control

Samples will be collected following standard sampling protocol (e.g., see the Quality Assurance and Quality Control Plan) by qualified personnel using suitable sampling equipment. Samples for laboratory analysis will be filtered and preserved (as required), and stored in a cool environment before shipping to the laboratory. Quality control samples (i.e., duplicates and blanks) will be collected at a quantity of 10% of all samples collected.

5.2 SEDIMENT QUALITY

5.2.1 Objectives

The sediment quality program was designed to meet the Type A Water Licence requirements and the EEM sediment quality monitoring requirements. The sediment quality program objectives are the same as those defined for water quality, with the following modification:

- Collect sediment quality as supporting data for the benthic invertebrate and water quality components for the purpose of meeting Part 2, Section 16 of the MMER requirements (Government of Canada 2002); and
- Evaluate the accuracy of the FEIS predictions and measure the effects of Project activities on sediment quality.

5.2.2 Study Design and Schedule

The study design for monitoring sediment quality considers the requirements of MMER/EEM, while aligning with other components sampling schedule, when possible. Sediment quality samples will be

collected in conjunction with the benthic invertebrate surveys to measure Project effects on freshwater sediments, and by extension on the benthic invertebrate community and fish habitat. Sediment quality samples will measure the total organic carbon concentration and particle size distribution at each site, to provide contextual information for the benthic invertebrate community analysis as per the EEM guidance documents, as well as sediment metal concentrations. The sampling effort is consistent with other comparable monitoring programs in Nunavut and the Northwest Territories, and discharge for the Project, with sampling effort sufficient to provide appropriate statistical power for monitoring mine-related effects.

5.2.3 Field Methods

Sampling will be conducted along with the benthic invertebrate program and in coordination, when possible, with the water quality program. Surficial sediment grabs will be collected with an Ekman sampler. The upper two to five centimetres, and the centre portion of the grab, will be targeted. At each station, up to three grabs will be collected and the material combined to form a composite sample.

Samples will be collected in containers provided by an accredited analytical laboratory. The suite of parameters to be analyzed in the samples is listed in Table 5.2-1. Sediment quality samples will be analyzed by an accredited laboratory at detection limits less than aquatic life guidelines. The specific limits will be provided once the analytical laboratory has been selected.

Supporting environmental information of field profiles (pH, temperature, dissolved oxygen, conductivity), total water depth, and sediment characteristics will also be collected.

Table 5.2-1. Sediment Quality Parameters

Group	Parameters
Particle Size and Carbon Content	gravel, sand, silt, clay
Nutrients	total organic carbon
Metals[1]	aluminum, antimony, arsenic, beryllium, boron cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc

1 The term metals as used includes metalloids (i.e., arsenic).

5.2.4 Data Analysis and Interpretation

Sediment results will be compared to aquatic life guidelines and analyzed for spatial and temporal trends to determine if parameters are increasing over time, if parameters are increasing above guidelines, and if there are differences between the exposure and reference areas.

Descriptive summary statistics will be reported for all collected sediment quality parameters. Quantitative (i.e., statistical) and qualitative (i.e., visual) methods will be used to evaluate potential differences in sediment quality between reference and exposure areas. All statistical assumptions will be considered and met before accepting the results of statistical inference. Where guidelines are not available, data will be compared to baseline data and reference area data; if necessary, site-specific guidelines will be developed.

5.2.5 Quality Assurance and Quality Control

Samples will be collected following standard sampling protocol (e.g., see the Quality Assurance and Quality Control Plan) by qualified personnel using suitable sampling equipment. Samples for laboratory analysis will be stored in a cool environment before shipping to the laboratory. Quality control samples (i.e., duplicates) will be collected at a quantity of 10% of all samples collected.

5.2.6 Sediment and Erosion Control

Sediment and erosion control measures will be applied throughout construction and maintained from the life of the Project. Efforts will be made to minimize the disturbance of the landscape and natural vegetation cover, and to schedule ground preparation to maintain adequate cover and avoid activities during periods of expected rainfall. The Project has been designed to use winter road only access corridors thereby limiting stream crossing and instream works and hence the potential effects on water and sediment quality. Efforts will be made during the final design stage to have the right-of-way cross each stream as close to perpendicular as possible to minimize the amount of riparian vegetation that may need to be disturbed during construction. Depending on the site-specific requirements, civil design structures may be used to prevent erosion and the deposition of sediment in the aquatic environment (a list of potential structures and approaches shown in Table 6.1-1).

Table 5.2-2. Sediment and Erosion Control and Mitigation Measures, Back River Project

Slope Texturing	
Description	Contouring and roughening of slope face.
Installation Locations	Slopes and in large, flat surface areas
Performance Issues	May cause sloughing in very wet soils; should be used in combination with other measures.
Benefits	Reduces runoff flow velocities, increases infiltration, collects sediment, and promotes growth of vegetation.
Fibre Rolls	
Description	Tube-shaped devices filled with plant-derived fibres.
Installation Locations	Along slopes and in channels with low flow velocities.
Performance Issues	Labour intensive installation. Have limited sediment capture zones. May be displaced by soil movement (i.e., slumping) or by high flows.
Benefits	Function well in freeze-thaw conditions. Can be used on slopes too steep for silt fences. Biodegradable.
Check Dams and Energy Dissipation Structures	
Description	Structures made from rock that reduce flow velocities and dissipate energy.
Installation Locations	In-channel, particularly in regions of high flow velocities.
Performance Issues	Requires supply of suitable material non-potentially acid generating (PAG) or metal leaching (ML) rock. May require maintenance after high flow events.
Benefits	Permanent structures that reduce flow velocities and energy, and filter sediments. May be a suitable substitute for gabions and armouring entire channel.
Gabions	
Description	Caged structure filled with riprap or granular borrow material. Slows flow velocities and dissipates energy.
Installation Locations	In-channel or in runoff flow paths.

Performance Issues	Labour intensive installation. Requires supply of suitable material (non-PAG or ML rock).
Benefits	Robust structure able to resist high flow velocities. Can be built from riprap too small in diameter to be used as armouring.
Riparian Zones	
Description	Preserve a native vegetation buffer.
Installation Locations	Buffers along existing natural surface flow features.
Performance Issues	Requires careful planning and management during construction to preserve zone.
Benefits	Most effective natural sediment control feature; slows runoff velocity and filters sediment.
Silt Fences	
Description	Temporary barriers used to divert and slow runoff to allow suspended material to sediment before reaching water bodies.
Installation Locations	Used in areas of cuts and excavations, downslope from exposed or erodible areas.
Performance Issues	Temporary structures only for short-term diversion of sediments from aquatic systems.
Benefits	Usable in areas where armouring or other measures are not applicable.

Runoff in the Project area occurs during a short period of June through September/October, due to the Arctic climate and permafrost ground conditions. Streams and rivers begin to flow in May, after freezing solid during the winter, and peak during freshet in June and July. The freshet period is typically short, and instantaneous flows can be quite large (see the Hydrology baseline information, Volume 6, Chapter 1 of the DEIS). Water control and erosion control structures will be designed to freshet peak flows, and areas and structures vulnerable to freshet flows will be identified. Water control structures will be monitored for ice and snow blockages, which will be cleared as necessary.

5.3 BENTHIC INVERTEBRATE COMMUNITY

5.3.1 Objectives

The benthic invertebrate community program was design to meet the Type A Water Licence requirements and the EEM requirements. The benthic invertebrate community program objectives are the same as those defined for water and sediment quality, with the following modification:

- Meet the requirements of Part 2, Section 9 of the MMER requirements (Government of Canada 2002); and
- Evaluate the accuracy of the FEIS predictions and measure the effects of Project activities on benthic invertebrate communities.

5.3.2 Study Design and Schedule

Benthic invertebrate samples will be collected in conjunction with the sediment quality surveys to measure Project effects on the freshwater the benthic invertebrate community and fish habitat.

Sediment quality samples will measure the total organic carbon concentration and particle size distribution at each site, to provide contextual information for the benthic invertebrate community analysis as per the EEM guidance documents, as well as sediment total metal concentrations.

The study design for monitoring benthic invertebrates considers the requirements of MMER/EEM, while aligning with other components sampling schedule, when possible. The sampling effort for the proposed

benthic invertebrate community study design is consistent with other comparable monitoring programs in Nunavut and the Northwest Territories, and discharge for the Project, with sampling effort sufficient to provide appropriate statistical power for monitoring mine-related effects.

Benthic invertebrate samples will be collected within a standard depth range and comparable substrate type at the sampling stations by qualified personnel. For a given year, five replicate stations will be sampled within each of the five sampling area (total of 25 stations) with one composite sample taken at each station.

5.3.3 Field Methods

Benthic invertebrate samples will be collected within a standard depth range and comparable substrate type at all sampling stations. A standard Ekman grab will be used to collect grab samples from a boat anchored at each sampling station. Each replicate will be a composite sample collected from between three and five grab samples; final number of grab samples to be determined based on site-specific considerations. The composited samples will be sieved through a 500 µm mesh screen and material retained in the mesh will be placed into a single pre-labelled container, thus creating a single composite sample for each station. Samples will be preserved in 10% neutral buffered formalin.

Sediment samples for chemistry (e.g., metals, nutrients, and carbon content) and particle size distribution will be collected as described in Section 5.2 at the same time, along with supporting environmental information of field profiles (pH, temperature, dissolved oxygen, conductivity), total water depth, sediment characteristics, and benthic sample-related information.

Benthic invertebrate samples will be shipped to a qualified taxonomist for processing, enumeration, and identification to the lowest taxonomic level, typically genus, using recognized taxonomic keys. The samples will be processed according to the standard methods in the Metal Mining Technical Guidance document (Environment Canada 2012) and a reference collection will be produced.

5.3.4 Data Analysis and Interpretation

From the taxonomic analysis of the benthic invertebrate community, the following benthic invertebrate effect endpoints will be calculated and used to evaluate whether changes in the benthic invertebrate community have occurred.

- Total organism density (as organisms per m^2);
- Taxonomic richness as total richness;
- Simpson's diversity and evenness indices;
- Relative invertebrate abundance by major taxonomic group as a percentage of total abundance;
- Densities of dominant taxa: defined as those taxa accounting for more than 5% of the total invertebrates across all stations; and
- Bray-Curtis Index (BCI).

Both appropriate statistical (quantitative) and visual (qualitative) methods will be used to evaluate potential differences in benthic community structure between areas. Both univariate (e.g., ANOVA) and multivariate statistical analysis techniques (e.g., nonmetric multidimensional scaling [NMDS]) will be considered. Relationships between habitat variables and the benthic invertebrate metrics will be evaluated using tools such as calculating Spearman rank correlation coefficients and examining scatter plots. Statistical assumptions will be considered and met before accepting the results of statistical inference.

If a significant difference between reference and exposure areas is identified then it will be evaluated to determine whether the observed change in the benthic community is within FEIS predictions. The findings of the benthic invertebrate data analysis will be further interpreted in light of results of other monitoring components, such as changes in water and sediment quality.

5.3.5 Quality Assurance and Quality Control

Samples will be collected following standard sampling protocol by qualified personnel using appropriate sampling equipment. Samples will be analyzed by qualified taxonomists using techniques consistent with the Metal Mining Technical Guidance for EEM (Environment Canada 2012) to assess sample sorting efficiency and assessment subsampling procedures should subsampling be required. Ten percent of the samples will be re-sorted. Benthic invertebrate samples will be stored for six years following analysis and a reference collection will be compiled. Data quality will be verified by screening for potential data entry errors.

5.4 FISH

5.4.1 Objectives

The fish program includes a fish health program on two target species (Slimy Sculpin and Lake Trout) and a fish tissue chemistry program on one target species (Slimy Sculpin). The programs were designed to meet the EEM requirements (Government of Canada 2002), and the Type A Water Licence requirements, with specific objectives related to fish as follows:

- Meet the requirements of Part 1, Section 9 of the MMER regarding a study respecting fish population and fish tissue (Government of Canada 2002), specifically:
  - Determine whether the Project has an effect on the growth, reproduction, survival or condition of fish; and
  - Determine whether the Project has an effect on metal concentrations in fish tissue.
- Evaluate the accuracy of the FEIS predictions and measure the effects of Project activities on fish.

5.4.2 Study Design and Schedule

Biological sampling to assess fish health and fish tissue will employ a lethal and a non-lethal fish health survey at the exposure (i.e., Goose Lake and two areas in Propeller Lake) and reference (i.e., Reference B Lake) lakes. The fish health survey will focus on two fish species, as per EEM guidance (Environment Canada 2012). The lethal survey will target Slimy Sculpin, and the non-lethal survey will target Lake Trout.

Slimy Sculpin are small-bodied, relatively short-lived fish that occupy small home-ranges and, therefore, reflect local conditions. The lethal fish health survey will target 20 mature male, 20 mature female, and 20 juvenile Slimy Sculpin from each site, as per EEM guidance (Environment Canada 2012). A total of four areas among the three study lakes will be sampled, including one area in Goose Lake, two areas in Propeller Lake, and one area in Reference B Lake (Table 4.3-4). Whole-body Slimy Sculpin samples will be submitted for fish tissue chemistry analyses; a total of eight samples adult male and eight adult female samples will be submitted. The fish health and fish tissue chemistry survey will target Slimy Sculpin in the fall (i.e., August), as they begin to develop their gonads for spawning the following spring.

Lake Trout are susceptible to long-term population level effects from lethal sampling, therefore a non-lethal sampling program is proposed. A minimum target sample size of 100 Lake Trout (juvenile and adult) is proposed for each site, in line with EEM guidance (Environment Canada 2012). Non-lethal fish tissue chemistry plug samples will be collected from a subsample of fish and will be submitted for fish tissue chemistry analyses for mercury only; a total of eight adult male and eight adult female samples will be submitted. The non-lethal fish health survey will target Lake Trout in the spring (i.e., July), as they are most active in the spring and target sample sizes can be best achieved at this time.

The sampling effort for the proposed fish health and fish tissue study design is consistent with other comparable monitoring programs in Nunavut and the Northwest Territories, and discharge for the Project, with sampling effort sufficient to provide appropriate statistical power for monitoring mine-related effects.

5.4.3 Field Methods

Fish collections will be completed using angling, gillnets, beach seines, and backpack electrofishing as fishing methods. Sampling locations will be determined by the presence of appropriate habitat. As much

as is reasonably possible, the same amount of effort will be expended using each fishing method within each lake to minimize any possible sampling bias among lakes.

Whole-body Slimy Sculpin and non-lethal tissue plug Lake Trout samples will be submitted for tissue chemistry analysis. If individual Slimy Sculpin fish do not meet minimum sample size requirements for routine tissue chemistry analysis (i.e., 5 grams [g] wet weight [ww]), then samples will be submitted for low-volume microanalysis (i.e., minimum sample volume 0.5 g ww). If Slimy Sculpin samples do not meet either the routine or microanalysis volume requirements, then fish will be combined with others of similar size and same sex (i.e., male only and female only) to create composite samples which meet minimum sample volume requirements. Non-lethal sampling using tissue plugs (Baker et al. 2004) will be employed for Lake Trout.

Fish tissue chemistry samples will be submitted to an appropriate laboratory for analyses of mercury, metals, and major ions listed in Table 5.4-1.

Table 5.4-1. Fish Tissue Parameters

Group	Parameters
Physical parameter	% Moisture
Major Ions and Nutrients	calcium, magnesium, phosphorus, potassium, sodium
Metals	aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, cesium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, rubidium, selenium, silver, strontium, tellurium, thallium, tin, titanium, uranium, vanadium, zinc, and zirconium

Slimy Sculpin aging structures (i.e., otoliths) and gonads will be submitted for aging and histology analysis, for determination of age and confirmation of sex and reproductive status. Non-lethal Lake Trout aging structures (i.e., pelvic fin rays and scales) will also be submitted for age determination.

5.4.4 Data Analysis and Interpretation

The measurement endpoints of survival, growth, reproduction, and condition will be assessed by collecting fish health data from Slimy Sculpin at the exposure and reference areas every three years, and comparing biological variables (e.g., age, size, organ weights) among sites and over time to monitor for changes in fish health during the life of the Project. Lethal sampling of Slimy Sculpin for the fish health program will include measurement and assessment of the biological variables and effects endpoints listed in Table 5.4-2, and the non-lethal sampling of Lake Trout will include a subset of the variables and effects endpoints.

Table 5.4-2. Fish Biological Variables and Effects Endpoints

Biological Variables	Effects Endpoints	Lake Trout	Slimy Sculpin
Age	Age	X	X
Size (length and weight)	Condition (body weight against length)	X	X
Size at age	body weight against age	X	X
Liver weight	Relative liver size	-	X
	liver weight against body weight		
Gonad weight	Relative gonad size	-	X
	gonad weight against body weight		
Fecundity (egg number and weight)	Relative fecundity	-	X
	(# of eggs/female against body weight)		
	Relative egg size (mean egg weight against body weight [or age])	-	X
Stomach fullness	Food availability	-	X
DELT (deformities, eroded fins, lesions, and tumours)	-	X	X

Note: - = not applicable; x = data will be collected

For fish tissue, an effect on fish usability is defined as total mercury concentrations that exceed 0.5 mg/kg ww as measured in an exposure area, and that are statistically different and greater than mercury concentrations measured from a reference area (Government of Canada 2002). Effects endpoints will be considered statistically different between reference and exposure sites at $\alpha = 0.1$, and target sample sizes of eight fish per group are expected to achieve sufficient power (i.e., >0.8). Sample sizes and achieved power will be re-assessed as part of the regular reporting requirements.

Descriptive summary statistics will be reported for all effect endpoints and tissue chemistry parameters. Fish data will be divided by sex, state of maturity (i.e., male and female fish will be analyzed separately, and immature fish will not be included), and presence or absence of parasites. This is necessary due to different energetic requirements associated with reproduction, which result in differences in growth patterns and subsequent differences in growth rate, body weight, gonad size, and liver size (Environment Canada 2012). Parasitism will also be considered due to the influence some parasites, especially tapeworms, can have on nutrient uptake and energy availability for reproduction and growth.

Once data are sub-divided based on sex and state-of-maturity and, if applicable, parasitism status, but prior to further statistical analyses, data will be tested for normality and homogeneity of variances and screened for potential outliers. All data will be $\log_{10}$ transformed prior to screening the data for outliers and completing the statistical analyses. This will be done because the majority of biological data do not satisfy the statistical requirements of normality and homogeneity of variance unless log transformed. The transformed data will be screened for potential outliers by visual examination of box and whisker plots and linear regression plots. Studentized residuals (SR) from the linear regression analyses will be used as an additional screening tool. Observations that are more than three standard deviations (i.e., SR>|3|) from the mean will be checked and validity confirmed; data points will only be removed if warranted. Any outliers that will be removed will be identified, the reasons for removal (e.g., transcription error, analytical error) will be described, and the screening will be re-run (i.e., box plots, linear regression).

An ANOVA will be used to test for statistical differences between the exposure and reference sites for fish age and size (i.e., length and weight), and tissue chemistry concentrations. The remaining effects endpoints, except diet and DELT, will be analyzed for statistical differences and interactions between the exposure and reference sites using Analysis of Covariance (ANCOVA). Fish tissue chemistry mercury concentrations will also be analyzed by ANCOVA. Potential differences in DELT characteristics between exposure and reference sites will be compared using the Chi Square (X^2) test.

5.4.5 Quality Assurance and Quality Control

Samples will be collected following standard sampling procedures by qualified personnel using suitable sampling equipment. Data quality will be screened for entry errors and will be checked for outliers using boxplots and regression plots. Data entry errors will be corrected, while outliers may be removed to avoid strong leverage. If there is no clear explanation for an outlier, analysis will be conducted in the presence and in the absence of the outlier(s) to determine the magnitude of influence it has on the conclusions, as per EEM guidance (Environment Canada 2012).

Fish samples (e.g., fish tissue chemistry) will be analyzed by an accredited laboratory with trained staff. Analyses will be conducted by recognized protocols and methods with properly calibrated and maintained instrumentation.

5.4.6 Fish and Fish Habitat Protection from Blasting

All Project activities requiring the use of explosives in or near water bodies will adhere to the *Guidelines for Use of Explosives In or Near Canadian Fisheries Waters*, as directed by Fisheries and Ocean Canada (DFO) (Wright and Hopky 1998). The blasting management plan will be discussed with DFO prior to any blasting activities, and subject to adaptive management.

6. Response Framework and Corrective Action

6.1 INTRODUCTION

A Response Framework within an AEMP links the interpretation of monitoring results to management actions, with the intent of meeting the FEIS assessment predictions and maintaining the assessment endpoints (e.g., suitability of water to support an aquatic ecosystem, Table 3.3-1). The Response Framework follows a systematic approach of evaluation and interpretation of results and implementation of follow-up action (e.g., confirmation of results, further study) or mitigation at pre-defined levels of change (i.e., Action Levels) to reduce or reverse unacceptable or unexpected effects and prevent a significant adverse effect.

This Response Framework was developed with guidance from the Draft Guidelines for Adaptive Management – a Response Framework for Aquatic Effects Monitoring (WLWB 2010).

6.2 APPROACH

Action Levels (i.e., Low, Moderate, and High) will be used within the Response Framework to determine if follow-up action is required to manage and reverse any detected changes in the aquatic environment. If a Low Action Level has been reached for one or more AEMP component measurement endpoints, for one or both of the impact hypotheses, a management response action will be initiated. Specific terms used in the Response Framework include: Benchmarks, Action Levels, and Significance Threshold, and are defined as follows:

- Benchmark
  - For purposes of the AEMP, a benchmark is a generic term used to refer to a set of numerical standards that are appropriate for the Project and are used for screening of monitoring results. Benchmarks may be derived from generic aquatic life guidelines, generic drinking water guidelines, site-specific water quality guidelines, or baseline concentrations. Benchmarks are set at a level to be protective of aquatic life or drinking water quality.
- Action Levels
  - Action Levels (Low, Moderate, and High) are pre-defined levels of environmental change, often but not exclusively linked to benchmarks, results of statistical tests, or a combination of the two. Exceedance of an Action Level may trigger follow-up management actions or responses. Low Action Levels are still to be developed, and will be set for each monitoring component for each of the two hypotheses. The Low Action Levels will be set through evaluation and consideration of baseline data and regulatory guidelines. Setting of the Low Action Levels can have large management and operational implications, thus setting of the Low Action Levels, if they are to be based on statistics of baseline data or regulatory guidelines, requires appropriate and detailed evaluation following collection of sufficient data to quantify natural variability in the system. As per the WLWB (2010) guidance document, Low Action Levels will be set initially, followed by setting of Moderate and High Action Levels should a Low Action response be triggered.
- Significance Threshold
  - The Significance Threshold is a level of change that would result in a significant adverse effects to assessment endpoints (e.g., water quality has changed such that a healthy aquatic

ecosystem cannot be supported). This is considered an unacceptable level of change. The Significance Thresholds focus on the key values of the environment that are to be protected.

If a change in the monitoring data is detected that exceeds a Low Action Level, the type of action taken will depend upon the type of effect observed. Examples of actions are provided in Table 6.2-1.

Table 6.2-1. Examples of Action Levels and Responses

Action Level	Example of Action Level to Support the Impact Hypotheses	Example of Action Level Response
Low	difference between reference and exposure areas, or from baseline conditions, but below an applicable benchmark[1]	Confirm AEMP best practices were used
		Confirm that the Low Action Level trigger was appropriate
	increasing trend toward conditions outside of baseline or normal range, or toward a benchmark	Compare to FEIS predictions
		Investigate further to identify contributing factors from the Mine
		Examine ecological relevance
		Identify potential mitigation options
		Increase monitoring (frequency or locations)
		Set Moderate and High Action Levels
Moderate	significant difference between reference and exposure areas, or from baseline conditions, and benchmark exceeded	Confirm AEMP best practices were used
	consistently increasing trend approaching benchmark exceedance	Confirm that the Moderate Action Level trigger was appropriate
		Compare to FEIS predictions
		Investigate further to identify contributing factors from the Mine
		Examine ecological relevance and implications (e.g., conduct a risk assessment)
		Implement mitigation and examine effectiveness of mitigation
		Increase monitoring (frequency or locations)
High	benchmarks consistently exceeded, or effect is above predictions but below the Significance Threshold[2]	Confirm AEMP best practices were used
		Confirm that the High Action Level trigger was appropriate
		Compare to FEIS predictions
		Identify and implement improved mitigation to reverse trend
		Remediate

1 A benchmark is a standard (e.g., guideline, site-specific water quality objective) used in the screening of results; benchmarks are specific to a Project.
2 A significance threshold is considered a level of unacceptable change and is linked to the assessment endpoints (Table 3.3-1).

6.3 ACTION LEVELS AND SIGNIFICANCE THRESHOLDS

The mine has the potential to result in toxicological impairment (hypothesis 1) and nutrient enrichment (hypothesis 2). Action Levels will be developed for all monitoring components for both hypotheses. Action levels will not be developed for end of pipe effluent data. Rather the end of pipe results will be compared to the MMER and water licence limits, and results of the acute and chronic toxicity tests will be used to evaluate potential constituents of concern for analysis of the receiving environment data. Low Action Levels are the first to be developed, but only after sufficient review of the existing data such that appropriate quantitative metrics are identified. For example, if a waterbody has naturally elevated concentrations of a metal above the generic water quality guidelines, it would be inappropriate to set the action level for that parameter equal to the generic guideline (or other to be determined ecologically relevant benchmark). Further work will be completed to identify appropriate guidelines or benchmarks, but it is anticipated the Response Framework for the Action Levels will be similar to those in Table 6.3-1. Where guidelines are not available, data will be compared to baseline data and reference area data; if necessary, site-specific guidelines will be developed. The definition of Normal Range will be provided for each measurement endpoint, and is generally considered to be the range of natural variability observed in a measurement endpoint, and may include a temporal and spatial component.

Table 6.3-1. Proposed Action Levels for Toxicological Impairment and Nutrient Enrichment Hypotheses

Action Level	Water Quality		Benthic Community	Fish Health	
	Aquatic Life	**Human Consumption[1]**		**Aquatic Life**	**Human Consumption[1]**
Low	Concentration in exposure area greater than normal range[2], supported by temporal trend	Drinking water parameters in exposure area above a defined percentage of a drinking water quality benchmark[3]	Decline in exposure area below the normal range in total density, richness, or densities of dominant taxa	Statistically significant difference in fish health endpoints[4] or fish tissue chemistry that are beyond the normal range	Metals in edible fish tissue above normal range
	AND		AND	AND	
	Concentration exceeds a defined percentage of AEMP benchmark[3]		Deviation of trends in total density, richness, or densities of dominant taxa compared to reference areas	Change is in direction and of magnitude that is indicative of an impairment to fish health	
	AND				
	Deviation of trends in concentrations compared to reference areas				
Moderate	TBD[5]	TBD[5]	TBD[5]	TBD[5]	TBD[5]
High	TBD[5]	TBD[5]	TBD[5]	TBD[5]	TBD[5]

1 Applies to the toxicological impairment hypothesis but not the nutrient enrichment hypothesis
2 Normal range is to be developed for key variables assessed by each monitoring component
3 Benchmark and percentage of benchmark used in the AEMP to be developed
4 Key fish health endpoints are condition, relative gonad size, and relative liver size
5 TBD – to be determined if a Low Action Level is reached.

6.4 PLAN EFFECTIVENESS

The Plan is intended to verify that the Project monitoring is conducted as proposed, mitigation and management measures are effective at mitigating adverse effects on the freshwater receiving environment, and relevant laws and regulations are met. As part of environmental reporting, Sabina will distribute copies of the annual AEMP report to stakeholders to report on mitigation, management and monitoring activities. Sabina may also conduct annual (or as necessary) evaluations of the efficacy of mitigation and management activities and of monitoring activities using relevant methods, such as power analyses or time series analyses. Should new, more sensitive, monitoring methods be introduced, or existing methods be found to lack statistical power or a robust design, updated methods will be proposed. This Plan will be updated as required.

7. Environmental Reporting

7.1 ANNUAL AEMP REPORT

An AEMP report on the status of the aquatic environment and detailing any observed trends will be prepared. Reporting of environmental monitoring will include documentation of data collection methodology and data management. The reporting process is an important component of adaptive management, and will serve to track developments in mitigation measures to minimize Project effects on the aquatic environment.

Reporting of all environmental monitoring data will be conducted in accordance with Regulatory requirements and will include annual reports. The annual AEMP report will include the following:

- A summary of Project activities during the monitoring interval;
- A summary of the QA/QC monitoring data obtained during the most recent reporting period;
- Description of the methods used for sample and data collection;
- Detailed evaluation of effects on the designated monitored parameters;
- Results from the evaluation of effects, in text and figures;
- Conclusions from the evaluation of effects; and
- Recommendations.

Standardized formats will be used for the annual reports.

7.2 REPORTS UNDER MMER

The AEMP will conform to the reporting requirements of MMER in addition to the annual AEMP report. As a condition of MMER, an initial study design will be submitted to an authorization officer with 12 months of the trigger and six months before biological monitoring is initiated (Schedule 5, s. 14(a) and 15; Government of Canada 2002). This report will contain:

- Site characterization;
- A detailed description of the study to collect data on fish health, fish tissue chemistry, benthic invertebrate community, and supporting environmental data;
- The sampling schedule; and
- A description of the quality assurance and quality control measures for the EEM program.

The first interpretative report will be submitted within 30 months after the mine becomes subject to MMER. The first Cycle 1 interpretative report would follow the Study Design Report, and would occur during any phase where discharge occurs. The interpretative report will contain:

- Documentation and description of sampling areas;
- Schedule of sample collection;
- Sample design, including sample sizes;
- Results of data assessment with appropriate statistical analyses and all supporting raw data;

- Identification of any biological effects;
- Comparison of any effects with results from sublethal toxicity testing (from effluent characterization);
- Conclusions of biological monitoring and water quality studies, taking into account any other potential factors not related to the effluent (anthropogenic or natural), and a description of quality assurance and control measures that were implemented;
- Description of how future study design for monitoring will be affected by the results; and
- Date when the next biological EEM cycle will commence.

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20. WILDLIFE MITIGATION AND MONITORING PROGRAM PLAN (SIGNIFICANTLY REVISED)

BACK RIVER PROJECT
Wildlife Mitigation and Monitoring Program Plan

February 2017

Table of Contents

ERM

BACK RIVER PROJECT
WILDLIFE MITIGATION AND MONITORING PROGRAM PLAN

Table of Contents

Table of Contents i
List of Figures vii
List of Tables vii
List of Plates viii
List of Appendices viii

List of Acronyms ix

Definitions of Project Areas xi

1. Introduction 1-1
1.1 Integration of Traditional Knowledge 1-1

2. Scope and Objectives 2-1

3. Planning and Implementation 3-1
3.1 Updates to the WMMP PLan 3-1

4. Applicable Legislation and Guidelines 4-1

5. Roles and Responsibilities 5-1

6. General Mitigation, Management and Monitoring 6-1
6.1 Mitigation and Management for Wildlife 6-2
6.1.1 Wildlife Policies and Employee Education 6-2
6.1.2 Noise Abatement 6-3
6.1.3 Spill Management 6-3
6.2 Monitoring for Wildlife 6-4

7. Caribou 7-1
7.1 Mitigation and Management for Caribou 7-1
7.1.1 Overview of Project Interactions with Caribou 7-1
7.1.1.1 Beverly/Ahiak Caribou 7-1
7.1.1.2 Bathurst Caribou 7-2
7.1.1.3 Dolphin and Union Caribou 7-7
7.1.2 Overview of Potential Effects to Caribou 7-7
7.1.3 Herd Vulnerability and the Sabina Adaptive Management Approach 7-8

7.1.4 Mitigation and Management for Habitat Loss for Caribou 7-12
7.1.5 Mitigation and Management for Disturbance of Caribou 7-12
7.1.5.1 Management System to Reduce Disturbance to Caribou 7-12
7.1.5.2 Levels of Management for Caribou during Normal Operations 7-14
7.1.5.3 Management for Shifts in Calving Ranges 7-17
7.1.5.4 Design Mitigation 7-20
7.1.5.5 Construction Management 7-20
7.1.5.6 Fixed Wing Aircraft Management 7-20
7.1.5.7 Helicopter Management 7-20
7.1.5.8 Blasting Management 7-21
7.1.5.9 Heavy Equipment Management 7-23
7.1.5.10 Winter Ice Road Management 7-23
7.1.5.11 Resumption of Activities 7-23
7.1.6 Mitigation and Management for Disruption of Movement of Caribou 7-24
7.1.7 Mitigation and Management for Direct Mortality and Injury of Caribou 7-25
7.1.8 Mitigation and Management for Indirect Mortality of Caribou 7-26
7.1.9 Mitigation and Management for Attraction of Caribou 7-26
7.1.10 Mitigation and Management for Exposure to Contaminants by Caribou 7-26
7.2 Monitoring for Caribou 7-27
7.2.1 Caribou Monitoring to Trigger Mitigation 7-27
7.2.1.1 Monitoring Seasonal Ranges of Caribou 7-28
7.2.1.2 Near Real-time Collar Monitoring 7-31
7.2.1.3 Active Caribou Monitoring by Wildlife Monitors 7-33
7.2.1.4 Incidental Observations 7-35
7.2.1.5 On-site Camera Monitoring 7-37
7.2.1.6 Over the Horizon Monitoring 7-38
7.2.1.7 Human Activity Monitoring 7-38
7.2.2 Caribou Monitoring to Measure Predicted Effects 7-39
7.2.2.1 Footprint Monitoring 7-39
7.2.2.2 Behaviour Monitoring Program 7-40
7.2.2.3 Stress Hormone Study 7-43
7.2.2.4 Regional Collar Monitoring for Zone of Influence 7-43
7.2.2.5 Noise Monitoring 7-45
7.2.2.6 Dust Monitoring 7-46
7.2.2.7 Collaborative Herd-scale Monitoring 7-47
7.2.2.8 Regional Camera Monitoring Program 7-47

8. Muskox 8-1
8.1 Mitigation and Management for Muskox 8-1
8.1.1 Overview of Potential Effects to Muskox 8-1
8.1.2 Mitigation and Management for Habitat Loss for Muskox 8-2

8.1.3 Mitigation and Management for Disturbance of Muskox 8-2
8.1.3.1 Design Mitigation 8-2
8.1.3.2 Fixed Wing Aircraft Management 8-2
8.1.3.3 Helicopter Management 8-3
8.1.3.4 Blasting Management 8-3
8.1.3.5 Heavy Equipment Management 8-3
8.1.4 Mitigation and Management for Disruption of Movement of Muskox 8-3
8.1.5 Mitigation and Management for Direct Mortality and Injury of Muskox 8-4
8.1.6 Mitigation and Management for Indirect Mortality of Muskox 8-5
8.1.7 Mitigation and Management for Attraction of Muskox 8-5
8.1.8 Mitigation and Management for Exposure to Contaminants for Muskox 8-5
8.2 Monitoring for Muskox 8-5
8.2.1 Muskox Monitoring to Trigger Mitigation 8-6
8.2.1.1 On-site Camera Monitoring 8-6
8.2.1.2 Incidental Observations 8-6
8.2.1.3 Monitoring for Muskox in Relation to Blasting 8-7
8.2.2 Muskox Monitoring to Measure Predicted Effects 8-8
8.2.2.1 Footprint Monitoring 8-8
8.2.2.2 Regional Monitoring of Muskox with Motion-triggered Cameras 8-8
8.2.2.3 Behaviour Monitoring 8-12
8.2.2.4 Contributions to Regional/Collaborative Programs with GN 8-12
9. Grizzly Bear and Wolverine 9-1
9.1 Mitigation and Management for Grizzly Bear and Wolverine 9-1
9.1.1 Overview of Potential Effects to Grizzly Bear and Wolverine 9-1
9.1.2 Mitigation and Management for Habitat Loss for Grizzly Bear and Wolverine 9-2
9.1.3 Mitigation and Management for Disturbance of Grizzly Bear and Wolverine 9-2
9.1.3.1 Design Mitigation 9-2
9.1.3.2 Construction Management 9-2
9.1.3.3 Operations Management 9-3
9.1.3.4 Fixed-wing Aircraft Management 9-3
9.1.3.5 Helicopter Management 9-3
9.1.3.6 Blasting Management 9-4
9.1.3.7 Winter Ice Road Management 9-4
9.1.4 Mitigation and Management for Disruption of Movement of Grizzly Bear and Wolverine 9-5
9.1.5 Mitigation and Management for Direct Mortality and Injury of Grizzly Bear and Wolverine 9-5
9.1.6 Mitigation and Management for Indirect Mortality of Grizzly Bear and Wolverine 9-5
9.1.7 Mitigation and Management for Attraction of Grizzly Bear and Wolverine 9-5

9.1.7.1 Design Mitigation 9-5
9.1.7.2 Wildlife Attractant Management 9-6
9.1.7.3 General Mitigation and Management to Reduce Human-Wildlife Interactions 9-6
9.1.7.4 Protocol for Responding to Observations of Grizzly Bear and Wolverine 9-7
9.1.7.5 Protocol for Management of Problem Wildlife 9-8
9.1.8 Mitigation and Management for Exposure to Contaminants for Grizzly Bear and Wolverine 9-9
9.2 Monitoring for Grizzly Bear and Wolverine 9-9
9.2.1 Grizzly Bear and Wolverine Monitoring to Trigger Mitigation 9-10
9.2.1.1 On-site Camera Monitoring 9-10
9.2.1.2 Incidental Observations 9-11
9.2.1.3 Skirting and Building Monitoring 9-11
9.2.1.4 Waste Management Monitoring 9-12
9.2.1.5 Pre-Construction Surveys for Grizzly Bear Dens on the Winter Ice Road 9-13
9.2.1.6 Monitoring for Grizzly Bear in Relation to Blasting 9-14
9.2.2 Grizzly Bear and Wolverine Monitoring to Measure Predicted Effects 9-15
9.2.2.1 Footprint Monitoring 9-15
9.2.2.2 Regional Monitoring of Grizzly Bears with Motion-triggered Cameras 9-15
9.2.2.3 Contributions to Regional Programs with GN 9-15

10. Raptors 10-1
10.1 Mitigation and Management for Raptors 10-1
10.1.1 Overview of Potential Effects to Raptors 10-1
10.1.2 Mitigation and Management for Habitat Loss for Raptors 10-2
10.1.3 Mitigation and Management for Disturbance of Raptors 10-2
10.1.3.1 Design Mitigation 10-2
10.1.3.2 Construction Management 10-2
10.1.3.3 Operations Management 10-2
10.1.3.4 Fixed Wing Aircraft Management 10-3
10.1.3.5 Helicopter Management 10-3
10.1.4 Mitigation and Management for Disruption of Movement of Raptors 10-3
10.1.5 Mitigation and Management for Direct Mortality and Injury of Raptors 10-3
10.1.6 Mitigation and Management for Indirect Mortality of Raptors 10-3
10.1.7 Mitigation and Management for Attraction of Raptors 10-4
10.1.8 Mitigation and Management for Exposure to Contaminants for Raptors 10-4
10.2 Monitoring for Raptors 10-4
10.2.1 Raptor Monitoring to Trigger Mitigation 10-4
10.2.1.1 Pit and Quarry Wall Nest Monitoring 10-4

10.2.1.2 Pre-clearing Surveys for Raptor Nests 10-5
10.2.1.3 Incidental Observations 10-7
10.2.2 Raptor Monitoring to Measure Predicted Effects 10-7
10.2.2.1 Footprint Monitoring 10-7
10.2.2.2 Regional Surveys for Raptors 10-7

11. Waterbirds 11-1
11.1 Mitigation and Management for Waterbirds 11-1
11.1.1 Overview of Potential Effects to Waterbirds 11-1
11.1.2 Mitigation and Management for Habitat Loss for Waterbirds 11-2
11.1.3 Mitigation and Management for Disturbance of Waterbirds 11-2
11.1.3.1 Design Mitigation 11-2
11.1.3.2 Construction Management 11-2
11.1.3.3 Fixed-wing Aircraft and Helicopter Management 11-3
11.1.4 Mitigation and Management for Disruption of Movement of Waterbirds 11-3
11.1.5 Mitigation and Management for Direct Mortality and Injury of Waterbirds ... 11-3
11.1.6 Mitigation and Management for Indirect Mortality of Waterbirds 11-3
11.1.7 Mitigation and Management for Attraction of Waterbirds 11-4
11.1.8 Mitigation and Management for Exposure to Contaminants for Waterbirds... 11-4
11.2 Monitoring for Waterbirds 11-4
11.2.1 Waterbird Monitoring to Trigger Mitigation 11-4
11.2.1.1 Waterbird Monitoring on Project Ponds 11-4
11.2.1.2 Pre-clearing Surveys for Waterbird Nests 11-5
11.2.1.3 Incidental Observations 11-5
11.2.2 Waterbird Monitoring to Measure Predicted Effects 11-6
11.2.2.1 Footprint Monitoring 11-6
11.2.2.2 Regional Monitoring for Waterbirds 11-6

12. Upland Birds 12-1
12.1 Mitigation and Management for Upland Birds 12-1
12.1.1 Overview of Potential Effects to Upland Birds 12-1
12.1.2 Mitigation and Management for Habitat Loss for Upland Birds 12-2
12.1.3 Mitigation and Management for Disturbance of Upland Birds 12-2
12.1.4 Mitigation and Management for Disruption of Movement of Upland Birds 12-2
12.1.5 Mitigation and Management for Direct Mortality and Injury of Upland Birds 12-2
12.1.6 Mitigation and Management for Indirect Mortality of Upland Birds 12-2
12.1.7 Mitigation and Management for Attraction of Upland Birds 12-2
12.1.8 Mitigation and Management for Exposure to Contaminants for Upland Birds 12-3
12.2 Monitoring for Upland Birds 12-3
12.2.1 Upland Bird Monitoring to Trigger Mitigation 12-3

12.2.1.1 Pre-clearing Surveys for Upland Bird Nests 12-3
12.2.1.2 Incidental Observations 12-3
12.2.2 Upland Bird Monitoring to Measure Predicted Effects 12-3
12.2.2.1 Footprint Monitoring 12-3
12.2.2.2 Regional Monitoring for Upland Birds 12-4

13. Seabirds and Seaducks (Marine Birds) 13-1
13.1 Mitigation and Management for Marine Birds 13-1
13.1.1 Overview of Potential Effects to Marine Birds 13-1
13.1.2 Mitigation and Management for Habitat Alteration for Marine Birds 13-2
13.1.3 Mitigation and Management for Disturbance of Marine Birds 13-2
13.1.3.1 Design Mitigation 13-2
13.1.3.2 Construction Management 13-2
13.1.3.3 Shipping Management 13-2
13.1.3.4 Fixed-wing Aircraft and Helicopter Management 13-3
13.1.4 Mitigation and Management for Direct Mortality and Injury of Marine Birds . 13-3
13.1.5 Mitigation and Management for Indirect Mortality of Marine Birds 13-3
13.1.6 Mitigation and Management for Exposure to Contaminants for Marine Birds 13-3
13.2 Monitoring for Marine Birds 13-3
13.2.1 Marine Bird Monitoring to Trigger Management 13-4
13.2.1.1 Pre-clearing Surveys for Marine Birds 13-4
13.2.2 Marine Bird Monitoring to Measure Predicted Effects 13-4
13.2.2.1 Footprint Monitoring 13-4
13.2.2.2 Regional Monitoring for Marine Birds 13-4
13.2.2.3 Marine Bird Monitoring during Project Shipping 13-4

14. Ringed Seals (Marine Mammals) 14-1
14.1 Mitigation and Management for Marine Mammals 14-1
14.1.1 Overview of Potential Effects to Marine Mammals 14-1
14.1.2 Mitigation and Management for Habitat Alteration for Marine Mammals 14-2
14.1.3 Mitigation and Management for Disturbance of Marine Mammals 14-2
14.1.3.1 Shipping Management 14-2
14.1.3.2 Fixed-wing Aircraft Management 14-2
14.1.3.3 Winter Ice Road Management 14-2
14.1.4 Mitigation and Management for Direct Mortality and Injury of Marine Mammals 14-2
14.1.5 Mitigation and Management for Indirect Mortality of Marine Mammals 14-3
14.1.6 Mitigation and Management for Exposure to Contaminants for Marine Mammals 14-3
14.2 Monitoring for Marine Mammals 14-3
14.2.1 Ringed Seal Monitoring to Trigger Mitigation 14-3
14.2.1.1 Pre-Construction Surveys for Seal Lairs 14-3

14.2.2 Marine Mammal Monitoring during Project Shipping 14-4

15. Polar Bears 15-1

15.1 Mitigation and Management for Polar Bears 15-1

15.1.1 Overview of Potential Effects to Polar Bears 15-1

15.1.2 Mitigation and Management for Polar Bears in Relation to Accidental Fuel Release or Spill Event in the Marine Environment 15-1

15.1.3 Mitigation and Management for Direct Mortality and Injury of Polar Bears ... 15-1

15.2 Monitoring for Polar Bears 15-2

16. Mitigation and Adaptive Management 16-1

17. Checking and Corrective Action 17-1

18. Record Keeping 18-1

19. Environmental Reporting 19-1

20. Plan Effectiveness 20-1

21. QA/QC 21-1

References R-1

List of Figures

FIGURE **PAGE**

Figure 6.2-1. Local Study Area and Regional Study Area for Caribou and Terrestrial Wildlife 6-11

Figure 6.2-2. Local and Regional Study Areas for Marine Wildlife 6-13

Figure 7.1-1. Calving, Post-Calving and Total Herd Ranges of the Beverly/Ahiak Caribou 7-3

Figure 7.1-2. Calving, Post-Calving and Total Herd Ranges of the Bathurst Caribou 7-5

Figure 7.1-3. Distribution of the Dolphin and Union Caribou Herd 7-9

Figure 7.1-4. Caribou Herd Vulnerability Assessment and Management Actions 7-11

Figure 7.2-1. Potential Monitoring Locations and Viewscape for Wildlife Monitoring 7-29

Figure 8.2-1. Remote Camera Baseline Study Design (dots) and Proposed Sampling Design (circles) 8-9

List of Tables

TABLE **PAGE**

Table 4-1. Relevant Acts and Regulations for Wildlife and Wildlife Habitat 4-1

Table 6.2-1. Overview of Wildlife Monitoring Programs that Trigger Management Actions 6-5

Table 6.2-2. Overview of Proposed Focal Species Monitoring Programs to Test Predictions of FEIS 6-8

Table 9.1-1. Wildlife Sensitive Periods Applicable for Grizzly Bear and Wolverine/Furbearers to the Project 9-3

Table 9.1-2. Protocol to Determine Appropriate Management Responses to Human-Animal Interactions.....9-9

Table 11.1-1. Recommended Buffer Distances for Waterbird Nest Sites Found during Pre-clearing Surveys 11-3

List of Plates

PLATE **PAGE**

Plate 7.2-1. Image of Elk grazing at 1 km using an Infinity Optics remote camera. 7-35

List of Appendices

Appendix 1. The Caribou Decision Tree

Appendix 2. Caribou Mitigation, Monitoring, and Management Infographic

List of Acronyms

ERM

List of Acronyms

BACI	Before-After-Control-Impact
CWS	Canadian Wildlife Service
dB	decibel; dBA and dBC are frequency weightings used to measure and report noise levels.
DEIS	Draft Environmental Impact Statement
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
FEIS	Final Environmental Impact Statement
GN	Government of Nunavut
GN DOE	Government of Nunavut Department of Environment
GNWT	Government of the Northwest Territories
GNWT ENR	Government of the Northwest Territories Department of Environment and Natural Resources
GPS	Global positioning system
HMMP	Hazardous Materials Management Plan
IMO	International Maritime Organization
KIA	Kitikmeot Inuit Association
NIRB	Nunavut Impact Review Board
OPMP	Oil Pollution Management Plan
OR	Odds ratio
QA/QC	Quality assurance/quality control
SARA	*Species at Risk Act*
SCP	Spill Contingency Plan
SOP	Standard operating procedure
SOPEP	Shipboard Oil Pollution Emergency Plan
TK	Traditional knowledge
TSF	Tailings storage facility
USFWS	United States Fish and Wildlife Service
VEC	Valued ecosystem component

WEMP	Wildlife Effects Monitoring Program
WMMP	Wildlife Mitigation and Monitoring Program
ZOI	Zone of influence

Definitions of Project Areas

ERM

Definitions of Project Areas

RSA	Regional Study Area – The area identified for baseline studies for large mammals, raptors and waterfowl and used in the FEIS as the assessment area. The RSA is defined as the area within 30 km of the Project Footprint. This area was extended to 35 km on the east side of the RSA to encompass the Western River.
LSA	Local Study Area – The area used for baseline studies for upland birds and vegetation mapping. The LSA is defined by local watersheds surrounding the PDA, MLA and winter road.
PDA	Project Development Area – The area assessed for the FEIS where the Project will be constructed. The planned footprint of the Goose site is approximately 15% of the Goose PDA area. The PDA was chosen to be large enough to allow future changes in the locations of Project features.
MLA	Marine Laydown Area – The PDA surrounding the marine laydown in Bathurst Inlet.
Footprint	The physically constructed area of the Project where wildlife habitat will be removed or directly physically disturbed.
On-Site	Within the footprint, or immediately adjacent to the footprint. Accessible by Project personnel by land based vehicle or on foot from the footprint.
Local-Scale	Studies or activities taking place on-site or in the area surrounding the Project footprint out to the visible horizon.
Regional-Scale	Studies or activities taking place within the RSA. Generally, regional-scale monitoring is conducted to evaluate if wildlife are avoiding the Project so the scale extends from the Project footprint out to a distance where no avoidance is anticipated to provide a control area for monitoring.
ZOI Test Area	As part of the camera monitoring program to determine whether there is a zone of influence, cameras are placed within a ZOI test area close to the Project footprint where fewer wildlife may be observed.
ZOI Control Area	As part of the camera monitoring program to determine whether there is a zone of influence, cameras are placed in a ZOI control area at a distance beyond where a ZOI may occur to provide a comparison for the cameras in the ZOI test area.

1. Introduction

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1. Introduction

The Back River Project (the Project) has been designed to minimize, mitigate, and/or manage potential adverse effects on the environment while systematically seeking to enhance positive effects. As part of the requirements of the Final Environmental Impact Statement (FEIS) guidelines issued by the Nunavut Impact Review Board (NIRB), this document presents the Wildlife Mitigation and Monitoring Program (WMMP) Plan (the WMMP Plan) that Sabina Gold & Silver Corp. (Sabina) will follow concurrent with the development of the Project.

This Plan describes actions that are intended to reduce Project-related effects on wildlife. The Plan is intended to ensure wildlife habitats and populations are maintained in the area that will be influenced by Project development, while taking into account operational requirements and the safety of Project employees.

Unless otherwise indicated, measures described in the Plan apply to all Project components for the life of the Project. This plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the monitoring program.

The WMMP Plan for the FEIS includes considerable changes and additions in response to comments, suggestions and requests from the reviewers of the previous version of the WMMP Plan, including: Kitikmeot residents, Hunters and Trappers Organizations, the Kitikmeot Inuit Association (KIA), the NIRB, the Government of Nunavut (GN), the Government of the Northwest Territories (GNWT) and Aboriginal groups from the NWT.

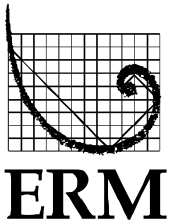
Sabina is committed to minimizing its impacts to wildlife and has designed its monitoring and mitigation activities to be flexible and adaptable as part of its overall management strategy to be responsive to concerns regarding uncertainty in potential effects to wildlife, particularly caribou, raised during the FEIS. As a result, the WMMP Plan meets and in most cases exceeds the mitigation and management measures for any mining project in the Canadian Arctic. The monitoring program used to trigger mitigation and management activities for potential Project effects is likewise the most advanced and comprehensive monitoring program in the Canadian Arctic.

1.1 INTEGRATION OF TRADITIONAL KNOWLEDGE

This Plan represents an adaptive approach to understanding the effects of the Project on the landscape and the species that live there. In this context, the Plan is part of a continually evolving process that relies not only on the efficacy of data collection and analytical results, but is also dependent on feedback from the communities, government, Aboriginal groups and the public. Having an adaptive and flexible program allows for appropriate and necessary changes to the design of monitoring studies, and the mitigation and monitoring plans. Some changes may come about through the observation of unanticipated effects or inadequacies in the sampling methods used to detect measurable effects. Other changes may result from ecological knowledge acquired through working with Aboriginal community members and discussions with elders, both in the field and through workshops.

Sabina is committed to considering and incorporating traditional knowledge (TK) into the Plan on an ongoing basis. The incorporation of traditional knowledge will occur throughout all stages of the Plan, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs to obtain feedback.

2. Scope and Objectives



2. Scope and Objectives

The WMMP Plan targets the following valued ecosystem components (VECs) that are included in the Final Environmental Impact Statement (FEIS):

1. caribou (Bathurst, Beverly/Ahiak, and the Dolphin and Union herds);
2. grizzly bear;
3. muskox;
4. wolverine/furbearers;
5. migratory birds (waterbirds, upland birds);
6. raptors (e.g., falcons, eagles, hawks, ravens, and owls);
7. seabirds and seaducks; and
8. marine mammals (ringed seals).

In addition, while not included as a VEC in the FEIS, the Plan also considers polar bear.

Mitigation for potential effects of the Project was taken into consideration in the Project design and included avoidance of key wildlife habitats. The process of Project design and avoidance was conducted during the preparation phase for the Draft Environmental Impact Statement (DEIS) and FEIS. The FEIS evaluates the potential for effects given the final footprint after the redesign of Project elements. The overall objective of the Plan is to minimize effects due to the Project given this final footprint design.

The objectives of the WMMP Plan are to:

- guide on-site adaptive management (both monitoring and mitigation activities) at the Project site;
- incorporate Traditional Knowledge (TK) into the Plan wherever possible;
- minimize any Project-related effects on wildlife species and their habitat predicted in the FEIS;
- avoid adverse effects on protected species and their habitats;
- describe regional-based monitoring activities for selected wildlife VEC species and their habitat;
- provide achievable and measureable goals for evaluating mitigation and monitoring activities;
- ensure monitoring is based on current methods that are consistent with other monitoring programs in the Arctic; and
- identify opportunities for regional, collaborative monitoring with government agencies where a need has been identified.

The WMMP Plan describes and presents the following components:

- the planning and implementation processes for the Plan, including the personnel and their responsibilities (Section 5);

- the mitigation and adaptive management measures that will be carried out on-site to reduce any predicted effects due to the Project (Sections 6 to 15);
- the Wildlife Effects Monitoring Program (WEMP) including:
  - numerous on-site monitoring programs to evaluate the success of mitigation and management, and to trigger and guide adaptive mitigation and management activities (Sections 7 to 15);
  - species-specific monitoring programs to monitor regional populations of selected VEC species to evaluate the predicted effects from the FEIS (Sections 7 to 15); and
- the process for adaptive management, checking and corrective action, record keeping, reporting, and quality assurance/quality control (QA/QC).

The WMMP Plan is designed to be effective for all Project sites, including:

- the Goose Project Development Area (Goose site) including buildings, on-site roads, open pits, ponds, and the Tailings Storage Facility (TSF);
- the Marine Laydown Area Project Development Area (MLA PDA);
- the winter ice roads between the two PDAs as well as winter ice roads to George and the proposed Bathurst Inlet Port and Road (BIPR);
- the shipping corridor through the Northwest Passage; and
- areas surrounding the areas listed here that may be accessed by aircraft.

3. Planning and Implementation

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3. Planning and Implementation

Planning for the WMMP Plan started with the development of the EIS, which identified existing (baseline) conditions and available TK, assessed potential effects of the Project, and developed mitigation measures to minimize these effects. These plans will continue to be elaborated and executed throughout the construction, operation, and closure phases of mining. Environmental management and monitoring will be tracked, reviewed, and updated through ongoing maintenance of the plan. These updates will incorporate relevant feedback from interested parties which include, but are not limited to, the KIA, GN, GNWT, NIRB, and community members and groups.

The FEIS identified potential effects of the Project on wildlife VECs. Mitigation to reduce these effects and monitoring to evaluate the efficacy of mitigation and interactions between the Project and wildlife VECs is included in the Plan (Sections 7 to 15).

Regional VEC monitoring is described (Sections 7 to 15) for those VEC species included in the assessment (including polar bears). Results of these studies will guide management activities. The Plan will be updated periodically, as mitigation standards change, due to data recorded by the WMMP and/or data available from outside sources. In some cases, such as caribou, regional monitoring is planned through a collaborative process with government biologists and other industrial operations. To date, no regional monitoring plan is available for Sabina to contribute to.

3.1 UPDATES TO THE WMMP PLAN

The WMMP Plan has been updated several times following input during the DEIS and FEIS process. The versions of the WMMP Plan include:

1. Version 1 (2013) – This was the original draft of the WMMP Plan and was included in the DEIS application.
2. Version 2 (2015) – The DEIS WMMP Plan was updated following commitments made during the DEIS hearings and following discussions with the KIA, GN and GNWT.
3. Version 3 (March 2016) – The FEIS WMMP Plan was updated following Information Requests and Technical Comments and technical meetings with the KIA and GN and presented to the NIRB and reviewers prior to the FEIS hearings in April, 2016.
4. Version 4 (September 2016) – Version 3 of the WMMP Plan was re-arranged to organize the document by species, rather than by facility type. The Plan was updated following joint submissions of proposed Terms and Conditions and Commitments made with the KIA and the GN during the FEIS hearings. The Version 4 WMMP Plan also includes measures to address the proposed commitments made by the GNWT during the FEIS review phase.
5. Version 5 (October 2016) – Version 4 of the WMMP Plan was updated following a meeting with the KIA to produce Version 5, which was presented to the KIA, GN and GNWT in October, 2016.
6. Version 6 (November 2016) – Following a meeting with the GNWT on October 24th in Yellowknife and a two day workshop with the KIA and GN on October 25th and 26th, Version 6 of the WMMP Plan was produced. This workshop resulted in an additional 86 commitments and text changes to the WMMP Plan. The majority of these changes were small changes, or clarifications to the text of proposed monitoring programs. This document was submitted for additional peer review, conducted by Golder Associates and Environmental Dynamics Inc. (EDI).

7. Version 7 (February 2017) – (This document) Version 6 of the WMMP Plan was updated following peer review to produce Version 7, the current version of the WMMP Plan.

The WMMP Plan will be updated as needed during the life of the Project in conjunction with the KIA, GN, GNWT, and community members and groups. The WMMP Plan will be submitted to the NIRB for review and approval. Prior to commencement of any WMMP Plan update, the KIA, GN and GNWT will be consulted on the scope of the update to ensure that concerns are addressed. Sabina will work collaboratively with the KIA, GN and GNWT on relevant elements of the update. Sabina will be the holder of the document and once the draft updates are complete, the GN, KIA and GNWT will be given the opportunity for a full review of the updated Plan.

Updates may be triggered by significant changes in the Project plan, results reported in the annual WEMP report that indicate changes in conditions that are likely to be biologically meaningful, significant updates to the scientific understanding or methods relevant to wildlife at the Project site, or as necessary.

4. Applicable Legislation and Guidelines

ERM

4. Applicable Legislation and Guidelines

Mitigation measures to lessen Project effects on wildlife are derived, in part, from federal and territorial legislation. A summary of this legislation is listed in Table 4-1.

Table 4-1. Relevant Acts and Regulations for Wildlife and Wildlife Habitat

Act or Regulation	Implications for Management
Canada *Species at Risk Act (SARA)* (2002)	• Protects wildlife on federal lands as well as the critical habitat of those species listed on the "List of Wildlife Species at Risk," and protects all SARA-listed migratory birds. • Section 137 amends the *Canadian Environmental Assessment Act* (1992) to clarify, for greater certainty, that environmental assessments must always consider effects to listed wildlife species, their critical habitat, or the residences of individuals of that species. • Section 79(2) states "the person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans."
Canada *Migratory Birds Convention Act* (1994)	• Prohibits the taking or killing of migratory birds, their nests, and eggs, and the deposition of harmful substances in areas frequented by migratory birds. • Species protected include waterbirds, cranes, rails and coots, shorebirds including gulls and terns, pigeons and doves, insectivorous songbirds (excluding blackbirds), seabirds, loons, grebes, herons, egrets, and bitterns. Raptors are not protected under the *Act*.
Nunavut *Scientists Act* (2011)	• Requires a licence to conduct environmental research (except for wildlife).
Nunavut *Wildlife Act* (2003)	• Provides guidelines on wildlife harvesting, habitat protection, respectful conduct toward wildlife, and designation and protection of species at risk and their habitat. • Pertinent regulations are: Wildlife General Regulations (1999), and Wildlife Licenses and Permits Regulations (1999).
Nunavut *Land Claims Agreement Act* (1993)	• Provides guidelines for NIRB on the review of potential environmental and social effects of development projects.

5. Roles and Responsibilities

ERM

5. Roles and Responsibilities

The General Manager of the Project is ultimately responsible for the success of the Plan and approves all relevant policies and documents, audits, action plans, and the verification process.

The Environment Manager, along with their direct reports, is responsible for the implementation of this Plan including: overall management of the plan, monitoring, operations, internal and external reporting, and ensuring compliance and adaptive management.

6. General Mitigation, Management and Monitoring

ERM

6. General Mitigation, Management and Monitoring

This section describes a series of mitigation and management measures that will be implemented to eliminate or minimize effects of the Project for wildlife, backed by a suite of monitoring programs to trigger mitigation when necessary and to evaluate potential effects of the Project on wildlife. The Plan is designed to be effective and achievable, and will incorporate Aboriginal TK, land user information, the latest scientific information, best management practices, and the results of monitoring activities specifically designed to evaluate the efficacy of the mitigation and management activities.

Mitigation

Mitigation measures are activities that are ongoing on a constant basis, or are designed into the Project. Examples of mitigation actions include the no-hunting regulation for employees while on site, keeping wastes in wildlife-proof buildings, and maintaining all Project vehicles and equipment to minimize the noise they make. Examples of design mitigation are the building skirting which will prevent wildlife such as wolverine from access under Project buildings, and ramps to facilitate caribou crossing all-season roads.

Monitoring

Three types of monitoring will be conducted: 1) to evaluate the success of mitigation actions, 2) to trigger management, and 3) to evaluate predicted Project effects.

Monitoring will be conducted to evaluate the success of mitigation – including camp inspections for cleanliness, inspections of buildings and skirting to ensure they are wildlife-proof, monitoring the waste facility for wildlife use, and noise and dust monitoring. If these inspections indicate a problem, the mitigation activities will be updated accordingly. Monitoring will also be conducted to trigger management —wildlife monitors will record the presence of caribou and other wildlife near the Project, and all drivers and pilots will monitor for and avoid wildlife. Monitoring will also be conducted to evaluate predicted Project effects, for example, caribou collars will be monitored to evaluate if caribou are avoiding the Project site.

Management

Management actions are triggered by monitoring. Examples include giving wildlife the right of way whenever they are observed on Project roads and ceasing blasting and heavy mobile equipment when caribou are observed near the Project site.

This section describes: 1) the general mitigation and management measures applicable to all wildlife species, and 2) the framework of the Wildlife Effects Monitoring Program (WEMP) that will evaluate the effectiveness of mitigation and management measures and will monitor them for predicted effects on VEC species.

Sections 7 to 15 describe the mitigation, management, and monitoring for each wildlife VEC species and for polar bears. The sections are organized by potential effects (e.g., habitat loss, disturbance, etc.). There is some overlap between the general mitigation and management strategies provided in Section 6 and the specific strategies outlined in Sections 7 to 15 for individual wildlife VECs (and polar bears).

6.1 MITIGATION AND MANAGEMENT FOR WILDLIFE

There are several general mitigation and management measures that will be implemented for wildlife at the Project. These general measures include the development of a wildlife education program (including training for all Project employees), enforcement of wildlife policies, a noise abatement program, and fuel management plans. Many other measures are presented elsewhere in this document, such as those to reduce the potential effects in relation to Project construction and operation activities (including attractants) and road, aircraft, and ship traffic.

6.1.1 Wildlife Policies and Employee Education

The goal of wildlife policies and employee education is to create employee and contractor awareness of each person's responsibilities to minimize Project effects on wildlife, including disturbance and disruption to wildlife, and ensure the safety of all employees. All contractors and employees working on the Project will participate in the program through inductions and annual refresher courses. Through this program, all Project personnel will be encouraged to promote stewardship activities and will be educated about and expected to comply with the management provisions in the WMMP.

There will be three wildlife policies that will be used at the Project:

- no feeding of wildlife;
- no littering; and
- no firearms and no hunting by Project personnel while on an active shift at the Project site.

The education program will include training in the following areas:

- employees and contractors will be educated on basic local wildlife ecology (including wildlife information from TK) and possible Project-related effects on wildlife and biodiversity;
- road restrictions and operating protocols (e.g., wildlife right-of-way, speed limits, check-ins, road-wildlife reporting programs);
- awareness of wildlife-sensitive locations (e.g., movement corridors, breeding areas) and wildlife-sensitive periods;
- local wildlife species of concern and threats to native biodiversity;
- wildlife attractant management;
- bear-aware training for relevant staff who work outdoors;
- wildlife incidental observation reporting;
- wildlife incident/accident reporting and response procedures;
- anonymous reporting system for employees to voice concerns and inform management of non-compliance; and
- compliance requirements and disciplinary action that will be enforced by Project management.

6.1.2 Noise Abatement

Noise abatement will be conducted throughout the life of the Project to meet safety regulations for Project personnel and to reduce any disturbance to wildlife. Mitigation measures will include:

- ensuring equipment is fitted with appropriate mufflers and silencers;
- ensuring equipment is well maintained;
- identifying enclosures, berms, acoustic screening, and shrouding where stationary sources require control;
- strategic placement of waste rock piles to block plant sources of noise;
- housing stationary sources of noise in buildings; and
- other possible general noise abatement measures that can be implemented on-site to minimize static noise due to generators, vehicles, and other sources.

Management of noise sources, e.g., staged reduction of Project activities when wildlife are present, is discussed in the appropriate section for each wildlife species.

6.1.3 Spill Management

Prevention of unplanned releases of fuel or other chemicals during the life of the Project will be accomplished through strict enforcement of the fuel and spill management plans (FEIS, Volume 10), including the following plans:

- The Fuel Management Plan (FMP) outlines the approach for managing hydrocarbon products that are to be stored and managed at the Project. The FMP meets Federal and Territorial statutory requirements and will be included in Sabina's future Type A Water Licence Application. The scope of this plan focuses on the environmental protection measures required for fuel management. This entails the implementation of procedures for transportation, handling, inspection, storage, transfer, reporting, and documentation for all fuel products throughout the mine life. These products include diesel, gasoline, lubricating oils, hydraulic fluids, propane, and paint thinner. Sabina's intent is that through the diligent implementation of measures outlined in this plan the frequency of spill incidents will be minimized at the mine.
- The Spill Contingency Plan (SCP) is designed to protect worker and public safety and minimize any effects of a spill on the environment. It addresses all potential spills of fuel, soluble solids, liquids like solvents or paint, flammable gases and other hazardous substances at all Project sites, including the Goose site, the Marine Laydown Area, temporary winter supply road (winter ice road), on-ice airstrips, etc. It meets all Canadian legislation and will be updated as part of the Type A Water License.
- The Oil Pollution Management Plan (OPMP) is a requirement of the *Canada Shipping Act* (2001) and describes the responses to oil spill scenarios at the Marine Laydown Area to minimize environmental damage and ensure worker safety. It provides instructions to guide all personnel in emergency spill response situations, defines the roles and responsibilities of management and responders and outlines the measures taken to prevent spills, the related exercise and evaluation programme, and the mechanism for regular updates to the plan.
- The Shipboard Oil Pollution Emergency Plan (SOPEP) is a requirement of the International Maritime Organization (IMO) for all ships transporting fuel; it describes the equipment, training and procedures that the ship must have on board in order to manage and address any fuel spills during shipment or unloading to minimize any effects on the environment. Sabina will require

that the shipping company providing fuel to the Project will have an approved SOPEP in place prior to shipping any fuel to site.

- The Hazardous Materials Management Plan (HMMP) outlines the safe handling requirements, storage, transportation, disposal, and reporting of hazardous materials at the Goose site and the Marine Laydown Area throughout the life of the Project. This plan provides environmental protection measures, spill response procedures, and conforms with all existing federal and territorial acts and regulations. A Cyanide Management Plan is a sub-plan of the HMMP and is in accordance with the International Cyanide Management Code; it addresses the transportation, handling, storage, management, and monitoring of cyanide at the Project.

6.2 MONITORING FOR WILDLIFE

A Wildlife Effects Monitoring Program (WEMP) is proposed to evaluate the effectiveness of mitigation and management in reducing potential effects of the Project on wildlife. The goal of the WEMP is to assess interactions between the Project and wildlife populations in order to modify operations if there is evidence that the Project is having an effect on wildlife. Wildlife monitoring programs will be conducted to:

1. evaluate whether mitigation is working;
2. trigger management actions; and
3. test the predictions of the FEIS.

Monitoring programs of facilities and mitigation measures are summarized in Table 6.2-1 and described in the section for the relevant wildlife species. Monitoring programs to test the predictions of the FEIS are presented in Table 6.2-2.

This WEMP will be updated by Sabina prior to construction of the Project to include the detailed study designs of programs as well as standard operating procedures and sent to the NIRB, KIA, GN, GNWT for comment prior to use.

Monitoring programs will be largely conducted in the Local Study Area (LSA) and Regional Study Area (RSA) for terrestrial and marine wildlife, as presented in Figures 6.2-1 and 6.2-2. Some monitoring programs for select wildlife VECs may extend beyond the boundaries of the Regional Study Area, particularly for regional collaborative programs with government.

Table 6.2-1. Overview of Wildlife Monitoring Programs that Trigger Management Actions

Monitoring Programs that Trigger Management (Section of the document where they are described)	Baseline/ Pre-construction	Mobilization and Construction	Operations	Temporary Closure	Care and Maintenance*	Reclamation/ Closure*	Post-Closure
Caribou (Section 7.2)							
1) Monitor Seasonal Caribou Ranges *Use collar data to track during which seasons caribou are likely to interact with the Project*	--	Yearly	Yearly	Yearly	Yearly	Yearly	--
2) Near Real-time Collar Monitoring *Use collar data to track near real-time location of caribou herds*	--	Ongoing	Ongoing	--	--	Ongoing	--
3) Active Caribou Monitoring *Wildlife monitors will survey for caribou from raised platforms or using cameras*	--	Ongoing	Ongoing	--	--	Ongoing	--
4) Incidental Wildlife Reporting *Incidental observations of wildlife and incidents*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
5) On-site Camera Monitoring *Use motion-trigger cameras to track caribou interactions with Project infrastructure*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
6) Over the Horizon Monitoring *If ZOI monitoring indicates that management must be conducted for caribou when they are over the horizon (greater than can be observed from site)*	--	If triggered	If triggered	--	--	If triggered	--
7) Human Activity Monitoring *Reporting hunting and fishing on the Project site*	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	--
8) Noise Monitoring *Monitor noise levels outside the footprint*	One time	One time	Every three years	--	--	One time	--
Muskox (Section 8.2)							
1) On-site Camera Monitoring *Use motion-trigger cameras to track muskox interactions with Project infrastructure*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
2) Incidental Wildlife Reporting *Incidental observations of wildlife and incidents*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--

(continued)

Table 6.2-1. Overview of Wildlife Monitoring Programs that Trigger Management Actions (continued)

Monitoring Programs that Trigger Management (Section of the document where they are described)	Baseline/ Pre-construction	Mobilization and Construction	Operations	Temporary Closure	Care and Maintenance*	Reclamation/ Closure*	Post-Closure
Muskox (Section 8.2) *(cont'd)*							
3) Active Caribou Monitoring *Wildlife monitors will also survey for muskox from raised platforms or using cameras*	--	Ongoing	Ongoing	--	--	Ongoing	--
Grizzly Bear (Section 9.2)							
1) On-site Camera Monitoring *Use motion-trigger cameras to track grizzly bear interactions with Project infrastructure*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
2) Incidental Wildlife Reporting *Incidental observations of wildlife and incidents*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
3) Infrastructure Monitoring *Fence inspections and wildlife observations*	--	Monthly	Monthly	--	Monthly	Monthly	--
4) Waste Management Monitoring *Monitoring waste storage areas for misdirected waste or signs of wildlife*	Weekly	Weekly	Weekly	--	Weekly	Weekly	--
5) Pre-clearing Surveys for Bear Dens *Identify dens prior to construction of the winter ice road*		If triggered	If triggered			If triggered	
Raptors (Section 10.2)							
1) Pit and Quarry Wall Nest Monitoring *Monitor pits for nesting raptors*	--	Yearly, in Spring	Yearly, in Spring	--	--	--	--
2) Pre-clearing Surveys for Nests *Pre-survey areas if construction occurs during nesting season*	--	If triggered, in Spring	If triggered, in Spring	--	--	--	--
3) Incidental Wildlife Reporting *Incidental observations of wildlife and incidents*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--

(continued)

Table 6.2-1. Overview of Wildlife Monitoring Programs that Trigger Management Actions (completed)

Monitoring Programs that Trigger Management (Section of the document where they are described)	Baseline/ Pre-construction	Mobilization and Construction	Operations	Temporary Closure	Care and Maintenance*	Reclamation/ Closure*	Post-Closure
Waterbirds (Section 11.2)							
1) Waterbird Monitoring in Ponds *Monitor waterbird usage of Project ponds if water quality does not meet wildlife guidelines (if water is present in ponds during the Project Phase in question)*	--	Weekly (May through October)	Weekly (May through October)	Twice yearly (Spring and late Summer)	Twice yearly (Spring and late Summer)	Weekly (May through October)	--
2) Pre-clearing Surveys for Nests *Pre-survey areas if construction occurs during nesting season*	--	If triggered, in Spring	If triggered, in Spring	--	--	--	--
3) Incidental Wildlife Reporting *Incidental observations of wildlife and incidents*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Upland Birds (Section 12.2)							
1) Pre-clearing Surveys for Nests *Pre-survey areas if construction occurs during nesting season*	--	If triggered, in Spring	If triggered, in Spring	--	--	--	--
2) Incidental Wildlife Reporting *Incidental observations of wildlife and incidents*	Ongoing	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Marine Birds (Section 13.2)							
1) Pre-clearing Surveys for Nests *Pre-survey areas if construction occurs during nesting season*	--	If triggered, in Spring	If triggered, in Spring	--	--	--	--
Marine Mammals (Section 14.2)							
On-Ice Monitoring at the MLA *Pre-survey sea ice if on-ice works occur Feb 15-March 15*	--	If triggered	If triggered	--	If triggered	If triggered	--

** Monitoring is dependent on personnel being present at site.*

Table 6.2-2. Overview of Proposed Focal Species Monitoring Programs to Test Predictions of FEIS

Focal Species Monitoring[1]	Baseline/ Pre-Construction	Site Prep/ Construction	Operations	Temporary Closure	Care and Maintenance	Reclamation/ Closure	Post-Closure
Caribou (Section 7.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
2) On-site Monitoring by Wildlife Monitors	--	Ongoing	Ongoing	--	--	Ongoing	--
3) Behaviour Monitoring Program	--	Ongoing	Ongoing	--	--	--	--
4) Stress Hormone Study	--	--	1 Time	--	--	--	--
Regional Monitoring							
5) Regional Collar Monitoring for ZOI (reporting)	--	Every 3 years	Every 3 years	Every 3 years	Every 3 years	Every 3 years	Every 3 years
6) Regional Camera Monitoring Program for ZOI	2 years	Every 3 years	Every 3 years	--	--	--	Every 3 years
7) Noise Monitoring	1 Time	1 Time	Every 3 years	--	--	1 Time	--
8) Dust Monitoring	1 Time	1 Time	Every 3 years	--	--	--	--
Herd-Scale Monitoring							
9) Contribution to GN/GNWT monitoring initiatives	--	TBD	TBD	TBD	TBD	TBD	TBD
Muskox (Section 8.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
Regional Monitoring							
2) Regional Camera Monitoring Program	2 years	Every 3 years	Every 3 years	--	--	--	Every 3 years
Herd-Scale Monitoring							
3) Contribution to GN/GNWT monitoring initiatives	--	TBD	TBD	--	--	--	--
Grizzly Bear (Section 9.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
Regional Monitoring							
2) Regional Camera Monitoring Program for ZOI	2 years	Every 3 years	Every 3 years	--	--	--	Every 3 years
Herd-Scale Monitoring							
3) Contribution to GN/GNWT monitoring initiatives	--	TBD	TBD	--	--	--	--

(continued)

Table 6.2-2. Overview of Proposed Focal Species Monitoring Programs to Test Predictions of FEIS (continued)

Focal Species Monitoring	Baseline/ Pre-construction	Site Prep/ Construction	Operations	Temporary Closure	Care and Maintenance	Reclamation/ Closure	Post-Closure
Wolverine/Furbearer (Section 9.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
Regional Monitoring							
2) Regional Camera Monitoring Program for ZOI	2 years	Every 3 years	Every 3 years	--	--	--	Every 3 years
Herd-Scale Monitoring							
3) Contribution to GN/GNWT monitoring initiatives	--	TBD	TBD	--	--	--	--
Raptors (Section 10.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
Regional Monitoring							
2) Aerial monitoring to estimate productivity	3 years	Every 3 years	Every 3 years	--	--	--	--
Waterbirds (Section 11.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
Regional Monitoring							
2) Aerial and ground surveys to measure breeding for waterbirds	3 years	Every 3 years	Every 3 years	--	--	--	--
3) Aerial surveys to examine staging areas for waterbirds	3 years	Every 3 years (2 times yearly)	Every 3 years (2 times yearly)	--	--	--	--
Upland Birds (Section 12.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
Regional Monitoring							
2) PRISM/ VRPC surveys for upland breeding birds	3 years	Every 2 years	Every 2 years	--	--	--	--

(continued)

Table 6.2-2. Overview of Proposed Focal Species Monitoring Programs to Test Predictions of FEIS (continued)

Focal Species Monitoring	Baseline/ Pre-construction	Site Prep/ Construction	Operations	Temporary Closure	Care and Maintenance	Reclamation/ Closure	Post-Closure
Seabirds/Seaducks[2] (Section 13.2)							
Local-Scale Monitoring							
1) Footprint Size Monitoring	--	Ongoing	Ongoing	--	--	--	--
Regional Monitoring							
2) Aerial and ground surveys to measure breeding for marine birds	3 years	Every 3 years[2]	Every 3 years[2]	--	--	--	--
3) Aerial surveys to examine staging areas for marine birds	3 years	Every 3 years (2 times yearly)	Every 3 years (2 times yearly)	--	--	--	--
4) Incidental Seabird Observations from Ships	--	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Marine Mammals (Section 14.2)							
Regional Monitoring							
1) Incidental Marine Mammal Observations from Ships	--	Ongoing	Ongoing	--	Ongoing	Ongoing	--
Polar Bears (Section 15.2)							
Regional Monitoring							
1) Incidental Marine Mammal Observations from Ships	--	Ongoing	Ongoing	--	Ongoing	Ongoing	--

[1] *Monitoring programs to test the predictions of the FEIS will also be used to trigger mitigation and management as discussed in the text of each monitoring section.*
[2] *Proposed monitoring for seabirds/seaducks and ringed seals would be conducted only when the Marine Laydown Area is active.*
Note: Survey frequency may change depending on Project-related changes to population abundances and distributions or climate change or upon consultation with stakeholders.

Figure 6.2-1
Local Study Area and Regional Study Area for Caribou and Terrestrial Wildife

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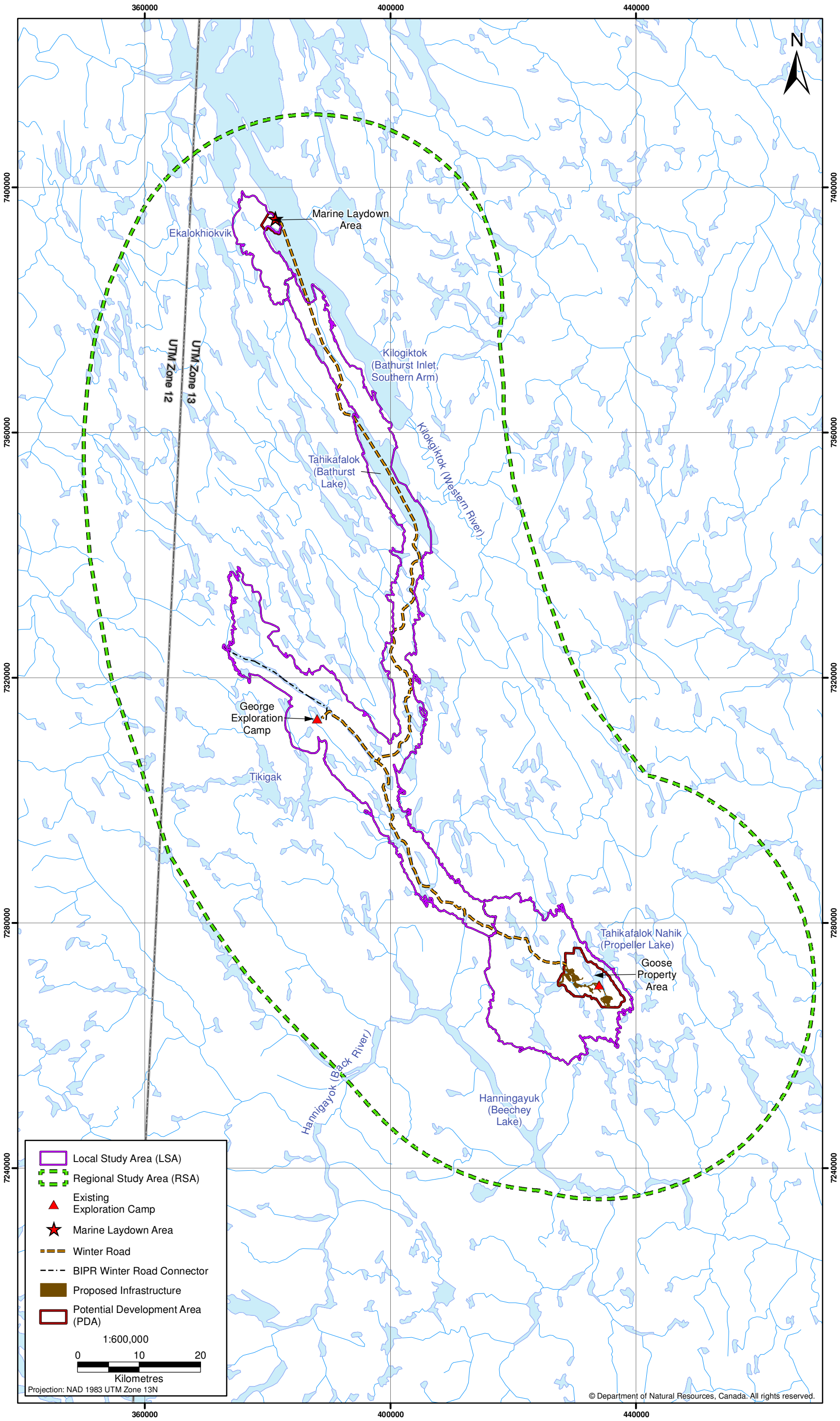
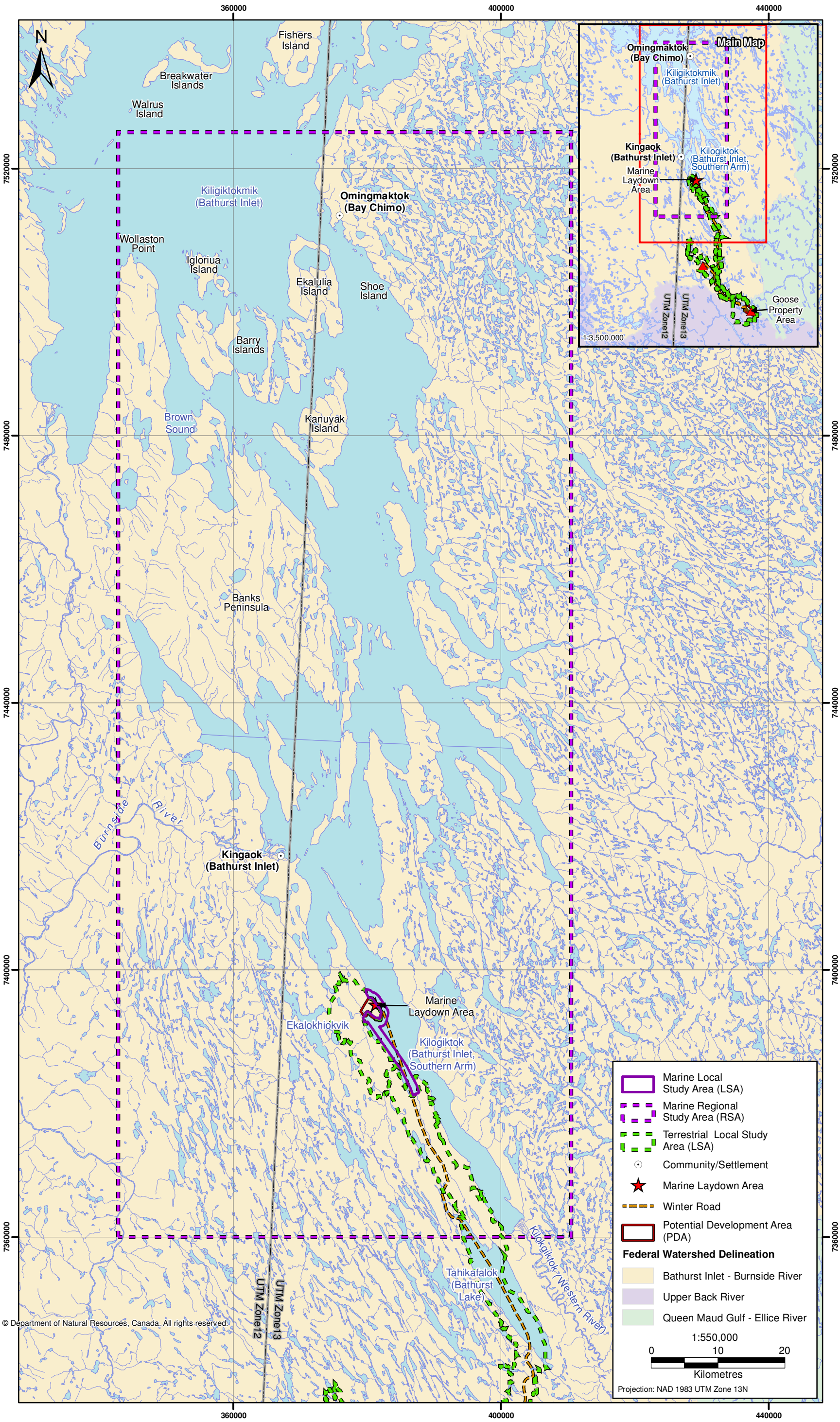


Figure 6.2-2
Local and Regional Study Areas for Marine Wildlife



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7. Caribou

ERM

7. Caribou

7.1 MITIGATION AND MANAGEMENT FOR CARIBOU

7.1.1 Overview of Project Interactions with Caribou

Mitigation, management and monitoring is presented for the Beverly/Ahiak, Bathurst, and Dolphin and Union caribou herds. Caribou from the Beverly/Ahiak herd will likely interact with the Project during the summer months, and to a lesser degree during the fall and winter periods. The range boundaries for the Bathurst and Dolphin and Union caribou herds are approximately 100 km from the Project site, and do not interact with the Project. Despite this, mitigation, management and monitoring is proposed for all caribou, regardless of herd.

7.1.1.1 Beverly/Ahiak Caribou

The Beverly caribou are named for Beverly Lake, where they historically calved. The Ahiak caribou was formerly known as the Queen Maud Gulf herd. Currently, both herds calve in the Queen Maud Gulf area.

Inuit TK has identified historic patterns in caribou movements and distribution, with relatively static calving areas and more unpredictable distribution during winter (KIA 2012, 2014). Inuit TK indicates that caribou have historically calved in the Queen Maud Gulf area over a long period, and wintered further south. Inuit TK includes observations of large numbers of caribou migrating across nadlok (crossing places), including the river crossing of the Back River at the east end of Beechey Lake and a lake crossing on the northern arm of Beechey Lake (KIA 2012, 2014). Based on the migration route of the Beverly/Ahiak herd, it is likely that these caribou, crossing in late summer and fall were from this herd. The abundance of caribou, and of their main predators, wolves, was high enough around Beechey Lake to support a large winter camp, the settlement of families for multiple years, and two fur trading posts. Inuit TK includes reference to an important community at Beechey Lake called Tudlak (KIA 2012, 2014).

The Beverly/Ahiak caribou herd consists of the Beverly and the Ahiak caribou sub-populations. Traditionally, the Beverly sub-population overwinters (November 1 to April 14) in the boreal forest below the treeline, generally to the east of the winter distribution of the Bathurst caribou herd. The Ahiak sub-population generally overwinters on the tundra between the treeline and Bathurst Inlet. During this period, some Beverly/Ahiak caribou may occur near the Project area. However, the herd appears to have merged their seasonal distribution in recent years (Adamczewsk et al. 2015).

During spring migration (April 15 to June 5), Beverly/Ahiak caribou travel north and east towards their calving grounds in the Queen Maud Gulf area (Figure 7.1-1). A small proportion (approximately 2%) of the Beverly/Ahiak caribou spend the winter to the west of the proposed winter ice road, and may cross the winter ice road while it is still in operation. Specific mitigation is proposed for the period of April 15 to the end of the winter ice road season to reduce any disruption of movement to these caribou.

During calving (June 5 to 20), the Beverly sub-population generally occupies the western half of the Queen Maud Gulf, while the Ahiak sub-population occupies the eastern half of the gulf. The calving grounds of the Beverly sub-population average 252 km (minimum of 145 km) northeast of the Goose site. The Ahiak sub-population calves further east away from the Goose site.

During post-calving (June 20 to July 25), Beverly/Ahiak caribou generally stay in the Queen Maud Gulf area, with the Beverly sub-population averaging 274 km (minimum of 165 km) from the Goose site.

During summer (July 26 to August 31), the Beverly/Ahiak caribou disperse south and west to areas between the treeline and Bathurst Inlet. This is the period when the highest numbers of caribou are observed at the Goose site.

During fall (September 1 to October 31), the Beverly/Ahiak caribou herd generally proceed south and the number of caribou observed at site decreases to low numbers for the winter period.

7.1.1.2 Bathurst Caribou

The Bathurst caribou herd is named for Bathurst Inlet. Inuit TK reports that the historic calving ground of the Bathurst caribou is both east and west of Bathurst Inlet (KIA 2012) approximately 100 km north of the Goose site. This is consistent with scientific reports listed above for the period of 1930s to present (Gunn, Poole, and Wierzchowski 2008).

Inuit TK also identifies areas with observations of females with calves surrounding Contwoyto, Nose and Beechey lakes (Luoma and Presser 2009; KIA 2012). This is also consistent with scientific data, with the current post-calving and summer range occurring near these lakes.

TK also identified several important nadlok for caribou and harvesting including two esker complexes north of Nose Lake used for movement (KIA 2012, 2014). Baseline studies reported that caribou continue to use these sites in moderate to large numbers. The islands of Bathurst Inlet were considered to be good places to hunt caribou in the open water season, and several key nadlok were observed where caribou swam across Bathurst Inlet. Note that these naddlok are all more than 30 km from Project sites.

The Bathurst herd moves yearly between calving grounds on the tundra and wintering range in the boreal forest. The Bathurst caribou herd overwinters in the boreal forest (November 1-April 14), generally below treeline, 250 to 750 km southwest of the Goose site. During spring (April 15 to June 5), Bathurst caribou move quickly north to their calving sites via Contwoyto Lake, which is an average of 185 km west of the Goose site.

From approximately June 5 to 15, the Bathurst herd occupies the calving grounds located between the Hood and Burnside Rivers, approximately 210 km northwest of the Goose site. During post-calving (June 15 to July 20), Bathurst caribou travel southeast and make their closest approach to the Goose site, approximately 60 km west of the Project site. The Nunavut Planning Commission (NPC) identified core calving and post-calving ranges for the Bathurst caribou herd (Figure 7.1-2). These areas do not overlap with the Project site, with the calving range approximately 210 km north-west of the Goose site (minimum of 160 km) and the post-calving range an average of 192 km from the Goose site (minimum 82 km).

During summer (July 21 to August 31), Bathurst caribou are centered around Contwoyto Lake, which is approximately 185 km from the Project site. During late summer and fall (September 1 to October 31), they travel south, away from the Project, and return to their wintering grounds below the treeline.

Even though the current Bathurst herd range does not overlap the Project site, mitigation is planned specifically for this herd to limit any potential disturbance should they move near the Project site.

Figure 7.1-1
Calving, Post-Calving and Total Herd Ranges of the Beverly/Ahiak Caribou

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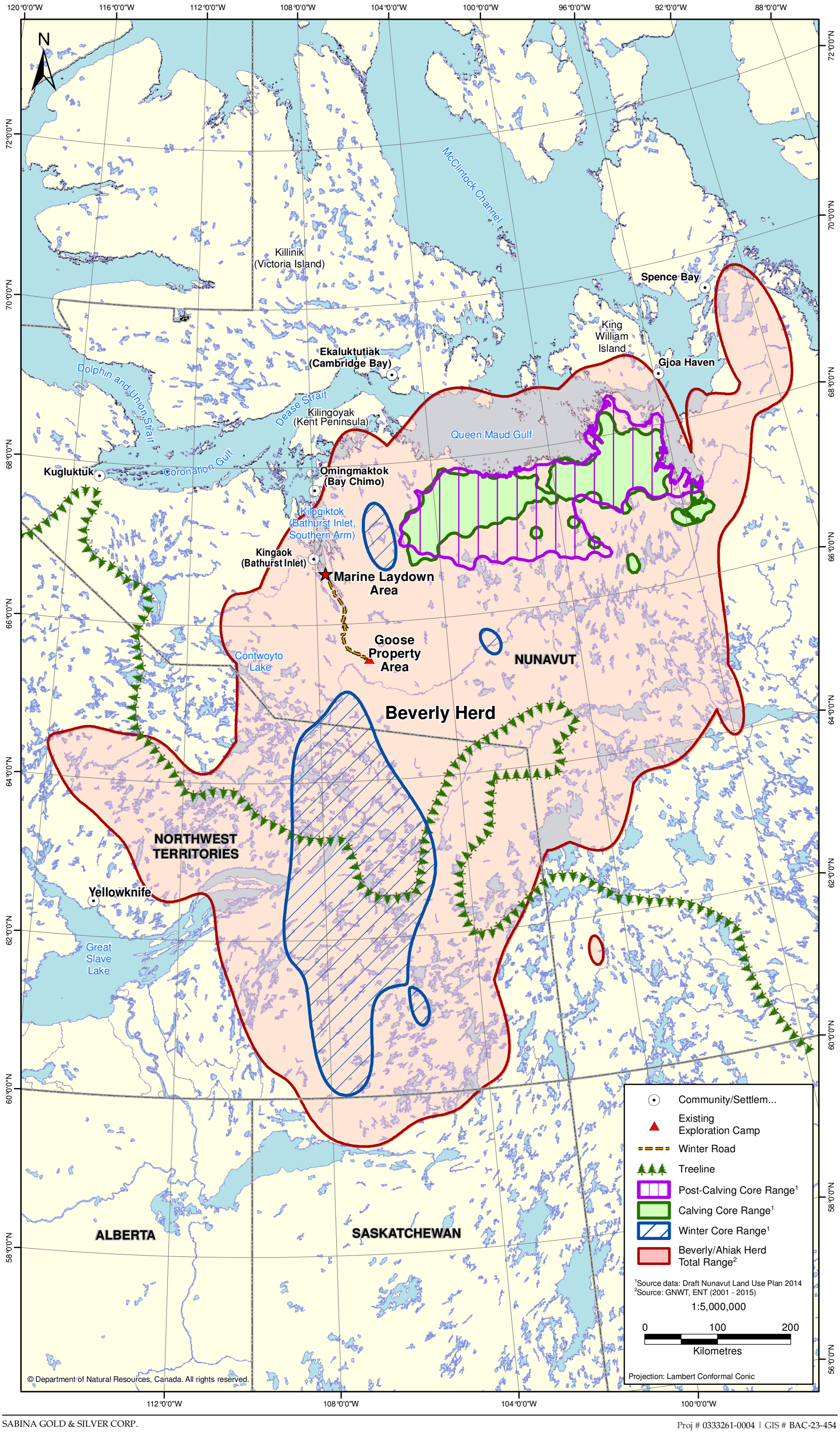
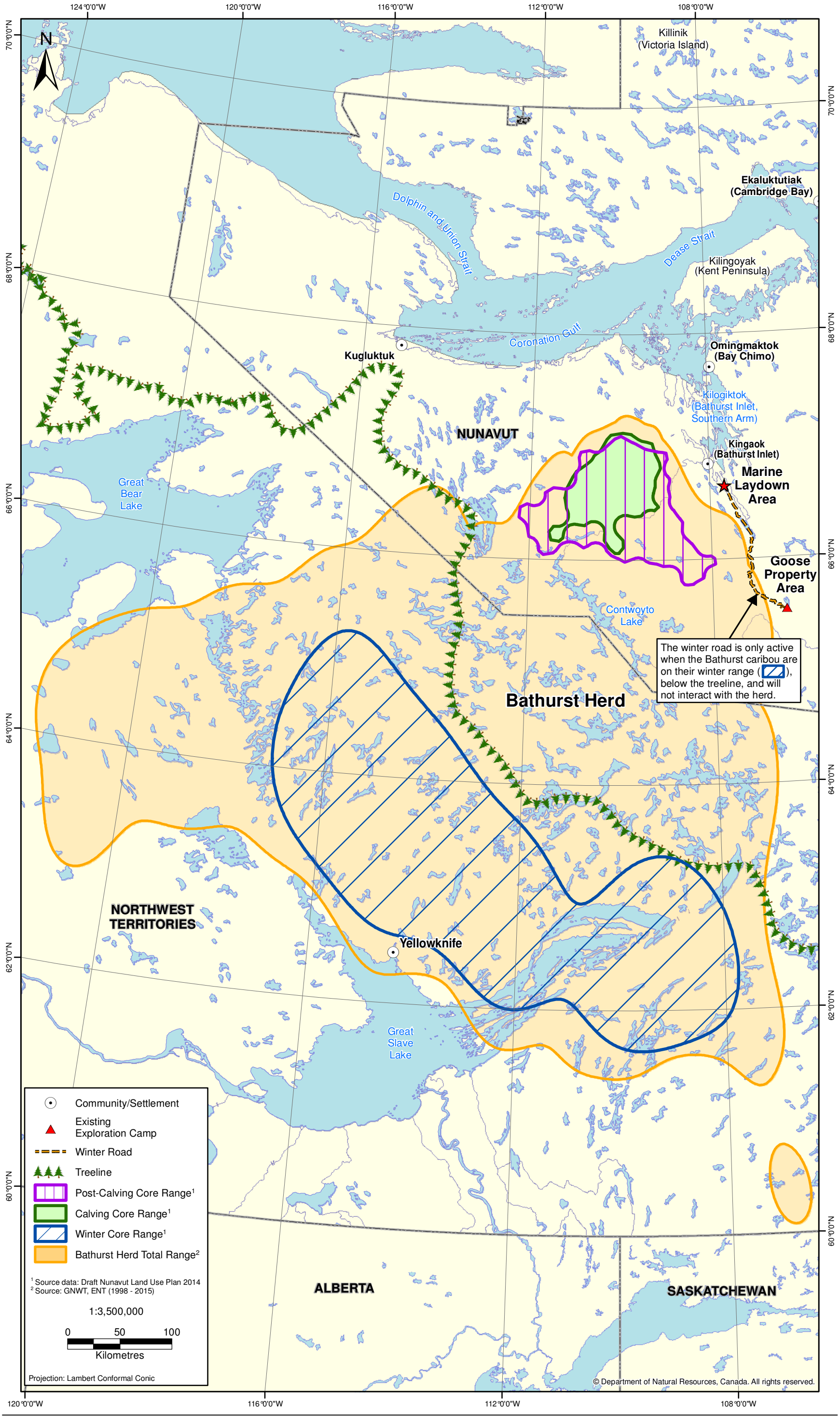


Figure 7.1-2
Calving, Post-Calving and Total Herd Ranges of the Bathurst Caribou



7.1.1.3 Dolphin and Union Caribou

Inuit TK distinguishes Dolphin and Union from mainland caribou by their light color, and refers to the Dolphin and Union herd as island caribou (KIA 2012, 2014). Inuit TK includes observations of the historical distribution of the Dolphin and Union herd in winter, primarily in two concentrations on the east and west of Bathurst Inlet, which corresponds with their current winter distribution based on collar data. Collar data indicates that the Dolphin and Union caribou herd winters (December 8 to April 16) on the Nunavut mainland between Kugluktuk and the Queen Maud Gulf, generally within 100 to 150 km from the coast (Figure 7.1-3. Their winter distribution is generally north of the Project Marine Laydown Area.

Inuit TK indicates that the Dolphin and Union caribou migrate across Dease Strait and Queen Maud Gulf during the spring to Victoria Island. Collar data indicates that spring migration (April 17 to June 29) averages 48 days. They spend the calving (June), post-calving and summer (July 1 to October 19) periods on Victoria Island.

TK indicates that caribou historically gathered on the southern coastline of Victoria Island to rut and wait for the sea ice to form. Once the sea ice is solid, these caribou migrate south. TK identified a variety of crossing locations on the ocean, often near islands and points of land. Collar data indicates that the migration starts in the last week of October and takes an average of 23 days.

Due to their use of the sea ice for migration, ice-breaking shipping has been identified as a threat to this species (COSEWIC 2004). As a consequence, the Project will not ship after October 15 except for emergency or unforeseen circumstances.

7.1.2 Overview of Potential Effects to Caribou

Seven potential effects of the Project on caribou were evaluated in the FEIS: habitat loss, disturbance, disruption of movement, direct mortality, indirect mortality, attraction, and exposure to contaminants. The potential for synergistic effects to result in reduced productivity of caribou was also considered in the FEIS. The potential for synergistic effects will be limited by implementing mitigation and management measures for the seven direct effects listed above, and discussed further in this section.

Habitat loss will occur in the Project footprint where natural vegetation is removed during construction of the Project, and habitat loss was rated as a residual effect in the FEIS. Habitat loss will be minimized by reducing the Project footprint.

The primary effect evaluated for caribou was indirect habitat loss caused by disturbance, measured as the potential for caribou to avoid the Project site, which was rated as a residual effect in the FEIS. A variety of mitigation, monitoring and management activities are proposed, including design mitigation to limit noise, fixed and rotary-winged aircraft management, and management of blasting, on-site roads and winter ice roads should caribou be observed near the site. Following comments from the KIA, GN, and GNWT during the FEIS review, the proposed trigger distances for management activities were increased and the group size required to trigger management decreased. A planned shutdown procedure for the Goose site was developed for the unlikely event of the Bathurst or Beverly caribou herds shifting their core calving or post-calving areas to overlap with the Project site.

The potential for disruption of caribou movement patterns by the winter ice road was predicted to not result in a residual effect to caribou during the winter and spring migration periods after the implementation of mitigation measures, including traffic management. Following comments from the KIA and GN during the FEIS review phase, additional monitoring and mitigation was included in the plan.

The potential for direct mortality due to vehicle collisions was not rated as a residual effect to caribou after the implementation of mitigation measures, including the setting speed limits and giving all wildlife the right of way.

The potential for indirect mortality associated with increased access for hunters to the Project area was not rated as a residual effect to caribou after the implementation of mitigation measures, including closing the winter ice road to the public, prohibiting employees from bringing firearms to the site, and hunting while at work.

The potential for caribou to be attracted to the Project site was not considered a residual effect in the FEIS because caribou are not typically attracted to industrial facilities.

A risk assessment provided in the FEIS concluded that caribou would not be at risk of uptake of hazardous chemicals. A series of standard management plans for chemicals will be implemented, including fuel, spill response, marine spills, and management of hazardous materials. After the implementation of mitigation measures, potential exposure to contaminants is not expected to result in a residual effect to caribou. Following comments from the KIA during the FEIS review, additional monitoring of the TSF is proposed, as well as adaptive management should caribou be attracted to the Project infrastructure as a source of salt.

7.1.3 Herd Vulnerability and the Sabina Adaptive Management Approach

The Project will be following the management philosophy described in the Beverly and Qamanirjuaq Caribou Management Plan 2013-2022 (BQCMB 2014). This plan proposes a suite of monitoring and management actions in response to the vulnerability level of the herd. The Beverly and Qamanirjuaq Caribou Management Board (BQCMB) determines the vulnerability of the herd in collaboration with co-management partners. The determination is based on a suite of indicators, such as seasonal distribution and range use, population size, herd productivity, health, harvest level, range quality, predators and insects, and weather and climate. The herd is then assigned a vulnerability score from very low to very high, which informs monitoring for seasonal distribution, population size, productivity, and harvest management.

The Project will be following the recommendations of this plan using the herd vulnerability scores set by the management groups for each herd, with intense management of the Project when the vulnerability level of caribou herds is high, and more relaxed management should the herds vulnerability become low or very low (Figure 7.1-4). Should the herd management groups not have an established vulnerability score Sabina will engage the relevant authorities (KIA, GN, GNWT) to determine an interim vulnerability score. Wildlife biologists and land users consider the current vulnerability of the Bathurst herd to be high to very high. Wildlife biologists and land users consider the Beverly herd is possibly in decline, and hence the herd vulnerability level may be low to medium.

As a consequence of the Bathurst herd vulnerability score, Sabina is proposing a set of mitigation and management actions for the Project that are very protective of caribou, and represent the highest level of protection of any proposed or operating mine in Nunavut or the Northwest Territories.

Should the herd vulnerability change in the future resulting from a change in caribou herd size or distribution then this plan may be revisited to provide an appropriate level of protection for caribou. Sabina will engage with the KIA, GN and GNWT to discuss options of how the change in herd vulnerability should influence the WMMP prior to revising the WMMP and the WMMP will be made available for review and comment prior to implementation.

Figure 7.1-3
Distribution of the Dolphin and Union Caribou Herd

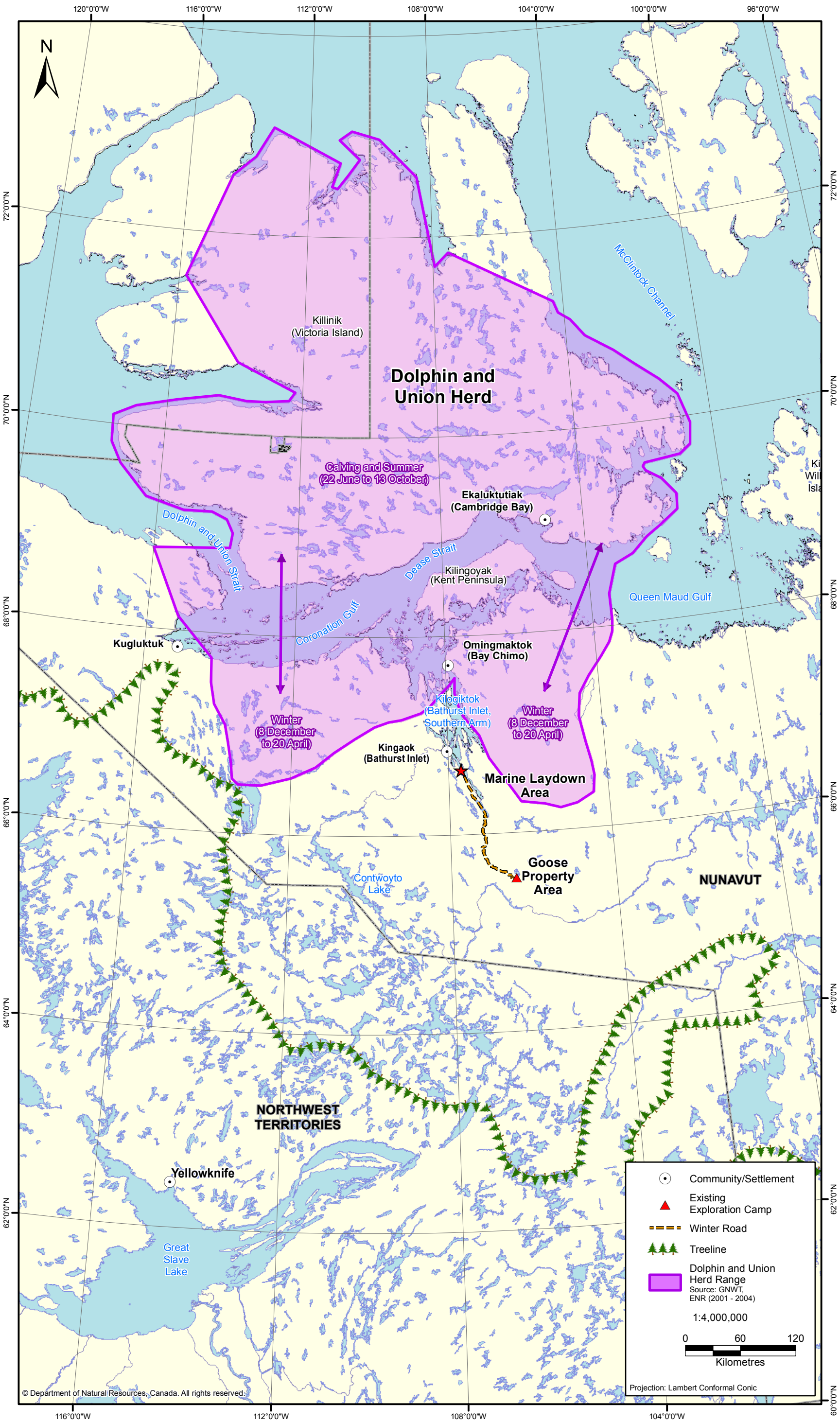
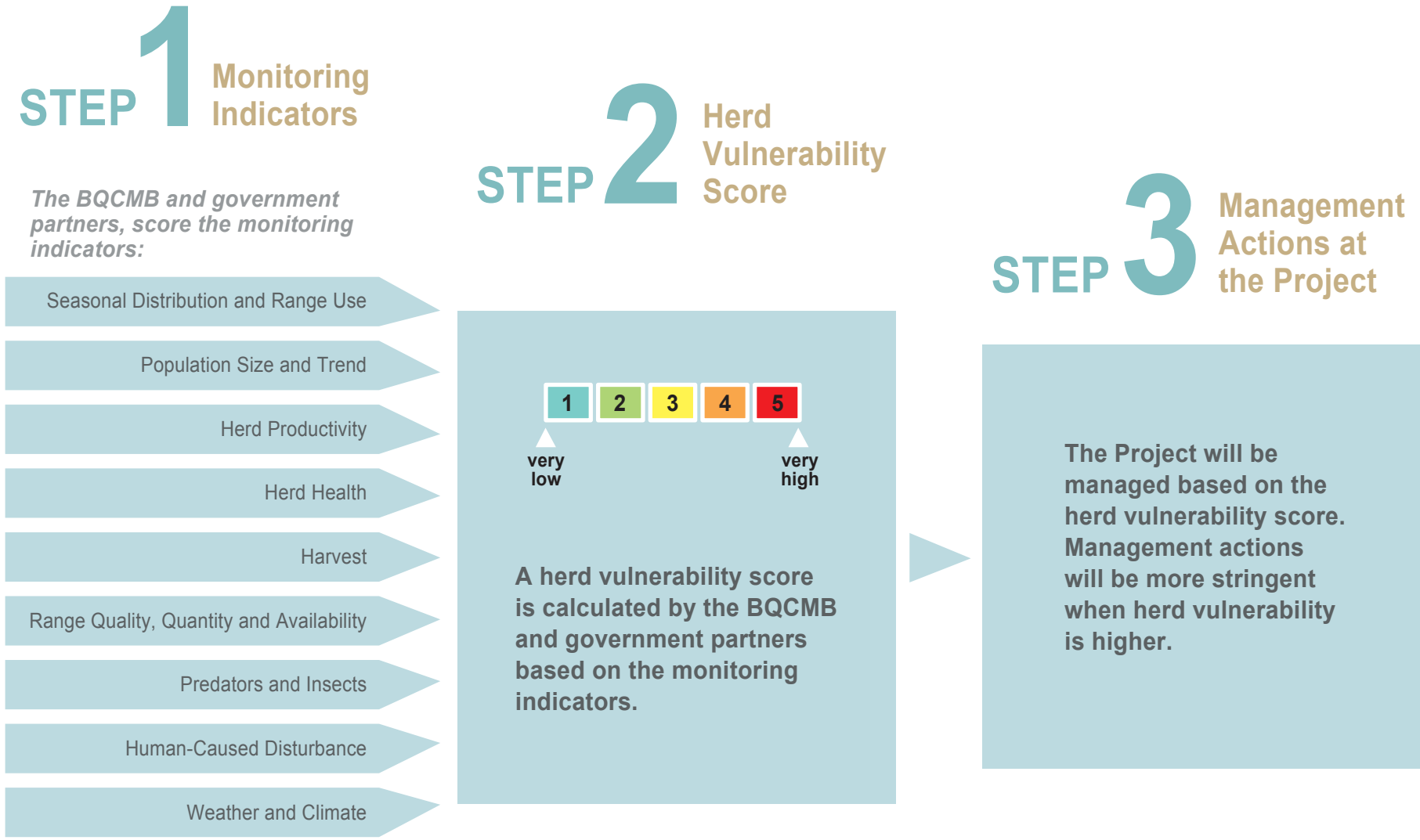


Figure 7.1-4

Caribou Herd Vulnerability Assessment and Management Actions



7.1.4 Mitigation and Management for Habitat Loss for Caribou

The following mitigation and management measures will be conducted during the construction, operations, and closure phases of the Project to reduce the potential for habitat loss for caribou:

- Sabina has designed the Project footprint to be as small as possible.
- Sabina has designed the Project footprint to fall outside of important areas for caribou wherever possible. Special locations were identified from TK and baseline studies and include river and lake crossing points, eskers used as movement corridors, hills and ridges used as insect relief, and important traditional Inuit harvesting sites. The nearest of these are the crossing of the Back River at the east end of Beechey Lake (more than 35 km south of the Goose site), a lake crossing on the northern arm of Beechey Lake (more than 30 km south), two large eskers used for movement (more than 35 km west of the RSA), the Western River (more than 30 km east of the Goose site), and the islands east of Kingaun (Bathurst Inlet Lodge) used by caribou to cross Bathurst Inlet (more than 40 km north of the MLA). These special locations are all more than 30 km from Project sites and will not be affected by the Project.
- Dust will be managed on the Project site by setting and enforcing speed limits on all-season on-site roads and applying dust suppressants, as needed. Dust suppressants will be approved and non-toxic for wildlife. Dust deposition rates and potential effects on vegetation will be monitored as described in the Air Quality Monitoring and Management Plan (Volume 10, Chapter 17).
- Areas of the Project will be reclaimed progressively during operations and at closure to minimize the area of disturbance to wildlife as described in the Mine Closure and Reclamation Plan (Volume 10, Chapter 29). Post-closure environmental monitoring will continue until it has been verified that reclamation has successfully met closure and reclamation objectives.

7.1.5 Mitigation and Management for Disturbance of Caribou

7.1.5.1 Management System to Reduce Disturbance to Caribou

Sabina has designed a management system to reduce the potential for disturbance to caribou. This system includes design mitigation and management actions that will be triggered by ongoing monitoring. The types of monitoring and the associated management actions fall into three tiers of responses, described below.

Tier 1: Planning for Caribou

Sabina has used TK, collar data, aerial survey data and remote camera data to determine the times of year when caribou may interact with the Project area. These data indicate that there is no interaction with the Bathurst herd over the past 20 years, although TK does tell us that the Bathurst herd has migrated near the Project area in the past but not for at least 20 years. Beverly caribou interact with the Project area primarily during the summer months, and to a lesser degree during the fall and winter. Over the past five years very few caribou have been observed on site during the spring migration, calving, or post-calving periods and these animals tended to be males, which range more broadly than females.

These data were used to plan mitigation and management activities for caribou, which are described in the following sections, and include:

- triggering a site notification where on-site personnel will be notified that caribou may be present and reminded of their responsibilities to mitigate potential effects on caribou;

- managing the winter ice road during spring migration, when Beverly caribou may cross the road; and
- taking into consideration the higher likelihood of caribou near the Goose site during summer when planning outdoor construction activities (Section 7.1.5.3).

Ongoing monitoring for caribou will include re-analyzing collar data each year to investigate if a shift in seasonal distribution is occurring. These data would be supplemented with data from incidental observations and remote cameras (Sections 7.2.1.4 and 7.2.1.5). If a shift in distribution occurs, then additional management is planned for caribou, including:

- If the calving or post-calving core range overlaps the Project site, then Sabina will plan and conduct a Level 6 (planned Operational shutdown) of the Goose site for that period when caribou are present within a suitable buffer to ensure that caribou are not disturbed (see Section 7.1.5.2).

Ongoing monitoring of caribou distribution will enable updates and revisions to the plan on an annual basis. Monitoring results and adaptive management will be reported in the annual WMMP Report.

Tier 2: Active Monitoring for Caribou

Trained wildlife monitors will conduct active monitoring for caribou on the Project site during all seasons. The purpose of active caribou monitoring is to trigger site alerts and a staged reduction in Project activities, including management of helicopters, blasting and heavy mobile equipment.

Wildlife monitors will be Sabina personnel trained to conduct caribou observations from fixed observation points using the proposed long-range monitoring cameras, or through driving surveys on on-site roads or the winter ice road, or a combination of both. Fixed observations point and long-range cameras will be located in areas to maximize the area where monitors can observe caribou at distances of up to 5 km from the Project site. More information on active monitoring for caribou is described in Section 7.2.1.3.

In addition to active monitoring from the Project site, Sabina has committed to implement, if needed, an “over-the-horizon” monitoring program for caribou at distances greater than can be observed directly from the Project site (i.e., more than 5 km). This program would be triggered if the Zone of Influence (ZOI) Monitoring Program indicates that caribou are avoiding the Project site at distances greater than 5 km. More information on the “over-the-horizon” monitoring program is available in Section 7.2.1.6. Additional information on the Zone of Influence Monitoring Program is available in Section 7.2.2.4.

Active monitoring will be used to trigger a staged reduction in Project activities, including management of helicopters, blasting and heavy mobile equipment. More information on the triggers and actions is available in Sections 7.1.5.6 through Section 7.1.5.9.

Tier 3: Incidental and Near Real-time Collar Observations

The majority of monitoring and management actions will be addressed through monitoring long-term data (Tier 1: Planning for Caribou) and active monitoring at the Project site (Tier 2: Active Monitoring). Incidental observations of caribou and near real-time collar monitoring (Tier 3) will also play a role in monitoring and management.

Incidental observations by all Project personnel will be reported to the Environment Department. This includes helicopter and fixed-wing pilots, drivers, and other Project personnel. If caribou are observed near the Project site, the Environment Department may deploy wildlife monitors to conduct additional scans and may trigger a site notification or site alert. More information on incidental observations is available in Section 7.2.1.4.

Incidental observations by drivers will also be used to trigger management actions by those drivers on on-site roads and the winter ice road. Drivers will report observations and give caribou the right of way at all times and will slow down or stop should caribou be located near the road. More information is available in Section 7.1.5.10 and Section 7.1.7.

Caribou collars transmit their location data on a regular basis. This near real-time location data can supplement the planned management activities (Tier 1) and active monitoring (Tier 2) by providing an early warning in the unlikely event that caribou may be shifting their distribution during the sensitive periods of calving and post-calving. Collectively, these data can be used to trigger a staged reduction in Project activities should it appear that caribou have chosen to use the Project area during calving or post-calving. More information on the triggers and management of these staged reductions in activities is available in Section 7.1.5.2.

7.1.5.2 Levels of Management for Caribou during Normal Operations

The Project site will be managed through four levels of response to caribou presence, including:

- Level 1 – Normal operations;
- Level 2 – Site notification;
- Level 3 – Site alert; and
- Level 4 – Staged reduction in Project activities.

The four levels of response are described in the following sections. Similar management would apply during Construction, Operations, and Closure. Management Levels 5 (Rapid Operational Shutdown) and 6 (Planned Operational Shutdown) are directed toward shifts in calving range of caribou and are discussed in Section 7.1.5.3, Management for Shifts in Calving Range. Should pregnant females or family units (one cow and one newborn calf) be identified in close proximity to the Project during the sensitive periods (June 5 – July 31), Sabina will immediately engage the KIA and the GN to determine if additional mitigation, other than what is below, is warranted.

Level 1 – Normal Operations

Normal operations are conducted year-round. Active caribou monitoring is conducted in all seasons during normal operations. Response levels 2 through 4 can be triggered in any season to replace normal operations.

Level 2 – Site Notification

A site notification will be triggered by the Environmental Manager during sensitive seasons for caribou (calving, post-calving and early summer) from June 5 to July 31.

Site notification includes passing information to all Project personnel to be vigilant for caribou on site and to remind personnel of their responsibilities to protect caribou. Site notification methods may include email or radio notices, postings on bulletin boards and entranceways to buildings, and discussing caribou at morning meetings.

Level 3 – Site Alert

A site alert can be triggered at any time of year if groups of caribou are observed near the Project site. Site alerts for caribou are similar to the safety warnings disseminated if a grizzly bear is observed on-site. Active Project personnel will be alerted by radio that caribou are in the area and reminded of their responsibilities to protect caribou and that staged reductions in Project activities may occur imminently. Site alert methods may include email or radio notices, postings on bulletin boards and entranceways to buildings, and discussing caribou at morning meetings.

A site alert will also trigger the mine manager to prepare for a possible staged reduction in Project activities (Level 4). This will include:

- notifying the manager for the open pits to inform them that blasting may be halted in the near future;
- notifying the vehicle dispatcher that heavy mobile equipment may be halted in the near future;
- notifying the helicopter staff and pilots, and any aircraft in the air, that caribou are in the area and appropriate setback or elevation buffers must be maintained, and that should groups of caribou occur near the heli-pads that helicopter activity may be suspended; and
- notifying the managers of activities that rely on the above that a suspension of activity may occur and to plan accordingly.

Level 4 – Staged Reduction in Project Activities

The objective of staged reductions in Project activities is to limit the amount of noise and/or visual disturbance that emanates from the Project site. Staged reductions in Project activities are triggered by active caribou monitoring (Section 7.2.1.3) or by incidental observations (Section 7.2.1.4) or ordered by the Sabina Environment Manager. This staged reduction in Project activities affects management of the following:

1. Helicopters (Section 7.1.5.7):

   During calving, post-calving, and early summer (June 5 to July 31), helicopter pilots will avoid groups of 30 or more caribou either 610 m vertically or 2 km horizontally. During the rest of the year, pilots will avoid groups of 30 or more caribou by 300 m vertically or 1 km horizontally.

2. Open pit blasting (Section 7.1.5.8):

   During all seasons, groups of 30 caribou or more within 4 km will cause cessation of open pit blasting.

3. Heavy equipment on Goose site roads (Section 7.1.5.9):

   During calving, post-calving and early summer (June 5 to July 31), groups of 30 caribou or more within 1 km of the Goose site will trigger a cessation of heavy mobile equipment, with a 500 m buffer the rest of the year.

4. Vehicle traffic on the on-site and winter ice roads (Section 7.1.5.10):

   During all seasons, vehicles will slow for caribou within 500 m of the road, stop for up to 20 minutes when caribou are within 50 m of the road and with the intention to cross the road, and give right of way for caribou on the road. Additional mitigation applies on the winter ice road during spring (see Section 7.1.5.10).

Details of the triggers (caribou group size and distance from the site) and management are specific to the activity and discussed in the relevant sections of the WMMP Plan listed above and in Appendix 1, Staged Reduction Flowcharts.

During a staged reduction in Project activities, some activities will continue, including:

- Activities required to maintain the Project site so that components aren't damaged and for the safety of staff will continue. This includes operation of generators, heating of buildings, operation of circulation pumps, use of dust suppression, etc.
  - Note that the use of dust suppression is to counter dust produced by heavy equipment. If dust suppression isn't required, then Sabina will also discontinue dust suppression (spreading of water on roads) during a staged shutdown.
- Indoor activities will continue to operate, such as the process plant (the mill) and underground mining, but note that operation of heavy mobile equipment to move ore to the stockpile will have ceased.
- A loader will operate inside the plant site to feed ore from the ore stockpile into the adjacent mill. This loader will be chosen and maintained to limit noise propagation outside of the plant site.
- Smaller equipment will continue to be used as long as they meet the requirements of the various mitigation sections.
- Some vehicle and helicopter use may be required to conduct activities such as legally required water sampling to meet compliance obligations to federal and territorial departments or for the safety of Project personnel.
  - Light ground vehicles will be used preferentially over helicopters for these activities at all times. Note that standard vehicle management will occur. Drivers will slow when caribou are less than 500 m from the road, stop when caribou are less than 50 m from the road to let them cross and will stop indefinitely if caribou are resting on the road.
  - Note that standard helicopter management will still occur, including at the helicopter pads. If necessary to avoid caribou, helicopters will land elsewhere at the Project site, outside of the buffer distances for caribou (see helicopters, Section 7.1.5.7).
- Scheduled fixed-wing flights would be minimized, but continue to operate, although see Section 7.1.3.6 for restrictions on landing and takeoff when caribou are present on or near the runway.
- Any personnel who are on site and would normally be involved in blasting or heavy mobile equipment will be assigned to other tasks, such as maintenance, planning, training and other activities indoors or in the plant site.

Noise was modelled for the processing plant, generators and ventilation equipment at the Goose site to determine if there was any potential to disturb caribou during a staged reduction in Project activities.

- Noise from the operation of the generators and ventilation was modeled to occur at five locations. Noise from each source was modeled as reaching 60 dBA within approximately 250 m of the source (i.e., generally within the footprint).
- The operation of the mill and the single loader within the plant site, at the centre of the Goose site, are projected to produce a similar noise profile from a single point source, with noise reaching 60 DBA within approximately 250 m of the source.

- The combination of the generators, ventilation, the mill, and the single loader within the plant site are together modelled to produce a similar noise profile as the generators and ventilation alone.
- Traffic noise produced by transport trucks (A-train single trailer) was modeled for the Project as part of the FEIS (Volume 4, Chapter 2). The results indicated that traffic noise will dissipate to 45 dBA at less than 50 from the road alignment. Busses used to transport workers within the site are expected to produce comparable, or lower noise levels as transport trucks. Light duty pickup trucks are expected to produce significantly less noise than transport trucks.

Other sources of noise at the Goose site, will include helicopters, which will avoid groups of caribou by 2 km horizontally or 610 m vertically during calving, post-calving and early summer (June 5 to July 31), and 1 km horizontally or 300 m vertically the rest of the year, including at the helicopter pads. These distances are the recommended setback distances by multiple management agencies. This management will effectively manage any potential disturbance on caribou near the Goose site.

Baseline noise data gathered at site indicated that continuous noise levels ranged from approximately 20 to over 60 dBA away from the Goose and George camps. Twenty dBA was recorded during periods of no or low wind, while 60 dBA or above was recorded on windy days. Hence, noise during a stage reduction will fall within the natural variability of baseline noise generally within the Project footprint or the tundra immediately adjacent to the Goose site.

7.1.5.3 Management for Shifts in Calving Ranges

This section addresses any potential shifts where the calving range of a herd moves to overlap the Project site; including immediate management when a shift in calving range is observed (Level 5 – Rapid Operational Shutdown) and long-term responses to shifts in calving range in following years (Level 6 – Planned Operational Shutdown).

Level 5 - Rapid Operational Shutdown

This section describes Level 5 management response for caribou; a 'rapid operational shutdown' of the Project in response to caribou moving their calving or post-calving range to overlap the Project site. Rapid operational shutdown is intended to occur during the same year that a shift in calving or post-calving range is observed. Long-term response to a shift in calving range is addressed by Level 6 management – Planned Operational Shutdown.

Overall, the chance of a rapid shift in calving range is considered unlikely. The shifts in the calving range of the Bathurst caribou herd from east to west of Bathurst Inlet and of the Beverly from Beverly Lake to the Queen Maud Gulf Migratory Bird Sanctuary both took 10 or more years to occur. The shift in the Bathurst herd calving range began as early as 1981, moving from the western portion of the Queen Maud Gulf to the east side of Bathurst Inlet by the late 1980s, and to the west side of Bathurst Inlet during the 1990s over approximately 15 years (Gunn, Poole, and Wierzchowski 2008).

The Beverly caribou herd shifted its calving range on a similar time scale. Prior to 2000, the Beverly caribou herd historically calved between Garry and Beverly lakes. Aerial surveys conducted on this calving ground between 1967 and 1994 reported that the Beverly herd was consistently using this location (Campbell et al. 2012). An analysis of collaring data indicated that the Beverly had moved their calving area starting sometime in the mid-1990s and continuing through the 2000s, to be largely complete by 2011 in the Queen Maud Gulf area (Nagy et al. 2011).

These slow changes in the Bathurst and Beverly calving range were detected using aerial surveys and satellite collars, respectively, over a period of a decade. Any future changes in the calving ranges of

these herds will likely follow a similar timescale and will be detected by monitoring for long-term shifts in calving and post-calving ranges (Section 7.2.1.1). The Bathurst herd moved their calving range approximately 250 km in approximately 15 years, for an average movement rate of 17 km per year. If the Bathurst herd were to move its calving range towards the Project at this same rate, it would take approximately 10 years to reach the Project site.

However, some caribou herds may have exhibited more rapid shifts in calving range and management actions to limit disturbance to Bathurst or Beverly caribou will be undertaken in the unlikely event that either herd has a rapid range shift or shifts its core calving distribution to overlap the Project site. The following management actions will be conducted during construction and operations of the Project:

- Sabina will monitor annually for rapid changes in the Bathurst and Beverly/Ahiak caribou calving and post-calving distribution using a combination of satellite collar data, on-site cameras, and on-site wildlife monitors.
- Should collar data inform, wildlife monitors or cameras observe, groups of greater than 250 caribou within 4 km of on-site activities during calving and post-calving, then Sabina will implement a further reduction of Project activities beyond those planned as part of a staged reduction. These further reductions of Project activities are termed rapid operational shutdown.
- This rapid operational shutdown will affect blasting, open pit and underground operations, heavy equipment use, helicopter and fixed wing use.
- Should rapid operational shutdown be triggered, Sabina will communicate with all appropriate regulators on a regular (daily) basis.

The rapid operational shutdown will include:

- cessation of open pit and other surface blasting;
- cessation of open pit activities;
- cessation of heavy equipment on surface;
- cessation of helicopter usage including landings and take-offs;
- reduction of fixed wing aircraft use. Non-essential cargo flights will be suspended. Personnel flights and essential cargo will be paused for up to 2 days. If flights remain necessary, aircraft with a smaller noise profile or aircraft with greater capacity may be used;
- reduction in the number of light vehicles on surface;
- underground activities that do not require heavy mobile equipment use on surface may continue;
- a single loader may continue to operate inside the plant site to feed ore from the ore stockpile into the adjacent mill;
- on-site activities required to maintain the site, personnel safety and environmental compliance will continue; and
- all on-site activities conducted during a rapid operational shutdown will require written authorization from the General Manager, Environmental Manager or the Safety Manager.

Level 6 - Planned Operational Shutdown

This section describes Level 6 management response for caribou; a ‘planned operational shutdown’ of the Project during the years after collar data indicates that the Bathurst or Beverly/Ahiak caribou have moved their calving or post-calving range over the Project site.

Long-term monitoring for caribou will be conducted to determine if the seasonal ranges of Bathurst and Beverly/Ahiak caribou are remaining constant or changing through time. This monitoring is described as Tier 1 monitoring in Section 7.1.5.1, with details of satellite collar monitoring described in Section 7.2.1.1. The planned operational shutdown includes the following measures:

- Sabina will monitor for changes in Bathurst and Beverly/Ahiak caribou calving and post-calving distribution using a combination of satellite collar data, on-site cameras, and on-site wildlife monitors.
- Should this analysis indicate that core calving or core post-calving ranges have shifted to overlap the Project site then Sabina will conduct a planned operational shutdown the following year. The analysis will consider both the 50% and 80% core calving and core post-calving ranges.
- The planned operational shutdown will occur when caribou is anticipated on site and will be of sufficient duration to take into account annual variation in the timing and distribution of calving and post-calving caribou interactions with the Project.
- Once a range shift is identified Sabina will engage all relevant parties, including the KIA, GN, and GNWT, to discuss details of the planned operational shutdown. This discussion will occur at least 6 months prior to any potential operational shutdown. The final details will consider herd vulnerability level, final engineering design, operational plans, noise monitoring results, additional TK information, and new scientific evidence and best management practices.
- This planned operational shutdown will affect blasting, open pit and underground operations, heavy equipment use, helicopter and fixed wing use, and mill operations. This planned shutdown represents a further decrease in activities as compared to the staged reduction and rapid operational shutdown.

The planned operational shutdown will further reduce potential Project interactions with caribou including:

- reduction of on-site workforce;
- cessation of open pit and other surface blasting;
- cessation of open pit activities;
- cessation of underground activities;
- cessation of heavy equipment on surface;
- cessation of helicopter usage including landings and take-offs;
- cessation of fixed wing aircraft use. Cargo flights will be suspended. Personnel flights will be suspended. Should a flight be required due to emergency of unforeseen conditions, aircraft with a smaller noise profile will be used;
- restriction to essential light vehicles only;
- reduction in mill operations. A single loader may continue to operate inside the plant site to feed ore from the ore stockpile into the adjacent mill;
- on-site activities required to maintain the site, personnel safety and environmental compliance will continue; and
- all on-site activities conducted during a planned operational shutdown will require written authorization from the General Manager, Environmental Manager or the Safety Manager.

7.1.5.4 Design Mitigation

The following mitigation measures will be designed into the Project to limit disturbance to caribou:

- Project equipment will be chosen to limit the continuous noise produced by equipment such as generators, heavy equipment, and other mobile equipment. All Project equipment will be fitted with appropriate mufflers and silencers and will be well maintained.
- Project facilities will be designed to limit the amount of noise that emanates from the Project, such as housing static noise sources (e.g., the crushers, mill, and generators) in buildings and using acoustic screening such as walls or berms to muffle noise.

7.1.5.5 Construction Management

The following management actions will be applied during the construction phase of the Project to limit disturbance to caribou:

- To the extent possible, and with appropriate mitigation and monitoring in place, Sabina will take into consideration the greater potential of caribou presence in the area when planning outdoor construction activities (including site clearing, blasting, and operation of heavy equipment) during the period of July 26 to August 31.
- To limit loss of esker habitat for caribou, Sabina will choose an esker source that does not show, or shows fewer signs of caribou use.

7.1.5.6 Fixed Wing Aircraft Management

The following management actions will be applied to fixed-wing aircraft during all Project phases to limit disturbance to caribou:

- Fixed-wing aircraft will remain above 610 m local ground level at all times, except when landing or taking off from the Marine Laydown Area (MLA) or the Goose Airstrip.
- Note that fixed-wing aircraft flights may be suspended or delayed if large groups of caribou are near the airstrip during calving or post calving. See Section 7.1.5.3 for more information.
- Prior to aircraft landing on the airstrip, a visual inspection will be conducted to identify the presence of any wildlife on the airstrip. Small groups of wildlife will be escorted off the airstrip; the flight crew will be notified by radio that such action is taking place and aircraft will not be approved to land until the airstrip is clear. If groups of greater than 30 caribou are observed on the airstrip then no action will be taken. If the wildlife cannot be escorted from the airstrip within a reasonable length of time, the flight crew will be instructed to divert to another location.

7.1.5.7 Helicopter Management

The following management actions will be applied to helicopters during all Project phases:

- As part of pilot induction, pilots will be informed of the seasons when caribou are more sensitive to disturbance (e.g., calving and post-calving) and their responsibilities to monitor, report, and avoid caribou. Maps will be provided to pilots that identify important habitat areas for wildlife to be avoided, such as caribou water crossings.
- Pilots will report all incidental sightings of caribou to other pilots and the Environment Department.

- During calving, post-calving, and early summer (June 5 – July 31), large groups of caribou (more than 250) will be avoided by 610 m vertically or 4 km horizontally. The elevation of 610 m is taken from the draft Nunavut Land Use Plan (2014) for the operation of aircraft in calving and post-calving seasons/areas.
  - Note that standard helicopter management will still occur, including at the helicopter pads. If necessary to avoid caribou, helicopters will land elsewhere at the Project site, outside of the buffer distances for caribou.
- During calving, post-calving, and early summer (June 5 to July 31), helicopter pilots will avoid groups of 30 or more caribou either vertically (610 m) or horizontally (2 km).
- During the rest of the year, pilots will avoid groups of 30 or more caribou by 300 m vertically or 1 km horizontally.
- These buffers apply to take-off, landing, and in-flight.

7.1.5.8 Blasting Management

Above-ground blasting will occur in the open pits during the construction and operations phases of the Project. Blasting is typically conducted once per day in each pit and is proceeded by surveys for caribou presence as part of active monitoring for caribou. The following management actions will be applied during the construction and operations phases to limit any disturbance from open-pit blasting on caribou.

- Primarily the active caribou monitoring by wildlife monitors will determine the presence of caribou near the Project site. Incidental observations of caribou by pilots, drivers, and on-site personnel can also trigger management actions.
- At all times of year, if groups of caribou (30 or more) are observed within 4 km of the Project pits, then blasting in those pits will be delayed until caribou have moved beyond the trigger distance.

  Modelling of typical open pit blast noise was updated at the request of the KIA to determine at what distance noise levels reached 96 dB L_{peak}. This modelling reported that the typical noise from a blast in the Goose Main pit (the largest pit) would reach 96 dB L_{peak} at 3.7 km from the blast location in the pit.

  The noise threshold of 96 dB was chosen after discussion with the KIA and using reviews of the scientific literature. Reimers and Colman (2006) reviewed the effects of noise, vehicles and aircraft on caribou and reindeer and found that caribou will respond to anthropogenic noises, but are typically more sensitive to visual stimuli. Loud noises without accompanying visual stimuli did not provoke strong responses until the noises were very loud. Maier et al. (1998) reported that low-level overflights by jet fighters (a very loud noise, with a brief visual stimuli) averaging 1-1.5 times per day in Alaska caused caribou to increase the amount of time spent being active, and move greater distances during the post-calving period. A noise level of 96 to 106 dBA Sound Exposure Level (SEL) caused these reactions. Other studies of overflights on caribou reported only short-term startle responses to overflights and no effects on movement rates despite overflights that were lower in elevation and louder (115 to 127 dB) than Maier et al. (1998) (Harrington and Veitch 1991; Lawler et al. 2005). Manci et al. (1988) reported that the majority of ungulates have short term responses to noise.
- The distance at which caribou will trigger the cessation of blasting will be updated during the life of the Project based on herd vulnerability, and results from noise monitoring, behaviour monitoring, and zone of influence monitoring.

- Behaviour monitoring will be conducted periodically on caribou observed near the Project site to evaluate the response of caribou to blasting and whether caribou are more alert near the Project site.
- During all seasons, if any caribou are within the blast safety areas (i.e., the area potentially affected by fly rock or debris), then the blast will be delayed until caribou move out of the area. The blast safety area is part of the personnel safety requirements and is determined prior to each blast. The Explosives Safety and Security Branch (ESSB) of Natural Resources Canada (NRCan) is responsible for administering the *Explosives Act (1985)* and regulations. The *Explosives Act* requires anyone working with explosives to have a licence, certificate or permit issued by the Minister of Natural Resources. The *Explosives Use Act (1988)* states:

  > *Before detonating an explosive, a permit holder shall (a) sound an audible warning at a reasonable time before the detonation; (b) ensure that all avenues of approach to the site are guarded; (c) ensure that all workers and other persons near the site of the explosion have reached a place of safety; and (d) shout "fire" immediately before detonating the explosive.*

  The permit holder is therefore responsible for determining the area of safety prior to initiating a blast. A blast area can be defined as the area in which concussion (shock wave), flying material, or gases from an explosion may cause injury to persons. Current blasting protocols found in the Explosives Management Plan of De Beers Canada Inc. Gahcho Kue Mine, AREVA Resources Canada Inc. Kiggavik Project, and Victoria Gold Corp. Eagle Gold Project implement a blasting setback radius of 500 m prior to any blasting. The area of safety for the Project will be determined on a case by case basis considering factors such as, but not limited to: material to be blasted; type and amount of explosive material; blast pattern; and delay systems.
- Resumption of activities is discussed in Section 7.1.5.11.

Should less than 30 caribou be observed during calving, post-calving and early summer (June 5 – July 31), the following management will occur:

- Alert the environment department;
- Wildlife monitors will conduct behaviour monitoring of selected groups of caribou;
- Note that standard management for caribou still applies:
  - Standard road management will occur – all caribou will be given the right of way;
  - Standard helicopter management will occur.

In addition to blasts conducted in open pits as part of mining operations, the Project will also be conducting smaller blasting activities as part of construction, quarrying, and underground mining. The following measures apply to these smaller blasts:

- Generally, construction and quarry blasts are much smaller than those in the open pits during operations and therefore may require a smaller setback distance. These distances will be determined based on the size of the planned blasts using the same 96 dB buffer as the main pit blasts.
- Underground mining will also be conducted during certain periods of the Project lifecycle. Blasting is also conducted underground, but is of a lesser magnitude compared to above-ground blasting in the open pits. As a consequence, below-ground blasting may proceed at any time of the year.

- Behaviour monitoring will be conducted periodically on caribou observed near the Project site to evaluate the response of caribou to construction and quarry blasting.
- Resumption of activities is discussed in Section 7.1.5.11.

7.1.5.9 Heavy Equipment Management

Heavy mobile equipment is used to load and move waste rock from the open pits to the waste rock dumps and ore from the pits to the plant site. Heavy mobile equipment is also used in the maintenance of roads. Heavy mobile equipment operation occurs along gravel-surfaced all-season roads within the Goose project area. The following management actions will be applied during the construction and operations phases to limit any disturbance due to heavy mobile equipment operation on caribou:

- Primarily the wildlife monitors will determine the presence of caribou near the Project site. Incidental observations of caribou by pilots, drivers and on-site personnel can also trigger management actions.
- During the calving, post-calving and early summer seasons (June 5 to July 31), if large groups of caribou (more than 250) are observed by wildlife monitors within 4 km of the activity, then the use of heavy mobile equipment in the area will be stopped until caribou move through the area.
- During the calving, post-calving and early summer seasons (June 5 to July 31), if groups of caribou (30 or more) are observed within 1 km of the activity, then the use of heavy mobile equipment in the area will be stopped for one day. The distance of 1 km was chosen because it is larger than distances at which a review of caribou responses to vehicles (Reimers and Colman 2006) and skiers and persons on foot (Reimers et al. 2006).
- During all other seasons (August 1 to June 4), if groups of caribou (30 or more) are observed within 500 m of the activity, then the use of heavy mobile equipment in the area will be stopped until caribou move through the area.
- Resumption of activities is discussed in Section 7.1.3.11.

7.1.5.10 Winter Ice Road Management

Management actions to limit disturbance from the winter ice road are described in Section 7.1.6, management for disruption of movement.

7.1.5.11 Resumption of Activities

In some cases, individuals or groups of caribou may become habituated to the site. Caribou may see the mine site as a refuge from predators such as wolves, which may be less likely to approach areas of human occupation. Structures such as the airstrip may provide relief from insects. On first observation of groups of caribou, mitigation will be carried out as indicated above. Should the wildlife monitors identify an animal or group of animals that are observed on site for more than one day then mitigation actions will be relaxed for these animals. Note that in a circumstance where 250 or more caribou are observed within 4 km of site during calving and post-calving, that activities would not be resumed until after one day. Also note that in circumstances where 30 caribou are observed within 4 km of site during the rest of the year, that blasting will not be resumed until the caribou move beyond the trigger distance. The resumption of activities is approved by the Environmental Manager or designate.

During the seasons when caribou have most frequently been observed on site, collar information indicates that they are moving multiple kilometres per day in summer (10 to 20 km/day) and fall (5 to 10 km/day) (Gunn, Dragon, and Boulanger 2002). Hence, caribou will be moving on a daily basis and are unlikely to be observed on-site over multiple days.

7.1.6 Mitigation and Management for Disruption of Movement of Caribou

The Project will have on-site all season roads that connect the pits, waste rock dump, plant site, camp and airstrip. A winter ice road will also be used to connect the Goose site to the Marine Laydown Area. Mitigation and management for disruption of movement of caribou focuses on management of the winter ice road and on-site Project roads.

The following mitigation will be designed into the Project roads:

- Road-crossing structures will be built on permanent on-site roads at crossing locations identified by land users. Road-crossing structures may include ramps, stretches of the road shoulder made of smaller rocks, or other methods identified through TK, land user information, scientific literature, or based on best practice.
- The winter ice road will be constructed each winter such that it is not a barrier to movement for caribou; the height of snowbanks will be limited to approximately 1 m and snow plowing will be conducted in such a way as to limit the angle and vertical height of the snowbank edge.

The following management actions will be conducted whenever the winter ice road is in use:

- Traffic on all roads will be managed and monitored through a central dispatch.
- To reduce the frequency of traffic on the winter ice road that may deter caribou from crossing, trucks may be grouped into convoys during the spring migration.
- If a driver observes a caribou (or other large mammal) within 500 m of any road, the driver will slow to 40 km/hr, alert other drivers and proceed with caution.
- If a driver observes that caribou are within 50 m of the road and moving towards the road with the intention to cross it, then the vehicle will stop, the driver will alert the Environment Department, and will proceed when the animals have crossed the road and moved off; alternatively, after 20 minutes the driver may proceed slowly if animals have not made their road crossing.
- If caribou are resting on the road, then the driver will wait until the animals have moved off on their own.

During the spring, after April 15, when Beverly/Ahiak caribou may cross the winter ice road on their migration to the calving grounds, the following management will take place:

- The objective for the management of the winter ice road will be to have trucking on the winter ice road completed by April 15. If this is not possible due to unforeseen logistical reasons, then the following measures will be followed.
- Sabina will also contact the KIA, GN, and GNWT if trucking is necessary to occur after April 15.
- The movement of Beverly/Ahiak caribou will be monitored using collars and regular ground-based surveys of the winter ice road to determine if caribou are crossing the road. Ground-based surveys will also be triggered by the proximity of a collared caribou to the ice road.
- The road may be temporarily closed (i.e., no new trucks dispatched) at the discretion of the Environment Manager during this period if collar data or ground-based survey results indicate that Beverly/Ahiak caribou are crossing the road.
- If a driver observes that caribou are within 500 m of the road and moving towards the road with the intention to cross it, then the vehicle will stop, the driver will alert the Environment

Department, and will proceed either when the animals have crossed the road and moved off or proceed at slow speed after a wait of 20 minutes.

- If a driver observes caribou at a distance greater than 500 m of the winter ice road and moving towards the road then they will alert the Environment Department, slow to 40 km/hr and proceed with caution.

The following management actions will be conducted whenever the all-season roads are in use:

- If a driver observes caribou from the all season road, they will alert the environment department.
- If a driver observes a caribou (or other large mammal) within 500 m of any road, the driver will slow to 40 km/hr, alert other drivers and proceed with caution.
- If a driver on an all-season road observes that caribou are on the road or within 50 m of the road and moving towards the road with the intention to cross the road, then the vehicle will stop, the driver will alert the Environment Department, and will proceed when the animals have crossed the road and moved off or may then proceed slowly after a wait of 20 minutes.
- If a driver on the all-season road observed caribou on the road, they will stop the vehicle until the caribou move off.

7.1.7 Mitigation and Management for Direct Mortality and Injury of Caribou

Mitigation and management to prevent direct mortality and injury of caribou focuses on management of roads and aircraft at the landing strip to prevent any vehicle-caribou collisions. These actions will be conducted during all Project phases:

- Speed limits will be monitored and enforced, and set at 60 km/h on the winter ice road and 60 km/h on all season on-site roads.
- Wildlife will have the right-of-way on all Project roads. See Section 7.1.6 on mitigation and management for disruption of movement of caribou.
- Any wildlife mortalities on Project roads will be recorded through a reporting system and this information will be distributed to drivers. If a location is found where more than one wildlife mortality has occurred, then this location will be relayed to drivers and site-specific mitigation may be conducted, such as additional signage to alert drivers of speed limits, identified wildlife movement corridors, and wildlife sensitive areas (e.g., nearby active carnivore den).
- Any road-kill on Project roads will be removed and disposed of using approved methods (i.e., incineration or transport away from the Project site) as quickly as possible to avoid attracting other animals to the road side. The KIA, GN and relevant HTOs will be contacted to report and discuss what to do with the carcasses following any wildlife mortalities.
- The Project will conduct regular road and camp cleanups to ensure that no hazardous substances, wires, or loose materials are present to endanger wildlife, and ensure proper storage and disposal of wastes and hazardous wastes as per the Waste Management Plan (Volume 10, Chapter 10).
- Caribou may be deterred from the Project site should their immediate safety be in jeopardy. Examples of situations when deterrence would be acceptable include:
  - caribou have become acclimated to the camp and are posing a safety risk to Project personnel;

  - caribou are attracted to the TSF or other features as a salt source, but TSF water quality does not meet wildlife guidelines;
  - an individual or small group of caribou are occupying the airstrip and have the potential to be alarmed and run into the airstrip during landing or takeoff (but see Section 7.1.5.6 for a description of when this is allowed); and
  - a caribou has entered the open pit or other facility and has become disoriented.
- Prior to aircraft landing on the airstrip, a visual inspection will be conducted to identify the presence of any wildlife on the airstrip. If possible, the wildlife will be escorted off the airstrip; the flight crew will be notified by radio that such action is taking place and aircraft will not be approved to land until the airstrip is clear. If the wildlife cannot be escorted from the airstrip within a reasonable length of time, the flight crew will be instructed to divert to another location.

7.1.8 Mitigation and Management for Indirect Mortality of Caribou

The following mitigation and management actions will be conducted during all Project phases:

- All Project and contractor employees will be prohibited from carrying personal firearms and hunting on the Project site, except in the case of a certified wildlife monitor who is carrying a firearm for the safety of workers in the field when a problem bear, wolf, or wolverine has been identified.
- The winter ice road will be closed to the public.
- The winter ice road will be monitored and should people be observed hunting or using the winter ice road this information will be recorded.
- Should more than five groups of hunters be observed using the winter ice road, then enhanced management will be conducted to limit use of the winter ice road. Observations of persons using the winter ice road will be reported in the annual WEMP Report. If triggered, Sabina will liaise with the relevant HTOs to discuss possible options for enhanced management to limit hunter use of the winter ice road.
- Note that Section 89(1) of the Nunavut *Wildlife Act* (2003) prohibits a person from discharging a firearm along or across a trail, road or highway or within 1 km of a dwelling or building.

7.1.9 Mitigation and Management for Attraction of Caribou

Caribou are not expected to be attracted to the Project site; however, see Section 7.1.10 on mitigation and management for exposure to contaminants by caribou should caribou use Project ponds as a source of salt or water.

7.1.10 Mitigation and Management for Exposure to Contaminants by Caribou

The following mitigation and management actions will be conducted during all Project phases:

- Fuel will be managed safely to ensure fuels do not enter the environment and that wildlife, including caribou, are not exposed to fuels, as per the Fuel Management Plan (Volume 10, Chapter 4).
- Should a fuel spill occur, the fuel will be contained and cleaned up such that wildlife, including caribou, are not exposed to the fuel, on land as per the Spill Contingency Plan (Volume 10, Chapter 5) and in the marine environment as per the Oil Pollution Emergency Plan (Volume 10, Chapter 6) and the Shipboard Oil Pollution Emergency Plan (SOPEP). Sabina's fuel management plan and spill response plans are further discussed in Section 6.1.3.

- Hazardous materials will be stored and handled safely so that wildlife, including caribou, are not exposed to hazardous materials as per the Hazardous Materials Management Plan (Volume 10, Chapter 12).
- The Project will conduct regular road and camp cleanups to ensure that no hazardous substances, wires, or loose materials are present to endanger wildlife and to ensure proper storage and disposal of wastes and hazardous wastes as per the Waste Management Plan (Volume 10, Chapter 10).
- The Project will monitor the quality of water in the TSF as outlined in the Site Water Monitoring and Management Plan (Chapter 7 of Volume 10 of the FEIS). If the water quality in the TSF does not meet wildlife guidelines, then the TSF will be monitored to determine if caribou are drinking from the TSF. If caribou are using the TSF ponds and the water quality does not meet wildlife guidelines, then Sabina will develop an adaptive management plan, in conjunction with the KIA, to manage caribou access to the TSF.

7.2 MONITORING FOR CARIBOU

This section describes monitoring activities to minimize potential effects of the Project on caribou that will be included in the WEMP, primarily the disturbance of female and calf caribou during the important calving, post-calving and early summer periods, but also applies during other seasons. Monitoring and mitigation applies to both the Bathurst and the Beverly/Ahiak caribou herds.

The Project will undertake both long-term monitoring of the location of the calving and post-calving grounds, and site-specific monitoring to trigger mitigation. In addition, the Project will undertake monitoring to evaluate effects of the Project on caribou, as predicted in the FEIS.

This section is divided into two subsections, the first describing the monitoring that will be conducted to trigger mitigation activities designed to minimize impacts to caribou, and the second describing monitoring to evaluate the predicted effects of the Project on caribou in the FEIS.

7.2.1 Caribou Monitoring to Trigger Mitigation

Seven types of monitoring will be conducted specifically to trigger management activities designed to minimize effects on caribou. These monitoring programs are:

1. monitoring of seasonal ranges of caribou;
2. near real-time monitoring of collars;
3. active monitoring by on-site wildlife monitors;
4. incidental observations;
5. on-site cameras;
6. over the horizon monitoring; and
7. human activity monitoring.

Monitoring will also be conducted to test predicted effects on caribou, and may also trigger management of the Project site, as discussed in Section 7.2.2, including:

1. behaviour monitoring;
2. stress hormone study; and

3. regional collar monitoring for zone of influence.

The first step in monitoring and mitigation for caribou is to determine, using long-term collar data, when caribou may interact with the Project. These seasons are known, but will be monitored yearly for any change in distribution of caribou. Site alerts and active monitoring for caribou is based on this information.

Near real-time collar data will be used to evaluate if caribou are moving into new areas within a single year. These data will be used to trigger active monitoring and site alerts if they are not already triggered.

Active monitoring by on-site wildlife monitors will be conducted from spotting positions or using long-range cameras on towers to trigger staged reduction of Project activities. Incidental observations by pilots and drivers will trigger immediate mitigation, such as avoiding caribou or giving them the right of way on the road. Incidental observations will also trigger site alerts and active monitoring. On-site cameras will be used to evaluate caribou (and other wildlife) use of Project facilities, such as waste facilities, the TSF, road crossing ramps, etc. Over-the-horizon monitoring will be conducted if it appears that caribou must be monitored at distances greater than observable from high points of land in the Project site.

Finally, human activity monitoring will also be used to evaluate whether measures to prevent people from using the winter ice road have been successful (Section 7.2.1.7). The FEIS predicted that the winter ice road will not increase access to the Project area and that indirect effects to wildlife from the winter ice road, e.g., hunting pressure, will not occur. For these reasons, activity along the winter ice road will be monitored to verify the accuracy of the FEIS conclusions.

7.2.1.1 Monitoring Seasonal Ranges of Caribou

The seasonal movements of both the Bathurst and Beverly/Ahiak caribou herds are generally well known from TK and collaring studies that have been ongoing since 1996. During winter, the Bathurst caribou are largely below the treeline and more than 300 km to the south of the Goose site. During spring migration, they travel north, largely via Contwoyto Lake, over 150 km west of the Goose site. The calving grounds are centred 210 km to the northwest of the Goose site and their nearest edge is 160 km from the Goose site (Figure 7.2-1). The post-calving range of the Bathurst herd is an average of 92 km from the Goose site, with the nearest approach at 32 km (Figure 7.2-1). The summer range is to the southwest of the Project, centred on Contwoyto Lake.

During winter, Beverly/Ahiak caribou range over the area between Bathurst Inlet and the Saskatchewan border. During spring, the Beverly/Ahiak herd travels northeast to the calving and post-calving grounds in the Queen Maud Gulf Migratory Bird Sanctuary. The summer range of the Beverly herd extends south from Bathurst Inlet to the treeline, overlapping the Project site.

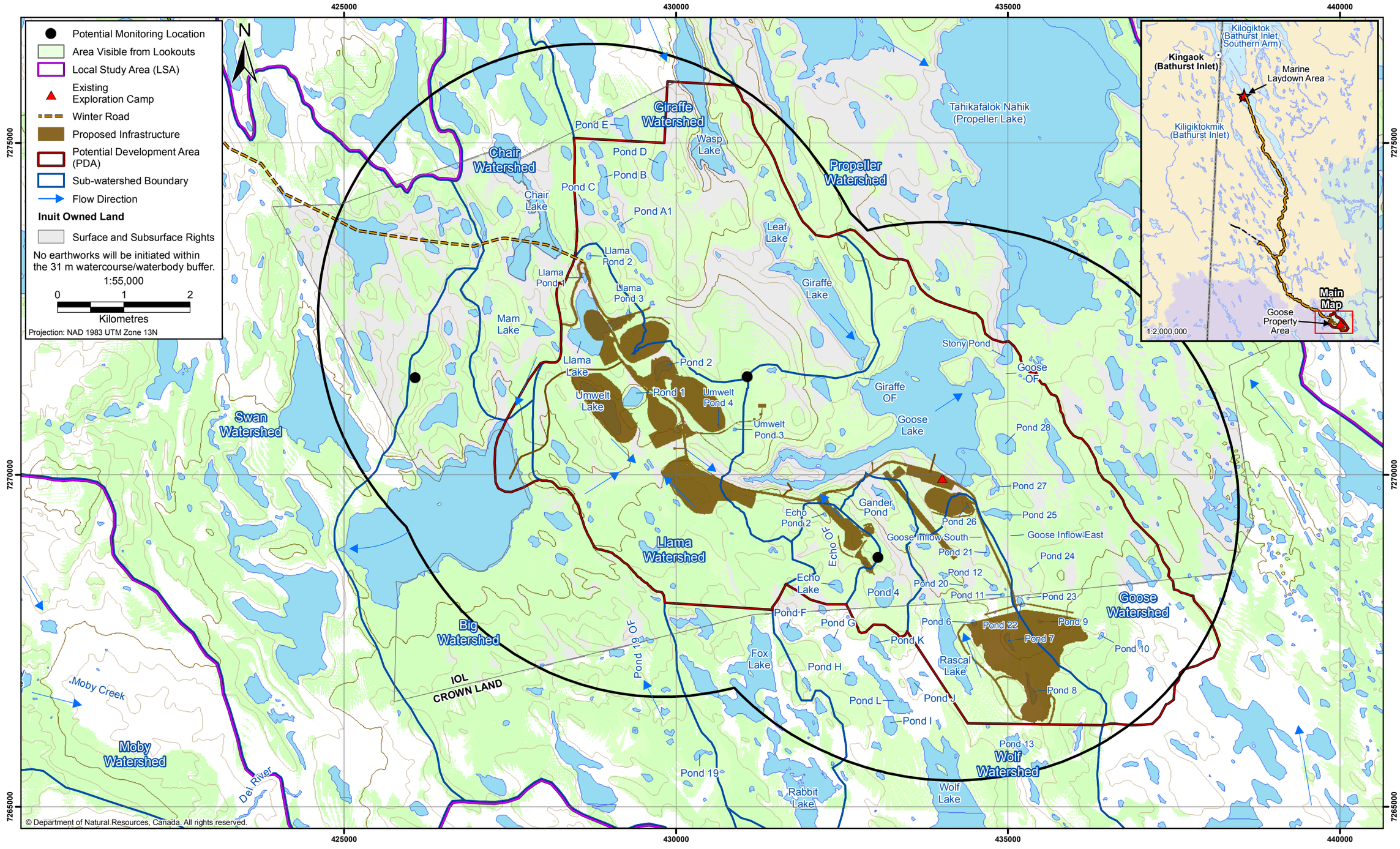
Objective

This program has two objectives:

1. Identify if and when caribou may interact with the Project site so that monitoring and mitigation activities can be planned for caribou, e.g., wildlife monitors can be on-site to conduct active caribou monitoring and mitigation.
2. Identify if the calving ground of the Bathurst or Beverly/Ahiak caribou herd has moved to overlap the Project site.

Figure 7.2-1
Potential Monitoring Locations and Viewscape for Wildlife Monitoring

ERM



Triggers for Monitoring

This monitoring program will occur during each year of construction, operations, temporary closure, care and maintenance, and reclamation and closure of the Project.

Methods

To evaluate when caribou are likely to interact with the Project, collar data for the Bathurst and Beverly/Ahiak caribou herds (1996 to present) will be used to calculate kernel utilization distributions (UD) for each season to monitor their degree of overlap with the Project. These distribution data will be used to evaluate what times of year these two herds are likely to interact with the Project. Currently, most interactions occur with the Beverly/Ahiak herd during the summer.

To evaluate if the calving and post-calving seasons of the Bathurst caribou herd are shifting and could overlap the Project site in the future, trends in the overlap of the 50% and 80% kernel density calving and post-calving ranges will be examined each year. The overlap of each seasonal range will be evaluated, as well as the degree of overlap with the Project to determine if the seasonal ranges are moving.

Triggers for Adaptive Management

Should the 50% or 80% core calving or post-calving ranges of the Bathurst herd shift through time to overlap the Project site, Sabina will liaise with the KIA, GN and GNWT to discuss the degree of overlap with the Project, the timing of overlap (is it for a day or several weeks), the details of the proposed planned operational shutdown actions, and the timing of this planned operational shutdown for the following year. Following these discussions, Sabina will conduct planned shutdowns in activities for these seasons as described in Section 7.1.5.2.

Reporting

Results of the calving ground collar monitoring program will be reported annually in the WEMP Report.

7.2.1.2 Near Real-time Collar Monitoring

Objective

There are two objectives for the near real-time collar monitoring program:

1. to identify if caribou are approaching the Project site, which will be used to trigger a site alert. Note that in general, the times of year when caribou are likely to interact with the site are well known and will be tracked by monitoring the seasonal ranges of caribou (Section 7.2.1.1). Therefore, this can be considered a backup plan to the long term monitoring of caribou seasonal ranges; and
2. to identify if and when the spring migration of the Beverly/Ahiak herd is likely to cross the winter ice road.

Triggers for Monitoring

The near real-time collar monitoring program will be in operation during periods when caribou are most sensitive to disturbance (calving and post-calving); during periods when caribou are more likely to be in the area surrounding the Project site (summer); and during operation of the winter ice road. Near real-time monitoring will occur during Construction, Operations and Reclamation/Closure.

Methods

Collar data will be acquired from the GNWT and GN for the Bathurst and Beverly/Ahiak herds.

Triggering a Site Alert

The Environment Manager will monitor collar data from the Bathurst and Beverly/Ahiak caribou herds to determine if groups of caribou are approaching the Project site.

Beverly/Ahiak Spring Migration

The winter ice road that connects the Goose PDA and MLA is planned to be active from December through the end of April. A proportion of the Beverly/Ahiak caribou spend the winter to the west of the winter ice road. This herd has been monitored using collars from 2001 to 2015. An analysis of these data indicate that Beverly/Ahiak caribou cross the proposed route of the winter ice road very infrequently during the winter (0.5% of caribou). Of the 365 spring migration events recorded by collars, approximately 1.3% of spring migrations crossed the winter ice road route, starting in mid-April. During spring migration, the Environment Manager will review the collar locations of wintering Beverly/Ahiak caribou to determine the timing and path of the spring migration relative to the winter ice road in April.

Triggers for Adaptive Management

The most common ZOI reported in the literature is in the range of 4 km (reviewed in Wolfe, Griffith, and Gray Wolfe 2000; Johnson C. et al. 2005; Weir et al. 2007; Johnson and Russel 2014). A recent study by Boulanger et al. (2012) reported an 11 to 14 km ZOI for the Ekati-Diavik mining complex in NWT. However, it should be noted that the Ekati-Diavik complex is 5 to 10 times larger than the proposed Project. Nevertheless, to be protective of caribou, the trigger distance for the near real-time collar monitoring will be 14 km or greater to ensure that caribou are outside any possible ZOI when ground-based monitoring is triggered. This distance will alert wildlife monitors and trigger active caribou monitoring (Section 7.2.1.3) and a site alert. Note that this trigger is not a hard trigger. The Environment Manager will be tracking caribou collar movements as the data becomes available and proactively preparing the environment staff for the future arrival of caribou as needed. The biologically-based trigger distance will then be expanded to account for any logistical delays in delivery of the collar data using the average daily movement rate of caribou as a guide.

Sabina will also be conducting regional monitoring of caribou that will use satellite collars to examine any potential ZOI for caribou (Section 7.2.2.4). The results of this monitoring plan will be used to update the biologically-based trigger distance.

Should caribou occur within the trigger distance, the following will be conducted:

1. Should collars indicate that caribou are approaching (see above) the Goose Project site during calving, post-calving, or early summer, the Environment Manager will trigger a site alert and alert wildlife monitors that caribou are approaching.
2. During the early spring migration, when collar data indicates that the Beverly/Ahiak caribou will begin crossing the winter ice road, the Environment Manager will trigger monitoring and mitigation on the winter ice road (Section 7.2.1.1).

Reporting

Results of the near real-time collar monitoring program will be reported in the annual WEMP Report.

7.2.1.3 Active Caribou Monitoring by Wildlife Monitors

Objective

The objective of active caribou monitoring is to reduce any potential disturbance effects on caribou due to Project activities. This program is designed to identify when caribou are in the vicinity of the Project and trigger mitigation if caribou are 1) within the trigger distance, 2) of a sufficient group size, and 3) present during the designated season.

The objective of this monitoring is also to be able to view both within and at greater distances than the proposed trigger distances (i.e., 4 km).

Triggers for Monitoring

Active monitoring will occur during Construction, Operations and Reclamation/Closure. Active caribou monitoring will be triggered:

1. during the periods of the year when caribou are most sensitive to disturbance (calving and post-calving) and when they are most likely to interact with the Project (summer);
2. when caribou are reported within the trigger distance set by the near real-time collar monitoring program; and
3. in response to incidental observations of caribou near the Project site by pilots, drivers, or on-site personnel.

Methods

Staffing and Training

Project personnel will be trained for the role of wildlife monitor. These personnel can come from any department, however, efforts will be made to use members of the environmental department. Wildlife monitors will primarily be regular full time staff of the Project with wildlife monitoring added to their responsibilities. In certain cases, additional, non-permanent staff may be utilized. Sufficient staff with the appropriate training will be on-site at all times of year to conduct wildlife monitoring. Efforts will be made to utilize local Kitikmeot Inuit or representatives of other aboriginal groups to act as wildlife monitors.

Sabina will develop a Wildlife Monitoring Training Program for wildlife monitors. Details of the training program will be shared with the KIA and GN prior to construction of the Project. Training will include:

- the roles and responsibilities of the environment monitor;
- safety considerations for the role;
- the triggers and management actions should caribou be observed on or near site;
- wildlife identification and management actions should other wildlife species be observed on or near site;
- identification of caribou sex and age classes;
- caribou behaviour to enable behavioural surveys of caribou (Section 7.2.2.2); and
- data entry and reporting.

Monitoring Locations

Three proposed locations are presented in the WMMP Plan that provide an uninterrupted view of the surrounding tundra. The Umwelt Lake observation point is west of Umwelt Lake and has a view to the west and north of the northwest portion of the Project (Figure 7.2-1). The Airstrip observation point is south of the airstrip and has a view north, east, and south of the Project footprint (Figure 7.2-1). The third monitoring location is located on the ridge to the west of the project to maximize the view of the tundra to the west of the Project.

Options for Monitoring

Three options are presented for caribou monitoring. The objective is to use Option 2, the tower cameras for the life of the Project. Options 1, observation blinds, and 3, vehicle-based monitoring, are proposed here until the towers can be installed and tested and as a backup in the event of a failure of the tower cameras.

Option 1: Observation Blinds

An observation tower with a blind at the top will be constructed at the observation points. When active monitoring is triggered, wildlife monitors will visit the observation blind during daylight hours and conduct a scan for caribou. The distance to caribou will be estimated using markers or a laser rangefinder. Group size and composition, including the presence of calves, will be recorded. These data will be sent to the Environment Manager, who will signal a site alert that caribou are in the vicinity.

Monitoring frequency will be dependent on:

1. the time of year and the number of caribou expected in a particular season determined through monitoring the seasonal ranges of caribou (Section 7.2.1.1);
2. the results of near real-time collar monitoring (Section 7.2.1.2); and
3. in response to incidental observations of caribou (Section 7.1.2.4).

During seasons when caribou are not expected to be on site, then monitoring will be conducted less frequently (i.e., twice per day). When caribou are more sensitive to disturbance (calving and post-calving) or are expected to be on site (i.e., summer and early fall), this monitoring frequency will increase to four times per day. Should near real-time collar data indicate that collared caribou are approaching the site, the monitoring frequency will increase to four times per day if it is not already at that frequency. Caribou monitoring may be triggered by incidental observations of caribou if the caribou are observed near site and at the discretion of the Environmental Manager.

Testing will be conducted to determine if observers can see caribou within and beyond the trigger distances for management actions, and the results of this testing will be reported to the KIA and GN.

Option 2: Tower Cameras

The second option for monitoring is a remote-controlled camera, which will be placed on a tower at the observation posts. The camera will have the ability to observe caribou out to the trigger distance. The controls and camera feed will be located in the Project Control Room. In this option, control room operators would be trained as discussed above to identify group size and composition.

Sabina has conducted research to ensure that the technology exists to support caribou monitoring using tower cameras. Several firms produce cameras that can fill the requirements for observing caribou at distances beyond the trigger distance. One example is from Infinity Optics, which produces surveillance cameras (http://www.infinitioptics.com/). An example of the image from their product is provided in Plate 7.2-1.

Plate 7.2-1. Image of Elk grazing at 1 km using an Infinity Optics remote camera.

This camera technology will be tested to ensure that it can identify caribou within and beyond the proposed trigger distances. The results of this testing will be reported to the KIA, GN and GNWT.

Option 3: Vehicle-Based Monitoring

Wildlife monitors will survey the tundra from vehicles on Project on-site roads at vantage points that allow a good view of the surrounding tundra. Methods will follow those for the observation blinds.

Triggers for Adaptive Management

The following triggers will be used for adaptive management:

- During the calving, post-calving, and summer seasons, if groups of caribou (30 or more) are observed within 4 km of the Project pits, then blasting will be delayed until caribou have moved through the area.
- During calving, post-calving and early summer, if medium-sized groups of caribou (30 or more) are observed within 1 km of the Project site, then the use of heavy mobile equipment outdoors will be delayed until caribou have moved through the area. The trigger distance will be 500 m at all other times of year.

Reporting

Data from the active caribou monitoring program will be reported in the annual WEMP report.

7.2.1.4 Incidental Observations

Objectives

The general objectives of the incidental wildlife observation program include:

- recording general wildlife activity in the Project area, including along roads;
- identifying unexpected conflicts or potential conflicts posed by existing Project facilities for wildlife, for example:

  - documenting wildlife-vehicle collisions;
  - identifying sections of the road that might be at risk for collisions (e.g., adjacent to high quality forage and near movement corridors);
- triggering additional monitoring and mitigation;
- identifying opportunities for adaptive management if a new risk to wildlife is identified; and
- assessing effectiveness of mitigation measures over time.

Triggers for Monitoring

The incidental observation monitoring program will be in place throughout construction and operations of the Project.

Methods

All personnel will be asked to report observations of wildlife species interacting with Project facilities to the Environment Department. Wildlife activity along the winter ice road will be recorded in a road wildlife log.

Environment staff will routinely inspect all Project facilities to check for signs of wildlife interaction or conflict, including:

- storage facilities and buildings that may serve as refuge;
- areas where chemicals may have been applied (e.g., dust suppressants).

When wildlife are observed the following information may be recorded:

- location, date, and time;
- type of interaction (e.g., attraction, nesting);
- species, number of animals, age, and sex (if possible);
- behaviour (e.g., feeding, resting);
- condition (e.g., limping, wounded, salivating); and
- any damage to or interaction with mine property.

Prior to construction of the Project, a detailed SOP will be produced for recording incidental observations of wildlife. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Triggers for Adaptive Management

Five activities may be triggered by the observation of caribou on or near the Project site:

1. Personnel will alert the Environment Department, which may trigger active monitoring or behaviour monitoring by wildlife monitors.
2. Should helicopter pilots observe caribou (and other wildlife) while flying, pilots will avoid the caribou (and other wildlife) as described in Section 6.5; Aircraft Management for Wildlife.
3. Should drivers observe caribou (and other wildlife) within 500 m of the road, they will slow down or stop, depending on how close caribou are to the road, and alert Dispatch who will

alert the Environment Department. The distance of 500 m is used because that is seen as a reasonable distance over which a driver can scan the surrounding area for wildlife.

4. Should unexpected observations be made of wildlife in distress (injured, etc.), then the Environment Department and the appropriate will be regulator notified.
5. In addition, observations of wildlife mortality including caribou along the road will be documented, and may in turn trigger additional mitigation as described in Section 7.1.7.

Reporting

Incidental observations and monitoring responses will be reported in the annual WEMP report.

7.2.1.5 On-site Camera Monitoring

Objectives

Two camera programs are proposed, an on-site program to examine wildlife interactions with the site and a regional program to evaluate ongoing wildlife activity in areas around the site (e.g., grizzly bears, muskox and wolverine, Sections 8.2.2.2 and 9.2.2.2). The objective of the on-site camera program is to monitor caribou (and other wildlife VECs) activities around Project infrastructure, including:

1. locations that are not staffed for long periods of time (e.g., on roads, camps, MLA);
2. areas with and without mitigation structures or activities to evaluate the efficacy of mitigation activities (e.g., at-road crossing structures); and
3. the time of year when caribou use the Project site.

Triggers for Monitoring

The on-site camera monitoring program will be in place throughout construction and operations of the Project.

Methods

Motion-triggered cameras will be placed in the following locations:

1. caribou road crossing ramps compared to road side locations without ramps (to assess road crossing by caribou);
2. waste management facilities (to assess activity of caribou, grizzly bear, wolverine);
3. Goose camp (to assess activity around camp);
4. Marine Laydown Area (to assess activity in the MLA);
5. tailings impoundment facility (to assess use of the TIA by caribou and migratory waterfowl); and
6. other sites as the need arises.

Monitoring will use motion-triggered all-weather cameras that will record both timed and triggered photos. Cameras accessible by road will be checked regularly such that adaptive management can be triggered in a timely manner. Remote cameras will be checked twice per year. Cameras may be repositioned as deemed necessary pending results of the photo data. All methods will follow those reported in the 2015 Back River Camera Report.

Across years, data analysis will evaluate 1) the timing of caribou presence, 2) activity around Project facilities, and 3) the use of road crossing structures. Changes in activity at these sites may trigger adaptive management.

Triggers for Adaptive Management

Observations of caribou using the Project site in a way that may be harmful to caribou will be adaptively managed.

Reporting

Data and analyses will be reported in the annual WEMP report.

7.2.1.6 Over the Horizon Monitoring

Should on-site behaviour monitoring or regional monitoring using satellite collars indicate that there is a need to monitor for caribou at distances greater than can be observed from the Umwelt Lake and Airstrip observation points, then the over-the-horizon monitoring program will be triggered. This monitoring would be implemented, if-triggered, during the Construction, Operations and Reclamation/Closure Phases of the Project.

Sabina will investigate methods for over-the-horizon monitoring that can detect caribou, but which do not disturb caribou in the process. Note that the proposed long-distance camera monitoring program (Section 7.2.1.3) will likely address the objective of over the horizon monitoring.

7.2.1.7 Human Activity Monitoring

Background and Trigger for Monitoring

The FEIS evaluated the potential effects of new access to the Project site along the winter ice road from the MLA and determined there was a negligible potential for increased access. To mitigate any potential effects, the winter ice road will be closed to the public. Human activity monitoring will evaluate whether people are using the winter ice road and whether measures to control access have been effective. Human activity monitoring will occur in each year that the winter ice road is active. The results of human activity monitoring will be used for adaptive management measures to prevent further usage of the winter ice road.

Objectives

The objective of human activity monitoring is to evaluate whether measures to prevent people from using the winter ice road have been successful.

Monitoring Methods

Incidental observations of people using the winter ice road will be reported to environment staff, including:

- type of vehicles used for access (e.g., snowmobile, quad, truck, etc.);
- number of individuals;
- purpose of access (e.g., hunting, recreational use); and
- outcome of any interactions with Project personnel.

Prior to construction of the Project, a detailed SOP will be produced that will include training requirements for staff, methods for monitoring, and data sheets.

Data Analysis

All observations will be collated into a database and evaluating for any changes from year to year.

Triggers for Adaptive Mitigation

Observations of people using the winter ice road will immediately lead to the local manager/team leader contacting the person and explaining the use policy. Should more than five groups of people be seen in a calendar year, then enhanced management will be implemented to further limit use of the winter ice road (Section 7.1.6), and a more direct monitoring program such as remote cameras of people using the winter ice road will be triggered and reported as part of the Socio-Economic Monitoring Report to NIRB. If triggered, Sabina will liaise with the relevant HTOs to discuss possible options for enhanced management to limit hunter use of the winter ice road.

Reporting

Observations of people using the winter ice road and any corrective actions taken will be reported in the annual WEMP report. This reporting will include the date, group size, types of vehicle, purpose of access, and results of any interactions with Project personnel. Data will be provided as a table in the WEMP report.

7.2.2 Caribou Monitoring to Measure Predicted Effects

Caribou monitoring to evaluate predicted effects will be undertaken at three different scales: local, regional, and cumulative.

Local-scale monitoring programs include:

1. footprint monitoring (monitoring for habitat loss);

Regional-scale monitoring programs include:

1. behaviour monitoring program (monitoring for disturbance);
2. stress hormone study (monitoring for disturbance);
3. regional collar-monitoring program to examine avoidance of the site (monitoring for disturbance/avoidance);
4. noise monitoring (monitoring for disturbance/avoidance);
5. dust monitoring (monitoring for disturbance/avoidance); and
6. regional camera monitoring.

Cumulative scale monitoring includes:

1. Collaborative, herd-scale monitoring with government (i.e., participation in the range planning process).

7.2.2.1 Footprint Monitoring

Background and Trigger for Monitoring

This monitoring program will track the as-built size of the Project, compared to the size presented in the FEIS. Monitoring will occur in each year of the Project, including reclamation/closure and as needed in post-closure to track the reclamation of the site.

Objectives

The objective of footprint monitoring is to quantify habitat losses for caribou due to construction and clearing of areas for Project infrastructure, site roads, mine sites, and camps.

Monitoring Methods

The as-built footprint will be compared to the previous year's footprints, the planned footprint, and wildlife habitat maps on a yearly basis. The yearly footprint will be taken from engineering drawings for the site as provided by the Project engineering staff. Areas available for progressive reclamation will be identified and recorded separately.

Data Analysis

A GIS analysis will be conducted to overlay the constructed footprint area with the habitat suitability mapping for caribou and all other VEC species conducted during baseline studies. Maps and a table of habitat loss will be produced.

Triggers for Adaptive Mitigation

If the constructed footprint exceeds the planned PDA area, then this area will be reported in the WEMP report.

Reporting

Footprint monitoring will be reported in the annual WEMP report during years that the footprint has increased in size. The report will contain maps of the Project footprint and the areas of habitat removed.

7.2.2.2 Behaviour Monitoring Program

Objective

The objective of behaviour monitoring is to test the FEIS prediction that caribou may be disturbed by Project activities, principally noise. This program will determine what behavioural responses caribou display in reaction to potential stressors at the Project site, including aircraft, vehicles, and blasting. The goal is a minimum of 10 behaviour samples per year.

Trigger for Monitoring

The behaviour monitoring program will be triggered in each year of construction and operations where there are caribou near the Project footprint.

Methods

Both focal and scan sampling will be used to record the behaviour of individual caribou and groups of caribou in the vicinity of the Project. The necessary technician skills include the ability to distinguish gender and age, classify behaviours, identify habitat types, and operate GPS and rangefinder equipment.

Below is an outline of the proposed monitoring protocols. Sabina will liaise with the GNWT and the GN (if they have also have a behaviour monitoring program) to determine the final methods of behaviour monitoring such that methods are comparable across projects and regions.

Focal Survey

The purpose of a focal survey is to capture the behaviour of caribou at the individual level to create an activity budget for each segment of the population. It is important to capture the entire demographics of the caribou population; therefore, whenever possible, focal surveys should alternate between

capturing the behaviour of males, cows, and cows with calves. Every attempt will be made to complete focal surveys at a variety of locations around site to assess the potential effects of each area and its associated activities on individual behavior.

When a herd has been located, the survey will begin at least five minutes after the arrival of the wildlife monitors. Surveyors should work in teams of two, with one person recording data/timing and the other person verbally calling changes in behavior and potential stressors that are detected (visual or audio). During this time, the following information will be recorded: date and arrival time, weather, insect harassment, habitat type, description of location relative to the mine, UTM coordinates, herd composition count/number, GPS location, estimated distance (m) to the herd (with a rangefinder) and cardinal direction (eight cardinal directions) to the caribou group from the waypoint.

The following rules will be used to select an individual from the herd for focal observation: for every 10 animals in the herd, focal surveys will be conducted on 2 different animals. If the herd group is a mixed group (bulls and cows), one survey on one cow and one survey on one bull will be conducted. If the herd is all cows, a survey will be conducted on two different cows. If herd is all bulls, a survey will be conducted on two different bulls.

Insect harassment will be assessed by watching one focal animal for two minutes. The number of times the animal demonstrates headshakes, skin shakes/shudders, and scratches will be recorded. During the remainder of the focal observation, any other insect avoidance behaviours, such as bolting, aberrant running, rigid standing, or jumping will be recorded. If the caribou are too far away to see skin shakes or shudders, insect abundance at the monitor's location will be used to index insect harassment.

Surveys will be conducted whenever caribou are observed in the vicinity of the Project area. The length of a focal survey is at least 30 minutes, assuming the focal individual remains within the surveyor's view for the entirety of the survey. The following behaviours will be recorded: bedding, feeding, standing, alert, walking, trotting, running, and sparring. Only one behavior type should be recorded per time period per individual being surveyed during the focal survey. If the individual is engaged in two behaviors at the same point in time (i.e., alert while standing), the dominant behavior is recorded (i.e., alert) for that point in time.

In the event that a stressor occurs at any point during a focal survey, the observers will record the time that the stressor occurred, the duration of the stressor from start to finish, and the response of caribou to the stressors. The minimum estimated distance from the stressor to the focal individual will also be estimated by using a rangefinder, and the behaviour of the caribou from the first indication of the stressor is recorded. Potential stressors include aircraft (helicopter and airplane), blasting, and three categories of vehicles: light (e.g., pick-up truck), medium (e.g., water truck, bus), and heavy truck (e.g., haul truck). Observers will watch the animal for at least 15 minutes following a stressor event to record the time it took to return to a non-alert behaviour (bedding or feeding).

Scan Survey

The purpose of a scan survey is to characterize the predominant behaviour of caribou groups in relation to Project activities. It is important to capture different demographics of caribou populations; therefore, whenever possible, scan surveys should attempt to capture bachelor herds, nursery groups, mixed herds and rutting groups. Every attempt should be made to complete scan surveys at a variety of locations around site to monitor the potential impact of each area and its associated activities on herd behavior.

Observers will wait at least five minutes before commencing the survey. During that time, information on group location and insect harassment, weather, site location, herd composition, GPS location, estimated distance in metres (with a rangefinder) and cardinal direction to the caribou group from the waypoint will be recorded. Surveyors should work in teams of two, with one person recording

data/timing and the other person verbally calling changes in behavior and potential stressors that are detected (visual or audio).

Insect harassment will be assessed by recording the number of times the group being surveyed demonstrates headshakes, skin shakes/shudders, and scratches in the space of a four-minute interval. During the rest of the scan survey, any other insect-avoidance behaviours such as bolting, aberrant running, rigid standing or jumping will be recorded. If the caribou are too far away to see skin shakes or shudders, insect abundance at the monitor's location will be used to index insect harassment.

Surveys will be conducted whenever caribou are observed in the vicinity of the Project area. On groups up to 30 animals, all animals will be included in the scan. For larger groups, a sub-sample of 20 to 30 animals will be observed. There may be multiple observations from a single large group, consisting of several consecutive scans on different sub-groups. If additional personnel are available, focal and scan observations may proceed concurrently. Data may be supplemented with the use of video recordings. The length of a scan survey is 32 minutes, and a scan observation will be conducted every 4 minutes. A scan sample consists of recording the number of individuals exhibiting the following behaviours: bedding, feeding, standing, alert, walking, trotting, running, and sparring.

In the event that a stressor occurs at any point during a scan survey (i.e., between the four-minute scan periods), the observers will record the time that the stressor occurred (i.e., the time that the stressor is first observed by surveyors), the duration of the stressor from start to finish, and the response of caribou to stressors as either exhibiting no reaction, or a reaction (caribou look towards disturbance; caribou walk away; caribou trot or run away). The minimum estimated distance from the stressor will also be estimated by using a rangefinder, and the behaviour of the caribou from the first indication of the stressor will be recorded. Potential stressors include aircraft (helicopter and airplane), blasting, and three categories of vehicles: light (e.g., pick-up truck), medium (e.g., water truck, bus), and heavy truck (e.g., haul truck). Following a stressor event, the scan survey will resume on the four-minute interval; the duration between each scan survey will always be four minutes, regardless of the frequency or number of stressor events.

Triggers for Adaptive Management

Should the behaviour monitoring program determine that caribou are having negative behavioural responses to Project activities outside of the current planned trigger distances for mitigation, then these mitigation distances will be reviewed and adjusted accordingly (Section 7.2.1). Mitigation will be adjusted in two ways, based on the types of reactions expressed by caribou:

- For behaviours which are measured as activity budgets, the review of mitigation measures will occur as part of the annual WEMP report, which will detail the behavioural change observed and the proposed change in mitigation. The WEMP report will be circulated to the KIA, GN and GNWT for comments.
- For behaviours which are overt and observable following a disturbance (getting up, startle and stare, or trotting/running away), the wildlife monitor will alert the Environmental Manager, who will adaptively manage the response of the project to minimize disturbance to caribou. Any changes in the mitigation will be reported to the KIA, GN and GNWT.

Reporting

The results of the behaviour monitoring program will be reported in the annual WEMP Report.

7.2.2.3 Stress Hormone Study

Objective

The objective of the stress hormone study is to test the FEIS prediction that caribou may be disturbed by activities near the Project site. This program will determine what physiological responses caribou have to the Project site.

Trigger for Monitoring

The stress hormone study will occur once during operations of the Project when there are caribou on or near the Project site. If possible, this study will occur in the first two years of operations.

Methods

This study will examine the level of stress hormones at a variety of distances from the Project site. Fecal pellets from caribou will be recovered at distances from 500 m to 30 km. The distance of 30 km will be used because it is twice the largest ZOI reported for caribou in the literature and so provides a good control area. A sufficient number of replicates will be used such that the program has the power to detect change in stress hormones with distance from the mine.

Fecal pellets will be collected in the fall, when only Beverly/Ahiak caribou are present and the recent fecal pellets are obvious against the snow. Samples will be swabbed for DNA, and DNA amplified using polymerase chain reaction (PCR) to test for female (X/X) and male (X/Y) caribou following methods from Wasser et al. (2004); Wasser et al. (2011). Samples will then be extracted and analyzed for progesterone, glucocorticoid (GC; cortisol), and the thyroid hormone triiodothyronine (T3) following standard methods. These data will provide pregnancy rate and stress levels of caribou at various distances from the Project site.

Sex ratio, pregnancy rate and stress hormone concentration will be compared to 1) distance from the Project site, 2) habitat type, 3) selection metrics for or against habitats from the resource selection function conducted as part of the DEIS, 4) noise data, and 5) dust data using simple linear regression. More detailed field and analysis methods will be circulated to the KIA, GN and GNWT for comment prior to implementation of the study.

Triggers for Adaptive Management

Should the stress hormone study determine that caribou are having negative physiological responses to Project activities, then potential Project stressors will be adaptively managed (Section 7.2.1).

Reporting

The results of the stress hormone study will be reported in the annual WEMP Report in the year during which the study is conducted.

7.2.2.4 Regional Collar Monitoring for Zone of Influence

Objective

The objective of the regional collar monitoring program is to investigate whether caribou alter their regional distribution following construction of the Project. This program will evaluate whether either the Bathurst or the Beverly/Ahiak caribou herds are 1) avoiding the Project site, 2) not avoiding the Project, but moving more quickly through the Project area, or 3) there is no change compared to baseline conditions.

Trigger for Monitoring

The regional collar monitoring program for zone of influence will be conducted every three years during Construction, Operations, Temporary Closure, Care and Maintenance, Reclamation/Closure and Post-Closure phases of the Project.

Methods – Zone of Influence

The analysis will be conducted separately for the Bathurst and Beverly/Ahiak caribou. Note that during the last 20 years, the Bathurst caribou have not overlapped the Goose site, so this analysis will be used to test the prediction that no effect on distribution will occur. The Beverly/Ahiak herd overlaps the Project site during summer and to a lesser degree during fall and winter. The FEIS predicted that caribou would avoid the Project site to some degree and this analysis will test for 1) a change in distribution, and 2) the magnitude of that change.

This analysis will follow the methods used by Boulanger et al. (2012) to examine the density of caribou surrounding the Project site using existing caribou collar data, or updated methods as they become available. This analysis will have one major difference, however, because there are almost 20 years of caribou collar data prior to construction. Hence, this analysis will be a Before-After-Control-Impact (BACI) design using collar data before and after construction of the Project with a dose-response calculation used by Boulanger et al. (2012) to define treatment and control.

To test for a ZOI, the density of caribou collar points before and after construction of the Project will be compared at various distances from the Project, grouped into 1-km bands. Models with a range of cut-points will be fit to determine the ZOI. The fit of each model will be compared by assessing its log-likelihood relative to the other models. The log-likelihoods should increase to a maximum at the most probable distance for the ZOI and then decrease thereafter. In addition, the estimated coefficient of the best-fit ZOI term will be used to determine an odds ratio for the ZOI. The odds ratio (OR) is an index of the probability of detecting caribou relative to the ZOI. For example, an OR of 2 would suggest that caribou are twice as likely to be observed beyond the ZOI as within it.

Habitat data will be included as predictors of caribou abundance in the regression models. These variables will be used to investigate possible mechanisms for any calculated ZOI surrounding the Project, including:

1. vegetation class;
2. habitat preference or avoidance score—taken from the resource selection function already completed for the Bathurst caribou post-calving and summer ranges as part of the DEIS; and
3. lake cover.

Project effects will also be assessed to determine if the ZOI is related to any of the following:

1. predicted noise from the Project (infrastructure, blasting and aircraft);
2. measured noise from the Project;
3. predicted dustfall from the Project; and
4. measured dustfall from the Project

Collar data for this program will be sourced from the GNWT and GN. Sabina is already in possession of the habitat data and will be collecting noise and dustfall data through monitoring programs.

In consultation with the GN, the Proponent shall revise the WMMP to more clearly define the technical specifications and requirements of the proposed collar-based regional monitoring programs designed to

monitor Project effects on caribou (i.e., the ZOI monitoring), and to monitor caribou range use for the purpose of mitigation (i.e., seasonal ranges use monitoring), including details on required statistical power, sample size, sampling schedule and frequency of data acquisition.

Prior to construction, Sabina will also update the WMMP to: 1) confirm that data suitable to meet these technical specifications and monitoring needs are available, 2) demonstrate that relevant data-sharing agreements are in place with government data suppliers, and 3) provide the minimum number of collars that would need to deployed on the relevant herds in order to calculate a ZOI. The revised WMMP shall be submitted to NIRB for review.

Methods – Movement Rate

This analysis will be conducted for both the Bathurst and Beverly/Ahiak caribou. The objective is to measure whether caribou increase their movement near the Project site after construction. Methods for this analysis will follow those for the ZOI analysis, but instead of comparing density of caribou at different distances from the Project site, this analysis will examine step length (the km per day moved) by caribou. Tests for predictive variables such as dust and noise will be conducted in the same manner as the ZOI analysis. This analysis has the same data requirements as the ZOI analysis.

Triggers for Adaptive Management

Should the regional collar monitoring program determine that caribou are avoiding the Project site more than predicted in the FEIS by 2 to 4 km, Sabina will investigate possible mechanisms for this avoidance and adaptively manage its activities.

Reporting

The results of the regional collar monitoring program will be reported in the annual WEMP Report during the years when the analysis is conducted.

7.2.2.5 Noise Monitoring

Objective

The objective of the noise monitoring program is to measure the amount of noise produced by the Project at various distances from the Project footprint to meet compliance requirements for personnel health and safety and to test the predictions of the FEIS. One objective of this noise monitoring will be to measure the noise produced by blasts.

Trigger for Monitoring

Noise monitoring was conducted during baseline studies and is proposed once during construction, every third year of operations and once during reclamation and closure. Monitoring will also be triggered by significant changes in the Project Operations. If there is a major change between and within Project phases, then the frequency will be reviewed and adjusted (i.e., before and after a major change (e.g., going in to or coming out of care and maintenance, starting an open pit). Additional blasting-specific surveys may be warranted to gain additional information on construction and open-pit blasting setback distances.

Methods

Noise monitoring will be conducted in winter (approximately March) and summer (approximately June) at 10 sites to address potential effects on:

1. birds: along the 45 dBA contour, 1 km and 3 km;

2. caribou: at 1 km, 3 km, 5 km, 14 km; and
3. at a control site at a distance greater than 14 km from the site.

The exact locations of the sites will be determined based on the final Project specifications and the predominant wind directions. Sound meters will make noise measurements every minute for 24 consecutive hours at a height of 1.5 m above ground. A B&K Model 2250 (or similar) sound level meter will be used; this is a Type 1 instrument with an operating range that captures low sound levels that are typical for an undisturbed wilderness area, measuring:

- L_{Aeq} (equivalent continuous sound pressure level in dBA);
- L_{Amax} (absolute maximum in dBA);
- L_{Amin} (absolute minimum in dBA); and
- L_{Ceq} (the C-weighted equivalent continuous sound pressure level in dBC).

A-weighting is the most commonly used parameter when a single-number overall sound level is needed, since it approximates the human perception of sound. C-weighting is used to evaluate sounds containing strong low-frequency components. To evaluate both the aesthetic appeal and speech interference of noise, 1/3 band octave data will be collected once per Project stage, and if noise levels exceeding Project criteria are found, the primary source requiring mitigation will be located.

Field notes will include a description of the monitoring site, time, calibration, surface type, noise sources, distance from obstacles, location, type of meter and weather. Preferred weather conditions are wind speeds less than 20 km/h, relative humidity less than 90%; no precipitation (rain or snow), and temperatures within the manufacturer's specifications.

Data Analysis

Analysis will follow those conducted in the noise baseline (FEIS Appendix V4-2A).

Triggers for Adaptive Mitigation

Noise levels exceeding noise-monitoring thresholds for human safety will trigger mitigation that will also act to reduce potential effects on wildlife receptors.

Reporting

Noise monitoring data will be reported as a stand-alone report and referenced in the WEMP.

7.2.2.6 Dust Monitoring

Objective

The objective of the dust monitoring program is to measure the amount of dust produced by the Project and deposited on the surrounding tundra at various distances from the Project footprint.

Methods

Please see Section Volume 10, Chapter 17; The Air Quality Monitoring and Management Plan, for a complete description of this program including triggers, methods, adaptive management, and reporting.

Triggers for Adaptive Management

Mitigation will be triggered should dustfall exceed applicable standards, predictions in the FEIS, or if there is a trend through time that indicates reason for concern.

Reporting

The results of the dustfall monitoring will be reported in the annual Air Quality Monitoring Report.

7.2.2.7 Collaborative Herd-scale Monitoring

Sabina is proposing to collaborate with government agencies from the NWT and NU to conduct collaborative, herd-scale monitoring for cumulative effects during construction and operations of the Project. This monitoring program would occur during Construction, Operations, Temporary Closure, Care and Maintenance, Reclamation/Closure and Post-Closure. Sabina will work with the GN and the GNWT in the following ways:

1. Sabina will participate in the GNWT-led Bathurst Range-Planning process by sending a representative.
2. Sabina will coordinate with the GNWT and the GN to contribute to government or industry-led cumulative effects monitoring for the Bathurst and/or the Beverly/Ahiak caribou herds. Examples include:
    a) financial (e.g., purchasing satellite collars);
    b) in-kind support (e.g., providing fuel, airstrip, and accommodation for a caribou survey); or
    c) collaborative (e.g., where Sabina provides data or personnel to accomplish a monitoring goal).

Sabina will report its contribution to cumulative effects monitoring in the annual WEMP report.

7.2.2.8 Regional Camera Monitoring Program

Please see section 8.2.2.2, Regional Monitoring of Muskox with Motion-Triggered Cameras, for information on the regional camera monitoring program to be used for caribou, muskox and grizzly bear. This monitoring program would occur every 3 years during Construction, Operations and Post-Closure, if triggered.

8. Muskox

ERM

8. Muskox

8.1 MITIGATION AND MANAGEMENT FOR MUSKOX

8.1.1 Overview of Potential Effects to Muskox

Seven potential effects of the Project on muskox were evaluated in the FEIS: habitat loss, disturbance, disruption of movement, direct mortality, indirect mortality, attraction, and exposure to contaminants. Mitigation and management measures to reduce the potential for these effects to result in residual effects on muskox are discussed in this section.

In addition, reduction in productivity was considered to evaluate the potential for synergistic effects on muskox. Limiting the potential for synergistic effects will be achieved by implementing the mitigation and management measures for the seven direct effects listed above.

Habitat loss will occur in the Project footprint where natural vegetation is removed for the construction of the Project, and habitat loss was rated as a residual effect in the FEIS. Habitat loss will be minimized by reducing the Project footprint and carrying out reclamation activities.

Indirect habitat loss caused by disturbance, measured as the potential for muskox to avoid the Project site, was rated as a residual effect in the FEIS. A variety of mitigation and management activities are proposed, including design mitigation to limit noise, fixed and rotary-winged aircraft management, and management of traffic on on-site roads and winter ice roads should muskox be observed near the site.

The potential for the disruption of muskox movement patterns due to the winter ice road was evaluated. With mitigation, including traffic management, this potential effect was not rated as a residual effect.

The potential for direct mortality due to vehicle collisions and altered predator-prey relationships was evaluated for muskox. With mitigation, including setting speed limits, maintaining the right of way for all wildlife, and compliance with Sabina's waste management practices, this effect was not rated as a residual effect.

The potential for indirect mortality was evaluated as the potential for increased access for hunters to the Project area. With mitigation, which includes closing the winter ice road to the public and prohibiting employees from bringing firearms to the site and hunting while at work, this was not rated as a residual effect.

The potential for muskox to be attracted to the Project site, in particular the winter ice road for ease of travel, was evaluated in the FEIS. Mitigation measures for wildlife encounters on all Project roads, such as setting speed limits and giving wildlife the right of way on the road, will ensure that should muskox be attracted to winter ice roads for ease of travel, this should not result in an increase in vehicle-muskox interactions. Therefore, no residual effects of attraction are expected for muskox following mitigation.

The potential for muskox to be exposed to contaminants was evaluated in the FEIS through a risk assessment, which found that muskox would not be at risk of uptake of hazardous chemicals. A series of standard management plans for chemicals was provided in the FEIS, including fuel, spill response,

marine spills, and management of hazardous materials. After management, exposure to contaminants was not rated as a residual effect for muskox.

8.1.2 Mitigation and Management for Habitat Loss for Muskox

The following mitigation and management measures will be conducted during the construction, operations, and closure phases of the Project to reduce the potential for habitat loss for muskox:

- Sabina will design the Project footprint to be as small as possible.
- Dust will be managed on the Project site by setting and enforcing speed limits on all-season on-site roads and applying dust suppressants where and when needed. Dust suppressants will be non-toxic for wildlife. Dust deposition rates and potential effects on vegetation will be monitored as described in the Air Quality Monitoring and Management Plan (Volume 10, Chapter 17).
- Areas of the Project will be reclaimed progressively during operations and at closure to minimize the area of disturbance to wildlife as described in the Mine Closure and Reclamation Plan (Volume 10, Chapter 29). Post-closure environmental monitoring will continue until it has been verified that reclamation has successfully met closure and reclamation objectives.

8.1.3 Mitigation and Management for Disturbance of Muskox

A series of mitigation and management strategies will be in place to reduce the potential for disturbance to muskox.

8.1.3.1 Design Mitigation

The following mitigation measures will be designed into the Project to limit disturbance to muskox:

- Project equipment will be chosen to limit the continuous noise produced by equipment such as generators, heavy trucks and other mobile equipment. All Project equipment will be fitted with appropriate mufflers and silencers and will be well maintained.
- Project facilities will be designed to limit the amount of noise that emanates from the Project, such as housing static noise sources (e.g., the crushers, mill and generators) in buildings and using acoustic screening such as wall or berms to muffle noise.

8.1.3.2 Fixed Wing Aircraft Management

The following management actions will be applied to fixed-wing aircraft during all Project phases to limit disturbance to muskox:

- Fixed-wing pilots will remain above 610 m local ground level at all times, except when landing or taking off from the Marine Laydown Area (MLA) or the Goose Airstrip.
- Prior to aircraft landing on the airstrip, a visual inspection will be conducted to identify the presence of any wildlife on the airstrip. If possible, the wildlife will be escorted off the airstrip; the flight crew will be notified by radio that such action is taking place and aircraft will not be approved to land until the airstrip is clear. If the wildlife cannot be escorted from the airstrip within a reasonable length of time, the flight crew will be instructed to divert to another location.

8.1.3.3 Helicopter Management

The following management actions will be applied to helicopters during all Project phases to reduce potential disturbance to muskox:

- As part of pilot induction, pilots will be informed of their responsibilities to monitor, report, and avoid groups of muskox.
- Pilots will avoid groups of muskox by 300 m elevation except where low-elevation surveys are required.
- Pilots will report all incidental sightings of muskox to the Environment Department.

8.1.3.4 Blasting Management

The following management actions will be applied during the construction and operations phases to limit any disturbance due to blasting on muskox:

- When groups of more than 10 muskox are observed by wildlife monitors or are observed incidentally at 1 km from the site, a site notification (Level 2 response) will be called and wildlife monitors will conduct behaviour monitoring on selected muskox groups.
- When groups of more than 10 muskox are observed within 1 km of the open pits, a site alert will be called and blasting will be halted until muskox move off. Only one other northern mining Project has an established blasting setback distance for muskox, which is 500 m. The proposed 1 km setback is twice this distance. A review of seven permitted and/or operating Arctic mining projects indicated that only one project is halting blasting when muskox are within a specified distance; the Meadowbank project halts blasting when a group of 10 or more animals are within 500 m of a blasting site.
- During all seasons, if any muskox are within the blast safety areas—the area potentially affected by fly rock or debris—then the blast will be delayed until the muskox move out of the area. The blast safety area is part of the personnel safety requirements and is determined prior to each blast.
- If muskox become acclimated to the site and have not moved off within 1 day, then blasting may resume as long as muskox are outside of the blasting safety zone. This is also the management for resumption of blasting at the Meadowbank project.

8.1.3.5 Heavy Equipment Management

Heavy mobile equipment (e.g., dump trucks) will follow the rules for traffic outlines in Section 8.1.4.

8.1.4 Mitigation and Management for Disruption of Movement of Muskox

Mitigation and management for disruption of movement of muskox focuses on management of the winter ice road between the Goose site and the MLA, and on all-season, on-site Project roads.

The following mitigation will be designed into the Project winter ice roads:

- The winter ice road will be constructed each winter such that it is not a barrier to movement for muskox; the height of snowbanks will be limited and snow plowing will be conducted in such a way as to limit the vertical height and angle of the snowbank edge.

The following management actions will be conducted whenever on-site roads and the winter ice road are in use:

- Traffic on all roads will be managed and monitored through a central dispatch.
- In order to reduce the frequency of traffic on the winter ice road that may deter muskox from crossing, trucks may be grouped into convoys.
- If a driver observes a group of more than 10 muskox (or individual grizzly bear, wolves and wolverine) within 500 m of any road, the driver will slow to 40 km/hr.
- Trucks will stop when groups of muskox (also grizzly bears, wolves and wolverine) are crossing the road.
- If an individual or small group of wildlife (also grizzly bears, wolves and wolverine) are standing on the road, then the driver will stop for up to 20 minutes, then proceed slowly to encourage the wildlife to move off the road.

8.1.5 Mitigation and Management for Direct Mortality and Injury of Muskox

Mitigation and management to prevent direct mortality and injury of muskox focuses on management of roads and aircraft at the landing strip to prevent any vehicle-muskox collisions, including:

- Speed limits will be monitored and enforced, and set at 60 km/h for winter ice roads and on all-season on-site roads.
- Wildlife will have the right-of-way on all Project roads. See section on disruption of movement for muskox.
- Any wildlife mortalities on Project roads will be recorded through a reporting system and this information will be distributed to drivers. If a location is found where more than one wildlife mortality has occurred, then this location will be relayed to drivers and site-specific mitigation may be conducted, such as additional signage to alert drivers of speed limits, and identified wildlife movement corridors.
- The Project will conduct regular road and camp cleanups to ensure that no hazardous substances, wires, or loose materials are present to endanger wildlife, and to ensure proper storage and disposal of wastes and hazardous wastes as per the Waste Management Plan (Volume 10, Chapter 10).
- Should muskox become acclimated to the Project site, and should their safety be at risk, then the Project may deter muskox. Examples of acceptable reasons to deter muskox include:
  - muskox have become acclimated to the camp and are posing a safety risk to Project personnel;
  - muskox are attracted to the TSF or other feature as a salt source, but TSF water quality does not meet wildlife guidelines; and
  - an individual or small group of muskox are occupying the airstrip and have the potential to be alarmed and run into the airstrip during landing or takeoff.
- The objective of deterrence is to encourage the muskox to leave the area, while not startling the muskox and causing them to exhibit defensive behaviours or to run away. Experience at other Arctic projects indicates that the presence of a light pickup truck or person near the muskox is all that is required to encourage muskox to leave the area.

8.1.6 Mitigation and Management for Indirect Mortality of Muskox

Mitigation and management to limit indirect mortality for muskox due to increased access and hunting will be the same as those used for caribou in (Section 7.1.6):

- No-hunting policy for Project personnel on-site; and
- closure to the public of the winter ice road to the MLA.

8.1.7 Mitigation and Management for Attraction of Muskox

Muskox are not expected to be attracted to the Project site unless they are using the winter ice road as a travel corridor. See Sections 8.1.4 and 8.1.5 for mitigation and management for disruption of movement and direct mortality on the winter ice road.

8.1.8 Mitigation and Management for Exposure to Contaminants for Muskox

The following mitigation and management actions will be conducted during all Project phases:

- Fuel will be managed safely to ensure fuels do not enter the environment and that wildlife, including muskox, are not exposed to fuels, as per the Fuel Management Plan (Volume 10, Chapter 4).
- Should a fuel spill occur, the fuel will be contained and cleaned up such that wildlife, including muskox, are not exposed to the fuel, on land as per the Spill Contingency Plan (Volume 10, Chapter 5) and in the marine environment as per the Oil Pollution Emergency Plan (Volume 10, Chapter 6).
- Hazardous materials will be stored and handled safely so that wildlife, including muskox, are not exposed to hazardous materials as per the Hazardous Materials Management Plan (Volume 10, Chapter 12).
- The Project will conduct regular road and camp cleanups to ensure that no hazardous substances, wires, or loose materials are present to endanger wildlife, and to ensure proper storage and disposal of wastes and hazardous wastes as per the Waste Management Plan (Volume 10, Chapter 10).
- Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

8.2 MONITORING FOR MUSKOX

This section describes monitoring and mitigation activities to minimize potential effects of the Project on muskox that will be included in the WEMP; it is divided into two subsections, 1) monitoring that will trigger management, and 2) monitoring to evaluate the predicted Project effects on muskox.

Monitoring to trigger management for muskox include:

1. monitoring for use of Project infrastructure using motion-triggered cameras;
2. incidental observations; and
3. monitoring for muskox in relation to blasting.

Monitoring to test the predictions of the FEIS on muskox include:

1. footprint monitoring to measure habitat loss in the Project footprint;
2. regional monitoring for muskox using remote motion-triggered cameras to measure avoidance;

3. behaviour monitoring; and
4. contributions to regional GN monitoring.

8.2.1 Muskox Monitoring to Trigger Mitigation

8.2.1.1 On-site Camera Monitoring

Objectives

The objective of the on-site camera program is to evaluate how muskox (and other wildlife VECs) interact with the Project site, and will be achieved by:

1. monitoring the Project site to examine how muskox interact with Project facilities (e.g., on roads, pits);
2. monitoring areas identified as important for muskox from land user knowledge (e.g., eskers, windswept benches) and at points with high numbers of muskox identified during baseline studies (e.g., the hilly area west of the MLA); and
3. recording the times at which muskox use the area near the Project during the year in order to guide mitigation activities.

Triggers for Monitoring

The on-site camera monitoring program will be in place throughout construction and operations of the Project.

Methods

Methods and analysis will follow those for the on-site camera monitoring for caribou (Section 7.2.1.5).

Triggers for Adaptive Management

Observations of muskox being attracted to and interacting with the Project site in ways that may cause harm to muskox or employees will trigger adaptive management to review the causes for why muskox are attracted and to provide mitigation.

Reporting

Data and analyses will be reported in the annual WEMP Report.

8.2.1.2 Incidental Observations

Objectives

For muskox, the objectives of the incidental observation program are to collect information that will be used to trigger suitable mitigation, including:

1. alerting the environmental personnel that muskox (and other wildlife) are on site;
2. managing the avoidance of muskox by pilots;
3. triggering vehicles to stop when muskox are on the on the Project site and winter ice roads; and
4. recording unexpected interactions with the Project.

Triggers for Monitoring

The incidental observation monitoring program will be in place throughout construction and operations of the Project.

Methods

Incidental observations of muskox will be recorded by all Project personnel, including environmental monitors, pilots, drivers on on-site and winter ice roads, and other Project personnel and recorded in a wildlife log. More details are available in Section 7.2.1.4, Incidental Observations (for caribou).

Triggers for Adaptive Management

Five activities may be triggered by the observation of muskox:

1. A spike in the number of muskox observed at site will trigger adaptive management.
2. Should pilots observe muskox (and other wildlife) while flying, pilots will avoid muskox.
3. Should drivers observe muskox on or adjacent to the road, they will give muskox the right of way.
4. Should muskox be observed within prescribed distances of active blasting, then monitoring will be conducted blasting schedules may be modified (see Section 8.2.1.3).
5. Should unexpected observations be made of wildlife in distress (injured, other.), then the Environment Department will be notified and the appropriated regulator notified.

Reporting

Data, analyses, and adaptive management actions will be reported in the annual WEMP report.

8.2.1.3 Monitoring for Muskox in Relation to Blasting

Objectives

The objective of this monitoring program is to trigger appropriate mitigation measures should muskox be observed within a certain distance of above-ground blasting (Section 8.1.3.4).

Triggers and Methods

When wildlife monitors are conducting scans for caribou (Section 7.2.1.3), muskox sightings will also be recorded. This monitoring will be conducted during the Construction, Operations, and Reclamation/Closure phases of the Project.

Triggers for Adaptive Management

If muskox are observed within 1 km of the location of above-ground blasting, then a site alert will be called and adaptive management will be triggered and muskox behaviour will be recorded. If muskox are observed within 500 m, then blasting will be halted until muskox move away.

Reporting

Data, analyses, and adaptive management actions will be reported in the annual WEMP report.

8.2.2 Muskox Monitoring to Measure Predicted Effects

8.2.2.1 Footprint Monitoring

Objective

The objective of footprint size monitoring is to measure the actual habitat lost within the constructed Project footprint for each wildlife VEC.

Methods, Analysis, and Reporting

The methods, analysis and reporting for footprint monitoring will follow the footprint monitoring methods for caribou (Section 7.2.2.1).

8.2.2.2 Regional Monitoring of Muskox with Motion-triggered Cameras

Objective

The FEIS predicted that muskox may avoid the Project mine site (the Goose site) due to disturbance. The objective of the regional camera monitoring program is to determine if muskox are avoiding the Goose site.

The regional camera monitoring program described here will also be used for grizzly bears and wolverine/furbearers (Section 9.2.2.2).

Trigger for Monitoring

The regional monitoring program using cameras will be triggered every third year of Construction, Operations and Post-Closure, if triggered, of the Project.

Methods

Remote motion-triggered cameras are a reliable method for examining wildlife habitat associations in the Arctic due to the landscape's short vegetation and features such as eskers and river crossings that direct wildlife movement through the landscape (Cutler and Swann 1999; Noel et al. 2006).

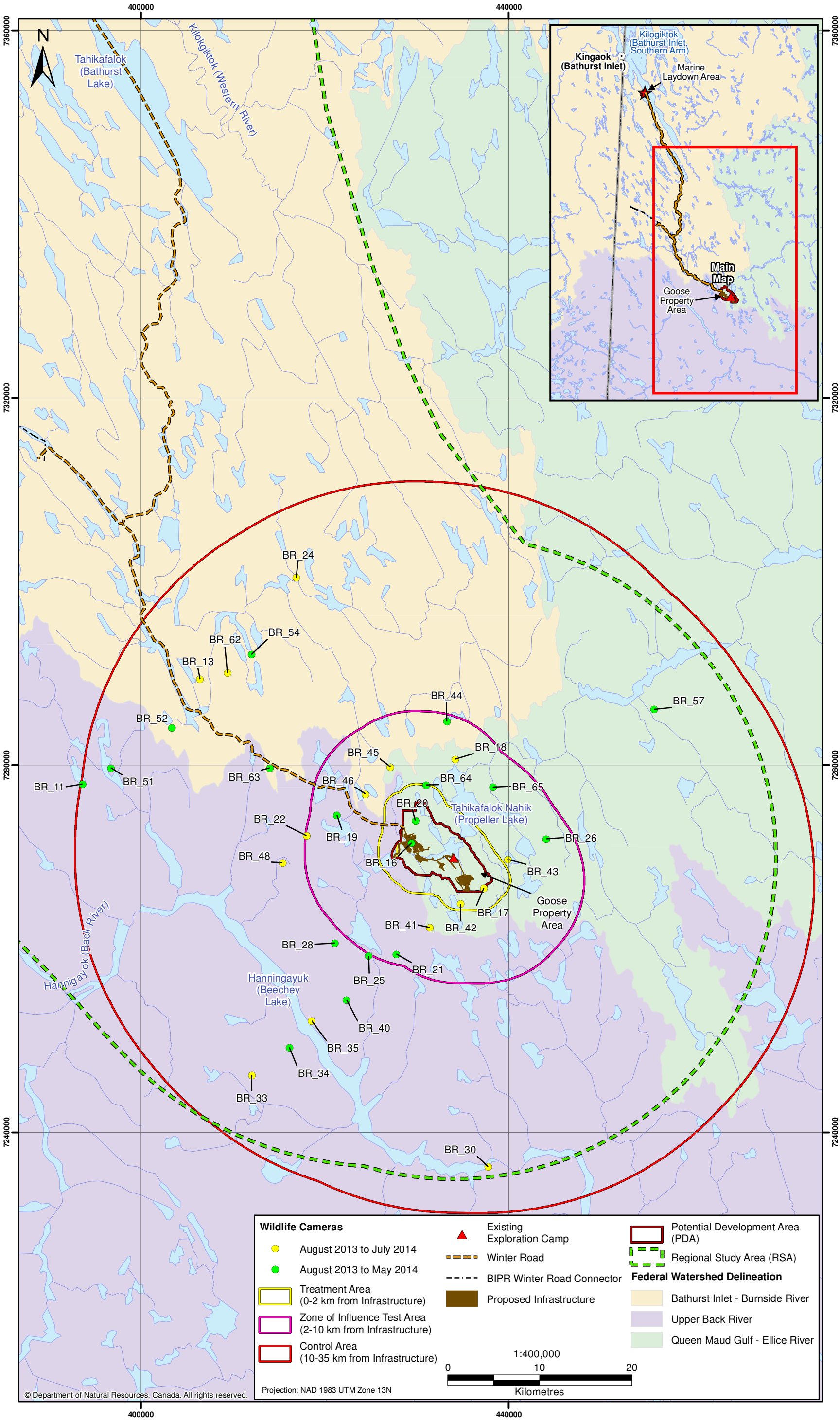
The regional camera monitoring program will be designed as a Before-After -Control-Impact (BACI) study, using the existing camera data from 2012 to 2015 as the before category. The existing camera study was arranged in five transect lines that run from southwest to northeast, perpendicular to the planned winter ice road (Figure 8.2-1; Rescan 2013, 2014). The five transects were monitored year-round during 2012 and 2013. Most cameras were recovered at the end of 2013, with the two southern transects monitored again in 2015.

Cameras will be placed in the field during the construction and operations phases of the Project. To evaluate ZOI-type effects, the cameras were grouped into three "zones" (Figure 8.2-1):

1. treatment, with cameras arrayed within 2 km of the Project site;
2. zone of influence (ZOI), with cameras arrayed between 2 and 10 km; and
3. control, with cameras arrayed outside of 10 km of the Project site.

Figure 8.2-1

Remote Camera Baseline Study Design (dots) and Proposed Sampling Design (circles)



In as many cases as possible, cameras will be re-deployed into their original positions so that the before and after data is comparable. Newly installed cameras will be calibrated against cameras that are being replaced in previous monitoring locations. Treatment cameras will be deployed at and within 2 km of the Goose site. Zone of influence and control and ZOI cameras will be deployed at baseline conditions and at additional locations such that ZOI and control cameras are placed in each cardinal direction from the Goose site. In order to control for potential effects of habitat, during baseline studies cameras were predominantly placed in areas of heath tundra. New cameras will also be placed in heath tundra and an analysis will be conducted using baseline data, prior to deployment, to determine the power to detect a ZOI given the number of cameras and using baseline data. Candidate locations for cameras will be chosen from vegetation maps prior to camera deployment, with final camera positioning conducted by a biologist in the field.

To improve independence, cameras will not be in line of sight of each other, and will preferably be a minimum of 2 km apart. Camera separation distances within ZOI and control zones will be similar to treatment cameras to minimize differences due to clustering, although some clustering of treatment cameras is unavoidable. Cameras will be oriented to ensure the area within 40 m in front of the camera is clear so that cameras are equal in their 'trigger zone' field of view.

Baseline studies were conducted with 60 cameras in five transects. These cameras will be distributed evenly, with 20 each in treatment, ZOI, and control groups. Camera locations will remain fixed over the foreseeable future to allow comparability between years and to improve power over time. Each camera will be deployed over all 12 months of the year. Camera data will be collected daily using triggered photos. Statistical tests and models will be carried out on monthly data. In order to ensure that camera effort is accounted for, each camera will also take timed photos which will be examined to obtain the number of days it is active and unobscured in each month. Thus, the camera program will include approximately n=20 cameras in each of g=3 zones with m=12 months of replicate data.

Cameras will be mounted in a security enclosure on a wooden tripod, which will be secured with rocks and covered with a plywood cap to deter birds from landing on the camera. In some cases, cameras will be protected with plywood sides to prevent excessive snow infiltration. Lithium batteries will be used to maintain camera performance at low temperatures.

Cameras will be programmed to take two types of photos: timed photographs and motion-triggered photographs. During winter, timed photos will be taken from 10 am to 5 pm to conserve batteries during dark periods. Cameras will take motion-triggered photos whenever there is movement in the field of view (about 25 to 30 m). Cameras will take 10 photos at one-second intervals with each trigger. Each image records the photo type (i.e., timed [T] or motion triggered [M]), the camera number, date, time, temperature, and, for motion-triggered photos, the number from the triggered series of photos taken (i.e., 1/10 to 10/10).

Data Analysis

Camera data will be analyzed to detect differences between muskox detections at increasing distances from the Goose site by fitting a spline, using a dose-response method (Boulanger et al. 2012) or other distance-dependent methods. If there is insufficient power using these methods, then a generalized linear mixed model (GLMM) will be used to detect differences in the treatment, ZOI and control areas, which will be chosen at distances established from avoidance studies in the literature. The model will include covariates for treatment, month, and a random effect for camera. A binomial distribution was used to model the proportion of days of effort with at least one muskox detected. If more powerful tests are developed or adapted to test these data, then these methods will be used in lieu of those above.

Power will also be calculated using the *simr* package (Green and MacLeod 2016) to carry out a simulation-based power of the GLMM to detect treatment effects of 0.4, 0.7 and 1.0. These effect sizes equate to odds of 1.5, 2.0 and 2.7 respectively. The number of cameras will be set between 14 and 29 per group. Type I errors (alpha) of 0.05 and 0.10 will be assessed.

8.2.2.3 Behaviour Monitoring

Objective

The objective of behaviour monitoring for muskox is to determine the effects of potential stressors (aircraft, blasting, vehicles) on muskox.

Methods, Analysis and Reporting

Behaviour monitoring for muskox will be conducted by wildlife monitors if muskox are observed within 1 km of the Project site. The methods, analysis and reporting for behaviour monitoring will follow the behaviour monitoring methods for caribou (Section 7.2.2.2).

8.2.2.4 Contributions to Regional/Collaborative Programs with GN

Should the GN develop a regional monitoring program for muskox that will also test the FEIS prediction that muskox will avoid the Goose site, then Sabina will consider contributing to this program in lieu of the proposed regional camera monitoring program.

9. Grizzly Bear and Wolverine

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9. Grizzly Bear and Wolverine

9.1 MITIGATION AND MANAGEMENT FOR GRIZZLY BEAR AND WOLVERINE

9.1.1 Overview of Potential Effects to Grizzly Bear and Wolverine

Seven potential effects to VECs grizzly bear and wolverine/furbearers were evaluated in the FEIS; these included habitat loss, disturbance, disruption of movement, direct mortality, indirect mortality, attraction, and exposure to contaminants. Due to the similarities in the residual effects predicted for both VECs (i.e., grizzly bear and wolverine/furbearers), mitigation and management measures are discussed together in this section.

In addition, reduction in productivity was considered, to evaluate the potential for synergistic effects on grizzly bears and wolverine/furbearers. Limiting the potential for synergistic effects will be achieved by implementing the mitigation and management measures for the seven direct effects listed above.

Habitat loss will occur in the Project footprint where natural vegetation is removed for the construction of the Project, and habitat loss was rated as a residual effect for grizzly bears and wolverine/furbearers in the FEIS. Habitat loss will be minimized by reducing the Project footprint and carrying out reclamation activities.

Indirect habitat loss caused by disturbance, measured as the potential for grizzly bears and wolverine/furbearers to avoid the Project site, was rated as a residual effect in the FEIS. A variety of mitigation and management activities are proposed, including design mitigation to limit noise, fixed and rotary-winged aircraft management, and blasting management should grizzly bears, wolverine, and other furbearers be observed near the site.

The potential for the disruption of grizzly bear and wolverine/furbearer movement patterns due to Project roads was evaluated. With mitigation, including setting speed limits and giving all wildlife the right of way, this effect was not rated as a residual effect.

The potential for direct mortality due to vehicle collisions was evaluated for grizzly bears and wolverine/furbearers. With mitigation, including setting speed limits and giving all wildlife the right of way, this effect was not rated as a residual effect.

The potential for indirect mortality was evaluated as the potential for increased access for hunters to the Project area. With mitigation, which includes closing the winter ice road to the public and prohibiting employees from bringing firearms to the site and hunting while at work, this was not rated as a residual effect.

The primary effect evaluated for grizzly bears and wolverine/furbearers was attraction to the Project area, and this was considered a residual effect for both grizzly bears and wolverine. A variety of mitigation and management activities are proposed to limit the attractiveness of the site to wildlife such as grizzly bears, wolverine, and other furbearers, including management of wastes, constructing and maintaining buildings to exclude bears and wolverines, and monitoring for and carrying out appropriate responses to problem animals.

The potential for grizzly bears and wolverine/furbearers to be exposed to contaminants was evaluated in the FEIS through a risk assessment, which found that grizzly bears and wolverine/furbearers would

not be at risk of uptake of hazardous chemicals. A series of standard management plans for chemicals was provided in the FEIS, including fuel, spill response, marine spills, and management of hazardous materials. After management, exposure to contaminants was not rated as a residual effect for grizzly bears and wolverine/furbearers.

Unless otherwise specified, mitigation and management actions for grizzly bears and wolverine will also be conducted for other furbearers such as wolves and foxes.

9.1.2 Mitigation and Management for Habitat Loss for Grizzly Bear and Wolverine

The following mitigation and management measures will be conducted during the construction, operations, and closure phases of the Project to reduce the potential for habitat loss for grizzly bears and wolverine:

- Sabina will design the Project footprint to be as small as possible.
- Dust will be managed on the Project site by setting and enforcing speed limits on all-season on-site roads and the application of dust suppressants where and when needed. Dust suppressants will be non-toxic for wildlife. Dust deposition rates and potential effects on vegetation will be monitored as described in the Air Quality Monitoring and Management Plan (Volume 10, Chapter 17).
- Areas of the Project will be reclaimed progressively during operations and at closure to minimize the area of disturbance to wildlife as described in the Mine Closure and Reclamation Plan (Volume 10, Chapter 29). Post-closure environmental monitoring will continue until it has been verified that reclamation has successfully met closure and reclamation objectives.
- The maternal dens of wolverine will be avoided, as well as the winter dens of grizzly bears.

9.1.3 Mitigation and Management for Disturbance of Grizzly Bear and Wolverine

A series of mitigation and management strategies will be in place to reduce the potential for disturbance to grizzly bears and wolverine/furbearers. These strategies are outlined below.

9.1.3.1 Design Mitigation

The following mitigation measures will be designed into the Project to limit disturbance to grizzly bears and wolverine:

- Project equipment will be chosen to limit the continuous noise produced by equipment such as generators, heavy trucks, and other mobile equipment. All Project equipment will be fitted with appropriate mufflers and silencers and will be well maintained.
- Project facilities will be designed to limit the amount of noise that is emanated by the Project, such as housing static noise sources (e.g., the crushers, mill and generators) in buildings and using acoustic screening such as wall or berms to muffle noise.

9.1.3.2 Construction Management

The following management actions will be applied during the construction phase of the Project:

- Carnivore (wolverine, wolf and fox) dens within 2 km of the Project footprint will be identified prior to construction and avoided where possible.
- Eskers containing known carnivore dens will not be used as a source of quarry material within an appropriate buffer.

- Construction activities will be avoided within 1 km of active wolf, fox, and wolverine dens during the active season, wherever possible. Note that this is for planned activities based on results of existing baseline surveys for wildlife. If unforeseen dens are observed during pre-construction surveys, appropriate mitigation and monitoring will occur, which may include establishing a buffer distance to limit disturbance. See Section 9.1.3.7 for additional detail on avoidance of dens during construction of the winter ice road.
- If work must be conducted near or at a den site during the active season, then Sabina will liaise with the GN prior to conducting the work.
- If a wildlife feature that is legislatively protected (carnivore den) is found within the slated Project footprint, then a buffer will be established and the feature will be avoided until such time as the wildlife has completed the use of the feature (Table 9.1-1). Following wildlife leaving the site, activities within the buffer will resume and the feature may be removed from within the stated Project footprint.
- If a wildlife feature that is legislatively protected (carnivore den) is found within a buffer of 1.0 km of construction activities, then the feature will be monitored for the duration of the season and the breeding success of the wildlife VEC will be reported in the following WEMP report.

Table 9.1-1. Wildlife Sensitive Periods Applicable for Grizzly Bear and Wolverine/Furbearers to the Project

VEC	Activity	Sensitive Period
Grizzly bear dens	Denning Cub rearing	October 15 to May 7 May 7 to October 15
Wolverine dens	Denning Early pup rearing	February 21 to May 7 May 7 to July 1
Wolf dens	Natal Denning Early pup rearing	May 1 to September 15 September 15 to October 31

9.1.3.3 Operations Management

The following management actions will be applied during the operations phase of the Project:

- If a special habitat feature (active carnivore den) is located within 1.0 km or within the Project footprint during active operations, the feature will be monitored until the cubs leave the den or nest, and den success will be reported in the WEMP report.

9.1.3.4 Fixed-wing Aircraft Management

The following management actions will be applied to fixed-wing aircraft during all Project phases to limit disturbance to grizzly bears and wolverine:

- Fixed-wing pilots will remain above 610 m local ground level at all times, except when landing or taking off from the Marine Laydown Area (MLA) or the Goose Airstrip.

9.1.3.5 Helicopter Management

The following management actions will be applied to helicopters during all Project phases:

- As part of pilot induction, pilots will be informed of their responsibilities to monitor, report, and avoid grizzly bear and wolverine/furbearers and dens. Maps will be provided to pilots that

identify important habitat areas for wildlife to be avoided, such as dens that are repeatedly used between seasons, such as wolf, fox, and wolverine dens.

- Pilots will adhere to the required minimum altitude limit of 300 m for aircraft flight (with the exception of take-off and landing and where low elevation surveys are required).
- Pilots will report all incidental sightings of grizzly bears and furbearers to the Environment Department.

9.1.3.6 Blasting Management

The following management actions will be applied during the construction and operations phases to limit any disturbance due to blasting on grizzly bears (not applied to other furbearers). When grizzly bears are observed by wildlife monitors (Section 7.2.1.3) or are incidentally observed (Section 9.2.1.2), the following mitigation will be triggered:

- When grizzly bears are observed by wildlife monitors or are observed incidentally at less than 2 km from the site, a site alert will be called (see Section 9.1.7.4 – Protocol for Responding to Observations of Grizzly Bear and Wolverine).
- When grizzly bears are observed within 1 km of the open pits, then blasting will be ceased until the bear moves off. Note, that a review of seven operating and/or permitted mines in the Canadian Arctic indicates that there is no precedent for setting a distance at which blasting will be halted for bears. Typically, management for bears is to prevent them from being attracted to mines and exploration camps, rather than managing disturbance to bears. The Meadowbank project uses a 500 m buffer to trigger blasting management for muskox.
- Note that mining projects in the Canadian Arctic report that grizzly bears can easily become acclimated to mining operations. If a bear is observed for more than 24 hours in proximity of the Project, then blasting may resume as long as the bear is out of the blast safety area.
- During all seasons, if any bears are within the blast safety areas—the area potentially affected by fly rock or debris—then the blast will be delayed until caribou move out of the area. The blast safety area is part of the personnel safety requirements and is determined prior to each blast.

9.1.3.7 Winter Ice Road Management

The winter ice road to the MLA will be built across lakes and portages and on the sea ice of southern Bathurst Inlet. The FEIS evaluated the potential for construction of the road to remove or disturb grizzly bear dens in the tundra and concluded that this potential effect was very unlikely because the areas preferred for denning (e.g., eskers) are not preferred for winter ice roads. During the DEIS review, the GNWT requested that pre-construction surveys be conducted for grizzly bear dens.

Considering the above, the following mitigation strategies will be implemented prior to construction of the winter ice road:

- The road portages between lakes will be planned to avoid areas with a higher chance of supporting grizzly bear denning (e.g., eskers).
- If the planned portages occur in areas preferred by grizzly bears as den sites, then pre-construction surveys will be conducted (Section 9.2.1.5).
- The following actions will be taken if a likely grizzly bear den is discovered during pre-construction surveys in order to reduce the chance of disturbance or mortality of bears:
  - marking the location of the bear den with a GPS;

- communicating the location of the den to construction personnel;
- avoiding the bear den by 1 km; and
- under special circumstances, implementing an exception to the 1 km buffer for logistical reasons following consultation with the GN.

9.1.4 Mitigation and Management for Disruption of Movement of Grizzly Bear and Wolverine

Mitigation and management for disruption of movement of grizzly bears and wolverine/furbearers focuses on management of the winter ice road (only for wolverine) and on-site Project roads.

The following management actions will be conducted whenever on-site roads and the winter ice road are in use:

- Traffic on all roads will be managed and monitored through a central dispatch.
- In order to reduce the frequency of traffic on the winter ice road that may deter wildlife from crossing, trucks may be grouped into convoys.
- All wildlife will be given the right of way on Project roads.

9.1.5 Mitigation and Management for Direct Mortality and Injury of Grizzly Bear and Wolverine

Mitigation and management to prevent direct mortality and injury of grizzly bears and wolverine focuses on management of roads to prevent any vehicle-wildlife collisions. Management for problem wildlife encountered at the Project is described in Section 9.1.7 Mitigation and Management for Attraction of Grizzly Bear and Wolverine/Furbearers.

The mitigation and management strategies outlined for caribou in Section 7.1.5, Mitigation and Management for Direct Mortality and Injury of Caribou are applicable for grizzly bear and wolverine/furbearers, and will serve to reduce the potential for direct mortality and injury of grizzly bears and wolverine/furbearers.

9.1.6 Mitigation and Management for Indirect Mortality of Grizzly Bear and Wolverine

The mitigation and management strategies outlined for caribou in Section 7.1.6, Mitigation and Management for Indirect Mortality of Caribou with regards to no hunting policies and access management and human activity monitoring along site roads are applicable to grizzly bears and wolverine/furbearers and will serve to reduce the potential for indirect mortality for these species.

9.1.7 Mitigation and Management for Attraction of Grizzly Bear and Wolverine

Mitigation and management to prevent attraction of grizzly bears and wolverine/furbearers focuses on management of wastes and infrastructure design to prevent wildlife from accessing the Project. A series of mitigation and management strategies will be in place to reduce this potential effect, as outlined below.

9.1.7.1 Design Mitigation

- Design buildings to exclude wildlife (e.g., construct vents to prevent small mammals and birds from entering and install skirting around the bottom of buildings to exclude bears and wolverine).
- If wildlife are able to access buildings through damaged skirting, then skirting will be repaired immediately.

- If wildlife are able to access buildings through vents, windows, or by other means, then measures will be taken to exclude wildlife.

9.1.7.2 Wildlife Attractant Management

- Wildlife attractants will be managed to reduce the attractiveness of the site to bears and wolverines.
- If wildlife (i.e., grizzly bears and wolverine) are found to use elements of the Project infrastructure (e.g., the waste management facility), then a review of waste management activities will be triggered.
- If grizzly bears and wolverine persist in using infrastructure components despite updated waste management and site audits, then other exclusion infrastructure may be used (e.g., fencing).
- All attractants and wastes (garbage, food waste) will be stored at temporary (construction) and permanent site infrastructure in bear-proof storage containers. Bear-proof containers must be tightly secured at all times. Standard procedures for waste containers that are considered effective at preventing bears from accessing wastes will be implemented.
- Regular road and camp cleanups will be conducted to ensure that no hazardous substances, wires, or loose materials are present to endanger wildlife and to ensure proper storage and disposal of hazardous wastes.
- Waste will be removed from collection sites regularly, incinerated in an approved incinerator or stored in wildlife-proof areas and wildlife-proof buildings until incineration.
- All waste which should not be incinerated will be disposed at an approved disposal site as soon as possible.
- Landfills will be used only for disposal of non-wildlife attracting waste.

9.1.7.3 General Mitigation and Management to Reduce Human-Wildlife Interactions

- Implement facilities design and maintenance to exclude grizzly bears and wolverines, as described in 9.1.7.1.
- Ensure management of attractants, particularly wastes, as described in 9.1.7.2.
- Implement a policy of no feeding and no intentional attraction of wildlife, as well as a no littering policy.
- Disseminate protocol for human-wildlife Interactions to all employees and contractors as part of their orientation.
- Lead management responses undertaken by identified supervisors.
- Ensure all field and outdoors staff receive training on responding to grizzly bear and wolverine encounters, including identification of grizzly bear behaviour, emergency communications protocols, and the use of deterrents.
- Ensure personnel do not disturb wildlife that avoid humans and show normal feeding behaviour.
- Inform employees about and enforce disciplinary consequences of disregarding measures taken to manage problem wildlife (e.g., area closures).
- Identify appropriate personnel (i.e., environmental monitor, wildlife biologist) to monitor and evaluate human-wildlife conflicts using the protocol for human-wildlife interactions to

determine whether animal should be considered a problem animal and to identify an appropriate course of action.

- Avoid destruction of wildlife unless no other recourse is possible. Grizzly bears or other wild animals that cause injury to humans as a result of natural defensive or protective behaviour (e.g., protecting its young during a startling encounter) should not be destroyed or translocated.

9.1.7.4 Protocol for Responding to Observations of Grizzly Bear and Wolverine

This section provides guidance to Project personnel for responding to grizzly bears, and to a lesser extent, wolverine, should they be observed on or near site.

The philosophy of responding to grizzly bears and wolverine can be summarized as:

1. Reduce risk to Project personnel through training and immediate response to possible grizzly bear/wolverine interactions.
2. Dissuade grizzly bears and wolverines from the Project site through management activities (managing wastes, eliminating wildlife attractants, maintaining skirting and fencing, etc.) to make the site less appealing to wildlife.
3. Only if #2 above has been implemented and if grizzly bears or wolverine persistently approach the site, or Project personnel are at risk, would any action towards the animal be taken.

The following mitigation and management actions will be conducted during all Project phases for responding to observations of grizzly bears and wolverine:

- All incidental observations of grizzly bears and wolverine (Section 9.2.1.2) from pilots, drivers, and on-site and field personnel will be immediately reported to the Environment Department.
- The Environment Department will keep a log of all grizzly bear and wolverine sightings and will communicate these sightings to field and on-site crews immediately if there is a safety concern or daily as part of morning toolbox safety meetings. Information on bear and wolverine observations will also be posted and made available to all staff.
- All field crews will scan the immediate area, either by helicopter or from the ground, prior to leaving the safety of helicopters or vehicles to conduct work.
- Field crews will regularly scan the areas around their work site approximately every five minutes.
- If field crews (i.e., those working without a vehicle or helicopter) observe a grizzly bear, they will contact the Environment Department and immediately arrange the removal of the field crew, irrespective of the distance to the grizzly bear. Note: if a grizzly bear is visible to a field crew, then the bear is already sufficiently close that procedures should be taken to remove/protect the field crew.
- The distance to the Project site will partially determine the response to a bear, including:
  - a grizzly bear observed at more than 4 km from site will be recorded, but will not trigger any management;
  - a grizzly bear observed at less than 4 km from site will trigger monitoring and a site-wide notice to alert personnel a bear is in the area;
  - a grizzly bear observed at less than 2 km from site will result in the mobilization of ground monitoring crews, prepared with appropriate deterrence options, if necessary. The helicopter may be put on notice as a deterrent option;

  - a grizzly bear observed at less than 1 km from site will result in vacating personnel from that part of the Project site, or to moving personnel indoors;
  - a grizzly bear observed less than 1 km from site and approaching camp will trigger the protocol for management responses, as outlined in Table 9.1-2.
- If personnel working on-site or near vehicles, aircraft or buildings observe a grizzly bear, personnel will immediately remove themselves from danger (e.g., take shelter in a vehicle, in a building, or leave the site) and then contact the Environment Department to report the sighting.
- If personnel working in the field or on-site observe a wolverine, wolf, or fox or if there is a problem animal reported on-site, the crew will immediately communicate the observation to the Environment Department and remove themselves from the area if the animal appears aggressive. If the animal does not appear aggressive and there are no reports of problem or habituated wolverine on-site, the crew may continue to observe the animal.
- If a grizzly bear or wolverine is observed in camps, or are repeatedly observed near camps (e.g., two or three times within a week), then this will trigger:
  - a review of waste management activities to ensure that these animals are not being attracted to site;
  - a review of camp facilities management to ensure that skirting and fencing are in good condition, and repair of any structures that may allow access for these animals;
  - an update to all personnel that a potentially habituated animal may occur on-site and that appropriate safety protocols should be implemented (e.g., post warnings, conduct area closure, etc.).
- If a grizzly bear or wolverine is observed routinely at camp, or animals are behaving in a habituated or aggressive fashion, then the Protocol for Management of Problem Wildlife (Section 9.1.7.5) will be triggered.

9.1.7.5 Protocol for Management of Problem Wildlife

If an animal has been identified as a “problem animal”, then this protocol is triggered. The Protocol is written to address problem bears and wolverine; however, it can be modified to address other problem wildlife if necessary.

The following management options are meant to ensure the safety of personnel, and dissuade habituated or aggressive grizzly bears or wolverine from visiting the site. Ideally, this list of options would be followed sequentially as a situation develops, but managers may choose to escalate the actions taken in response to an aggressive, predatory, or injured animal as described in Table 9.1-2. Options include:

1. Monitoring: report and record wildlife sightings and signs.
2. Post warnings: provide accurate and current information of all potentially dangerous wildlife in the area.
3. Area closures: restrict worker access to areas with problem wildlife, pending suitable controls.
4. Adverse conditioning (AVCD): apply AVCD activities to problem wildlife to prevent or reverse habituation.
5. Destruction: undertake (with authorization from appropriate wildlife management authority) only when an animal is considered to pose an unacceptable hazard to human safety.

Table 9.1-2. Protocol to Determine Appropriate Management Responses to Human-Animal Interactions

Type of Human-Animal Interaction	Management Response Options				
	Monitor	Post Warning	Area Closure	AVCD	Destroy
1. Animal sighting or sign reported	X	X			
2. Animal showing normal feeding behaviour and avoids people	X	X			
3. Animal reacting defensively following surprise or provoked encounter (defensive aggression)	X	X	X		
4. Animal tolerates people but ignores them and their facilities (no threat present)	X	X	X	X	
5. Animal shows repeated interest in people and/or human facilities, which will likely result in food-conditioning or close approaches (habituated)	X	X	X	X	
6. Animal receives minimal or low-level reinforcement to unnatural food sources (mildly food-conditioned)	X	X	X	X	
7. Animal is heavily habituated to people and has repeatedly obtained unnatural foods (food-conditioned)	X	X	X	X	
8. Animal has previously been relocated and is unlikely to change its behaviour		X	X	X	X
9. Animal displays aggressive, offensive, or predatory behaviour and is an imminent threat to human safety		X	X	X	X

The measures taken, and their efficacy, will be evaluated and reported to the GN on an ongoing basis until the situation has been resolved, and summarized in the annual WEMP report.

The objective for this section is to result in zero injuries or mortalities to grizzly bears or wolverine. Exceedance of this objective will result in a thorough review of on-site wildlife attractant management and waste management programs. It should be noted that a wildlife injury or mortality is not required to trigger the review of these programs. As discussed above, a review of wildlife attractant and infrastructure monitoring policies is also triggered by the repeated observation of grizzly bears or wolverine on-site.

9.1.8 Mitigation and Management for Exposure to Contaminants for Grizzly Bear and Wolverine

The mitigation and management strategies outlined for muskox in Section 8.1.8, Mitigation and Management for Exposure to Contaminants for Muskox are applicable for grizzly bears and wolverine/furbearers, and will serve to reduce the potential for exposure to contaminants of these species. Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

9.2 MONITORING FOR GRIZZLY BEAR AND WOLVERINE

This section describes monitoring and mitigation activities to minimize potential effects of the Project on grizzly bears and wolverine/furbearers that will be included in the WEMP, primarily those related to attraction to the Project. Monitoring is divided into two sections: 1) monitoring to trigger management, and 2) monitoring to evaluate the predicted effects of the Project on grizzly bears and wolverine/furbearers.

There are six types of monitoring that will trigger management:

1. monitoring for use of waste and other facilities using cameras;
2. incidental observations;

3. skirting and building monitoring;
4. waste management monitoring;
5. pre-construction surveys for grizzly bear dens on the winter ice road; and
6. monitoring for grizzly bear in relation to blasting.

Three monitoring programs are proposed for grizzly bears and wolverine/furbearers to test the predictions of the FEIS:

1. footprint monitoring to measure habitat loss in the Project footprint;
2. regional monitoring for grizzly bears and wolverine/furbearers using remote motion-triggered cameras to measure avoidance or attraction; and
3. contributions to regional GN monitoring initiatives if they will adequately test the FEIS predictions.

9.2.1 Grizzly Bear and Wolverine Monitoring to Trigger Mitigation

9.2.1.1 On-site Camera Monitoring

Objectives

The objective of the on-site camera program is to evaluate how grizzly bears and wolverine/furbearers (and other wildlife VECs) interact with the Project site; actions include:

1. monitoring the Project site to examine how grizzly bears and wolverine/furbearers interact with Project facilities (e.g., on roads, camps) particularly at locations that are not staffed for long periods of time (such as the MLA);
2. monitoring the Project site at areas with and without mitigation structures or activities to evaluate the efficacy of mitigation activities (e.g., at road-crossing structures vs. without); and
3. recording the times at which grizzly bears and wolverine/furbearers use the Project site during the year.

Triggers, Methods and Reporting

The on-site camera monitoring program will be in place throughout construction and operations of the Project.

Methods

Please see Section 7.2.1.5, On-site Camera Monitoring (for caribou) for details on the methodology and analysis for the on-site camera monitoring program.

Triggers for Adaptive Management

Observations of grizzly bears being attracted to and interacting with the Project site in ways that may cause harm to bears or employees (e.g., frequenting the waste management facility) will trigger adaptive management to review the causes for why bears are attracted and to provide mitigation.

Reporting

Data and analyses will be reported in the annual WEMP Report.

9.2.1.2 Incidental Observations

Objectives

For grizzly bear and wolverine/furbearers, the objectives of the incidental observation program are to collect information on the timing and occurrence of these carnivores on the Project site, trigger suitable management, and to record unusual or unexpected interactions between these animals and the Project.

Triggers for Monitoring

The incidental observation monitoring program will be in place throughout construction and operations of the Project.

Methods

Incidental observations of grizzly bears and wolverine/furbearers will be recorded by all Project personnel, including environmental monitors, pilots, drivers on on-site and winter ice roads, and other Project personnel. More details are available in Section 7.2.1.4, Incidental Observations (for caribou).

All observations will be recorded by the Environment Department in the wildlife log.

Triggers for Adaptive Management

Six activities may be triggered by the observation of grizzly bears:

1. A spike in the number of bears observed at site will trigger adaptive management.
2. Should grizzly bears be observed near the site, personnel will alert the Environment Department, which may trigger monitoring by environment personnel and mitigation actions.
3. Should pilots observe grizzly bears (and other wildlife) while flying, pilots will avoid bears.
4. Should drivers observe grizzly bears on or adjacent to the road, they will give bears the right of way.
5. Should grizzly bears be observed within prescribed distances of active blasting, then monitoring will be conducted and blasting schedules may be modified (see Section 9.2.1.6).
6. Should unexpected observations be made of wildlife in distress (injured, etc.), then the Environment Department and the appropriate regulator will be notified .

Reporting

Data, analyses, and adaptive management will be reported in the annual WEMP Report.

9.2.1.3 Skirting and Building Monitoring

Objective

The objective of skirting and building monitoring is to evaluate whether mitigation measures to exclude bears and wolverine/furbearers from Project buildings and other infrastructure has been successful and to trigger appropriate management.

Methods

Environmental staff will monitor skirting and fencing on a monthly basis. Monitors will walk the perimeter of the skirting/fencing looking for damage, downed fencing, animals, or animal sign inside the fence. Cases where the fence/skirting has been damaged or breached will be recorded in an inspection log, and may include the following information:

- damage to the fencing or materials that may be causing the fence to be ineffective (i.e., snow, vegetation); and
- any wildlife observed accessing through the fencing/skirting.

Prior to construction of the Project, a detailed SOP will be produced and distributed to the NIRB and the KIA for review and comment. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Data Analysis

The results of the regular infrastructure monitoring and any management actions taken will be collated into a database and tracked for changes between years and whether any changes are related to specific activities or mitigation actions.

Triggers for Adaptive Mitigation

Damaged skirting and fencing will be reported to maintenance staff and trigger either immediate repair or installation of new/additional skirting and fencing.

Reporting

Results of regular infrastructure monitoring and any triggered management will be reported in the annual WEMP report.

9.2.1.4 Waste Management Monitoring

Objective

The objective of waste management monitoring is to evaluate if waste management is being effective and not producing an attractant for wildlife, such as grizzly bears and wolverines.

Methods

Waste monitoring is divided into four parts:

1. incidental observations of misdirected wastes;
2. regular surveys of waste facilities;
3. records of observations of wildlife at waste facilities; and
4. an annual audit of waste management and camps.

All staff will be responsible for recording incidental observations of misdirected wastes or inappropriate waste storage. All personnel will report to the Environment Department when they observe waste disposed of in a manner that could attract wildlife (i.e., littering, misdirected waste, uncontained waste, wildlife accessing waste). Waste disposal facilities will be monitored weekly by environmental or

operations staff to ensure that wastes are being properly disposed of and inspected for signs of wildlife activity (e.g., chew marks on waste, wildlife-mediated waste dispersion, wildlife scat or tracks).

Cases of misdirected waste or wildlife-waste interaction will be recorded in a waste inspection log, which will include the location, date, and time; type and amount of waste; and any damage to mine property. Any incidents where wildlife have accessed wastes will be reported to environment personnel. Problem wildlife may be evaluated by environment personnel and corrective measures implemented in consultation with the Nunavut Department of Environment.

In addition, an annual audit will be conducted of the various camps and facilities to evaluate any opportunities for improvement in the handling of wastes and wildlife attractant management. Prior to construction of the Project, a detailed SOP will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Data Analysis

The results of the regular waste management measures and the annual audit of the site will be collated into a database and tracked for changes between years and whether any changes are related to specific activities or mitigation actions.

Triggers for Adaptive Mitigation

- Waste management activities may be triggered by observations of misdirected wastes.
- Incidental observations of grizzly bears, wolverines or foxes on the site will trigger waste management monitoring.
- Repeated observations of grizzly bears, wolverines or foxes, which are known to be attracted to camps and facilities, will trigger waste management monitoring (including a site audit if there are several observations in a month) and a review of the wildlife attractant management measures (Section 9.1.7.2).

Reporting

Results of regular waste monitoring, the annual audit, any mitigation that has been conducted, and the success of that mitigation will be reported in the annual WEMP report.

9.2.1.5 Pre-Construction Surveys for Grizzly Bear Dens on the Winter Ice Road

Objectives

The objective of bear den monitoring is to reduce the chance of direct bear mortality due to construction of the winter ice road on locations where bears may have built dens.

Monitoring Methods

Monitoring methods will follow a four-step process:

1. The types of places where grizzly bears choose to den are relatively well understood. Bears are thought to choose areas of deep, dry soil and woody vegetation to coalesce the roof of the den – such as the lower slopes of eskers. The first step in identifying dens will be to identify the locations where the proposed road overlaps areas most likely to support denning, using terrain data from Terrestrial Ecosystem Mapping conducted in the Local Study Area for the DEIS.

2. During the detailed engineering and planning phase for the winter ice road to the MLA, engineers and biologists will use the data provided in step #1 and conduct a detailed field inspection of the road route. Field observations will be used to supplement the areas identified in #1 above.
3. Where possible, the road route will be altered to avoid these areas identified in #1 and #2 to reduce the chance of affecting a bear den.
4. If it is not possible to avoid an area where grizzly bears may den, then pre-construction surveys will be conducted using Forward Looking Infrared (FLIR) or other applicable methods as technology and success of the program determines.

Data Analysis

Maps of higher likelihood denning sites, along with the results of pre-construction surveys, will be recorded in a database and maintained throughout the life of the Project.

Triggers for Adaptive Mitigation

If monitoring identifies a bear den, then a suitable buffer will be set up for the den (Section 9.1.3.7).

Reporting

All reports of bear dens will be included in the annual WEMP report.

9.2.1.6 Monitoring for Grizzly Bear in Relation to Blasting

Objectives

The objective of this monitoring program is to trigger appropriate mitigation measures should grizzly bears be observed close to the pits during above-ground blasting (Section 9.1.3.6).

Triggers for Monitoring

Monitoring will be conducted prior to blasts (Section 7.2.1.3).

Methods

As wildlife monitors are conducting pre-blast surveys, they will record any grizzly bears. See Section 7.2.1.3 for detailed methods.

Triggers for Adaptive Management

If any number of grizzly bears are observed within 1 km of the location of above-ground blasting, then adaptive management will be triggered (Section 9.1.3.6). If grizzly bears are observed closer to the site of the blast (within 500 m), then an additional set of adaptive management will be triggered.

Reporting

Data, analyses, and adaptive management actions will be reported in the annual WEMP report.

9.2.2 Grizzly Bear and Wolverine Monitoring to Measure Predicted Effects

9.2.2.1 Footprint Monitoring

Objective

The objective of footprint size monitoring is to measure the actual habitat lost within the constructed Project footprint for each wildlife VEC.

Methods

See Section 7.2.2.1, Footprint Monitoring (for caribou) for a description of this Program, including triggers, methods, adaptive management and reporting.

9.2.2.2 Regional Monitoring of Grizzly Bears with Motion-triggered Cameras

The FEIS predicted that grizzly bears and wolverine/furbearers may avoid the Project mine site (the Goose site) due to disturbance, or may be attracted to the Goose site. The objective of the regional camera monitoring program is to determine if grizzly bears and wolverine/furbearers are avoiding or attracted to the Goose Psite. This program will be the same as that used for muskox (Section 8.2.2.2).

9.2.2.3 Contributions to Regional Programs with GN

Should the GN develop a regional monitoring program for grizzly bears and wolverine that they can show will also test the FEIS prediction that grizzly bears and wolverine/furbearers will be either attracted to or avoid the Goose site, then Sabina will consider contributing to this program in lieu of the proposed regional camera monitoring program.

10. Raptors

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10. Raptors

10.1 MITIGATION AND MANAGEMENT FOR RAPTORS

10.1.1 Overview of Potential Effects to Raptors

Potential effects to raptors were evaluated in the FEIS; these included habitat loss, disturbance, disruption of movement, direct mortality, indirect mortality, attraction, and exposure to contaminants. Mitigation and management measures to reduce the potential for these effects to result in residual effects on raptors are discussed in this section.

In addition, reduction in productivity was considered to evaluate the potential for synergistic effects on raptors. Limiting the potential for synergistic effects will be achieved by implementing the mitigation and management measures for the seven direct effects listed above.

Habitat loss will occur in the Project footprint where natural vegetation is removed for the construction of the Project, and habitat loss was rated as a residual effect in the FEIS. Habitat loss will be minimized by reducing the Project footprint and carrying out reclamation activities.

Indirect habitat loss caused by disturbance was rated as a residual effect for raptors in the FEIS. A variety of mitigation and management activities are proposed, including design mitigation to limit noise, management of construction and operations activities to limit disturbance, and fixed and rotary-winged aircraft management to limit disturbance to raptors, particularly those nesting near the Project.

Disruption of movement for raptors due to the Project was not considered a residual effect in the FEIS because there will be no tall structures in the Project design that may impede movements of raptors on their home ranges, and migratory movements are typically done at high altitudes well above the Project.

The potential for direct mortality due to collisions with vehicles and aircraft, in addition to blast rock, was rated as a residual effect in the FEIS. A variety of mitigation and management activities are proposed, including blasting management and mitigation to limit disturbance to reduce the potential for mortality of raptors nesting near the Project.

The potential for indirect mortality was evaluated as the potential for increased access for hunters to the Project area. The lack of hunting for raptors, along with mitigation measures that include prohibiting employees from bringing firearms to the site and hunting while at work, this was not rated as a residual effect.

The potential for raptors to be attracted to the Project site, in particular for nesting opportunities in open pits and quarries, was rated as a residual effect in the FEIS. A variety of mitigation and management activities are proposed to reduce the chances of successful nesting within open pits and quarries, such as tactics to dissuade or deter raptors from establishing nests in areas of active work.

The potential for raptors to be exposed to contaminants was evaluated in the FEIS through a risk assessment, which found that raptors would not be at risk of uptake of hazardous chemicals. A series of standard management plans for chemicals was provided in the FEIS, including fuel, spill response, marine spills, and management of hazardous materials. After management, exposure to contaminants was not rated as a residual effect for raptors.

10.1.2 Mitigation and Management for Habitat Loss for Raptors

The mitigation and management strategies outlined for muskox in Section 8.1.2 Mitigation and Management for Habitat loss for Muskox are applicable for raptors, and will serve to reduce the effects of habitat loss on this VEC.

10.1.3 Mitigation and Management for Disturbance of Raptors

A series of mitigation and management strategies will be in place to reduce the potential for disturbance to raptors. These strategies are outlined below.

10.1.3.1 Design Mitigation

See Section 7.1.3.2 Design Mitigation (for caribou) for design measures to limit disturbance from Project infrastructure and activities applicable to all wildlife.

10.1.3.2 Construction Management

All raptor nesting sites in the LSA were identified as part of baseline studies. There are no raptor nesting sites within the proposed footprint area and only two nesting sites within 1.5 km of the Project site. The following management actions will be applied during the construction phase of the Project:

- Situate Project infrastructure to avoid active raptor nests, where possible.
- Schedule construction activities, where possible, to avoid disturbance of known raptors nests within 1.0 km during the nesting period: April 15 to August 15.
- During ground clearing, if it is not possible to avoid the nesting period, then conduct pre-construction surveys for raptor nests.
- If a raptor nest is found during pre-clearing surveys within the slated Project footprint, then the Environment Manager will set up a buffer with an objective of 1.5 km, but of at least 100 m, around the nest site. The nest will be monitored and the breeding success of the raptor will be reported in the WEMP (Section 10.2.1.2).
- The results of pre-construction surveys and the mitigation actions taken, including the exact buffer distance employed for any nest sites recorded during pre-clearing surveys, will be reported in the next Wildlife Mitigation and Monitoring Program Report or directly to appropriate regulators on a case-by-case basis to advise on the management response, if necessary.
- Prior to removal or deterrence of raptors, the Proponent will contact the GN to discuss proposed mitigation options as listed in the WMMP Plan, and will obtain the required permit prior to undertaking any activity that can lead to the destruction of raptor nests or the deterrence of raptors from nesting sites.

10.1.3.3 Operations Management

The following management actions will be applied during the operations phase of the Project:

- Project infrastructure (e.g., buildings, towers, etc.) will be constructed and maintained in such a way as to limit the attractiveness as a nesting site to raptors.
- Raptors can become acclimated to human activities and will build nests on infrastructure. If a raptor builds a nest on Project infrastructure (e.g., building, towers, etc.) then normal operations at that site can continue. The Environment Manager will manage the area surrounding the nest such that no new activities will be conducted within 100 m of the active raptor nest, but

existing activities can continue. The nest will be reported to the GN and monitored to determine the nest success, which will be reported in the WEMP.

10.1.3.4 Fixed Wing Aircraft Management

See Section 7.1.5.6 Fixed Wing Aircraft Management (for caribou) for measures to limit disturbance from fixed-wing air traffic applicable to all wildlife.

10.1.3.5 Helicopter Management

The following management actions will be applied to helicopters during all Project phases:

- As part of pilot induction, pilots will be informed of their responsibilities to monitor, report, and avoid raptors. Maps will be provided to pilots that identify areas with concentrations of wildlife during certain seasons, including areas with raptor nests.
- Pilots will avoid raptor nests by at least 300 m.
- Pilots will report all incidental sightings of raptors and raptor nests to the Environment Department.

10.1.4 Mitigation and Management for Disruption of Movement of Raptors

The Project is not expected to disrupt the movements of raptors within their territory during the breeding season nor during annual migratory movements.

10.1.5 Mitigation and Management for Direct Mortality and Injury of Raptors

Mitigation and management to prevent direct mortality and injury of raptors focuses on management of roads and aircraft at the landing strip to prevent any vehicle-raptor collisions, as well as blasting management for raptors that may choose to nest in open pits and quarries.

Management to prevent direct mortality of raptors on roads will include:

- Road-kill will be removed from the road and disposed using approved methods (i.e., incineration or transport away from the Project site) to avoid attracting carrion feeders to the roadside.

Cliff-nesting raptors can be attracted to mining pits as nesting sites. Management to prevent mortality to raptors in open pits and quarries include:

- The open pits will be monitored for raptor nesting (Section 10.2.1.1).
- If a raptor nest is observed being constructed in a pit, but the raptor has not yet laid eggs, then the nest will be removed by environment personnel.
- If locations are found that are frequently used as nests, then appropriate mitigation will be used to dissuade raptors from using this area (e.g., netting, bird spikes, etc.).
- If a raptor persist in attempting to nest in the pits despite the mitigation listed above, then raptors will be excluded from the pits using auditory or visual hazing methods (e.g., bear bangers, bright lights, playback of raptor calls, flashers, models of raptors, etc.). Sabina will obtain an appropriate permit prior to conducting these activities.

10.1.6 Mitigation and Management for Indirect Mortality of Raptors

The mitigation and management strategies outlined for caribou in Section 7.1.8 Mitigation and Management for Indirect Mortality of Caribou with regards to no-hunting policies, access management,

and human activity monitoring along site roads are applicable to raptors and will serve to reduce the potential for indirect mortality for this VEC.

10.1.7 Mitigation and Management for Attraction of Raptors

Monitoring and management for raptors attracted to the open pits as nesting sites is discussed in Section 10.1.7 and management for raptors attracted to nest on Project infrastructure is discussed in Section 10.1.3.3.

10.1.8 Mitigation and Management for Exposure to Contaminants for Raptors

The mitigation and management strategies outlined for muskox in Section 8.1.8, Mitigation and Management for Exposure to Contaminants for Muskox are applicable for raptors, and will serve to reduce the potential for exposure to contaminants of these species. Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

10.2 MONITORING FOR RAPTORS

This section describes monitoring and mitigation activities to minimize potential effects of the Project on raptors that will be included in the WEMP.

This section is divided into two subsections, the first describing the monitoring that will be conducted to trigger mitigation activities designed to minimize impacts to raptors, and the second describing monitoring to evaluate the potential effects of the Project on raptors.

Three types of monitoring have been proposed that will trigger mitigation activities designed to minimize impacts to raptors. These monitoring programs are:

1. pit and quarry wall nest monitoring;
2. pre-clearing surveys for raptor nests; and
3. incidental observations.

Two types of monitoring of raptors to measure predicted effects will be carried out:

1. measurement of habitat loss in the Project footprint; and
2. regional monitoring for raptors (aerial nest surveys).

10.2.1 Raptor Monitoring to Trigger Mitigation

10.2.1.1 Pit and Quarry Wall Nest Monitoring

Objectives

The objective of the pit and quarry wall nest monitoring is to identify active raptor nests at risk of disturbance from blasting activities, and implement mitigation to exclude raptors prior to nest building.

Trigger for Monitoring

Nest monitoring at pit and quarry sites will be conducted during the raptor nesting period if blasting is planned, to ensure that adults are excluded from the pit and cannot nest build.

Monitoring Methods

Nest surveys will be conducted in pit and quarry areas scheduled for blasting during the raptor breeding period by qualified personnel (i.e., biologists trained in bird identification and behaviour) on a weekly or bi-weekly basis. Standard methods will include a two-person team: one scans the pit walls for roosting raptors or nest-building while the other scans the sky for raptors.

Observations of birds, nests, and nesting activity such as nest construction, copulations, incubation, perching, food deliveries, and territorial displays will trigger deterrents. Additional monitoring will be conducted to confirm that deterrents were successful and the raptor has left the pit, or to trigger additional deterrents. Deterrents can include bear bangers, air cannons, and call playback device. Fencing may also be placed over a nesting site to exclude raptors from a particular location. Additional monitoring may be triggered when raptors are observed returning to the pit after deterrents have been used. Monitoring may then be conducted several times per day. The GN will be contacted and informed when a raptor has been observed in the pit and deterrents have been used.

In all instances, environment staff will identify opportunities for protecting established nests. In some cases, raptors may attempt to nest in areas of the pit sufficiently removed from blasting locations that there is little chance of raptor injury or disturbance by blasting. In these cases, and after informing GN, the raptors may be left to nest in the pit or quarry location. These raptors would then be monitored until the chicks have fledged the nest.

Prior to construction of the Project, a detailed SOP will be produced and distributed to the NIRB and the KIA for review and comment. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Data Analysis

Records of pit nest monitoring, including the dates monitored, the identity of the crew, the results of monitoring, any management actions taken and the success of these methods will be collated into a database.

Triggers for Adaptive Mitigation

Observations of raptors attempting to nest in the pit will trigger adaptive management measures, as listed in the methods section above.

Reporting

Results of monitoring, including the dates, personnel, observations, use of deterrents and effectiveness of deterrents, will be recorded and reported in the annual WEMP report.

10.2.1.2 Pre-clearing Surveys for Raptor Nests

Objectives

The objective of pre-clearing surveys for nests is to identify active bird (i.e., raptor, waterbird, upland bird, and marine bird) nests that are at risk of disturbance from construction activities and thereby trigger appropriate management (Section 10.1.3).

Trigger for Monitoring

Pre-clearing surveys would be triggered whenever vegetation clearing is planned during the bird breeding season, which for raptors spans April 15 to August 15. It should be noted that pre-clearing

surveys for raptor nests is largely directed towards species that nest on the ground, which would include short-eared owl, snowy owl, and northern harrier. All other raptor species that occur at the Project are cliff-nesting species and would not be at risk from ground-clearing activities.

Monitoring Methods

During the DEIS review, the Canadian Wildlife Service (CWS) requested that disturbance due to nest searches be minimized. This will be accomplished in three ways: 1) clearing work will avoid the bird breeding season, 2) should clearing work be required in the bird breeding season it will be focused (where possible) in vegetation communities that support lower densities of birds (thereby removing the need to conduct surveys in higher density nesting areas), and 3) survey methods that minimize disturbance to nests will be used. Note that the methods described below were designed for all bird species but some methods may not be directly applicable to one specific group (e.g., breeding behaviour cues are largely based on behaviours exhibited by upland birds and are not applicable to raptors).

Baseline surveys indicated that wetland and shrubby vegetation communities supported approximately 50% higher densities of nesting birds than did upland, dry lichen habitats. Where there are options, work will avoided in wetland and shrubby areas and focused on dry upland areas. Thus, the higher density of nests in wetland and shrubby areas can be preserved without the need for nesting surveys.

Nest surveys will be conducted within an appropriate period (suggested 14 days) in areas scheduled to be cleared for construction using standard observation techniques by qualified personnel (i.e., biologists trained in bird ecology and behaviour). Several survey methods are available for nest searching which trade off accuracy and the amount of disturbance to nesting birds. The choice of methods will be left to the discretion of the surveyors based on the habitat type, season, and topography with the proviso that they will reduce disturbance to birds as much as possible. As a guide, surveyors will walk transects through the area slated for clearing, each following a transect 15 m apart from the adjacent surveyor. Observers will stop every 25 m and note all birds within a 50-m radius.

To be as non-intrusive as possible, observers will record all evidence of potential breeding behaviour for all species observed; this could include observations of singing males, territorial and courtship displays, copulation, alarm calls, or detections of birds carrying nest material or food. Observers will note the approximate location of the nest, taking precautions to avoid approaching the nest as much as possible, and trigger the applicable work setback distances. Observers will not mark the nest with flags or tape, such that predators are not alerted to the presence of the nest. Observers will use a GPS to mark bird territories and nest sites.

Prior to construction of the Project, a detailed SOP will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Data Analysis

Records of pre-clearing surveys conducted (e.g., the locations, date, GPS track of surveyors, etc.) and the results of the surveys (birds observed, status, evidence of nests) along with any mitigation that has been triggered will be collated into a database.

Triggers for Adaptive Mitigation

The observation of a nesting bird in an area slated for development will trigger communications with the GN (raptors) or CWS (upland breeding birds), depending on the species, and will trigger adaptive management, in the form of setting a work buffer around the nest, as described in Section 10.1.3.

Reporting

The results of pre-clearing surveys for nests and the corrective action taken will be reported in the annual WEMP report.

10.2.1.3 Incidental Observations

Incidental observations of wildlife will be recorded by all Project personnel, including environmental monitors, pilots, drivers on on-site and winter ice roads, and other Project personnel during the construction and operations of the Project. Further details on the incidental wildlife program, including methods, are described in Section 7.2.1.4, Incidental Observations (for caribou).

There will be one adaptive management trigger if raptors are observed on or near the Project site. Incidental observations of raptors in the pits or quarries will trigger Pit and Quarry Wall Nest Monitoring (Section 10.2.1.1), and may in turn trigger mitigation to exclude the raptors (also described in Section 10.2.1.1)

In addition, any incidental observations of raptors that have chosen to nest on Project infrastructure will be reported to the Environment Department. On-site environmental monitors will monitor the nest and determine the nest success, which will be reported in the WEMP report

10.2.2 Raptor Monitoring to Measure Predicted Effects

10.2.2.1 Footprint Monitoring

Objective

The objective of footprint size monitoring is to measure the actual habitat lost within the constructed Project footprint for each wildlife VEC.

Methods

See Section 7.2.2.1, Footprint Monitoring (for caribou) for a description of this Program, including triggers, methods, adaptive management and reporting.

10.2.2.2 Regional Surveys for Raptors

Objective

The objective of regional monitoring for raptors is to evaluate if raptors are disturbed by Project activities, resulting in lower nesting success.

Trigger for Monitoring

The raptor monitoring program is proposed for every three years of construction and operations.

Methods

Raptor nests in the RSA will be monitored to determine distribution, occupancy, and productivity, following methods used during baseline surveys (Rescan 2013, 2014). Surveys will include two groups of nests: 1) nests within 1.5 km of Project infrastructure (the test group), and 2) nests in undisturbed reference areas within 10 km of the Project site.

The nests to be monitored will be determined during the first year of study. Surveyors will return to nests identified and monitored during baseline surveys and will evaluate each nest for safety of the survey crew.

In some cases, baseline surveys indicated that nests were located on cliffs above lakes, which can be a safety concern for helicopter-based surveys. Surveyors will rate the safety of each nest and determine which nests to include in the long-term monitoring program. The number of nests will be determined through a power analysis to be conducted on existing baseline data prior to the first monitoring survey. Detailed methods will be described in the WMMP Plan prior to construction of the Project.

Data Analyses

Data analyses will be conducted to determine trends over time in the distribution, occupancy rate, and productivity rate of raptors in test sites (within 1.5 km of mine infrastructure) and at reference sites. An analysis will also be conducted to determine if a ZOI is detectible at various distances from the Project site.

Triggers for Adaptive Mitigation

Results indicating lower breeding success by raptors near the Project site will trigger a review of Project activities to identify if there are adaptive management activities that can reduce any potential disturbance to raptors.

Reporting

Data and the results of analyses will be reported in the annual WEMP report.

11. Waterbirds

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11. Waterbirds

11.1 MITIGATION AND MANAGEMENT FOR WATERBIRDS

11.1.1 Overview of Potential Effects to Waterbirds

Seven potential effects to waterbirds, which includes ducks, coots, and loons, were evaluated in the FEIS; these included habitat loss, disturbance, disruption of movement, direct mortality, indirect mortality, attraction, and exposure to contaminants. Mitigation and management measures to reduce the potential for these effects to result in residual effects on waterbirds are discussed in this section.

In addition, reduction in productivity was considered to evaluate the potential for synergistic effects on waterbirds. Limiting the potential for synergistic effects will be achieved by implementing the mitigation and management measures for the seven direct effects listed above.

Habitat loss will occur in the Project footprint where natural vegetation is removed for the construction of the Project, and habitat loss was rated as a residual effect in the FEIS. Habitat loss will be minimized by reducing the Project footprint and carrying out reclamation activities.

Indirect habitat loss caused by disturbance was rated as a residual effect for waterbirds in the FEIS. A variety of mitigation and management activities are proposed, including design mitigation to limit noise, and fixed and rotary-winged aircraft management to limit disturbance to waterbirds.

Disruption of movement for waterbirds due to the Project was not considered a residual effect in the FEIS because waterbirds typically migrate at higher altitudes and there will be no tall structures in the Project design.

The potential for direct mortality due to collisions with vehicles and aircraft was evaluated in the FEIS. With mitigation, including setting speed limits and giving all wildlife the right of way, this effect was not rated as a residual effect.

The potential for indirect mortality was evaluated as the potential for increased access for hunters to the Project area. With mitigation, which includes prohibiting employees from bringing firearms to the site and hunting while at work, this effect was not rated as a residual effect.

The potential for waterbirds to be attracted to the Project site, in particular to man-made waterbodies such as the TSF, and to be exposed to chemicals of potential concern, was evaluated in the FEIS. With mitigation, including monitoring of water quality within Project ponds (constructed for the collection of runoff water and as a cap on the TSF) and implementing exclusion measures if waterbirds are using Project ponds where water quality does not wildlife guidelines, this effect was not rated as a residual effect.

The potential for waterbirds to be exposed to contaminants was evaluated in the FEIS through a risk assessment, which found that waterbirds would not be at risk of uptake of hazardous chemicals. A series of standard management plans for chemicals was provided in the FEIS, including fuel, spill response, marine spills, and management of hazardous materials. After management, exposure to contaminants was not rated as a residual effect for waterbirds.

11.1.2 Mitigation and Management for Habitat Loss for Waterbirds

Mitigation and management to reduce potential effects of habitat loss for waterbirds includes:

- Sabina has designed the Project footprint to be as small as possible and outside of sensitive areas for waterbirds, including identified staging areas from TK and baseline studies.
- Dust will be managed on the Project site by setting and enforcing speed limits on all-season on-site roads and the application of dust suppressants where and when needed. Dust suppressants will be non-toxic for wildlife. Dust deposition rates and potential effects on vegetation will be monitored as described in the Air Quality Monitoring and Management Plan (Volume 10, Chapter 17).

11.1.3 Mitigation and Management for Disturbance of Waterbirds

A series of mitigation and management strategies will be in place to reduce the potential for disturbance to waterbirds. These strategies are outlined below.

11.1.3.1 Design Mitigation

The following mitigation measures will be designed into the Project to limit disturbance to waterbirds:

- Project buildings will be constructed and equipment will be chosen to limit the continuous noise produced by equipment such as generators, heavy trucks and other mobile equipment.

11.1.3.2 Construction Management

The following management actions will be applied during the construction phase of the Project:

- Construction and operations activities will be scheduled, where possible, to avoid disturbance to waterbirds during the nesting period of May 15 to August 15.
- If construction is planned in waterbird habitat (lake margins and wetlands) during the nesting period, then Sabina will conduct pre-construction surveys for nests.
- If a waterbird nest is found during pre-clearing surveys then the Environment Manager will set up a buffer surrounding the nest, and the nest will be monitored for breeding success, which will be reported in the WEMP.
- The results of pre-construction surveys and the mitigation actions taken, including the exact buffer distance employed for any nest sites recorded during pre-clearing surveys, will be reported in the WEMP report.
- The objective of the Environment Manager will be to use the species-specific buffers suggested by Environment and Climate Change Canada (ECCC) in Table 11.1-1 and will endeavor to do so in all cases. Should the Environment Manager feel that the minimum buffer distance is inoperable, then the Environment Manager will contact ECCC for advice on mitigation activities. If the suggested buffer cannot be implemented for logistical reasons, the Environment Manager will ensure that a minimum buffer of at least 30 m will be enforced.
- If a nest must be removed for logistical reasons, Sabina will contact ECCC prior to removing the feature.

Table 11.1-1. Recommended Buffer Distances for Waterbird Nest Sites Found during Pre-clearing Surveys

Species Group	Suggested Buffer (m)
Gulls and Terns	300
Ducks*	150
Geese*	500
Loons, Tundra swan, and Sandhill crane*	750 - 1000

** range is dependent on species-specific guidelines advised by Environment and Climate Change Canada (2016)*

11.1.3.3 Fixed-wing Aircraft and Helicopter Management

See Section 7.1.3.4 Fixed-sing Aircraft Management (for caribou) for measures to limit disturbance from fixed-wing air traffic applicable to all wildlife. In addition to these measures, the following management actions will be applied specifically for waterbirds:

- As part of pilot induction, pilots will be informed of their responsibilities to monitor, report, and avoid waterbirds. Maps will be provided to pilots that identify areas with concentrations of waterbirds during certain seasons, including areas such as lakes used for staging by waterbirds.
- Reduce disturbance to colony-nesting birds and important staging areas during sensitive periods by maintaining an aircraft flight altitude of at least 650 m during horizontal (point to point) flights. The two waterbird staging areas closest to the Project are on Beechey Lake, approximately 35 km south of the Goose site, and at an unnamed lake approximately 15 km north of the George site.
- Reduce disturbance to known colonies of nesting, feeding, or moulting birds or known staging areas by maintaining a distance of 3 km from colonies of birds. TK and baseline surveys did not identify any colony nesting sites for waterbirds in the RSA.
- Pilots will report all incidental sightings of significant aggregations of waterbirds to the Environment Department.

11.1.4 Mitigation and Management for Disruption of Movement of Waterbirds

The Project is not expected to disrupt the movements of waterbirds during annual migratory movements.

11.1.5 Mitigation and Management for Direct Mortality and Injury of Waterbirds

Mitigation and management to prevent direct mortality and injury of waterbirds includes:

- pre-clearing surveys for nests prior to ground clearing during the breeding season (Section 11.2.1.2); and
- management of the airstrip to prevent any aircraft-bird collisions, such as surveying the airstrip prior to aircraft landing and taking off.

11.1.6 Mitigation and Management for Indirect Mortality of Waterbirds

The mitigation and management strategies outlined for caribou will also reduce the potential for indirect mortality for waterbirds, including the no-hunting policy for Project personnel and the closure of the winter ice road to the public (Section 7.1.6).

11.1.7 Mitigation and Management for Attraction of Waterbirds

Mitigation for attraction of waterbirds to Project ponds and exposure to water that may not meet wildlife guidelines is described in the following section.

11.1.8 Mitigation and Management for Exposure to Contaminants for Waterbirds

Standard mitigation and management strategies to prevent all wildlife from being exposed to contaminants is outlined for muskox in Section 8.1.8. Should waterbirds be attracted to the Tailings Storage Facility (TSF), monitoring and management to reduce any potential exposure of waterbirds to contaminants will include:

- Sabina will monitor the quality of water in the TSF, as described in the Site Water Monitoring and Management Plan (FEIS, Volume 10, Chapter 7).
- If the water in the TSF does not meet wildlife guidelines for waterbirds, then the TSF will be monitored to determine if waterbirds use the TSF during staging and breeding periods (Section 11.2.1.1).
- If the TSF contains water that does not meet wildlife guidelines and waterbirds are actively using the TSF, then adaptive management will be undertaken to exclude waterbirds from the TSF.
- The choice of exclusion methods will be an evolving process. Guidance will be taken from: Cassady St. Clair, 2014. *Final Report of the Research on Avian Protection Project* (2010-2014). Prepared for Alberta Justice, Edmonton, Canada.
- Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

11.2 MONITORING FOR WATERBIRDS

This section describes monitoring activities for waterbirds to 1) trigger mitigation, and 2) evaluate potential effects of the Project on waterbirds. Three types of monitoring have been proposed that will trigger mitigation activities designed to minimize impacts to waterbirds. These monitoring programs are:

1. waterbird monitoring in ponds;
2. pre-clearing surveys for waterbird nests; and
3. incidental observations.

Two types of monitoring will measure predicted effects:

1. footprint monitoring to measure habitat loss in the Project footprint; and
2. regional monitoring for waterbirds (aerial and ground surveys).

11.2.1 Waterbird Monitoring to Trigger Mitigation

11.2.1.1 Waterbird Monitoring on Project Ponds

Objectives

The objective for waterbird monitoring in on-site ponds is to determine if waterbirds are using the TSF, and thereby trigger management to exclude waterbirds.

Background and Trigger for Monitoring

If the water quality of the ponds does not meet wildlife guidelines, then waterbird monitoring will be undertaken at these ponds during all Project phases. This monitoring will be conducted weekly during Construction, Operations and Reclamation/Closure and twice yearly during Temporary Closure and Care and Maintenance.

Monitoring Methods

The TSF will be monitored during water quality sampling. Monitoring will be conducted using 1) stationary wildlife cameras, or 2) by a qualified person trained in bird ecology and behaviour. Camera studies would use cameras stationed on the rim of the TSF, programmed to take motion-triggered and timed photos. The ability to identify birds on the TSF using cameras would be ground-truthed prior to implementation of this program.

Monitoring by a person in the field would be conducted daily during the spring migration (late May) and weekly during the rest of the waterbird season. Surveys will be a fixed-duration scan sample using binoculars. Prior to construction of the Project, a detailed SOP will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Data Analysis

Records of the monitoring actions (location, methods, personnel, etc.) and the results of pond monitoring will be collated into a database and tracked for changes between years and whether any changes are related to specific activities or mitigation actions.

Triggers for Adaptive Mitigation

Observations of waterbirds in Project ponds where the water quality does not meet wildlife water quality guidelines will trigger mitigation to exclude the wildlife from the Project ponds (Section 11.1.7).

Reporting

All incidental observations of waterbirds using Project ponds, and management actions taken and their success will be reported in the annual WEMP report.

11.2.1.2 Pre-clearing Surveys for Waterbird Nests

Pre-clearing surveys for waterbird nests will use the same methods as for raptor pre-clearing surveys (Section 10.2.1.2) during the waterbird nesting season, May 15 to August 15.

11.2.1.3 Incidental Observations

Incidental observations of waterbirds will be recorded by all Project personnel, including environmental monitors, pilots, drivers on on-site and winter ice roads, and other Project personnel during the construction and operation of the Project. Further details on the incidental wildlife program, including methods, are described in Section 7.2.1.4, Incidental Observations (for caribou).

11.2.2 Waterbird Monitoring to Measure Predicted Effects

11.2.2.1 Footprint Monitoring

Objective

The objective of footprint size monitoring is to measure the actual habitat lost within the constructed Project footprint for each wildlife VEC.

Methods

See Section 7.2.2.1, Local Scale: Footprint Monitoring (for caribou) for a description of this Program, including triggers, methods, adaptive management and reporting.

11.2.2.2 Regional Monitoring for Waterbirds

Objective

The objective of regional monitoring for waterbirds is to determine if waterbirds are disturbed or otherwise affected by the Project near the Project site, resulting in reduced density or breeding success.

Triggers for Monitoring

Regional monitoring for waterbirds is planned for every three years during construction and operations of the Project.

Methods

Waterbird monitoring will consist of two types of surveys: 1) surveys to assess Project-related changes in the distribution of waterbirds in the RSA during staging periods, and 2) surveys to assess the effect of the Project on resident breeding waterbirds in the RSA. Analyses will be conducted to determine trends over time in the distribution (i.e., a Zone of Influence [ZOI]), and productivity of waterbirds in relation to mine infrastructure.

At the moment, there is no consensus in the scientific literature or from CWS on the best way to measure a ZOI on waterfowl distribution during staging and breeding. As such, two monitoring programs will be conducted and compared for their power to detect change in waterbird distribution and reported in the WEMP report. The two methods being trialed are 1) grid surveys, which are a continuation of the baseline survey methodology, and 2) total counts at individual ponds.

Grid surveys will follow a BACI study design, following the field design and methods conducted as part of baseline studies described in the 2012 and 2013 wildlife baseline reports (Rescan 2013, 2014). Baseline surveys used three survey blocks, 1) Goose block, 2) Goose control, 3) an MLA block. Monitoring surveys will use the Goose block and MLA blocks.

Staging Surveys

Aerial grid surveys will be conducted during spring and fall staging periods following established protocols described by the CWS and the USFWS (CWS and USFWS 1987) and will be continued on a three-year schedule while the Goose site and MLA are active.

The second monitoring method will be ground-based counts of all wetlands within a 5 km radius of the Project infrastructure. Ponds will be surveyed every three years from the ground for staging waterfowl

during the spring and fall staging periods. Detailed methods will be described in the WMMP Plan prior to construction of the Project.

Breeding Surveys

The survey plan for breeding surveys will parallel that of the staging surveys, with two possible methods being trialed and compared during the first year of migratory bird surveys. Aerial surveys will be conducted to record waterbird breeding in the terrestrial RSA as per the methods reported in (Rescan 2013) and (Rescan 2014). Data gathered during these baseline surveys indicated that evidence of breeding was low in the Project area. A limited number of broods were observed in the waterbird survey blocks in the terrestrial RSA in 2011 and 2012. However, it is not clear whether the limited number of broods detected in the RSA was a function of survey platform, or whether the Project area is an area which supports limited breeding for waterbirds.

The second method to be used will be ground-based surveys of ponds within 5 km of Project infrastructure in the Goose site and the MLA. Detailed methods will be described in the WMMP Plan prior to construction of the Project.

Data Analysis

Data analysis will focus on comparing the two methods for monitoring a ZOI (grid surveys vs. total counts at individual ponds/lakes). Following this analysis and reporting of the results to ECCC and the KIA, the method with the greater power to detect a ZOI will be chosen for future monitoring by the Project. Following selection of the monitoring methodology, surveys will be repeated every three years for the life of the Project.

Triggers for Adaptive Mitigation

Results indicating fewer waterbirds near the Project site will trigger a review of Project activities to identify if there are adaptive management activities that can reduce any potential disturbance to waterbirds.

Reporting

Data and the results of analyses will be reported in the annual WEMP report.

12. Upland Birds

ERM

12. Upland Birds

12.1 MITIGATION AND MANAGEMENT FOR UPLAND BIRDS

12.1.1 Overview of Potential Effects to Upland Birds

Seven potential effects to upland birds were evaluated in the FEIS: these included habitat loss, disturbance, disruption of movement, direct mortality, indirect mortality, attraction, and exposure to contaminants. Mitigation and management measures to reduce the potential for these effects to result in residual effects on upland birds are discussed in this section.

In addition, reduction in productivity was considered to evaluate the potential for synergistic effects on upland birds. Limiting the potential for synergistic effects will be achieved by implementing the mitigation and management measures for the seven direct effects listed above.

Habitat loss will occur in the Project footprint where natural vegetation is removed for the construction of the Project, and habitat loss was rated as a residual effect in the FEIS. Habitat loss will be minimized by reducing the Project footprint and carrying out reclamation activities.

Indirect habitat loss caused by disturbance was rated as a residual effect for upland birds in the FEIS. A variety of mitigation and management activities are proposed, including design mitigation to limit noise and management of construction activities to reduce disturbance to upland birds.

Disruption of movement for upland birds due to the Project was not considered a residual effect in the FEIS because there will be no tall structures in the Project design that may interfere with the daily or annual migratory movements of upland birds.

The potential for direct mortality due to collisions with vehicles and aircraft was evaluated in the FEIS. With mitigation, including setting speed limits and giving all wildlife the right of way, this effect was not rated as a residual effect.

The potential for indirect mortality was evaluated due to increased access and hunting of ptarmigan, the only hunted upland bird species. Mitigation includes a no-hunting and no-firearms policy for personnel on site. The potential for foxes and other furbearers to be attracted to the Project and increase nest predation was also evaluated. The area where upland birds may experience increased predation pressure was limited to an area 300 m from Project infrastructure, an area that was already considered lost to the Project PDAs. Considering the above, this effect was not rated as a residual effect.

The potential for upland birds to be attracted to lighting on the Project site was evaluated in the FEIS. With design mitigation to limit stray light, this effect was not rated as a residual effect.

The potential for upland birds to be exposed to contaminants was evaluated in the FEIS through a risk assessment, which found that upland birds would not be at risk of uptake of hazardous chemicals. A series of standard management plans for chemicals was provided in the FEIS, including fuel, spill response, marine spills, and management of hazardous materials. After management, exposure to contaminants was not rated as a residual effect for upland birds.

12.1.2 Mitigation and Management for Habitat Loss for Upland Birds

Mitigation and management to reduce potential effects of habitat loss for upland birds includes:

- Sabina has designed the Project footprint to be as small as possible and outside of sensitive areas for upland birds from TK and baseline studies.
- Dust will be managed on the Project site by setting and enforcing speed limits on all-season on-site roads and the application of dust suppressants where and when needed. Dust suppressants will be non-toxic for wildlife. Dust deposition rates and potential effects on vegetation will be monitored as described in the Air Quality Monitoring and Management Plan (Volume 10, Chapter 17).

12.1.3 Mitigation and Management for Disturbance of Upland Birds

A series of mitigation and management strategies will be in place to reduce the potential for disturbance to upland birds including:

- See Section 7.1.3.2, Design Mitigation (for caribou) for design measures to limit disturbance from Project infrastructure and activities applicable to all wildlife. In addition to these measures, buildings will be designed in order to exclude wildlife (e.g., construct vents to prevent small mammals and birds from entering) and if wildlife are able to access buildings through vents, windows, or by other means, then measures will be taken to exclude wildlife.
- Construction management measures for waterbirds will also apply to upland birds (Section 11.1.3.2) with suggested buffer sizes of 100 m for songbirds and 100 to 300 m for shorebirds.

12.1.4 Mitigation and Management for Disruption of Movement of Upland Birds

The Project is not expected to disrupt the daily nor annual movements of upland birds.

12.1.5 Mitigation and Management for Direct Mortality and Injury of Upland Birds

Mitigation and management to prevent direct mortality and injury of upland birds includes pre-construction nest searches, discussed in Waterbirds Section 11.1.3.2.

12.1.6 Mitigation and Management for Indirect Mortality of Upland Birds

The mitigation and management strategies outlined for caribou in Section 7.1.8, Mitigation and Management for Indirect Mortality of Caribou with regards to no-hunting policies, are applicable to upland birds (in particular ptarmigan, the only hunted upland bird species) and will serve to reduce the potential for indirect mortality for this VEC.

12.1.7 Mitigation and Management for Attraction of Upland Birds

The following mitigation and management measures will be conducted during the construction, operations, and closure phases of the Project to reduce attraction of upland birds to Project lighting:

- Directed lighting will be used rather than broad lighting, whenever possible.
- All lighting will be directed into the facility and toward the ground to limit stray light as a visual disturbance.
- The design avoided the use of tall towers requiring the use of solid and pulsating red lights , which seem to be more attractive to birds at night during inclement weather conditions than are white strobe lights (Erickson et al. 2002).

12.1.8 Mitigation and Management for Exposure to Contaminants for Upland Birds

The mitigation and management strategies outlined for muskox in Section 8.1.8, Mitigation and Management for Exposure to Contaminants for Muskox are applicable for upland birds, and will serve to reduce the potential for exposure to contaminants of this VEC. Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

12.2 MONITORING FOR UPLAND BIRDS

This section describes monitoring activities to for upland birds to 1) trigger mitigation, and 2) evaluate potential effects of the Project on waterbirds. Two monitoring programs will trigger mitigation activities to minimize effects on upland birds:

1. pre-clearing surveys for upland bird nests; and
2. incidental observations.

Two types of monitoring will measure predicted effects on upland birds:

1. footprint monitoring to measure habitat loss in the Project footprint; and
2. regional monitoring for upland birds (point count and PRISM surveys).

12.2.1 Upland Bird Monitoring to Trigger Mitigation

12.2.1.1 Pre-clearing Surveys for Upland Bird Nests

Pre-clearing surveys for nests may be triggered during the construction process. The process for pre-clearing surveys, including triggers for monitoring, methods, and triggers for adaptive mitigation, are described in detail in the monitoring section for raptors (Section 10.2.1.2) during the breeding season for upland birds, May 15 to August 15.

12.2.1.2 Incidental Observations

Incidental observations of wildlife will be recorded by all Project personnel, including environmental monitors, pilots, drivers on on-site and winter ice roads, and other Project personnel during the construction and operation of the Project. Further details on the incidental wildlife program, including methods, are described in Section 7.2.1.4, Incidental Observations (for caribou). There will be one adaptive management trigger if upland birds are observed on or near the Project site. In the event that upland birds are accessing buildings, then measures will be taken to exclude upland birds from entering to ensure both worker and wildlife safety (Section 12.1.3).

12.2.2 Upland Bird Monitoring to Measure Predicted Effects

12.2.2.1 Footprint Monitoring

Objective

The objective of footprint size monitoring is to measure the actual habitat lost within the constructed Project footprint for each wildlife VEC.

Methods

Please Section 7.2.2.1, Local Scale: Footprint Monitoring (for caribou) for a description of this Program, including triggers, methods, adaptive management and reporting.

12.2.2.2 Regional Monitoring for Upland Birds

Objective

The objective of regional monitoring is to determine if upland birds are avoiding the Project site.

Trigger for Monitoring

Regional monitoring is planned for upland birds every two years during construction and operations.

Methods

A combination of variable radius point-count surveys and PRISM plots will be used to monitor potential effects of the Project on upland birds every two years, with continued focus on areas near Goose site and the Marine Laydown Area. A suite of approximately 50 PRISM plots at varying distances from mine infrastructure within the RSA will be revisited and/or established. The plots will be distributed amongst representative cover types, and each plot will be located in a single cover type following standard CWS PRISM methods. Detailed methods will be described in the WMMP Plan prior to construction of the Project.

The number and locations of PRISM plots and point counts will be reviewed prior to each biennial survey, and they may change as data become available to ensure that changes in breeding bird density and species richness can be accurately assessed relative to the mine site. These surveys contribute data on density, richness, and diversity of other upland nesting species in the Arctic. Two trained biologists will conduct the survey according to established CWS guidelines. Incidental bird observations will also continue to be recorded on and near the mine site.

Data Analysis

A review of all available upland breeding bird data collected to date via PRISM plot surveys will be conducted to assess differences from baseline patterns in species density and richness. This analysis will be based on the most current analytical techniques and based on advice from the CWS.

Triggers for Adaptive Mitigation

Results indicating fewer upland birds near the Project site will trigger a review of Project activities to identify if there are adaptive management activities that can reduce any potential disturbance to upland birds.

Reporting

Data and the results of analyses will be reported in the annual WEMP report.

13. Seabirds and Seaducks (Marine Birds)

ERM

13. Seabirds and Seaducks (Marine Birds)

13.1 MITIGATION AND MANAGEMENT FOR MARINE BIRDS

13.1.1 Overview of Potential Effects to Marine Birds

Five potential effects to VEC seabirds and seaducks (here referred to as marine birds) in the marine RSA, which encompassed Bathurst Inlet, were evaluated in the FEIS; these effects included habitat alteration, disturbance, direct mortality, indirect mortality, and exposure to contaminants. Mitigation and management measures to reduce the potential for these effects to result in residual effects on marine birds are discussed in this section. Effects to marine birds outside of the assessment area for the FEIS were considered in a separate report, the Shipping Sensitivity Report (Appendix V7-6A of the FEIS). Mitigation and management to limit any potential effects is described below.

In addition, reduction in productivity was considered to evaluate the potential for synergistic effects on marine birds. Limiting the potential for synergistic effects will be achieved by implementing the mitigation and management measures for the five direct effects listed above.

Habitat alteration will occur in the Project footprint, specifically the Lightering Barge Terminal in Bathurst Inlet at the Marine Laydown Area (MLA), which may restrict access for marine birds to near-shore foraging habitat. Habitat alteration due to the Lightering Barge Terminal will be temporary each year. A residual effect was expected to occur VEC marine fish/aquatic habitat but not for VEC marine fish community by construction and operation of the Lightering Barge Terminal (Volume 7, Chapters 4 and 5). Therefore, it appears that there may be some small measurable change in forage availability (e.g., fish, bivalves) for marine birds in the area of the MLA, though species are expected to forage over a wide area and are not expected to exclusively use the terminal area for foraging. Therefore, habitat alteration was not anticipated to result in a residual effect.

Indirect habitat loss caused by disturbance was rated as a residual effect for marine birds in the FEIS. A variety of mitigation and management activities are proposed, including ship and fixed-winged aircraft management to reduce disturbance to marine birds.

The potential for direct mortality due to collisions with ships and aircraft was evaluated in the FEIS. With mitigation, including ship and fixed-wing aircraft management, this effect was not rated as a residual effect.

The potential for indirect mortality was evaluated as the potential for increased access for hunters to the Project area. With mitigation, which includes prohibiting employees from bringing firearms to the site and hunting while at work, this effect was not rated as a residual effect.

The potential for marine birds to be exposed to contaminants was evaluated in the FEIS through a risk assessment, which found that marine birds would not be at risk of uptake of hazardous chemicals. A series of standard management plans for chemicals was provided in the FEIS, including fuel, spill response, marine spills, and management of hazardous materials. After management, exposure to contaminants was not rated as a residual effect for marine birds.

13.1.2 Mitigation and Management for Habitat Alteration for Marine Birds

The primary mitigation and management strategies to minimize the effects of marine habitat alteration for marine birds are addressed by the design of the Project, including:

- There are no permanent in-water works associated with the terminal construction. The Lightering Barge Terminal will consist of a metal ramp laid upon natural substrate and designed to be removed at the end of each sealift season and reinstalled prior to the arrival of the first sealift vessel the following year.

13.1.3 Mitigation and Management for Disturbance of Marine Birds

Mitigation and management to prevent disturbance to marine birds focuses on Project design and construction measures, as well as management of shipping and air traffic in Bathurst Inlet and along the common shipping lane through the Northwest Passage.

13.1.3.1 Design Mitigation

See Section 7.1.3.2 Design Mitigation (for caribou) for design measures to limit disturbance from Project infrastructure and activities applicable to all wildlife.

13.1.3.2 Construction Management

Mitigation and management for marine birds is described under construction management for waterbirds (Section 11.1.3.2). Marine birds have the same nesting period and proposed nest buffers (Table 11.1-1) as for waterbirds.

13.1.3.3 Shipping Management

Mitigation and management actions to reduce potential effects on marine birds due to shipping include:

- Ships crews will monitor for large groups of marine birds (Section 13.2.2).
- Ships will avoid large groups of birds observed on the ocean surface except where the safety of the ship is in concern.
- Ships will avoid any known colonies of marine birds by a buffer distance to reduce the chance of ship-bird collisions, except where the safety of the ship is in concern. Colonies of marine birds were recorded from TK and during baseline surveys in the islands at the north end of Bathurst Inlet.
- If monitoring indicates that ships are striking a significant number of birds or marine mammals, then adaptive mitigation will be triggered.
- Ships will avoid the large colony of marine birds on King Leopold Island by a buffer distance of 30 km, except where the safety of the ship is in concern.
- Ships will adhere to marine setback distance of 500 m from sea duck colonies, moulting aggregations of sea ducks, and waterfowl while transiting through the Bathurst Inlet/Elu Inlet and Lambert Channel Key Marine Habitat Sites, except where the safety of the ship is in concern (FEIS, Volume 7, Chapter 6, Figure 6.11-1).

13.1.3.4 Fixed-wing Aircraft and Helicopter Management

The following mitigation and management actions will be applied to fixed-wing aircraft and helicopters during all Project phases:

- As part of pilot induction, pilots will be informed of their responsibilities to monitor, report, and avoid marine birds. Maps will be provided to pilots that identify areas with concentrations of wildlife during certain seasons, such as lakes used for staging by marine birds.
- Aircraft will maintain a minimum of 610 m flight altitude above colony-nesting birds and important staging areas during sensitive periods.
- Aircraft will reduce disturbance to known colonies of nesting, feeding, or moulting birds or known staging areas by maintaining a distance of 3 km from colonies of birds.
- Pilots will report all incidental sightings of marine birds to the Environment Department.

13.1.4 Mitigation and Management for Direct Mortality and Injury of Marine Birds

Mitigation and management strategies to prevent disturbance to marine birds, as outlined in the previous section, will be the main mitigation and management strategies to reduce the potential for direct mortality and injury to marine birds, i.e., to minimize the likelihood of ship or aircraft-marine bird collisions.

13.1.5 Mitigation and Management for Indirect Mortality of Marine Birds

The mitigation and management strategies outlined for caribou in Section 7.1.6 Mitigation and Management for Indirect Mortality of Caribou with regards to no-hunting policies are applicable to marine birds and will serve to reduce the potential for indirect mortality for this VEC.

13.1.6 Mitigation and Management for Exposure to Contaminants for Marine Birds

The mitigation and management strategies outlined for muskox in Section 8.1.8, Mitigation and Management for Exposure to Contaminants for Muskox are applicable for marine birds, and will serve to reduce the potential for exposure to contaminants of this VEC. Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

13.2 MONITORING FOR MARINE BIRDS

This section describes monitoring for marine birds in three sections: 1) to trigger mitigation, 2) to measure predicted effects, and 3) shipboard monitoring requested by the GN and Environment Canada during the review of the DEIS.

One type of monitoring is proposed to trigger management: pre-clearing surveys for nesting marine birds. Two types of monitoring are proposed to measure predicted effects:

1. footprint monitoring to measure habitat loss in the Project footprint; and
2. regional monitoring for marine birds (aerial and ground surveys).

Shipboard monitoring is also proposed for marine birds by ships in Nunavut waters.

13.2.1 Marine Bird Monitoring to Trigger Management

13.2.1.1 Pre-clearing Surveys for Marine Birds

Pre-clearing surveys for marine birds are described in detail in the section on pre-clearing surveys for raptor nests (Section 10.2.1.2) within the marine bird breeding period of May 15 to August 15.

13.2.2 Marine Bird Monitoring to Measure Predicted Effects

13.2.2.1 Footprint Monitoring

Objective

The objective of footprint size monitoring is to measure the actual habitat lost within the constructed Project footprint for each wildlife VEC.

Methods

Please Section 7.2.2.1, Local Scale: Footprint Monitoring (for caribou) for a description of this Program, including triggers, methods, adaptive management and reporting.

13.2.2.2 Regional Monitoring for Marine Birds

Objective

The objective of the regional marine bird monitoring program is to evaluate potential effects of the Project on the local population of these species, measured as a Zone of Influence (ZOI) of altered numbers of staging breeding birds and/or breeding success surrounding the Project site.

Methods

A marine bird monitoring program every three years is proposed for the WEMP when the MLA is active. Marine bird monitoring will consist of two types of surveys: i) surveys to assess Project-related changes in the distribution of marine birds in the RSA during staging periods, and ii) surveys to assess the effect of the Project on resident breeding marine birds in the RSA. Methods and analyses follow those developed for waterbirds and are described in Section 11.2.2.2, Regional Monitoring for Waterbirds.

13.2.2.3 Marine Bird Monitoring during Project Shipping

Objective

The objective for marine bird monitoring during Project shipping is to 1) trigger avoidance of large groups of birds by ships, and 2) record birds in the Northwest Passage.

Triggers for Monitoring

Marine bird monitoring will be conducted by all Project ships in each Project stage when shipping is occurring, including Construction, Operations, Care and Maintenance, and Reclamation/Closure.

Methods

Seabird monitoring will be conducted as incidental observations by the ship's bridge crew. Sabina will produce a simplified SOP, following the basic methods provided in the protocol outlined in Eastern Canada Seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms (Gjerdrum, Fifield, and Wilhelm 2012).

This seabird observer methodology will allow for the identification of seabird species present and provide an estimation of seabird densities along the shipping route. Detailed methods will be described in the WMMP Plan prior to construction of the Project. Data analysis will be conducted to quantify bird distribution and abundance. Data and the results of analyses will be reported in the annual WEMP report.

The results of monitoring activities will be reported in the WEMP report. In addition, Sabina commits to working with relevant parties, including ECCC, on relevant research on the cumulative effects of shipping including marine birds, by sharing all monitoring data collected during shipping activities. Discussions will include migratory bird monitoring priorities and proposed surveys and objectives in the WMMP.

Triggers for Adaptive Management

Ships will avoid large groups of birds observed on the ocean surface except where the safety of the ship is in concern. If bird strikes are occurring, then adaptive management will be undertaken, as described in Section 13.1.3.

Reporting

Data analysis will be conducted to quantify bird distribution and abundance. Data and the results of analyses will be reported in the annual WEMP report.

14. Ringed Seals (Marine Mammals)

ERM

14. Ringed Seals (Marine Mammals)

14.1 MITIGATION AND MANAGEMENT FOR MARINE MAMMALS

14.1.1 Overview of Potential Effects to Marine Mammals

Ringed seal was chosen as a representative species for the marine mammal community in the FEIS, because TK and baseline surveys indicated that this species was the primary species to occupy habitats within the assessment area of the FEIS. The following potential effects to ringed seals were evaluated: habitat alteration, disturbance, direct mortality, indirect mortality, and exposure to contaminants. Mitigation and management measures to reduce the potential for these effects to result in residual effects on ringed seals are discussed in this section. These mitigation and management measures were developed with the intention to safeguard all marine mammals, although some were created specifically for interactions anticipated to occur between ringed seals and the Project (e.g., seal lairs constructed along the winter ice road).

In addition, reduction in productivity was considered to evaluate the potential for synergistic effects on ringed seal. Limiting the potential for synergistic effects will be achieved by implementing the mitigation and management measures for the five direct effects listed above.

Effects to ringed seals and other marine mammals outside of the assessment area for the FEIS were considered in a separate report, the Shipping Sensitivity Report (Appendix V7-6A of the FEIS). Mitigation for these effects to marine mammals (including ringed seals) are included below.

Habitat alteration will occur in the Project footprint, specifically the Lightering Barge Terminal at the Marine Laydown Area (MLA) and the portion of the winter ice road that transits across Bathurst Inlet. Neither the barge nor winter ice road are expected to result in a residual effect of habitat alteration for the following reasons: 1) the small amount of habitat that may be altered, 2) the low density of seals expected to occur in southern Bathurst Inlet in both the summer and winter, and 3) the temporary nature of the Lightering Barge Terminal, which is unlikely to alter the marine fish community in the area (Volume 7, Chapter 5), and by extension, unlikely to prevent seals from accessing prey.

Indirect habitat loss caused by disturbance was evaluated for ringed seals in the FEIS. With mitigation, including ship and fixed-wing aircraft management to reduce disturbance to ringed seals, this effect was not rated as a residual effect. This mitigation to limit disturbance will be in place to reduce disturbance to other marine mammals along the common shipping route through the Northwest Passage.

The potential for direct mortality due to collisions with ships and aircraft was evaluated in the FEIS. With mitigation, including ship and fixed-wing aircraft management, this effect was not rated as a residual effect.

The potential for indirect mortality was evaluated as the potential for increased access for hunters to the Project area. With mitigation, which includes prohibiting employees from bringing firearms to the site and hunting while at work, this effect was not rated as a residual effect.

The potential for ringed seals to be exposed to contaminants was evaluated in the FEIS through a risk assessment, which found that ringed seals would not be at risk of uptake of hazardous chemicals. A series

of standard management plans for chemicals was provided in the FEIS, including fuel, spill response, marine spills, and management of hazardous materials. After management, exposure to contaminants was not rated as a residual effect for ringed seals.

14.1.2 Mitigation and Management for Habitat Alteration for Marine Mammals

The primary mitigation and management strategies to minimize the effects of marine habitat alteration for marine mammals are addressed by the design of the Project, including:

- There are no permanent in-water works associated with the terminal construction. The Lightering Barge Terminal will consist of a metal ramp laid upon natural substrate and designed to be removed at the end of each sealift season and reinstalled prior to the arrival of the first sealift vessel the following year.

14.1.3 Mitigation and Management for Disturbance of Marine Mammals

Mitigation and management to prevent disturbance to ringed seal and other marine mammals focuses on management of shipping and fixed-wing aircraft traffic in Bathurst Inlet and along the common shipping lane through the Northwest Passage, as well as management of the winter ice road.

14.1.3.1 Shipping Management

Mitigation and management actions to reduce potential disturbance of ringed seals and other marine mammals include:

- Ships will avoid any groups of marine mammals observed on the ocean surface except where the safety of the ship is in concern.

14.1.3.2 Fixed-wing Aircraft Management

See Section 7.1.3.4 Fixed Wing Aircraft Management (for caribou) for measures to limit disturbance from fixed-wing air traffic applicable to all wildlife.

14.1.3.3 Winter Ice Road Management

The winter ice road to the Marine Laydown Area will be built on the sea ice of southern Bathurst Inlet during December each year. Seals build lairs under snowbanks or pressure ridges in late February and should not be affected by the construction of the winter ice road. If new construction of winter ice roads or airstrips is planned on the sea ice of Bathurst Inlet during the seal pupping period of February 15 to April 15, then:

- Sabina will conduct pre-construction surveys for seal lairs (Section 14.2.1).
- If a seal lair is observed in the planned construction area then the position of the lair will be recorded and communicated to construction personnel, who will avoid the seal lair by at least 50 m.

14.1.4 Mitigation and Management for Direct Mortality and Injury of Marine Mammals

Mitigation to prevent mortality of ringed seals is discussed for seal lairs in the proceeding section. If a ringed seal is found on land in the MLA infrastructure area, the KIA will be contacted prior to any action being carried out.

14.1.5 Mitigation and Management for Indirect Mortality of Marine Mammals

The mitigation and management strategies outlined for caribou in Section 7.1.8 Mitigation and Management for Indirect Mortality of Caribou with regards to no-hunting policies are applicable to marine mammals and will serve to reduce the potential for indirect mortality for this VEC.

14.1.6 Mitigation and Management for Exposure to Contaminants for Marine Mammals

The mitigation and management strategies outlined for muskox in Section 8.1.8, Mitigation and Management for Exposure to Contaminants for Muskox are applicable for ringed seals and other marine mammals, and will serve to reduce the potential for exposure to contaminants to all marine mammal species. Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

14.2 MONITORING FOR MARINE MAMMALS

This section describes monitoring for marine mammals in two sections: 1) to trigger mitigation, and 2) shipboard monitoring requested by the GN and Environment Canada during the review of the DEIS.

Following a review of baseline data, a regional monitoring program has not been proposed for ringed seals to measure predicted effects. A monitoring program will only be effective if there are sufficient animals observed to be able to compare pre- and post-construction. Prior to construction, baseline surveys observed few to no lairs and seal pups in the Project location (south of Kingaok). In 2012, no large sea ice cracks, no lairs and only two seal pups were reported south of Kingaok. In the rest of Bathurst Inlet, lairs were typically found associated with large sea ice cracks. With no cracks in the sea ice south of Kingaok, it is likely that southern Bathurst Inlet is not high-quality habitat for lairs. With few observations of sea ice cracks, lairs and seal pups south of Kingaok, it was determined that a) there is likely little to no effect of the Project winter ice roads on ringed seals, and b) that the ability to detect an effect on the seal population there would be highly unlikely. Hence, no surveys for ringed seals are planned as part of the monitoring program for the Project.

14.2.1 Ringed Seal Monitoring to Trigger Mitigation

14.2.1.1 Pre-Construction Surveys for Seal Lairs

Objectives

The objective of on-ice monitoring is to determine the location of, and avoid, seal lairs when constructing the winter ice road and airstrip on the sea ice at the MLA.

Trigger for Monitoring

Pre-construction surveys will be conducted for seal lairs if on-ice construction is planned during the seal pupping season, February 15 – April 15, during Construction, Operations, Care and Maintenance, and Reclamation/Closure.

Monitoring Methods

Monitoring methods may include working with an Inuit hunter or using a thermal-vision camera. Sabina will work with relevant parties, including Fisheries and Oceans Canada (DFO) to determine the most effective methodology should construction be proposed during the seal pupping period and structures that may support lairs (ice ridges and snow banks) be unavoidable. Prior to construction of the Project, a detailed SOP will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Data Analysis

Records of the monitoring actions (location, methods, personnel, etc.) and the results of on-ice monitoring will be collated into a database.

Triggers for Adaptive Mitigation

On-ice operations will be moved based on locations of lairs to provide a 50-m buffer between on-ice operations and lairs as described in Section 14.1.3.

Reporting

The results of on-ice monitoring for seal lairs, if triggered by road construction during the seal pupping period, management actions taken and their success will be reported in the annual WEMP report.

14.2.2 Marine Mammal Monitoring during Project Shipping

Objective

The objective for marine mammal monitoring during Project shipping is to 1) trigger avoidance of marine mammals, and 2) record marine mammals in the Northwest Passage.

Triggers for Monitoring

Marine mammal monitoring will be conducted by all Project ships in each Project stage when shipping is occurring, including Construction, Operations, Care and Maintenance, and Reclamation/Closure.

Methods

Marine mammal surveys will be conducted as incidental observations by the ship's bridge crew. Sabina will produce a simplified SOP, following the basic methods provided in the protocol outlined in *Recommended Seabird and Marine Mammal Observational Protocols for Atlantic Canada* (Moulton and Mactavish 2004).

Triggers for Adaptive Management

Ships will avoid marine mammals except where the safety of the ship is in concern.

Reporting

Data analysis will be conducted to quantify marine mammal species occurrence, distributions and abundance. Survey effort will be clearly documented. Data and the results of analyses will be reported in the annual WEMP report. In addition, Sabina commits to working with relevant parties on relevant research on the cumulative effects of shipping including marine mammals by sharing all monitoring data collected during shipping activities.

15. Polar Bears

ERM

15. Polar Bears

15.1 MITIGATION AND MANAGEMENT FOR POLAR BEARS

15.1.1 Overview of Potential Effects to Polar Bears

The potential effects to polar bears from the Project were evaluated in the FEIS in the Shipping Sensitivity Report (Appendix V7-6A of the FEIS). The assessment on polar bear consisted of an evaluation of the worst- and best-case scenarios for polar bear populations should a fuel release or spill event occur in the marine environment along the western and eastern shipping route. The assessment considered the overall density of polar bears along the proposed routes, provided context for the potential spill scenarios along the routes, and identified the locations where a potential fuel release or spill event has the potential to affect the largest number of bears (worst-case scenario) and the fewest (best-case scenario).

Overall, there were two polar bear subpopulations, both of which overlap the eastern shipping route, that could be affected should a spill occur: the Lancaster Sound subpopulation and the M'Clintock Channel subpopulation. It appears that the Lancaster Sound subpopulation has the greater sensitivity to a potential spill event relative to the M'Clintock Channel subpopulation. Existing data indicates that the Lancaster Sound subpopulation has the highest overall density of bears and the highest number of identified summer retreats within the subpopulation area. Summer retreats are areas where polar bears are known to congregate during the summer, and include marine habitats where sea ice cover is known to persist during summer (e.g., multi-year ice in Victoria Strait) and terrestrial habitats on islands. Specifically, the areas of the greatest concern within the Lancaster Sound subpopulation area for a potential fuel release or spill event are the northern and western coasts of Somerset Island, where a number of summer retreats occur (Appendix V7-6A of the FEIS; Figure 5-1). The best case scenario would be a potential fuel release or spill event in any of the areas along the Northwest Passage that are not adjacent to polar bear summer retreats (see Appendix V7-6A of the FEIS; Figure 5-1). This constitutes the majority of the shipping route.

Mitigation and management for polar bears will focus on reducing the potential effects to the species should a fuel release or spill event occur in the marine environment, as well as reducing the potential for ship-polar bear collisions (i.e., direct mortality and injury).

15.1.2 Mitigation and Management for Polar Bears in Relation to Accidental Fuel Release or Spill Event in the Marine Environment

Sabina's fuel management plan and spill response plans are discussed in Section 6.1.3.

15.1.3 Mitigation and Management for Direct Mortality and Injury of Polar Bears

Mitigation and management actions to reduce potential effects on polar bears due to shipping include avoiding any groups of marine mammals, including polar bears, observed on the ocean surface except where the safety of the ship is in concern.

15.2 MONITORING FOR POLAR BEARS

Objective

Monitoring will be conducted specifically to document the occurrence of polar bears during Project shipping as requested by the GN and Environment Canada during the review of the DEIS.

Triggers for Monitoring

Polar bear monitoring will be conducted by all Project ships in each Project stage when shipping is occurring, including Construction, Operations, Care and Maintenance, and Reclamation/Closure.

Methods

Marine mammal surveys will be conducted as incidental observations by the ship's bridge crew. Sabina will produce a simplified SOP, following the basic methods provided in the protocol outlined in *Recommended Seabird and Marine Mammal Observational Protocols for Atlantic Canada* (Moulton and Mactavish 2004).

Triggers for Management

Ships will avoid any groups of marine mammals, including polar bears, observed on the ocean surface except where the safety of the ship is in concern.

Reporting

Data analysis will be conducted to quantify marine mammal species occurrence, distributions and abundance. Survey effort will be clearly documented. Data and the results of analyses will be reported in the annual WEMP report. The results of monitoring activities will be reported in the WEMP report. In addition, Sabina commits to working with relevant parties on relevant research on the cumulative effects of shipping including marine mammals by sharing all monitoring data collected during shipping activities.

16. Mitigation and Adaptive Management

ERM

16. Mitigation and Adaptive Management

The WMMP Plan describes actions that are intended to reduce Project-related effects on wildlife. This plan is intended to ensure wildlife habitats and populations are maintained in the area that will be influenced by Project development, while taking into account operational requirements and the safety of Project employees.

Unless otherwise indicated, measures described in the Plan apply to all Project components for the life of the Project. This Plan is designed to be adaptive, effective, and achievable in both the short and long term, and includes measurable objectives that will be evaluated in the Wildlife Effects Monitoring Program.

The results of mitigation activities will be reported regularly, as will the results of focal-species monitoring programs. This circle of mitigation activities, monitoring and evaluation, and new mitigation activities will adaptively manage wildlife issues identified and arising as a result of the Project.

17. Checking and Corrective Action

ERM

17. Checking and Corrective Action

Checking and corrective action evaluates the predicted effects of the Project on wildlife VECs, and evaluates the compliance of the Project with issued licences and permits (e.g., Project Certificate). Evaluation of predicted effects will be conducted through a combination of facility-specific monitoring and focal-species monitoring depending on the scale of the predicted effect. If checks and monitoring identify issues with human safety due to wildlife interactions or non-compliance with issued licenses or permits, then corrective action will be taken.

18. Record Keeping

ERM

18. Record Keeping

Record keeping will be conducted by Sabina and its subcontractors. Data will be entered into suitable electronic databases (e.g., MS Access), checked for quality control, and stored with subcontractors responsible for monitoring and with Sabina. Data will be entered in a format and program that allows for comparison between years, and storage in a single file format for each type of survey or monitoring activity. Data will be appended to each report and the compilation of all years of data will be transferred for storage with the GN. Data may also be shared, upon request, with ECCC and the GNWT for inclusion in regional monitoring programs.

19. Environmental Reporting

ERM

19. Environmental Reporting

The WEMP will be reported during construction, operations, care and maintenance, and closure (excluding periods of temporary closure and post-closure). The periodicity of reporting for the closure and post-closure phases will be agreed upon prior to closure commencing. The WEMP report will include monitoring data from the facility-specific and focal species monitoring programs. Results from both monitoring programs will be analyzed with comparisons to findings from earlier years (i.e., baseline and annual monitoring) and recommendations for change to the wildlife monitoring and management practices or new adaptive management measures (if any) will also be included.

Reporting on mitigation and management activities, including performance as evaluated by mitigation plan key performance indicators will be included in an Appendix to the WEMP.

The WEMP report will be delivered to regulatory agencies and stakeholders, including:

- the Government of Nunavut;
- the Kitikmeot Inuit Association or designate; and
- any monitoring partners involved in the collaborative effects assessment.

20. Plan Effectiveness

ERM

20. Plan Effectiveness

As part of environmental reporting, Sabina will distribute copies of the WEMP report to stakeholders and collaborate with the Kitikmeot Inuit Association to report on mitigation, management, and monitoring activities. Sabina will also conduct an evaluation (as necessary) of the efficacy of mitigation and management activities and of monitoring activities using relevant methods, such as power analyses. Should new, more sensitive, monitoring methods be introduced, or existing methods be found to lack statistical power or a robust design, updated methods will be proposed to the stakeholders in a revised Wildlife Mitigation and Monitoring Program Plan.

This Plan may be updated as frequently as every year, or not at all, if the mine plan and methods for mitigation and monitoring are robust. The new Wildlife Mitigation and Monitoring Program Plan will be implemented following review by stakeholders and an opportunity for response by Sabina.

21. QA/QC

ERM

21. QA/QC

Quality assurance and quality control (QA/QC) measures will be undertaken at three key stages in monitoring activities: 1) during field data gathering, 2) during data entry and analysis, and 3) through reporting and reassessment of methods as part of the evaluation of Plan effectiveness.

The process of data gathering in the field will be quality-controlled through the use of qualified wildlife biologists and a system of pre- and post-field checks to ensure that consistent, repeatable data is being gathered. Checks will be carried out by a second qualified biologist. QA/QC of data entry will be conducted via a process of standard data entry templates, and checking data through either double-entry data or feedback entry, where entered data is checked back to the field cards. QA/QC of data analysis will be conducted through a process of clear, written instructions for data analysis and pre- and post-analysis checks by a second qualified biologist. Finally, the efficacy of the methods as a whole will be evaluated through repeated scrutiny of the data using power analysis and through review by stakeholders.

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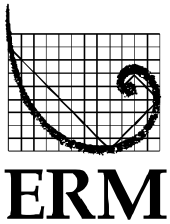

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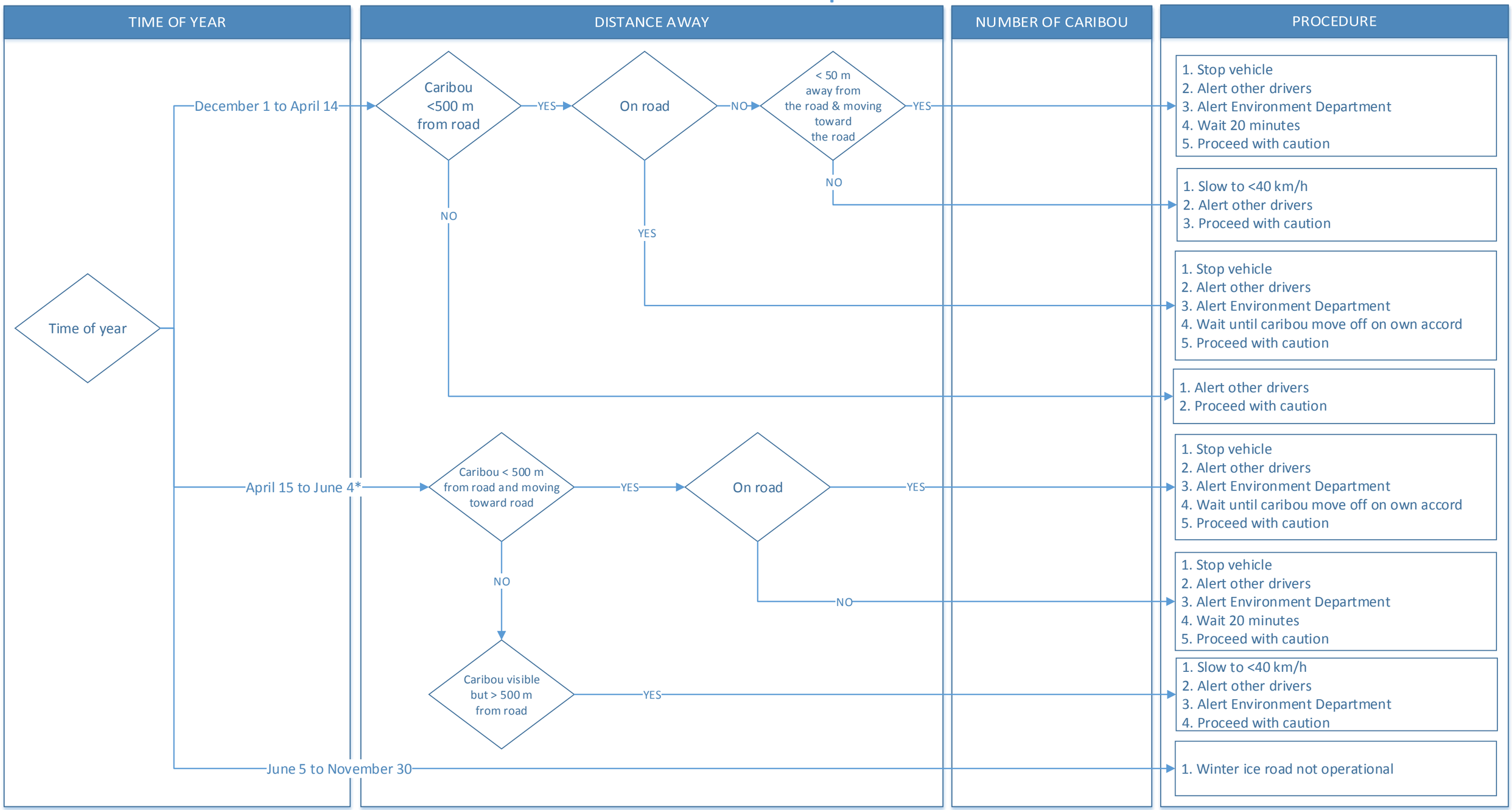
Appendix 1
The Caribou Decision Tree

ERM

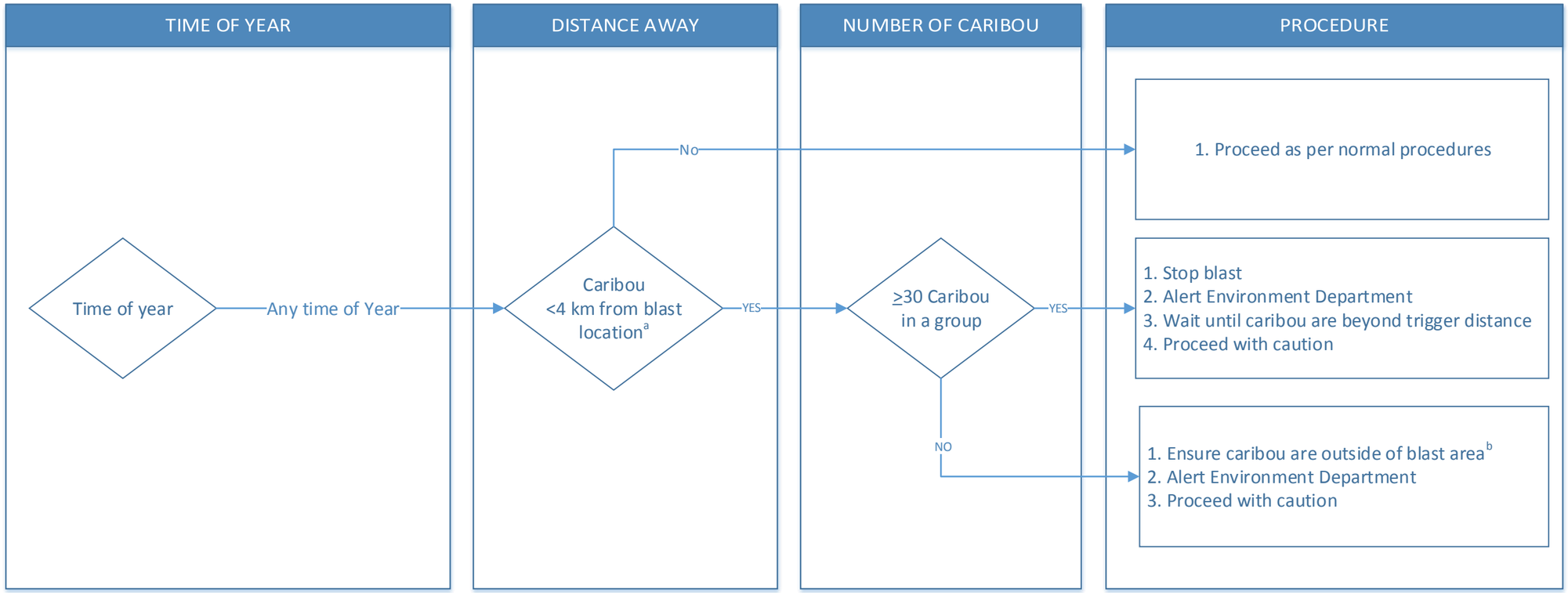
Winter Ice Road Operations



Mitigation /Monitoring:

- Traffic managed through central dispatch and trucks grouped into convoys
- Speed limit of 60km/hr
- Height and shape of snow banks will be managed to facilitate crossing by caribou
- Wildlife always have the right of way
- *Spring migration: Caribou collars will be monitored and caribou monitors will survey the road for caribou crossing the road.

Open Pit Mine Blasting Operations

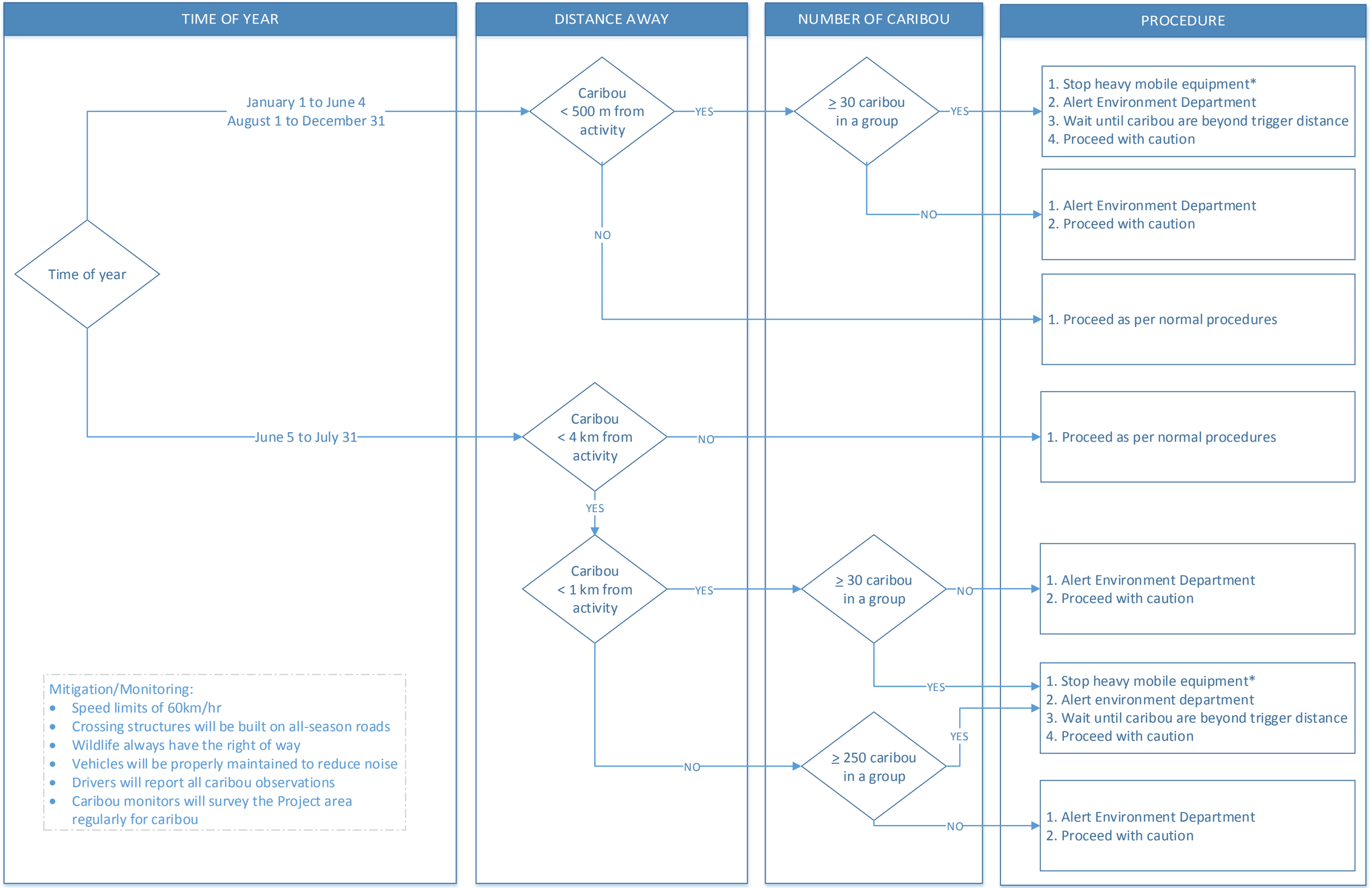


[a] *Setback distance may be updated during the life of the Project using the results of herd vulnerability, noise monitoring, behaviour monitoring, zone of influence monitoring, and changes to blast size.*
[b] *The blast safety area will be determined on a case by case basis considering factors such as, but not limited to: material to be blasted; type and amount of explosive material; blast pattern; and delay systems.*

Mitigation/Monitoring:

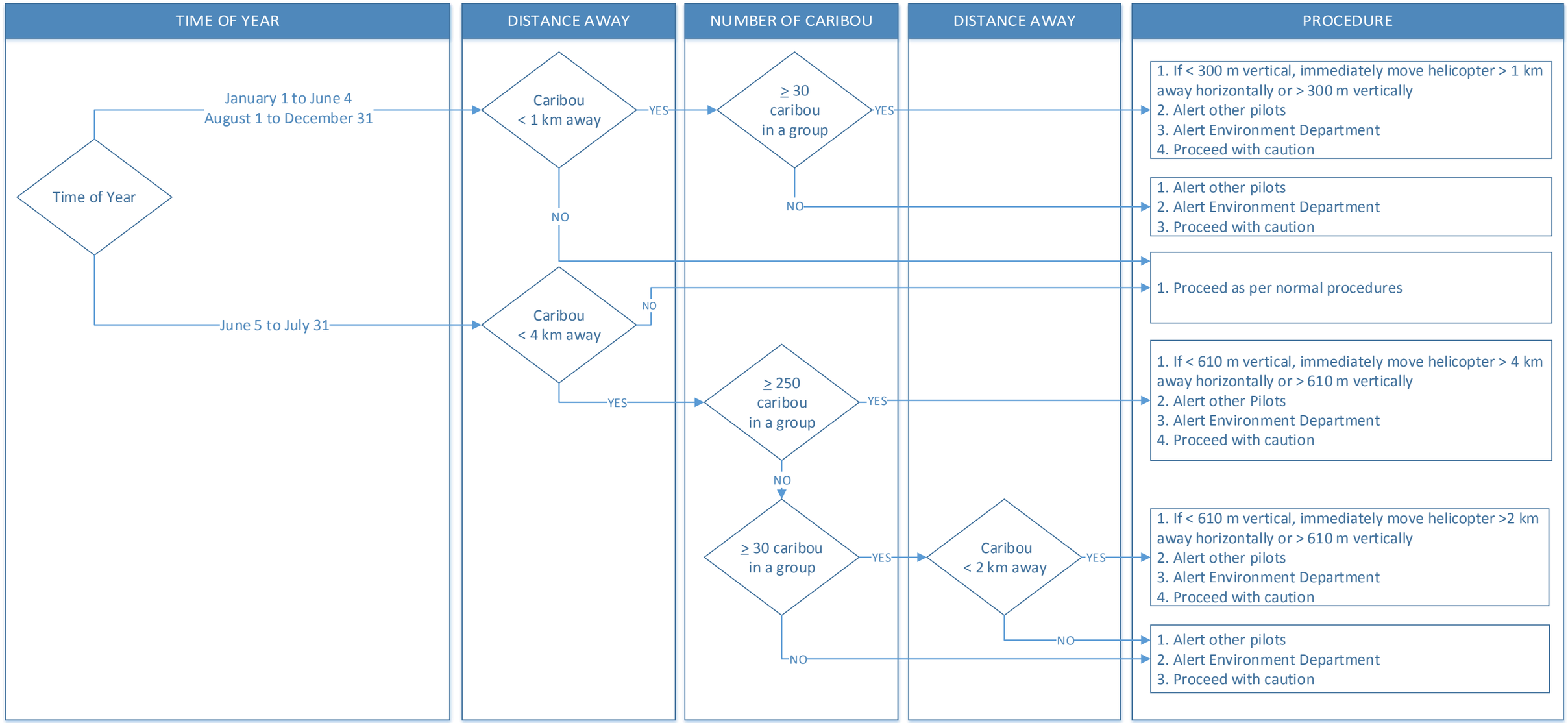
- Prior to blasts, caribou monitors will survey for caribou

Heavy Equipment Operations



**Excluding mill site operations and activities required to ensure the safety of staff and the safe operation/maintenance of equipment.*

Helicopter Operations



Mitigation/Monitoring:

- Pilot education on sensitive wildlife areas and periods
- Minimum standard flight height of 610 m between June 5 and July 31 and 300 m between January 1 to June 4 and August 1 to December 31, except where needed
- Pilots will report all caribou observations

Appendix 2
Caribou Protection Measures

ERM

CARIBOU PROTECTION MEASURES

BACK RIVER PROJECT

Sabina
GOLD & SILVER CORP.

Introduction

SABINA'S COMMITMENT TO CARIBOU PROTECTION

Caribou are integral to the identity, culture and livelihood of Inuit, First Nations, and Métis in northern Canada. Sabina has worked closely with community representatives, government and regulatory agencies, and other stakeholders to identify how development, climate change, land use, and other changes may affect caribou. Sabina is committed to operating the Back River Project in a way that minimizes any effect on caribou. Through our Wildlife Mitigation and Monitoring Program, we have committed to industry-leading measures to reduce any potential effect on caribou.

INCORPORATING TRADITIONAL KNOWLEDGE

We recognize that Indigenous peoples hold unique knowledge about caribou and their interconnections with wider ecological, cultural, economic, and spiritual systems. Sabina has worked closely with the Kitikmeot Inuit Association to understand and document Traditional Knowledge of the Project area and the wildlife and people who depend on it. We also reviewed publically available Traditional Knowledge from North West Territories Indigenous groups.

Sabina has incorporated this Traditional Knowledge into all aspects of the Back River Project. We designed the Project to avoid important traditional and current land use sites such as hunting camps, caribou movement corridors, river crossing sites, and ice crossing locations.

Traditional Knowledge was also used to determine potential effects on caribou, including caribou health, disturbance, and important habitat areas. Mitigation measures were similarly based on Traditional Knowledge, e.g., using open water shipping to protect the migration routes of island (Dolphin and Union) caribou, designing roads to not hinder caribou movement and minimizing noise and disturbance from aircraft, helicopters, vehicles, and blasting. Traditional Knowledge also identified that caribou calving ranges can periodically shift to new locations. Calving and Post-calving ranges will be monitored and Project shut downs will occur if these ranges shift to overlap the Project.

SABINA'S APPROACH

Through extensive consultation, Sabina developed a list of potential effects on caribou, as described in the Final Environmental Impact Statement. Sabina will use a system of mitigation, monitoring and management to reduce each potential effect on caribou.

Mitigation measures are activities that are ongoing on a constant basis, or are designed into the Project. Project design changes include designing buildings and waste facilities to exclude wildlife, and using open water shipping only. Mitigation will avoid or minimize potential effects on caribou.

Monitoring includes regularly scanning the Project area for caribou and will be conducted throughout the life of the Project. Community members and trained specialists will work as caribou monitors.

Management actions are triggered by monitoring. Examples include giving wildlife the right of way on Project roads and stopping blasting when caribou are observed near the Project site. Sabina has committed to adaptive management, where management activities are developed in response to monitoring studies, feedback from the Kitikmeot Inuit Association, community members, other stakeholders, and existing best management practices.

REPORTING

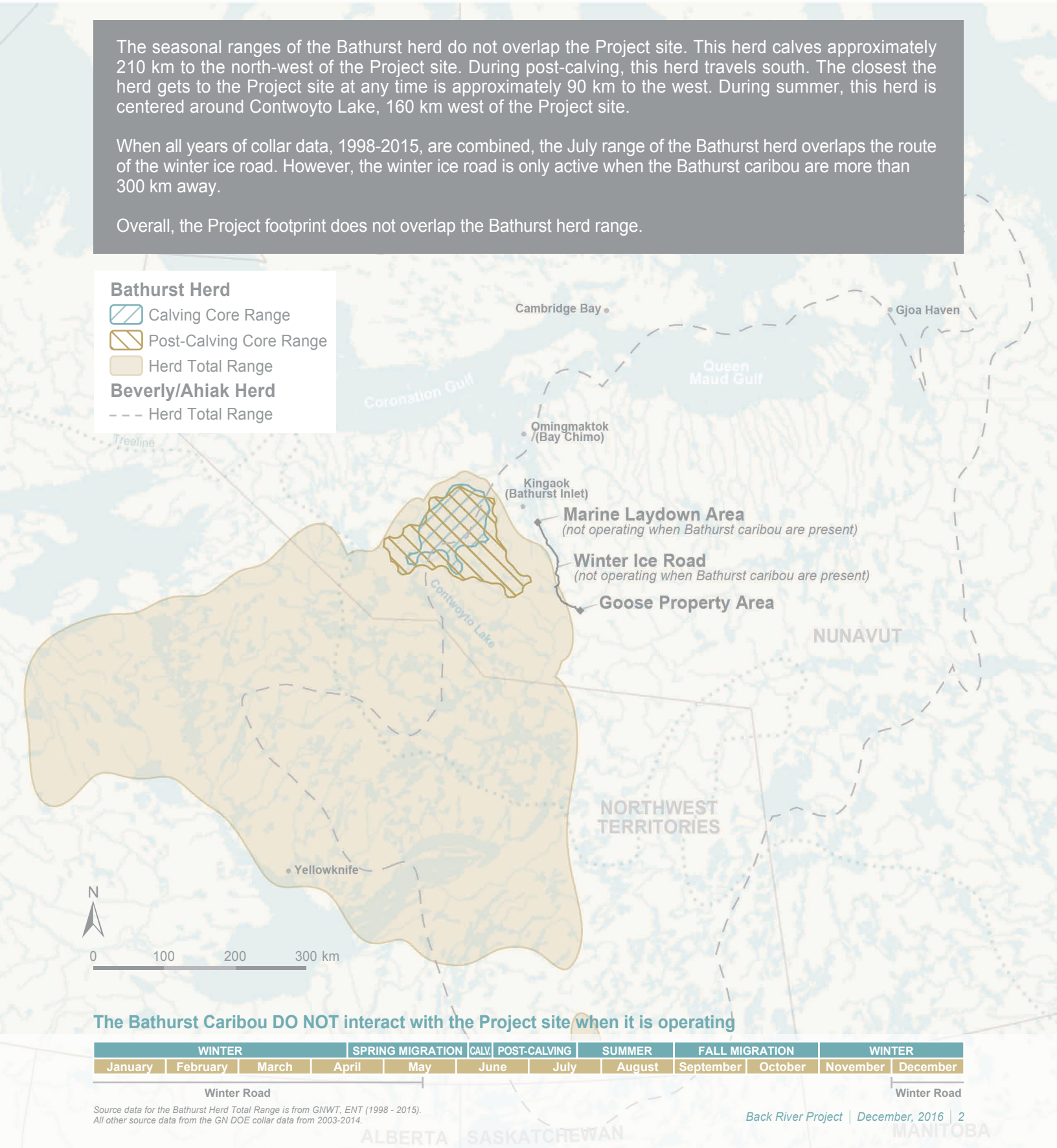
Sabina will report the results of all mitigation, monitoring and management activities in their annual Wildlife Effects Monitoring Program Report. This report will be circulated to the Kitikmeot Inuit Association, government agencies, and all other relevant stakeholders for discussion.

Bathurst Caribou

The seasonal ranges of the Bathurst herd do not overlap the Project site. This herd calves approximately 210 km to the north-west of the Project site. During post-calving, this herd travels south. The closest the herd gets to the Project site at any time is approximately 90 km to the west. During summer, this herd is centered around Contwoyto Lake, 160 km west of the Project site.

When all years of collar data, 1998-2015, are combined, the July range of the Bathurst herd overlaps the route of the winter ice road. However, the winter ice road is only active when the Bathurst caribou are more than 300 km away.

Overall, the Project footprint does not overlap the Bathurst herd range.



The Bathurst Caribou DO NOT interact with the Project site when it is operating

WINTER			SPRING MIGRATION		CALV.	POST-CALVING	SUMMER		FALL MIGRATION		WINTER	
January	February	March	April	May	June	July	August	September	October	November	December
Winter Road											Winter Road

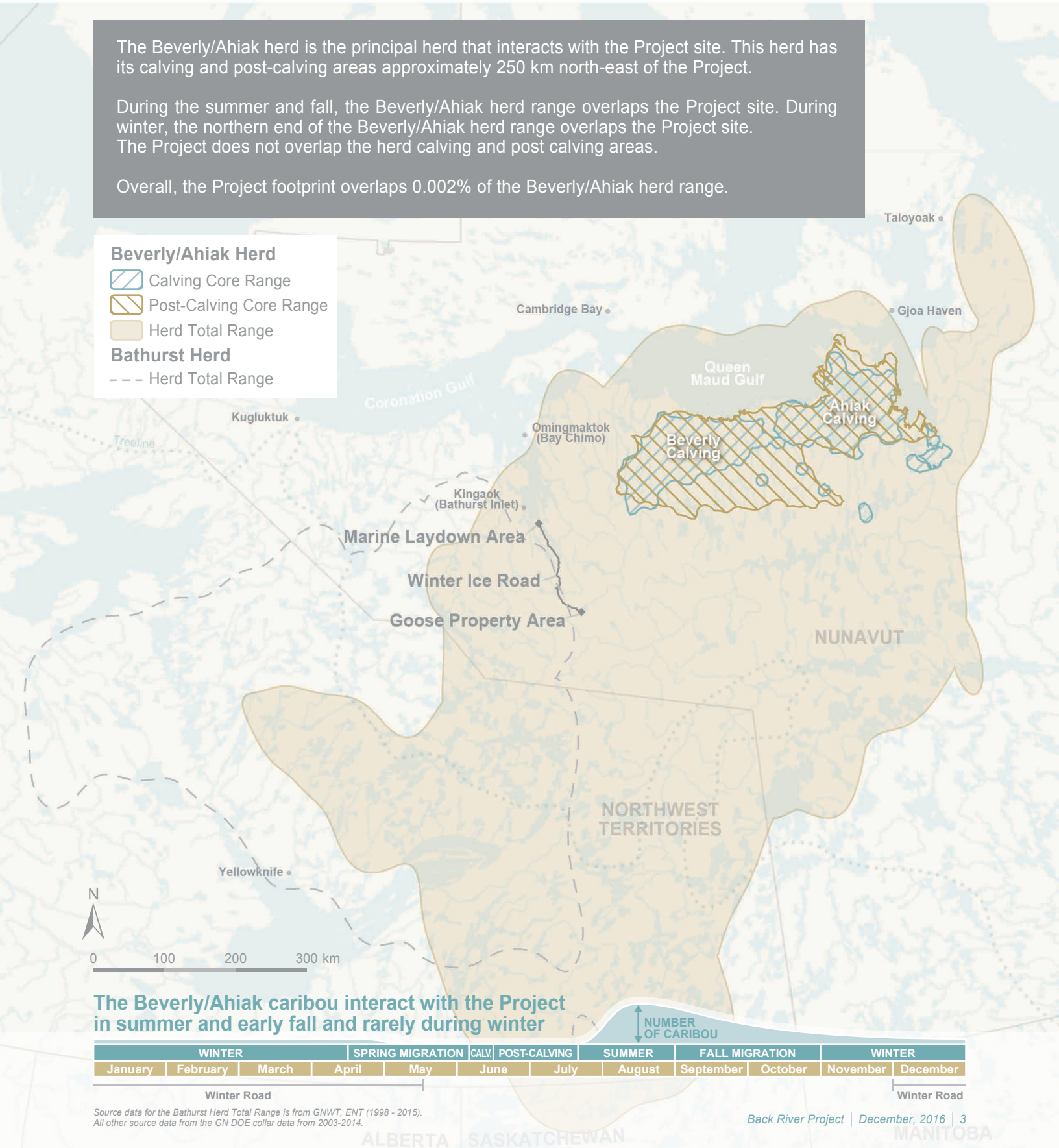
Source data for the Bathurst Herd Total Range is from GNWT, ENT (1998 - 2015).
All other source data from the GN DOE collar data from 2003-2014.

Beverly/Ahiak Caribou

The Beverly/Ahiak herd is the principal herd that interacts with the Project site. This herd has its calving and post-calving areas approximately 250 km north-east of the Project.

During the summer and fall, the Beverly/Ahiak herd range overlaps the Project site. During winter, the northern end of the Beverly/Ahiak herd range overlaps the Project site.
The Project does not overlap the herd calving and post calving areas.

Overall, the Project footprint overlaps 0.002% of the Beverly/Ahiak herd range.



The Beverly/Ahiak caribou interact with the Project in summer and early fall and rarely during winter

NUMBER OF CARIBOU

WINTER			SPRING MIGRATION		CALV.	POST-CALVING	SUMMER	FALL MIGRATION		WINTER	
January	February	March	April	May	June	July	August	September	October	November	December

Winter Road

Winter Road

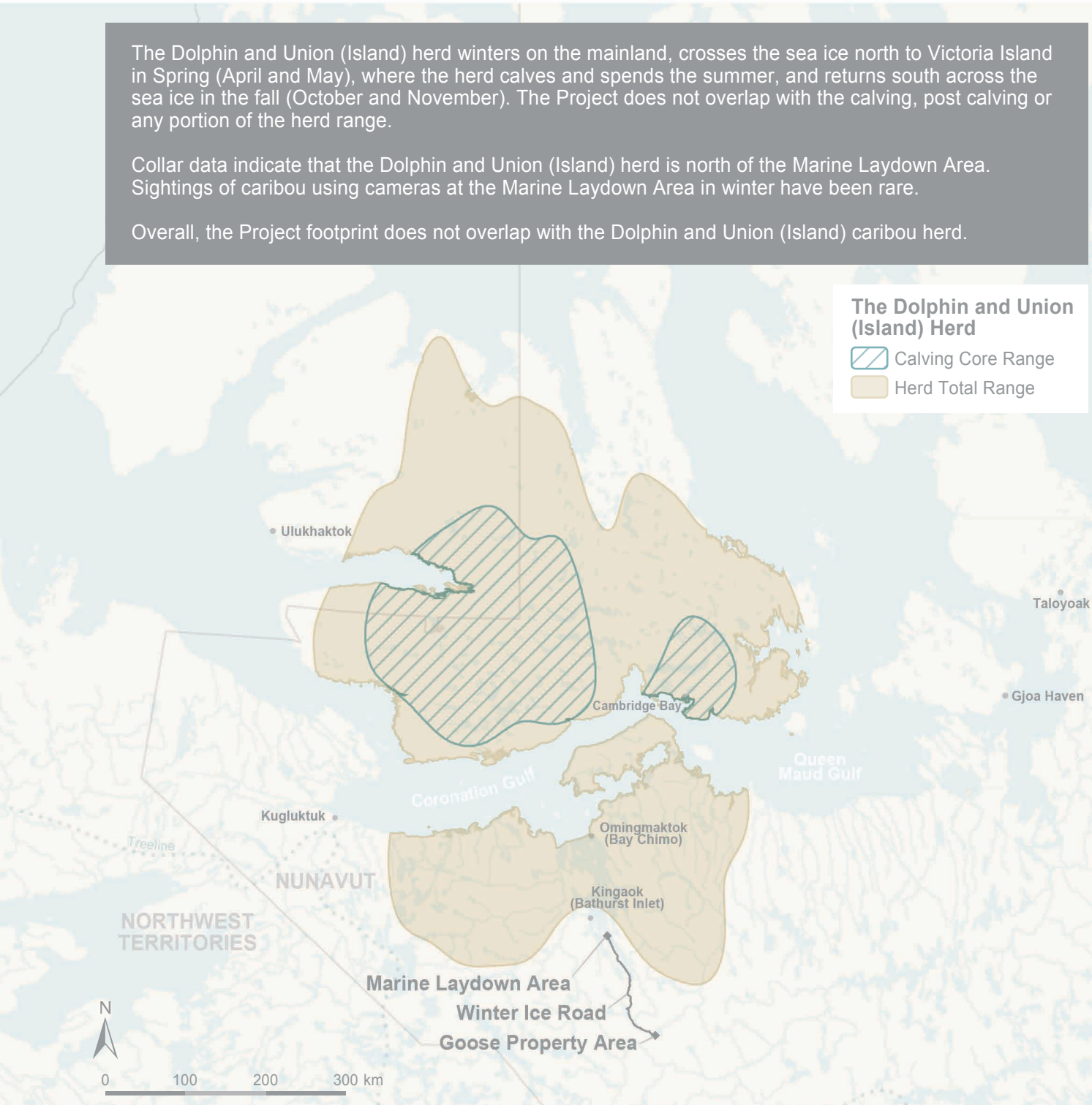
Source data for the Bathurst Herd Total Range is from GNWT, ENT (1998 - 2015).
All other source data from the GN DOE collar data from 2003-2014.

The Dolphin and Union (Island) Caribou

The Dolphin and Union (Island) herd winters on the mainland, crosses the sea ice north to Victoria Island in Spring (April and May), where the herd calves and spends the summer, and returns south across the sea ice in the fall (October and November). The Project does not overlap with the calving, post calving or any portion of the herd range.

Collar data indicate that the Dolphin and Union (Island) herd is north of the Marine Laydown Area. Sightings of caribou using cameras at the Marine Laydown Area in winter have been rare.

Overall, the Project footprint does not overlap with the Dolphin and Union (Island) caribou herd.



The Dolphin and Union herd are generally north of the Project site, even during winter

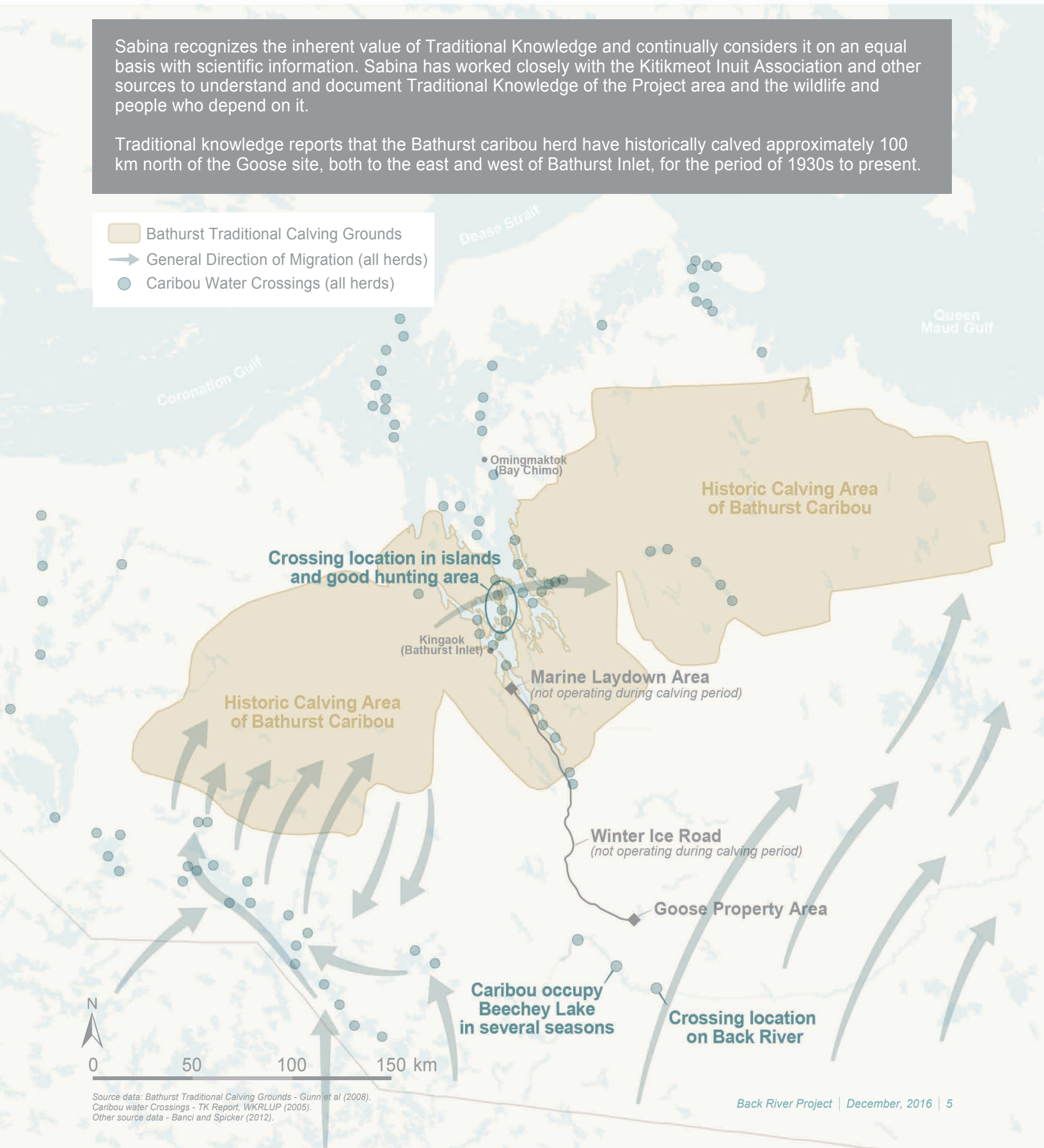
WINTER			SPRING MIGRATION		CALV.	POST-CALVING	SUMMER		FALL MIGRATION		WINTER	
January	February	March	April	May	June	July	August	September	October	November	December
Winter Road											Winter Road

All other source data from the GN DOE collar data from 1998-2004.

Traditional Knowledge

Sabina recognizes the inherent value of Traditional Knowledge and continually considers it on an equal basis with scientific information. Sabina has worked closely with the Kitikmeot Inuit Association and other sources to understand and document Traditional Knowledge of the Project area and the wildlife and people who depend on it.

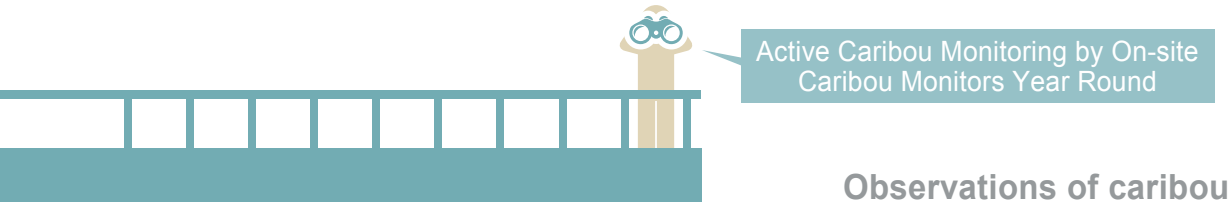
Traditional knowledge reports that the Bathurst caribou herd have historically calved approximately 100 km north of the Goose site, both to the east and west of Bathurst Inlet, for the period of 1930s to present.

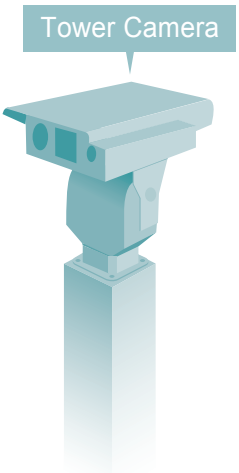


Source data: Bathurst Traditional Calving Grounds - Gunn et al (2008).
Caribou water Crossings - TK Report, WKRLUP (2005).
Other source data - Banci and Spicker (2012).

Wildlife Monitoring

Caribou monitors will be on site at all times.





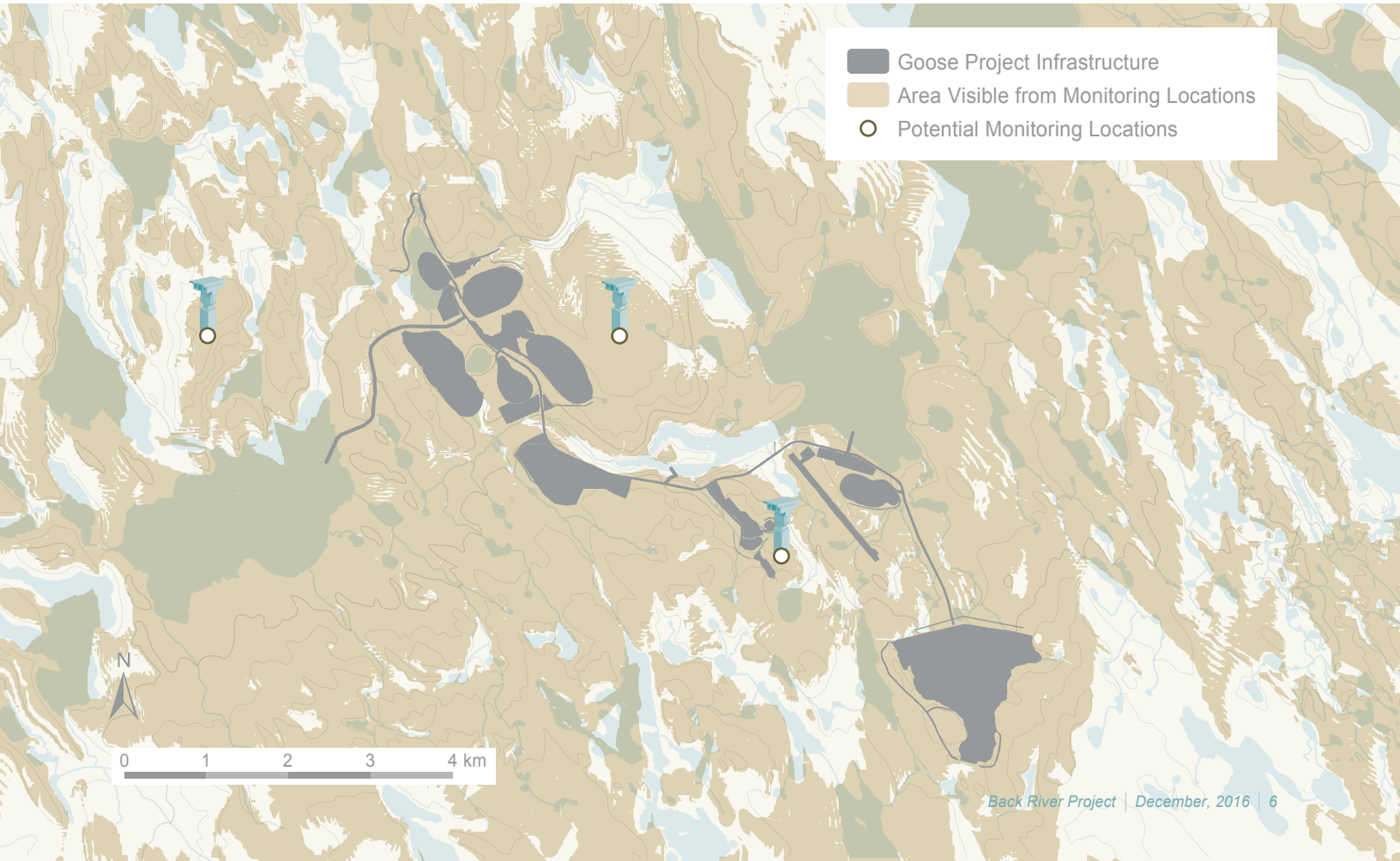
Observations of caribou can trigger

Staged Reduction

If a group of caribou (30-250 animals) are observed near the Project site, then the Project will manage the site to reduce disturbance by reducing or stopping blasting, heavy mobile equipment, vehicles on roads, helicopters and fixed wing aircraft.

Rapid Operational Shutdown

If a large group of caribou (>250 animals) move their calving or post-calving range over the Project site, then observations of caribou will trigger a 'rapid operational shutdown' to further reduce Project activities.



Levels of Caribou Protection

Sabina will have six levels of protection for caribou, based on season and group size. Wildlife monitors survey for caribou every day, year-round. Drivers and pilots survey for caribou while operating their vehicles.

Level 1 Normal Operations

Mining activities and active monitoring are conducted year-round. Response levels 2 through 4 can be triggered in any season to replace normal operations. Active caribou monitoring is ongoing.

Level 2 Site Notification

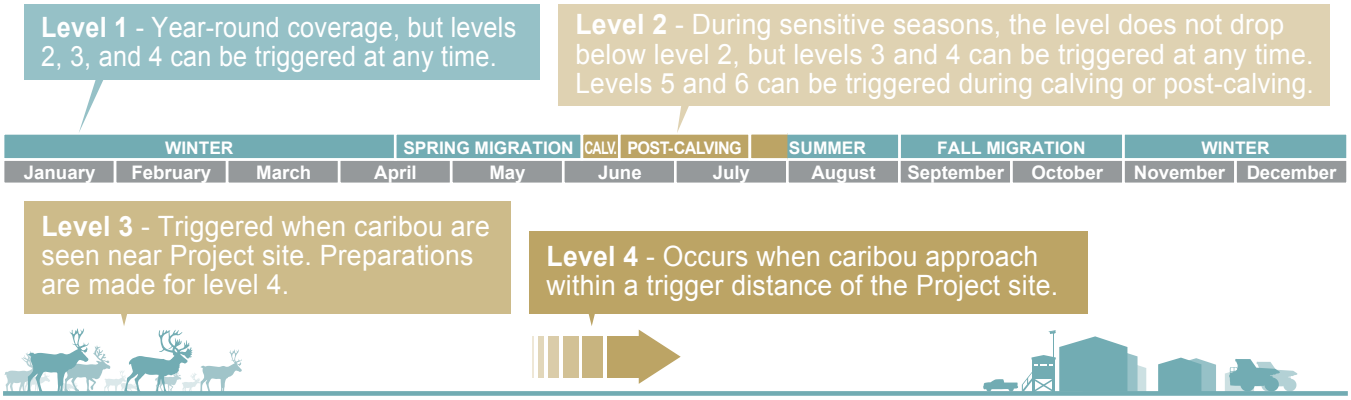
The Environmental Manager triggers a site notification during sensitive seasons for caribou (calving, post-calving and early summer). Site notification includes passing information on to all Project personnel by radio, bulletin boards and morning meetings. Personnel are reminded of their responsibilities to protect caribou.

Level 3 Site Alert

The Environmental Manager triggers a site alert if a group of caribou is observed near the Project site. The site alert prepares personnel for a potential, imminent Level 4 response.

Level 4 Staged Reduction in Project Activities

Observations of groups of caribou close to the site will trigger the management or stopping of Project activities, including blasting, heavy mobile equipment usage, helicopter flights, and vehicles on roads. The objective of staged reductions is to reduce potential noise and visual disturbances to caribou.



Management for Shifts in Calving Range

Level 5 Rapid Operational Shutdown

If large groups of caribou are observed on site during calving or post-calving, the Environmental Manager will limit outdoor activity, blasting, heavy mobile equipment, helicopter flights and vehicles on roads so the Project is making less noise than under Level 4 – Staged Reduction.

Level 6 Planned Operational Shutdown

If satellite collars confirm the calving or post-calving range has changed to overlap the Project site, Sabina will conduct a Planned Operational Shutdown during the following year to prevent disturbance to caribou.

Herd Vulnerability

Herd Vulnerabililty: Sabina's Management Approach

STEP 1 Monitoring Indicators

- Seasonal Distribution and Range Use
- Population Size and Trend
- Herd Productivity
- Herd Health
- Harvest
- Range Quality, Quantity and Availability
- Predators and Insects
- Human-Caused Disturbance
- Weather and Climate

STEP 2 Herd Vulnerability Score

Very High

5
4
3
2
1

Very Low

STEP 3 Management Actions at the Project

The Project will be managed based on the herd vulnerability score.

Management actions will be more stringent when herd vulnerability is higher.

The Bathurst herd is projected to be ranked a 4-5 herd vulnerability.

The Beverly/Ahiak herd is projected to be ranked a 2-3 herd vulnerability.

Herd Vulnerability Score

1	2	3	4	5
	Beverly/Ahiak herd		Bathurst herd	

Sabina will manage to the highest projected vulnerability.

Herd Vulnerability: Management in Sensitive Seasons

Sabina will have more intensive management during sensitive seasons: calving, post-calving, and early summer.

WINTER			SPRING MIGRATION	CALV.	POST-CALVING		SUMMER	FALL MIGRATION		WINTER	
January	February	March	April	May	June	July	August	September	October	November	December

Herd Vulnerability: Management and Group Size

Large groups (>250) - triggers rapid operational shutdown during calving and post calving

Groups (30 - 250) - triggers staged reductions all year: additional blasting setbacks and stopping heavy equipment

Individuals (<30) - triggers management of vehicles on roads, blasting, and helicopters

Source Beverly and Qamanirjuaq Caribou Management Plan 2013-2022.

Staged Reductions in Project Activities

Level 4 of caribou protection is staged reductions in Project activities.

1. Blasting

MITIGATION

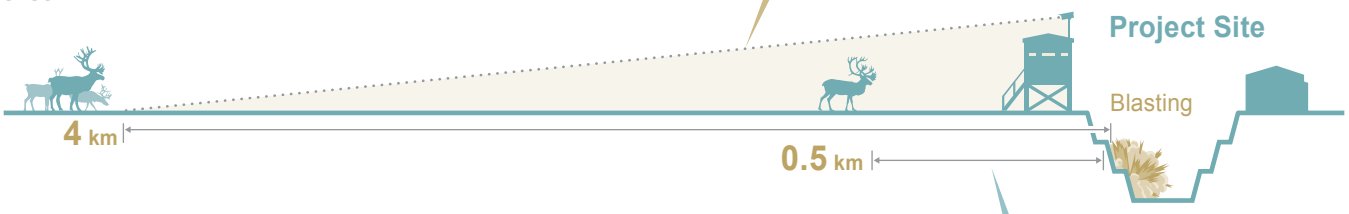
No blasting if caribou are within the safety area.

MONITORING

Wildlife monitors survey for caribou every day, year-round.

MANAGEMENT

During all seasons, **suspend blasting** if groups of 30 or greater caribou are within 4 km



During all seasons, **suspend blasting** if any caribou are within the 0.5 km blast safety area

2. Heavy Mobile Equipment

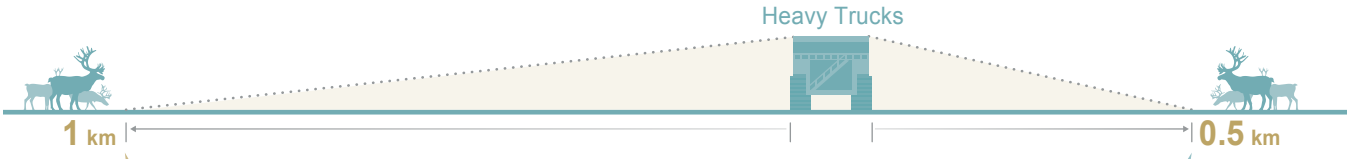
MITIGATION

Speed limits will be enforced (60 km/h).

MONITORING

Wildlife monitors survey for caribou every day, year-round.

MANAGEMENT



During calving, post-calving and early summer, **suspend heavy mobile equipment** if groups of 30 or greater caribou are within 1 km

During the rest of the year, **suspend heavy mobile equipment** if groups of 30 caribou or greater are within 0.5 km

3. Helicopters

MITIGATION

Pilots are trained to identify, report, and avoid caribou groups and high use areas for caribou.

MONITORING

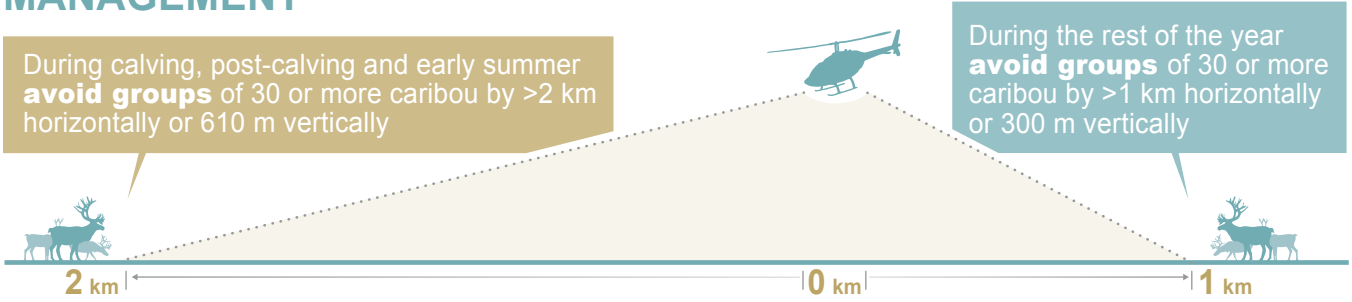
Pilots monitor for caribou while flying.

The Environmental Manager informs pilots of known caribou in the area and can ground flights if too many caribou are present near the site.

MANAGEMENT

During calving, post-calving and early summer **avoid groups** of 30 or more caribou by >2 km horizontally or 610 m vertically

During the rest of the year **avoid groups** of 30 or more caribou by >1 km horizontally or 300 m vertically



4. Roads

MITIGATION

Speed limits will be enforced (60 km/h) on all roads to reduce potential of interactions with wildlife.

On-site roads will have crossing ramps for caribou at locations chosen by land users and elders.

Snowbanks on the winter-ice road will be maintained to allow caribou to cross easily.

All roads will be closed to the public.

MONITORING

Drivers will report all caribou and other wildlife observations.

Caribou monitors will monitor the winter ice road in the spring during migration.

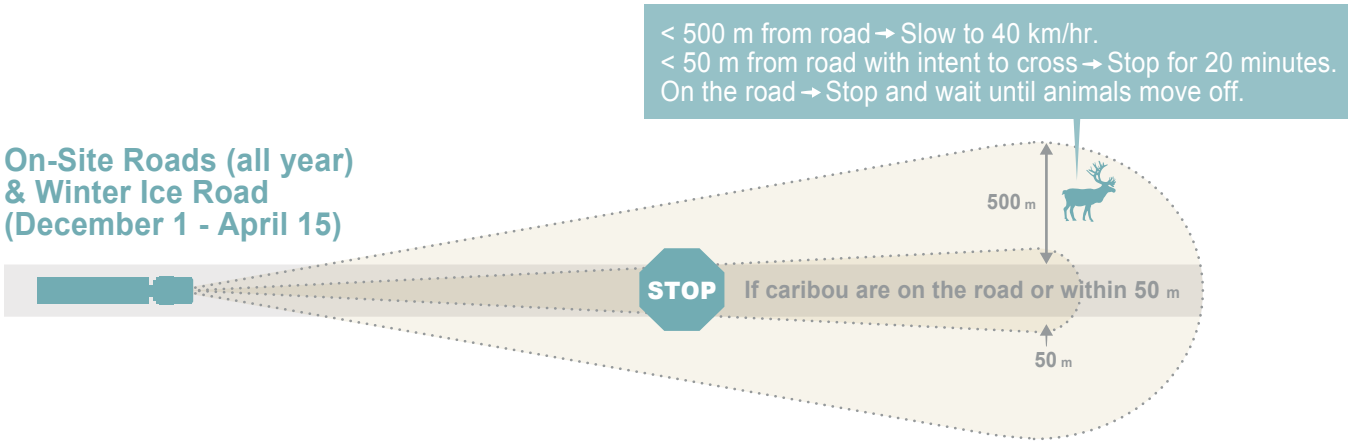
MANAGEMENT

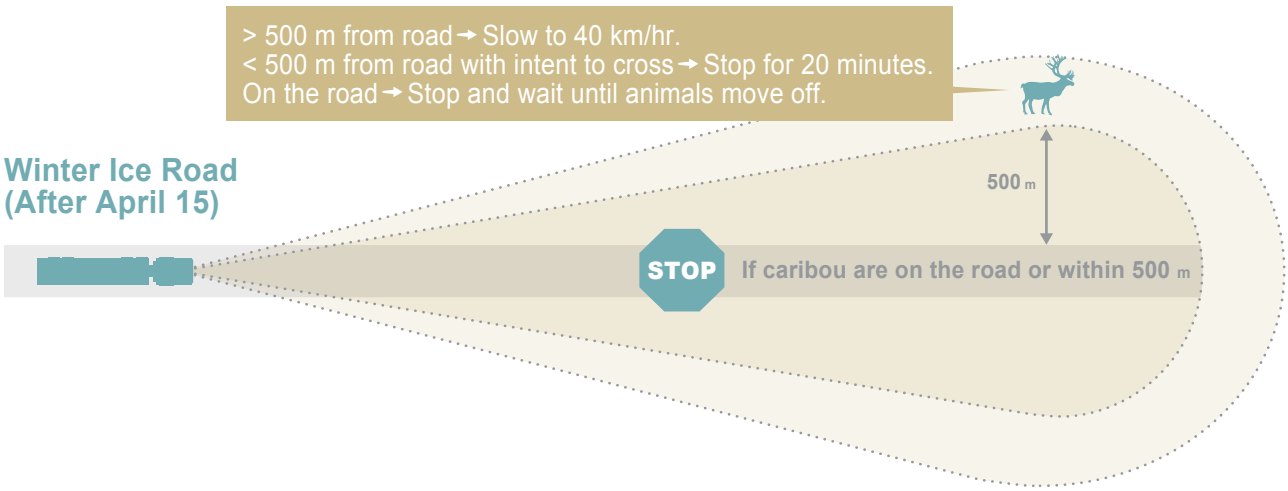
Focus on protecting caribou when they are more sensitive to disturbances, such as calving and post-calving.

If caribou are migrating across the ice road, traffic will be stopped.

Caribou will always be given the right of way on all Project roads.

Drivers will slow down or stop if caribou are near the road.

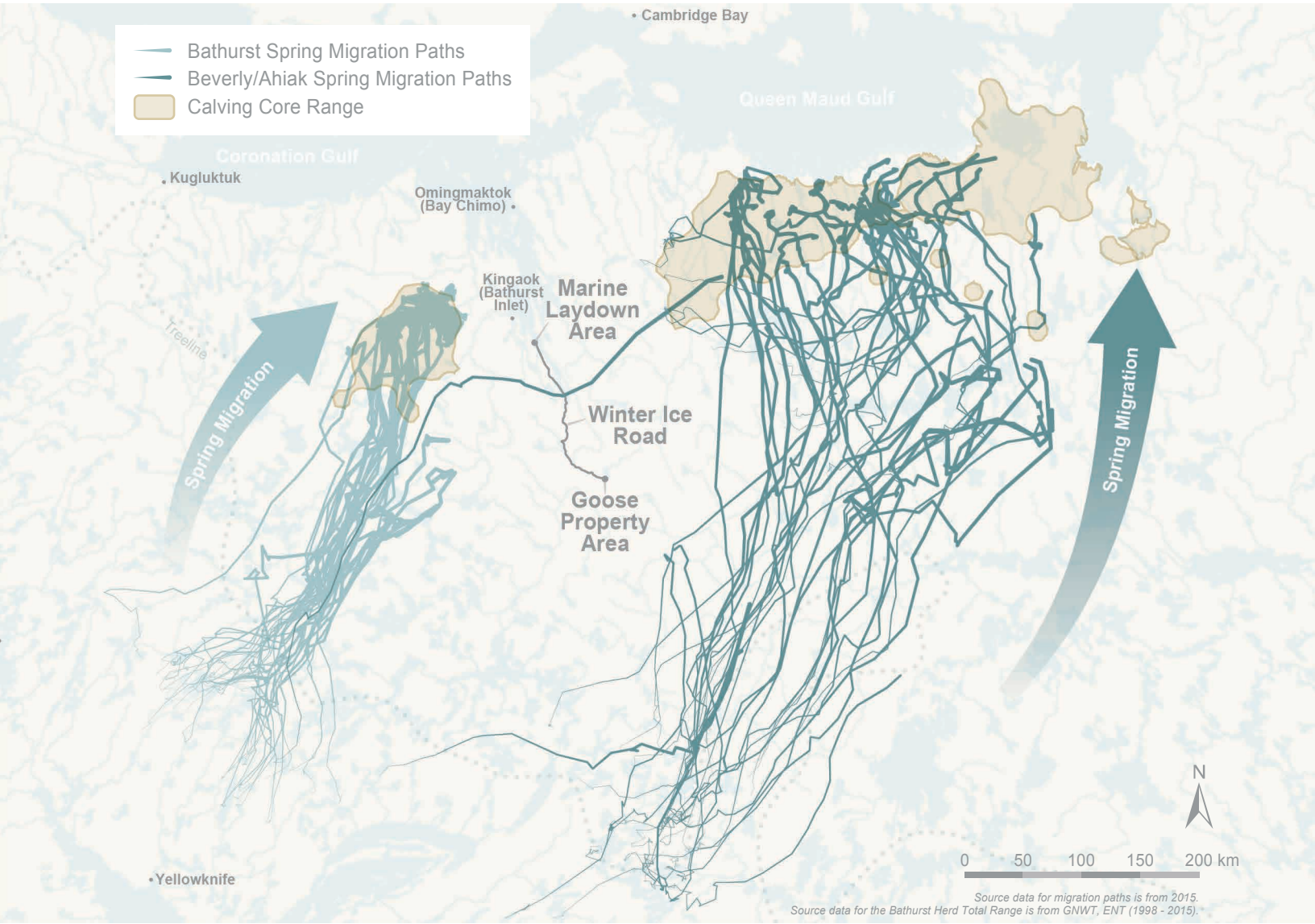




Satellite Collar Analysis

MONITORING

Collar data collected by the government will be used to map the distribution of Bathurst and Berverly/Ahiak caribou each year. Collar data will also be used to determine if caribou are acting differently than previous years.



MANAGEMENT

During spring, if collars show that Beverly/Ahiak caribou are approaching or crossing the winter ice road, then ground based monitoring will be triggered. The Environmental Manager may also shut down the winter ice road until caribou have left.

During spring migration to the calving ground, if either the Bathurst or Beverly/Ahiak caribou appear to be shifting their calving ground to overlap the Project site, then a site alert will be triggered and the Environmental Manager will discuss triggering a 'Rapid Operational Shutdown' with the KIA, GN and GNWT.

Responding to Shifts in Calving Range

Rapid Operational Shutdown

Rapid shifts in calving and post-calving range.

This program describes management responses within the year a shift in range is observed.

MONITORING

On-site wildlife monitors will monitor for caribou groups every day, year round.

Near real-time monitoring of caribou collars will warn Sabina that caribou are calving or post-calving in a different area than their normal range.

MANAGEMENT

If large groups (>250 caribou) are observed within 4 km during calving or post-calving, then '**Rapid Operational Shutdown'** is triggered which includes:

- Daily communication with regulators.
- Stop open pit blasting and other surface blasting.
- Stop open pit activities.
- Stop heavy equipment on surface.
- Stop helicopter usage including landings & take-offs.
- Reduction of fixed wing aircraft use.
- Reduction in the number of light vehicles on surface.
- Underground activities not requiring heavy mobile equipment use on surface may continue.

Planned Operational Shutdown

Long-term shifts in calving and post-calving range.

This program describes management responses the following year a shift in range is observed.

MONITORING

Annual analysis of the seasonal ranges of the Bathurst, and Beverly/Ahiak caribou herds will notify Sabina that a long-term shift in the calving or post-calving range has occurred.

This will be verified using the results of on-site wildlife monitoring and discussions with KIA, GN, and GNWT caribou biologists.

MANAGEMENT

If the core calving or post-calving range overlaps the Project site, then in the following year a '**Planned Operational Shutdown'** will be carried out, including:

- Daily communication with regulators.
- Stop open pit blasting and other surface blasting.
- Stop open pit activities.
- Stop heavy equipment on surface.
- Stop helicopter usage including landings & take-offs.
- Stop fixed wing aircraft use.
- Restriction to essential light vehicles only.
- Stop underground activities.
- Discussion with all relevant parties 6 months prior to planned operational shutdown.
- A planned reduction in the on-site workforce.
- Reduction in mill operations.

** On-site activities required to maintain the site, personnel safety, and environmental compliance will continue.*

Minimizing our Footprint

MITIGATION

Goose and Marine Laydown Area designed with a small footprint. Supply roads are temporary winter ice roads only.

MONITORING

The Project footprint will be measured annually, compared to the footprint proposed in the Final Environmental Impact Statement, and reported on.

Wildlife-Proofing Buildings

MITIGATION

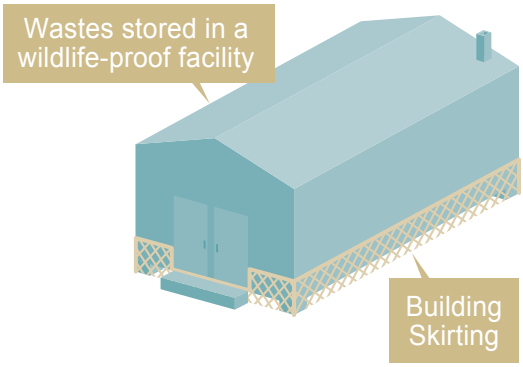
All buildings, camps, and equipment storage will be designed to be wildlife-proof, including doors and windows and building skirting to prevent curious animals from accessing Project materials.

MONITORING

Skirting and fencing will be monitored.

MANAGEMENT

Repair skirting and fences as needed.



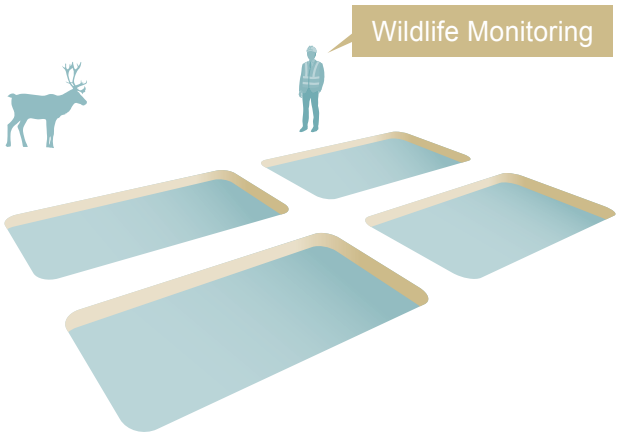
Minimizing Attractants

MITIGATION

Camps will be kept clean.

No-feeding policy for wildlife.

Wastes will be securely stored and incinerated.



MONITORING

Camps inspected for cleanliness daily.

Waste facilities and Project ponds monitored with cameras to see if wildlife are attracted.

Water quality in Project ponds will be tested to ensure it is safe for caribou and other animals.

MANAGEMENT

If monitoring indicates there is an attractant problem, the issue will be immediately managed – e.g., cleanups, or additional measures to deter wildlife from waste facilities. Land users and elders will be consulted on how best to deter wildlife.

If caribou are using the tailings management facility and the water is below wildlife standards, then caribou will be kept out.

Minimizing Noise

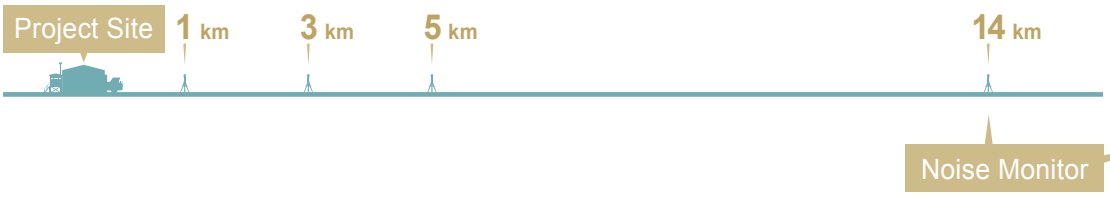
MITIGATION

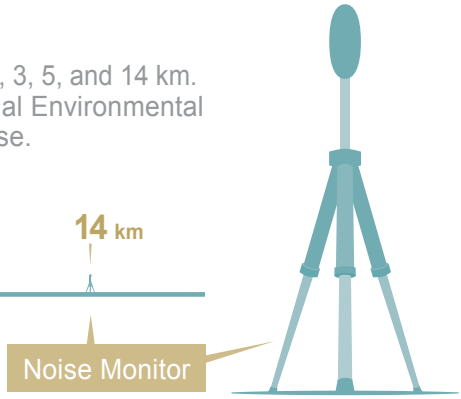
The Project will be designed to limit noise; equipment will be chosen and maintained to limit potential effects on caribou.

MONITORING

Noise Monitoring

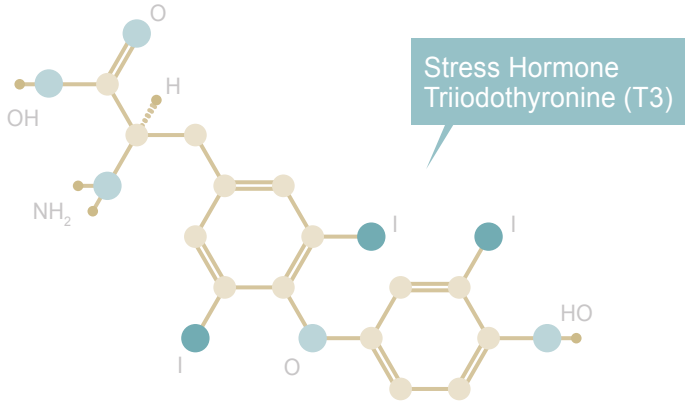
Noise from the Project will be monitored using sound recording equipment at 1, 3, 5, and 14 km. Additional mitigation will be triggered if noise exceeds predictions in the Final Environmental Impact Statement or if caribou are avoiding the Project site because of noise.





Zone of Influence Monitoring

The Project will use government collar data to determine if caribou are avoiding the Project site because of noise and activity. Collar data collected between 1998-2015 will be compared to collar data during construction and operations to see if fewer caribou are found in the Project area, or if they move through the area faster.



Behaviour Monitoring

The behaviour of caribou near the Project site will be observed and recorded to determine if they are disturbed by the Project.

Stress Hormone Monitoring

The Project will monitor the stress levels of caribou near the site by analyzing their droppings.

Minimizing Dust

MITIGATION

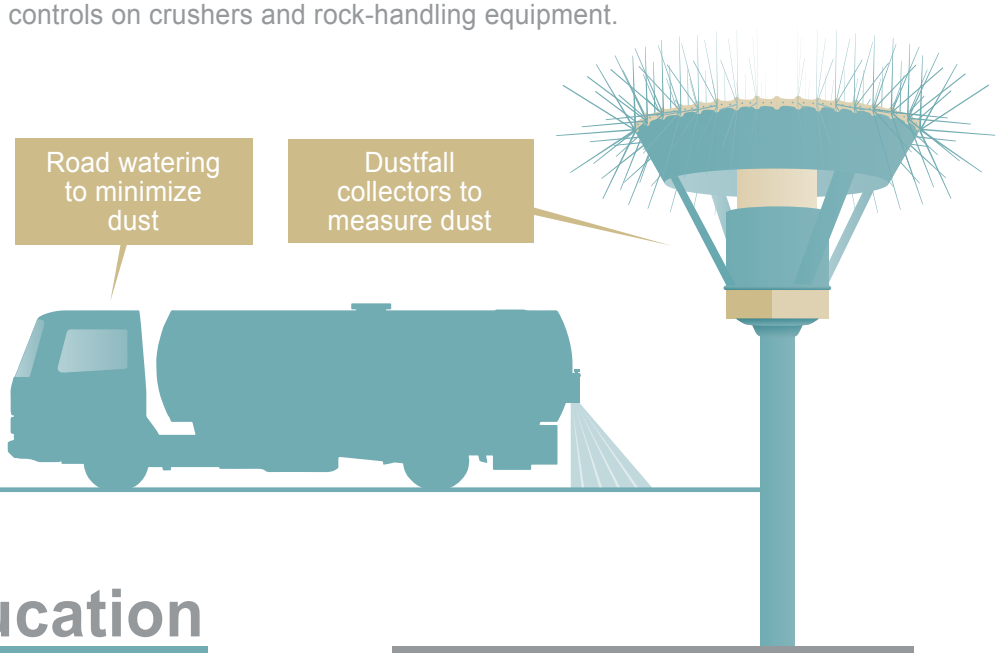
Dust will be controlled on site through watering and use of non-toxic dust suppressants on the road, skirting on conveyors, and controls on crushers and rock-handling equipment.

MONITORING

Dust will be monitored throughout construction and operations.

MANAGEMENT

If dust exceeds acceptable limits, then adaptive management will be used to further limit dust deposition.



Employee Education

All employees will go through a wildlife training program to teach the importance of wildlife protection, and the mitigation and management procedures that every employee must follow.

The Project will have strict wildlife policies to limit effects on wildlife - no feeding wildlife, no littering, no hunting on site.

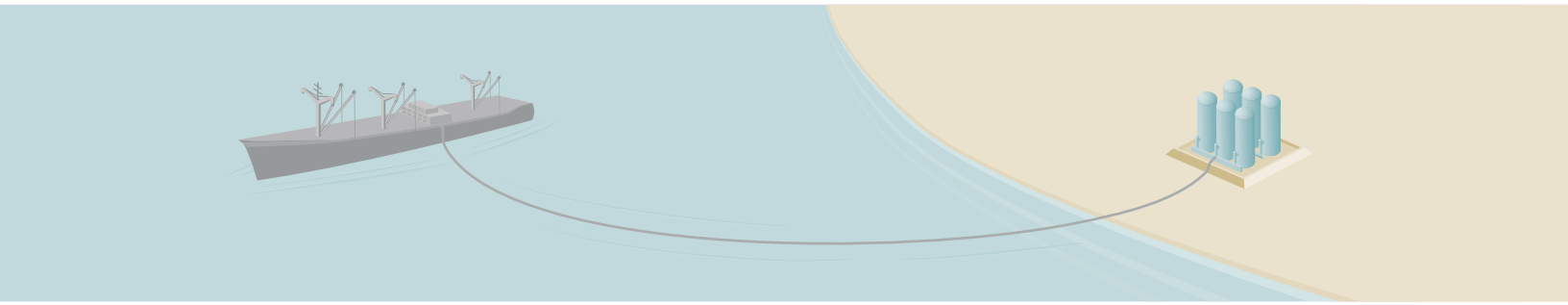
Training Provided

- Wildlife observation reporting
- Awareness of wildlife-sensitive periods and locations
- Local wildlife species
- Managing wildlife attractants
- No feeding of wildlife
- No harassment of wildlife
- No hunting
- Road operating procedures
- Wildlife incident/accident reporting and response procedures
- Bear-aware training for outdoor staff

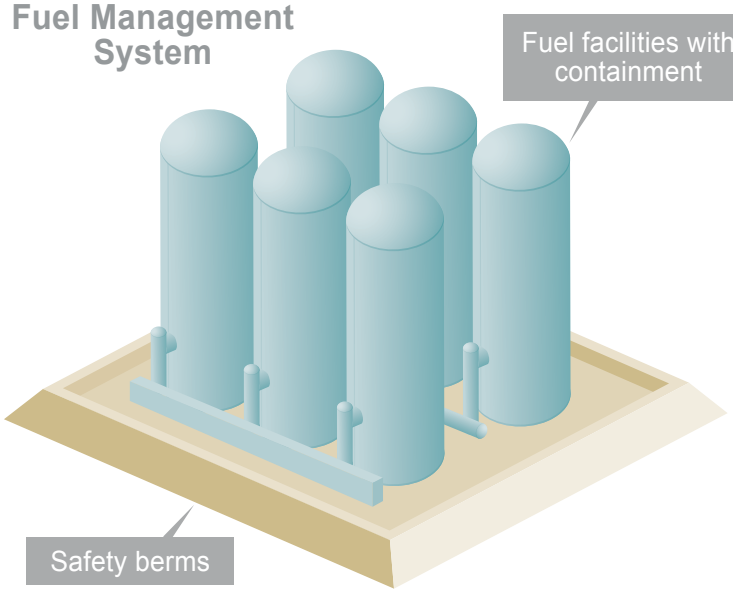
Material Management

MITIGATION

The Project will manage hazardous materials and fuel to ensure worker safety and minimize the potential environmental effects of a spill through management plans.



Fuel Management System



The Oil Pollution Emergency Plan (OPEP) is a requirement of the *Canada Shipping Act* and describes the responses to oil spill scenarios at the Marine Laydown Area.

The Shipboard Oil Pollution Emergency Plan (SOPEP) is a requirement of the *Canada Shipping Act* for all ships transporting fuel and describes the equipment, training, and procedures the ship must have on board in order to manage and address any fuel spills during shipment.

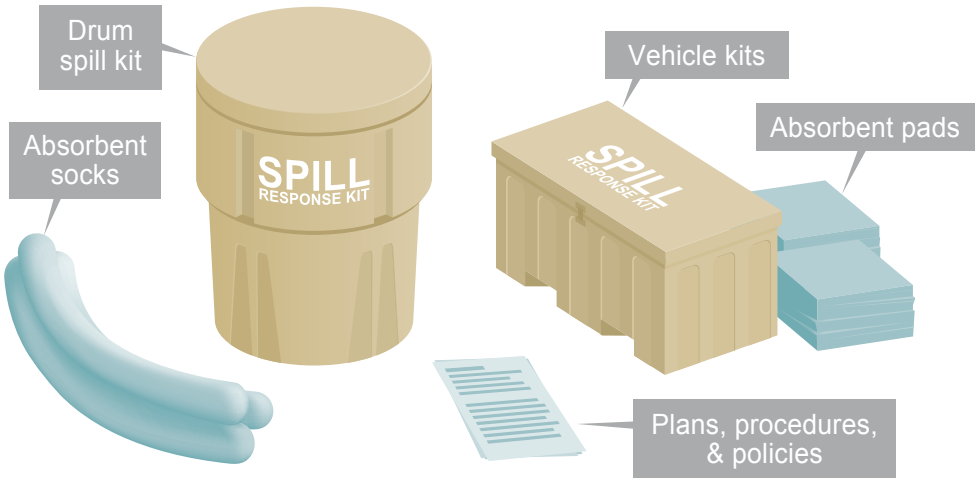
MONITORING

All personnel will report any spills.

MANAGEMENT

The Spill Contingency Plan addresses all potential spills of fuel and other hazardous substances at all Project sites.

Spill Response Kits



Caribou and Shipping

MITIGATION

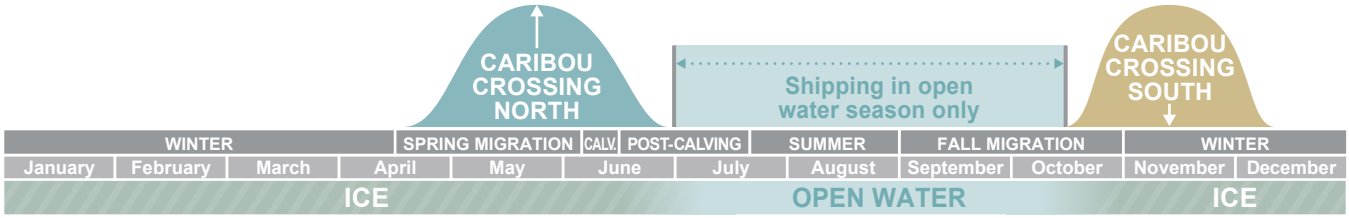
The Dolphin/Union caribou herd cross the sea ice of Coronation Gulf each spring and fall. To avoid affecting this herd during migration, the Project will only ship when there is open water.

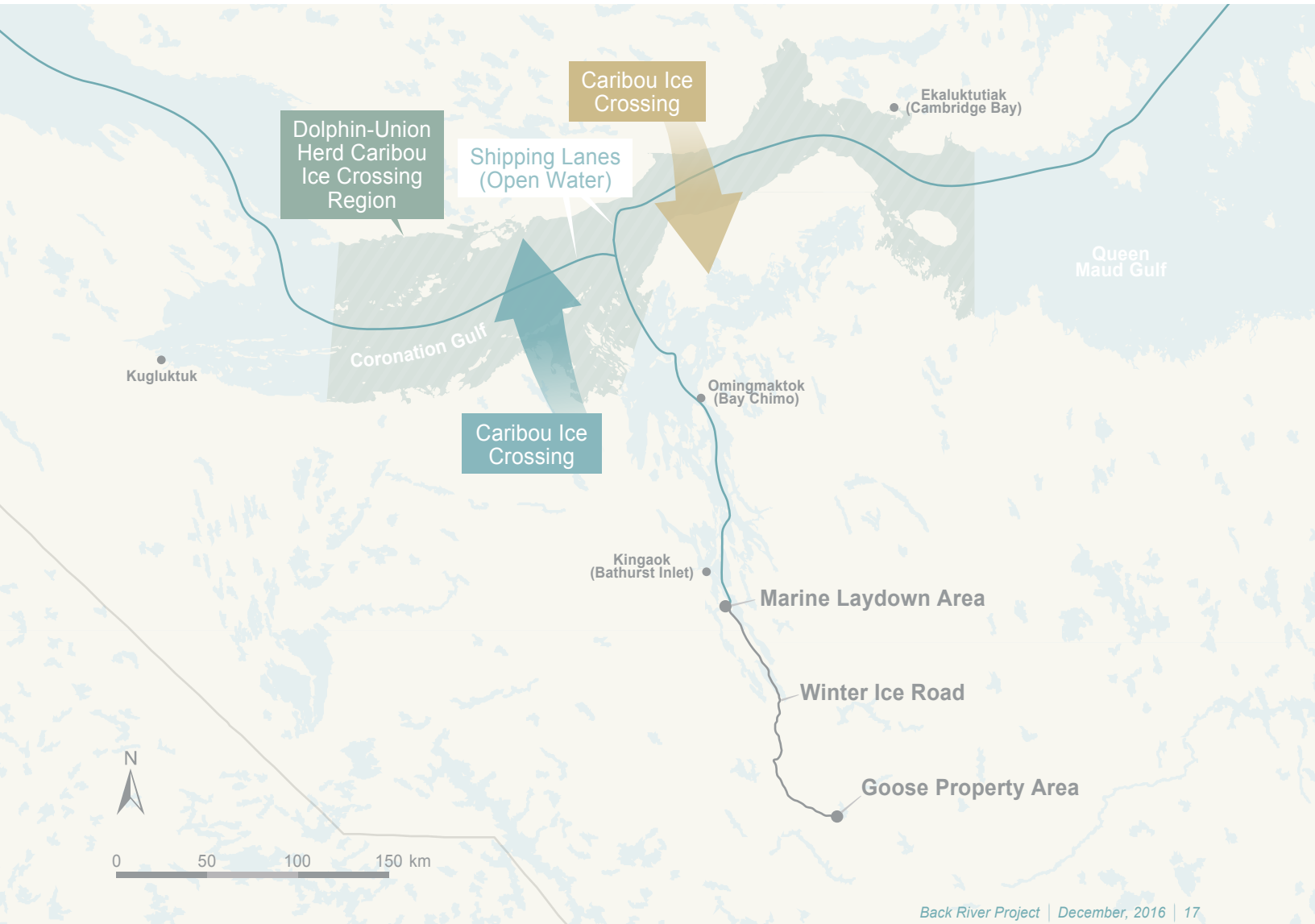
MONITORING

Ship's crew will monitor for spills. Any spills will be reported immediately and cleaned up.

MANAGEMENT

Sabina has emergency response plans to protect the marine environment and minimize impacts from potential spill events; these include the Ship Oil Pollution Emergency Plan, Oil Pollution Emergency Plan, and Spill Contingency Plan.





21. CONCEPTUAL FISH OFFSETTING PLAN (REVISED)

BACK RIVER PROJECT
CONCEPTUAL FISH OFFSETTING PLAN

February 2017
Project #1545534-9000-9000

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Prepared for:

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Prepared by:

Golder Associates Ltd.

BACK RIVER PROJECT
CONCEPTUAL FISH OFFSETTING PLAN

Table of Contents

Table of Contents i
List of Figures iii
List of Tables iv
List of Plates v
List of Appendices v

Glossary and Abbreviations vi

1. Introduction 1
1.1 Purpose 1
1.1.1 Requirements under the *Fisheries Act* 6

2. Community and Regulatory Engagement 8
2.1 Community Engagement 8
2.1.1 Back River Project 8
2.1.2 Back River Offsetting Option 9
2.1.3 Incorporation of Traditional Knowledge (TK) 13
2.1.3.1 Environmental Assessment 13
2.1.3.2 Offsetting Option 13
2.2 Regulatory Engagement 13

3. Regional Setting 15
3.1 Marine Laydown Area 15
3.2 Property Area 18

4. Project Activities Affecting Surface Waters 20
4.1 Mine Plan Overview 20
4.1.1 Tailings Storage Facility (TSF) 20
4.1.2 Umwelt Open Pit and Tailings Facility (TF) 21
4.1.3 Llama Open Pit and Reservoir Facility 21
4.1.4 Goose Main Open Pit and Tailings Facility (Goose Main TF) 22
4.1.5 Llama Lake 22
4.1.6 Umwelt Lake and Saline Water Pond 22

5. Mitigation and Adaptive Management Measures 23
5.1 Overview 23
5.2 Site Water Management 25

5.3 Sediment and Erosion Control 27
5.4 Blasting Plan 27
5.5 Routine Inspection and Monitoring 27

6. Project-Related Serious Harm to Fish 28
6.1 Introduction 28
6.2 Marine LayDown Area 28
6.2.1 Aquatic Habitat Footprint 28
6.2.2 Residual Serious Harm to Fish 29
6.3 Goose Property Area 29
6.3.1 Lakes 31
6.3.2 Ponds 32
6.3.3 Streams 35
6.3.4 Residual Serious Harm to Fish 39
6.4 Losses in Fisheries Productivity 39
6.4.1 Llama Lake-Umwelt Lake System 40
6.4.1.1 Species Composition 40
6.4.1.2 Fish Biomass 41
6.4.2 Goose Lake and Tributaries 41
6.4.2.1 Species Composition 41
6.4.2.2 Fish Biomass 42

7. Offsetting Option - Bernard Harbour 43
7.1 Introduction 43
7.2 Study Area 46
7.3 Bernard Harbour Baseline 47
7.3.1 Methods 47
7.3.1.1 Fish Capture and Sampling 47
7.3.1.2 Movement Monitoring 48
7.3.1.3 Habitat Surveys 49
7.3.2 Results 51
7.3.2.1 Fish Capture and Sampling 51
7.3.2.2 Upstream Passage 55
7.3.2.3 Fish Habitat 57
7.3.3 2014 Baseline Summary 62
7.3.4 2016 Baseline Summary 62
7.3.5 Baseline Synthesis 63
7.4 Remediation Plan 64
7.4.1 Low-Flow Channels 64
7.4.2 Benefits to Fisheries Productivity 66
7.4.2.1 Predicted Changes in Migration Success 66
7.4.2.2 Predicted Changes in Fish Biomass 66

7.4.2.3 Offsetting Accounting 69
7.4.3 Schedule 71
7.4.4 Monitoring 72
7.5 Contingencies 73
8. Complementary Measures 75
8.1 Fish-Out Life History Database 75
8.2 Bernard Harbour TK Study 75
8.3 Arctic Char Movement Study 76
9. Summary 78
References 1

List of Figures

FIGURE **PAGE**

Figure 1.1-1. Project Location 3
Figure 1.1-2. Potential Development Area and Layout Marine Laydown Area 4
Figure 1.1-3. Potential Development Area and Layout Goose Property Area 5
Figure 3.1-1. Local Study Area and Regional Study Area for Arctic Char 17
Figure 3.2-1. Local Study Area and Regional Study Area for Freshwater Fish and Aquatic Habitat 19
Figure 5.2-1. Goose Property Pumping and Culvert Schematic 26
Figure 6.3-1. Fish-Bearing Status within the LSA, Goose Property Area 30
Figure 6.4-1. Species Composition of the Llama-Umwelt Lake System, Goose Property Area 41
Figure 6.4-2. Species Composition of Goose Lake, Goose Property Area 42
Figure 7.1-1. Nulahugyuk Creek Baseline Monitoring, Bernard Harbour, 2014 45
Figure 7.3-1. Conceptual Schematic Showing Two-Way Fyke Net Trap Configuration in Nulahugyuk Creek 48
Figure 7.3-2. Daily Captures of Migratory Arctic Char in Nulahugyuk Creek, 2014 52
Figure 7.3-3. Length-Frequency Distribution of Arctic Char Captured in the Fyke Net Trap 53
Figure 7.3-4. Hingittok Lake Baseline Monitoring, Bernard Harbour, 2014 54
Figure 7.3-5. Fish Species Composition in Hingittok Lake, 2014 55
Figure 7.3-6. Proportion of Successful Migrants Detected at ULOA Plotted Against Passive Integrated Transponder (PIT) Tag Implantation Date 56
Figure 7.3-7. Results of Binary Logistic Regression Plotting the Probability of Migration Success Against Stream Discharge, Holding Arctic Char Body Weight Constant at 4.2 kg 57

Figure 7.3-8. Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from June 10, 2014 to July 17, 2014 60

Figure 7.3-9. Stream Discharge (m^3/s) and Staff Gauge Depth (cm) Recorded at Nulahugyuk Creek Between June 13, 2014 and July 15, 2014 61

Figure 7.4-1. Post-Remediation Predictions for Arctic Char Abundance in Nulahugyuk Creek and Hingittok Lake (Bernard Harbour) 68

Figure 7.4-2. A Comparison of Predicted Cumulative Gains in Fish Production Versus Cumulative Losses Over Time 70

List of Tables

TABLE **PAGE**

Table 2.1-1. Example Topics Discussed and Related Number of Comments per Topic Made During Sabina's Public Consultation and Engagement Program 9

Table 2.1-2. Community Engagement Activities Conducted by Sabina Regarding the Bernard Harbour Restoration Project 11

Table 2.1-3. Regulatory Engagement Activities Conducted by Sabina Regarding the Bernard Harbour Restoration Project 14

Table 3.1-1. Fish Species Captured or Presumed to Occur in Bathurst Inlet 16

Table 4.1-1. Mine Phase and Stage 20

Table 5.1-1. Summary of Select Mitigation and Management Measures for Fish and Aquatic Habitat 24

Table 6.3-1. Fish-Bearing Lakes and Ponds with Total or Partial Habitat Losses, Resulting in Serious Harm to Fish 34

Table 6.3-2. Fish-Bearing Streams with Total or Partial Habitat Losses, Resulting in Serious Harm to Fish 37

Table 7.3-1. Characterization of Barriers and Problem Locations for Fish Passage 50

Table 7.3-2. Summary of Arctic Char by Size Class Captured in Fyke Nets in Nulahugyuk Creek, June 12 to July 17, 2014 53

Table 7.3-3. Location of Radio Frequency Identification (RFID) Arrays and Detection Information 56

Table 7.3-4. Parameter Estimates for Binary Logistic Model Predicting Migration Success 57

Table 7.3-5. Summary of Potential Locations for Fish Passage Enhancement Projects 59

Table 7.3-6: Approximate Lake Area and Volume for Various Depth Intervals in Hingittok Lake, July 10 to 14, 2014 61

Table 7.3-7. Summary of mid-July to September Flow Conditions at Nulahugyuk Creek, Nunavut (2004-2016) 64

Table 7.4-1. Predicted Run Size, Annual Biomass, and Cumulative Biomass for Bernard Harbour Arctic Char for the Evaluation Monitoring Period 68

Table 7.4-2. Overview of Activities in Support of the Conceptual Fish Offsetting Plan for the Back River Project (2014 to 2025) 72

List of Plates

PLATE **PAGE**

Plate 7.1-1. Arctic Char struggling to migrate upstream through a shallow section of Nulahugyuk Creek, July 5, 2014. 44

Plate 7.3-1. Riffle habitat with small pool provided near bank (left), looking upstream, approximately 1.3 from mouth of Nulahugyuk Creek, July 16, 2014. 58

Plate 7.3-2a. Looking upstream towards barriers at Site 5, July 16, 2014..... 59

Plate 7.3-2b. Looking downstream towards barriers at Site 5, July 16, 2014. 59

Plate 7.3-3a. Looking upstream towards barriers at Site 6, July 16, 2014..... 60

Plate 7.3-3b: Looking downstream towards barriers at Site 6, July 16, 2014. 60

Plate 7.4-1. A Low-Flow Channel Previously Created in 2012 ('Project 2'), Looking Upstream, July 18, 2014..... 65

Plate 7.4-2. Directional Weir (Kugluktuk HTO Students in Background) for Migrating Arctic Char in Nulahugyuk Creek, June 24, 2015 65

List of Appendices

Appendix A. Bernard Harbour Restoration Project Agreement Between: The Kugluktuk Hunters and Trappers Organization and Sabina Gold & Silver Corp.

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

CRA	commercial, recreational, or Aboriginal
CPUE	Catch per unit effort
DFO	Fisheries and Oceans Canada
FEIS	Final Environmental Impact Statement
GIE	Goose Inflow East
Golder	Golder Associates Ltd.
ha	Hectare(s)
HTO	Hunters' and Trappers' Organization
KIA	Kitikmeot Inuit Association
km	Kilometre(s)
LSA	Local Study Area
m^3/s	Cubic metres per second
MLA	Marine Laydown Area
NTKP	Naonaiyaotit Traditional Knowledge Project
PIT	Passive Integrated Transponder
Project, the	The Back River Project
RSE	Rascal Stream East
TF	Tailings Facility
TK	Traditional Knowledge
TSF	Tailings Storage Facility
VEC	Valued Ecosystem Component
WRSF	Waste Rock Storage Areas

1. Introduction

1.1 PURPOSE

The proposed Back River Project (the Project) lies in western Nunavut in the continuous permafrost zone of the continental Canadian Arctic. It is composed of two main areas: the Marine Laydown Area (MLA) and the Goose Property Area (Goose Property; Figure 1.1-1).

The MLA is located on the western shore of Southern Bathurst Inlet, approximately 130 kilometres (km) north of the Goose Property (Figure 1.1-2). Here, the Project will sealift materials and supplies through Bathurst Inlet to the MLA annually during the open-water season only. Ships could travel via either the eastern or western portion of the Northwest Passage and then south in to Bathurst Inlet. It is estimated that between three and five vessels will report to the MLA for annual resupply and fuel as part of the Project. Key Project infrastructure for the Back River MLA includes the following:

- a temporary Lightering Barge Terminal;
- water intake pipe and desalination discharge pipe; and,
- the winter road where it crosses the Bathurst Inlet from the MLA to the Goose Property Area.

Mining will be completed using both open pit and underground methods. The Goose Property includes four open pits and four underground developments and the Project has an estimated mine life of ten years with a total production of 19.8 million tonnes (Mt) of ore (Figure 1.1-3). Key Project infrastructure at the Goose Property includes:

- four open pits, and four underground mines (Umwelt, Llama, Goose Main, and Echo);
- four waste rock storage areas;
- tailings storage facility (TSF);
- underground mining pads;
- a stockpile;
- camp;
- process plant; and,
- airstrip and roads, including a culvert for the haul road crossing.

The current mine plan includes the development of the Llama deposit, which is located under Llama Lake, and the construction of the Saline Water Pond at Umwelt Lake. Llama Lake and Umwelt Lake will be fished-out prior to the development of those Project components. Thus, the dewatering of Llama and Umwelt lakes for mining operations, and the construction of related infrastructure to support these activities is expected to result in unavoidable serious harm to fish (as defined in the *Fisheries Act*; see Section 1.1.1). The purpose of the Conceptual Fish Offsetting Plan (Chapter 21), a part of the Final Environmental Impact Statement (FEIS), is to summarize anticipated Project effects on fish and fish habitat, describe the option considered for offsetting (i.e., 'Bernard Harbour'), and outline a proposed conceptual plan to offset the serious harm to fish according to the Fisheries and Oceans Canada (DFO) Policy (DFO 2013a,b).

The development of the conceptual plan and the identification of the Bernard Harbour offsetting option within the plan is the result of continued community and regulatory engagement associated with the Project. The conceptual plan should demonstrate that it is reasonable to assume at this time that a feasible offsetting option exists, and that a Final Fish Offsetting Plan can be implemented for the Project. The Final Fish Offsetting Plan will be developed during the permitting phase of the Project.

Figure 1.1-1

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Project Location

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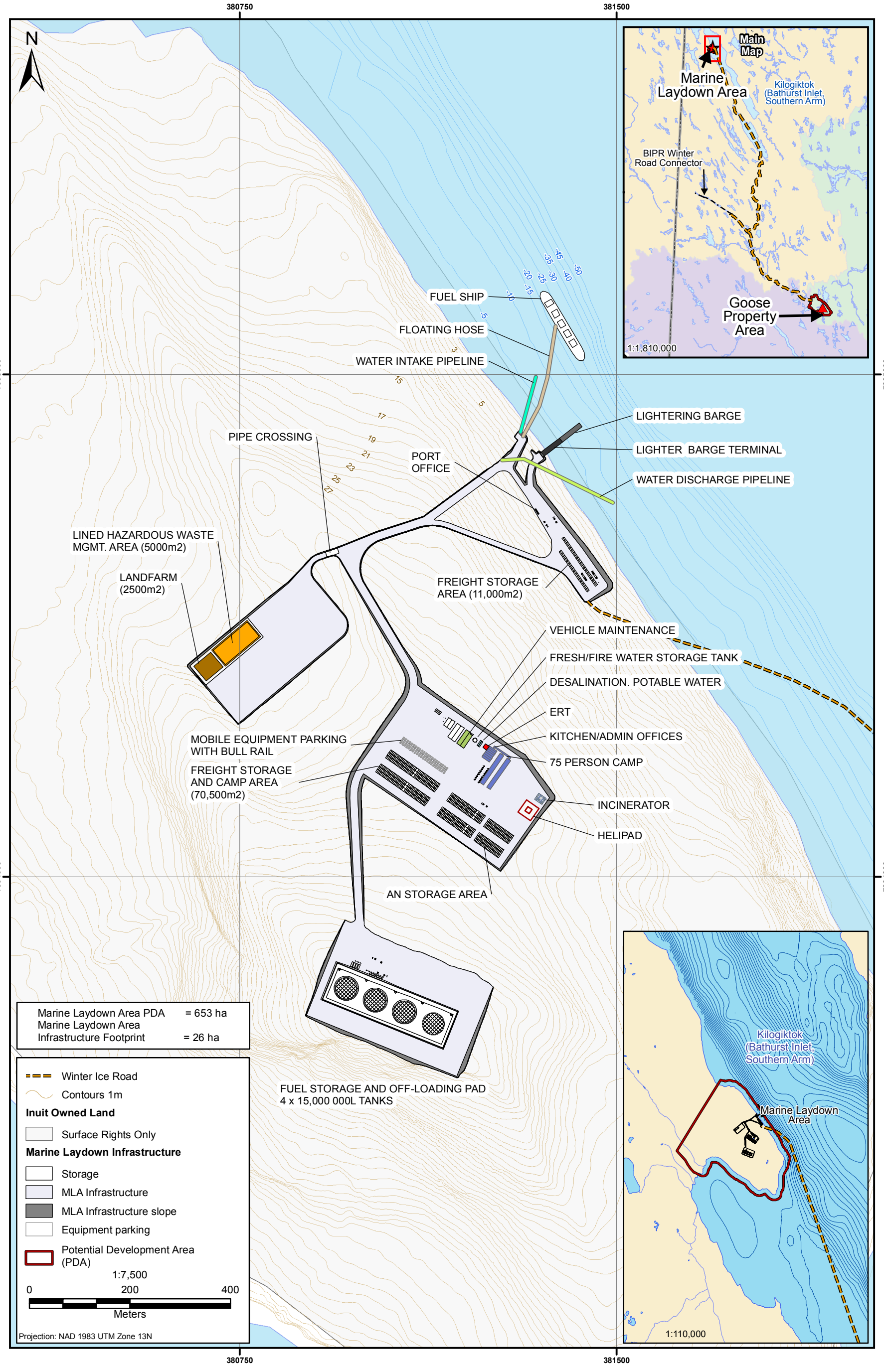

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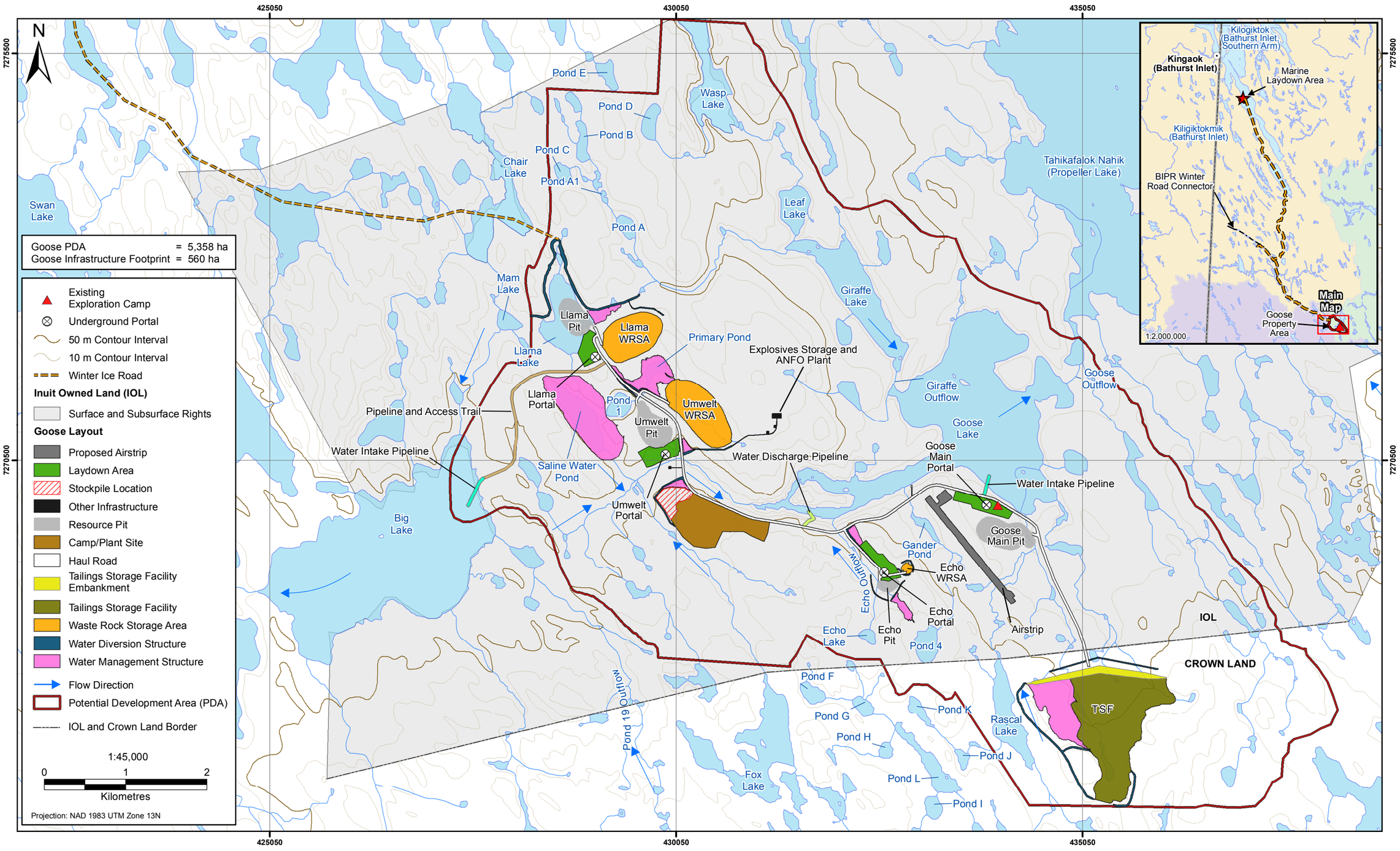
Figure 1.1-2

Potential Development Area and Layout
Marine Laydown Area



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Potential Development Area and Layout
Goose Property Area

Figure 1.1-3

1.1.1 Requirements under the *Fisheries Act*

Subsection 35(1) of the *Fisheries Act* prohibits the carrying on of a work, undertaking, or activity that results in serious harm to fish[1] that are part of a commercial, recreational, or Aboriginal (CRA) fishery or to fish that support such a fishery. However, where it is not possible to completely avoid serious harm to fish such that some residual serious harm to fish remains, an authorization under paragraph 35(2)(b) of the *Fisheries Act* is required to carry on a work, undertaking, or activity. A *Fisheries Act* Authorization will be required for the Project.

The Application for Authorization must include the following information:

- description of proposed work, undertaking, or activity;
- project engineering specifications, scale drawings, and dimensional drawings (for physical works);
- timeline information;
- location information;
- description of fish and fish habitat (aquatic environment);
- description of potential effects on fish and fish habitat;
- description of measures and standards to avoid or mitigate serious harm to fish;
- description of the residual serious harm to fish;
- offsetting plan; and,
- letter of credit, as security for completion of the offsetting plan.

An offsetting plan is developed to undertake offsetting measures to counterbalance the unavoidable residual serious harm to fish from the Project, with the goal of maintaining or improving the productivity of the CRA fishery. DFO's approach to offsetting is described in the Fisheries Protection Policy Statement (DFO 2013a) and Fisheries Productivity Investment Policy (DFO 2013b). A Final Fisheries Offsetting Plan will be produced during the permitting phase of the Project with engagement of local communities and will need to be submitted as part of the Application for Authorization under the *Fisheries Act*. The plan would be approved by DFO as a condition of the Authorization.

As described in the Fisheries Productivity Investment Policy (DFO 2013b), an offsetting plan must include information about the objectives of the offsetting measures, the measures to offset residual serious harm to fish, an analysis of how the offsetting measure will meet their objectives (i.e., methodology used and estimate of the offset), schedule for implementation, and monitoring. Offsetting measures are focused on improving fisheries productivity. The preference of DFO is that offsets occur near a project or within the same watershed; however, offsetting measures can be undertaken in waterbodies or for fish species other than those affected by the project, provided the measures are supported by clear fisheries management objectives or regional restoration priorities. Offsetting plans are negotiated with DFO on a case-by-case basis and would require engagement with Aboriginal groups. Offsetting measures should meet the following principles:

[1] "Serious harm to fish" is defined in Subsection 2(2) of the *Fisheries Act* and means "the death of fish or any permanent alteration to, or destruction of, fish habitat".

1) offsetting measures must support fisheries management objectives or local restoration priorities;

2) benefits from offsetting measures must balance project effects;

3) offsetting measures must provide additional benefits to the fishery; and,

4) offsetting measures must generate self-sustaining benefits over the long term.

The three general categories of offsetting measures include: Habitat Restoration and Enhancement; Habitat Creation; and, Chemical or Biological Manipulations. Habitat restoration and enhancement includes physical manipulation of existing habitat to improve habitat function and productivity; examples include:

- placement of material to improve habitat structures (e.g., spawning beds or reefs);
- increasing shoreline complexity;
- river bank stabilization and re-vegetation of riparian areas;
- improving access to off-channel habitats;
- removal of anthropogenic barriers to fish migration; and,
- enhancement of vegetated areas in lakes.

Habitat creation involves the development or expansion of aquatic habitat into a terrestrial area, such as creation or expansion of natural stream channels, lakes, side channel habitats, wetlands, or bays. Chemical or biological manipulations may include chemical manipulation of waterbodies or stocking of fish; however, these measures should be used only when the other groups of offsetting measures are not available, and only under specific circumstances, such as where the site-specific issues are well understood, the limitations to fisheries productivity are known, and fisheries management plans contain clear objectives for the fishery (DFO 2013b).

In remote, pristine areas where there is a lack of information about fisheries productivity and where offsetting opportunities are limited, such as near the Project, complementary measures may be considered in addition to other offsetting measures. Complementary measures may include data collection and/or scientific research related to maintaining or enhancing the productivity of CRA fisheries. According to DFO Policy, complementary measures may comprise up to 10 percent (%) of the required amount of offsetting, with the remaining 90% consisting of one or more projects that fall under the habitat enhancement, restoration, creation, or manipulation categories of offsetting measures.

2. Community and Regulatory Engagement

2.1 COMMUNITY ENGAGEMENT

Sabina has regularly engaged local communities and representatives of the Kitikmeot Inuit Association (KIA) on the Project. This has included engagement on various topics, such as fish offsetting requirements for the Project and, more specifically, the Bernard Harbour restoration project.

2.1.1 Back River Project

Sabina has been conducting community engagement and consultation activities for the Project since June 2012. During this time, dozens of meetings have been held with the public, Sabina's two community advisory groups in Cambridge Bay and Kugluktuk, local Hamlets, Hunters and Trappers Organizations (HTOs), youth, and other stakeholder groups. Approximately 185 community and stakeholder meetings on the Project were held prior to the November 2015 FEIS submission, during which time a substantial amount of feedback was received by the Company. Since the November 2015 FEIS submission, nearly 50 additional meetings with community and stakeholder representatives have been held on the Project (for a total of over 230 Project-related meetings to-date).

The focus of the engagement activities has generally been on the communities of Cambridge Bay, Kugluktuk, Bathurst Inlet, Bay Chimo, Gjoa Haven, Taloyoak, Kugaaruk, and Yellowknife. For example, public meetings were held in various communities in June 2012, November 2012, April 2013, August 2013, November 2013, June 2015, June 2016, July 2016, and November-December 2016. One-on-one meetings with community stakeholder groups have also been held at various times. The Nunavut Impact Review Board has additionally held public meetings on the Project in February 2013, March/April 2014, November 2014, and April 2016.

In addition to providing information to local communities on development plans for the Project, Sabina has discussed various topics, such as fish offsetting, tailings and contaminant management strategies, lake dewatering, potential fisheries and water-related effects, and other environmental management and monitoring-related topics. Copies of public meeting presentations made by Sabina can be found on www.backriverproject.com under the 'Additional Resources' tab. A complete list of the various stakeholder meetings Sabina has hosted or participated in since June 2012 is included in FEIS Addendum Appendix V3-1A.

Numerous questions, issues, and suggestions have been raised by local residents over the course of Sabina's public consultation and engagement program. Generally, communities have expressed support for the opportunities the Project will provide, but have also strongly expressed the need for the Project to be developed in a manner that is safe for both people and the environment. Particular concern has been expressed about potential long-term effects on fish, other wildlife resources, water quality, and from mine tailings and contaminants. Comments received during Sabina's public consultation and engagement program have been incorporated into a comprehensive public consultation database. This database contains over 165 topic directories and includes comments made by the public and information on when, where, and the forum in which the comments were made.

Topic directories (and the number of times a related comment was made) with potential relevance to fish offsetting requirements for the Project are presented in Table 2.1-1. Appendix V3-1G of the FEIS provides a full summary of the topics contained in Sabina's public consultation database, while FEIS Addendum Appendix V3-1C contains copies of all June 2012 – June 2015 meeting minutes and public comment forms from which the summary was developed. FEIS Addendum Appendix V3-1C also includes

meeting minutes and public comment forms for meetings held since the FEIS submission (up to February 2017).

Table 2.1-1. Example Topics Discussed and Related Number of Comments per Topic Made During Sabina's Public Consultation and Engagement Program

Back River Discussion Topic	Number of References by Community Members
Acid rock drainage	4
Environmental monitoring	35
Blocking watercourses	2
Dewatering of lakes	21
Mine contaminants and waste	77
Tailings	78
Waste rock	6
Water quality, quantity, and management	62
Wildlife – Fish	57

Sabina has gone through extensive effort to minimize or eliminate potential negative environmental and socio-economic effects in these areas. For example, a comprehensive environmental management and monitoring program has been developed, which addresses key areas of concern for local communities that were identified during public consultation. More details on Sabina's commitments to addressing community-identified issues are provided in Volume 3 (Public Consultation, Government Engagement, and Traditional Knowledge) of the FEIS.

All of the Project's existing camps and proposed infrastructure are located within the Kitikmeot Region. Accordingly, The KIA has been engaged on a regular basis by Sabina. Periodic site visits have been arranged for KIA board members and members of the KIA Lands, Environment and Resources Department, and the KIA has been kept informed of Sabina's various Project developments. The KIA is additionally responsible for issuing licences related to land and water use on Inuit Owned Land in the Kitikmeot Region, and Sabina is required to post reclamation security and negotiate wildlife compensation with them. Sabina is also required under the Nunavut Agreement to negotiate an Inuit Impact and Benefit Agreement (IIBA) with the KIA. As such, regular communication pertaining to these matters has occurred between Sabina and the KIA throughout the Project's development. The KIA has likewise been an active reviewer and participant in the environmental assessment of Sabina's Back River Project.

2.1.2 Back River Offsetting Option

Sabina's commitment to the offsetting option proposed in the Conceptual Fish Offsetting Plan (i.e., Bernard Harbour) began in mid-2014. Since that time, Sabina has engaged local residents about the offsetting option in a number of ways (see Table 2.1-2). Foremost, Sabina has partnered with the Kugluktuk HTO in the planning and execution of the Bernard Harbour option. Stream remediation (or enhancement) activities in the Nulahugyuk Creek - Hingittok Lake system in the Kitikmeot Region of Nunavut (also known as Bernard Harbour) were initially proposed in the early 2000s by the Kugluktuk HTO. The Kugluktuk HTO has since worked closely with Golder Associates Ltd. (Golder) to advance early stages of the project (e.g., initial environmental baseline and habitat enhancement work) and, for some time, the two organizations were seeking an industry partner to help advance the project to completion.

Sabina was identified as an industry partner in early 2014 and has since advanced the planning and implemented the Bernard Harbour offsetting option in cooperation with the Kugluktuk HTO. Details on

the relationship between the Kugluktuk HTO and Sabina in executing the Bernard Harbour offsetting option have been captured in the 'Bernard Harbour Restoration Project Agreement' between: The Kugluktuk Hunters and Trappers Organization and Sabina Gold & Silver Corp (see Appendix A), signed by both parties in June 2014, and later renewed in January 2017. Importantly, the Bernard Harbour offsetting option is to remain a Kugluktuk HTO-led initiative with Sabina providing support to the Kugluktuk HTO and ensuring that the objectives of the offsetting plan are achieved.

The Kugluktuk HTO has remained involved in the Bernard Harbour offsetting option through semi-regular planning meetings and updates. The Kugluktuk HTO has also been instrumental in the planning and execution of baseline studies and initial remediation work (in cooperation with Golder), and in the planning of future remediation of Bernard Harbour. While the activities, meetings, and correspondences associated with this baseline and initial work are not included in Table 2.1-2, they are reflected in the associated baseline reports that have been prepared by Golder (ANL and Golder 2005; Golder and ANL 2007; Golder 2013a). The Kugluktuk HTO has also played a key role in the Traditional Knowledge (TK) study that was conducted for the Bernard Harbour Offsetting Option (for more details, see Appendix V3-3D of the FEIS, or a summary of the TK study provided further below).

The Kugluktuk general public have been engaged about the Bernard Harbour restoration project in different ways. For example, a public meeting was held in Kugluktuk on June 17, 2015 where results of the Bernard Harbour TK study, results of baseline fieldwork, and plans for the Bernard Harbour offsetting option were presented by Sabina representatives. Another public meeting was held on June 7, 2016 to discuss the Project and the offsetting option. The offsetting option was also briefly reviewed with representatives of Sabina's Community Advisory Group in Kugluktuk and the Hamlet of Kugluktuk during June 2015 community meetings held for the Project. Various members of the Kugluktuk public have also assisted in the baseline fieldwork and initial stream enhancement work that has been conducted at Bernard Harbour (ANL and Golder 2005; Golder and ANL 2007; Golder 2013a).

Local residents generally appear very supportive of the remediation work planned for Bernard Harbour and wish to see the Bernard Harbour Arctic Char fishery returned to its previous status. The Kugluktuk HTO and those residents who have previously lived at Bernard Harbour (e.g., many of the TK study participants) have expressed a particular desire to see the offsetting option completed. A number of individuals have stated they appreciate the low impact approach that is being used (e.g., no use of heavy equipment) and the involvement of community members (including youth) in the project. Sabina intends to continue engaging the residents of Kugluktuk as necessary as the Bernard Harbour restoration project advances.

The KIA has been kept informed of plans for the Bernard Harbour offsetting option through semi-regular meetings and correspondence. A KIA representative additionally participated in a Bernard Harbour site visit hosted by Sabina in July 2014, where Golder's initial remediation work was examined and future offsetting plans were discussed. The KIA has also been provided with copies of the TK study data, so that it may be incorporated into their Naonaiyaotit Traditional Knowledge Project (NTKP) database. It is understood the KIA may utilize this information for their own purposes in the future. The data and results of the TK study are also intended to be freely shared with other Nunavut organizations that may benefit from its use.

Other members of the Nunavut and Northwest Territories public have been made aware of the Bernard Harbour offsetting option. For example, the project was briefly reviewed in the communities of Cambridge Bay, Taloyoak, Kugaaruk, and Yellowknife during June 2015 community meetings held for the Back River Project (a visit to Gjoa Haven had to be re-scheduled). Two presentations on Bernard Harbour were additionally made by Sabina representatives at the 2015 Nunavut Mining Symposium held in Iqaluit, where various community, government, and industry stakeholders participated. A full list of community engagement activities undertaken by Sabina in regards to the Bernard Harbour offsetting option can be

found in Table 2.1-2. Sabina will continue to engage northern residents as necessary on the Bernard Harbour restoration project as it advances.

Table 2.1-2. Community Engagement Activities Conducted by Sabina Regarding the Bernard Harbour Restoration Project

Location / Date	Individual(s) / Organization	Description
Kugluktuk		
March 19, 2014	David Nivingalok (Chairperson) and Kevin Klengenberg (Secretary-Treasurer), Kugluktuk HTO	Teleconference to discuss proposed fish offsetting work to be conducted at Bernard Harbour.
March 25, 2014	Kugluktuk HTO	Meeting to discuss proposed fish offsetting work to be conducted at Bernard Harbour and the associated TK study.
April 29, 2014	Kugluktuk HTO	Meeting to discuss 'Kugluktuk HTO-Sabina Bernard Harbour Restoration Project Agreement'.
June 1-6, 2014	Selected elders and knowledge holders	A series of traditional knowledge interviews were held with selected elders and local knowledge holders as a component of proposed fish offsetting activities in the Bernard Harbour, Nunavut area. A project overview meeting/presentation was also held with local study participants prior to the interviews commencing.
July 13, 2014	Bernard Harbour TK study participants, HTO chairperson, and acting HTO manager	A TK study results verification meeting was held with participants in the Bernard Harbour TK study and with the Kugluktuk HTO chairperson and acting manager. Various clarifications were made by the participants, which were later incorporated into the final TK study report.
July 17, 2014	Kugluktuk HTO chairperson	The chairperson of the Kugluktuk HTO accompanied Sabina representatives and various other attendees during a day-long site visit to Bernard Harbour.
February 12, 2015	Kugluktuk HTO representatives	Sabina met with the Kugluktuk HTO chairperson, treasurer, and manager to provide an update on the Bernard Harbour restoration project and TK study.
February 17, 2015	Kugluktuk HTO	Letter and copy of the draft 'Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut' provided to the HTO.
April 21, 2015	Kugluktuk HTO	Final copy of the 'Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut' provided to the HTO.
May 8, 2015	Barbara Adjun, Kugluktuk HTO Manager	Phone update on the Bernard Harbour offsetting option.
May 21, 2015	David Nivingalok, Kugluktuk HTO Chairperson	Phone update on the Bernard Harbour offsetting option.
June 17, 2015	General public	Public meeting – Project update and FEIS submission overview. The results of the Bernard Harbour TK study and plans for Bernard Harbour were reviewed.
June 18, 2015	Kugluktuk Community Advisory Group	Project update and FEIS submission overview. Plans for Bernard Harbour were briefly reviewed.
June 18, 2015	Kugluktuk HTO	Project update and FEIS submission overview. The results of the Bernard Harbour TK study and plans for the Bernard Harbour were reviewed.

(continued)

Table 2.1-2. Community Engagement Activities Conducted by Sabina Regarding the Bernard Harbour Restoration Project (completed)

Location / Date	Individual(s) / Organization	Description
June 19, 2015	Hamlet of Kugluktuk	Project update and FEIS submission overview. Plans for Bernard Harbour were reviewed.
July 8, 2015	David Nivingalok, Kugluktuk HTO Chairperson	Letter providing information on the 2015 Bernard Harbour work proposal.
June 7, 2016	General public	Public meeting – Project Update and Back River Offsetting Plan presented to community.
June 8-9, 2016	Kugluktuk HTO and Invited Participants	Bernard Harbour Restoration Project Workshop
November 9, 2016	Kugluktuk HTO	Conference call – results from 2016 field program were presented and discussed.
December 2, 2016	Kugluktuk HTO	Project update, Bernard Harbour project update, and update on revised Wildlife Mitigation and Monitoring Program
Cambridge Bay		
June 7-10, 2014	Selected elders and knowledge holders	A series of traditional knowledge interviews were held with selected elders and local knowledge holders as a component of proposed fish offsetting activities in the Bernard Harbour, Nunavut area.
June 15, 2015	Cambridge Bay Community Advisory Group	Project update and FEIS submission overview. Plans for the Bernard Harbour offsetting option were briefly reviewed.
June 16, 2015	Hamlet of Cambridge Bay Representatives	Project update and FEIS submission overview. Plans for the Bernard Harbour offsetting option were briefly reviewed.
June 16, 2015	General public	Public meeting – Project update and FEIS submission overview. Plans for the Bernard Harbour offsetting option were briefly reviewed.
Kingaok and Omingmaktok		
June 15, 2015	Residents of Kingaok and Omingmaktok	Dinner and meeting on the Back River Project (re: Project update and FEIS submission overview) in Cambridge Bay, specifically for residents of Kingaok and Omingmaktok. Plans for the Bernard Harbour were briefly reviewed.
Taloyoak		
June 17, 2015	General public	Public meeting – Project update and FEIS submission overview. Plans for the Bernard Harbour offsetting option were briefly reviewed.
June 17, 2015	Hamlet of Taloyoak	Project update and FEIS submission overview. Plans for the Bernard Harbour offsetting option were briefly reviewed.
Kugaaruk		
June 16, 2015	General public	Public meeting – Project update and FEIS submission overview. Plans for Bernard Harbour were briefly reviewed.
Iqaluit		
April 14, 2015	Various community, government, and industry stakeholders participated	Sabina and Golder representatives participated in the Nunavut Mining Symposium in Iqaluit and made two presentations related to the Bernard Harbour offsetting option.
Yellowknife		
June 15, 2015	General public	Public meeting - Project update and FEIS submission overview. Plans for the Bernard Harbour offsetting option were briefly reviewed.

2.1.3 Incorporation of Traditional Knowledge (TK)

The Conceptual Fish Offsetting Plan relies on the information collected from TK (including two KIA-led TK studies), public scoping, focus group meetings, government engagement, and scientific knowledge. To the extent possible, available TK is incorporated into the offsetting plan, including existing environment and baseline summaries, mitigation and adaptive management plans, and the selection of the offsetting option to counterbalance any losses in fisheries productivity.

2.1.3.1 Environmental Assessment

The following reports were reviewed for TK specific information related to fisheries at the Project and are summarized in other sections of the FEIS:

- Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project, Naonaiyaotit Traditional Knowledge Project (NTKP) (KIA 2012) (Appendix V3-3A of FEIS);
- Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project); results from Data Gaps Workshops, Final Report (June 2014) (KIA 2014) (Appendix V3-3C of FEIS); and
- Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (Appendix V3-3B of FEIS).

2.1.3.2 Offsetting Option

The Kugluktuk HTO has been instrumental in the planning and execution of baseline studies and initial remediation studies (in cooperation with Golder), and in the planning of the remediation of the creek at Bernard Harbour (e.g., ANL and Golder 2005; Golder and ANL 2007; Golder 2013a). The Kugluktuk HTO has also played a key role in the TK study that was conducted for the Bernard Harbour Offsetting Option.

In an effort to develop a better understanding of the Arctic Char fishery in the Bernard Harbour area (and related historic and contemporary environmental conditions), a TK study was conducted in 2014 to 2015. The TK study was carried out by Sabina in partnership with the Kugluktuk HTO and was intended to complement the scientific baseline studies that have also been conducted at Bernard Harbour. The TK study involved one-on-one interviews with 11 Bernard Harbour land users from Kugluktuk and Cambridge Bay, who were selected for inclusion in the study by the Kugluktuk HTO. The TK study also made use of various secondary sources (e.g., historic records, land use reports, academic publications) and a Bernard Harbour site visit to provide additional information on the Arctic Char fishery. Results of the study provided a baseline summary of a historically-significant Arctic Char fishery for local Inuit, and ultimately, confirmation that Bernard Harbour was the preferred offsetting option for the Project.

The TK study findings are summarized in the Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut (Appendix V3-3D of FEIS).

2.2 REGULATORY ENGAGEMENT

Sabina has regularly engaged DFO on the Project (Table 2.1-3). This has included engagement on topics such as fish offsetting requirements for the Project and, more specifically, the Bernard Harbour restoration project.

Table 2.1-3. Regulatory Engagement Activities Conducted by Sabina Regarding the Bernard Harbour Restoration Project

Date	Organization	Location	Purpose
2014			
February	Fisheries and Oceans Canada – Central and Arctic Region	Yellowknife	Introduction to the contents and structure of the Draft Environmental Impact Statement. Introduction of the Proposed Fisheries Offset Concept at Bernard Harbour
April	Fisheries and Oceans Canada – Central and Arctic Region	Yellowknife	Introduction to the Back River Project
June	Fisheries and Oceans Canada – Central and Arctic Region	Yellowknife	Update meeting and discuss attendance at the location of the proposed fisheries offset (Bernard Harbour site)
July	Fisheries and Oceans Canada – Regional Director, Ecosystems Management	Ottawa	Project status, Bernard Harbour and next steps
	Fisheries and Oceans Canada – Central and Arctic Region	Kugluktuk	Attendance at the Bernard Harbour site: along with the Kugluktuk HTO and KIA
August	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Discussion of authorization requirements for Site Preparation Work
October	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Further discussion of authorization requirements for Site Preparation Work
2015			
January	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Exploring equivalency in Offsetting Policies
March	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Discussed PHC comment responses and direction on habitat banking process. Feedback on Site Preparation proposed methodology
April	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Discussed proposed approach to significance / residual effects assessment for FEIS
May	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Feedback on Rascal Lake Realignment and effects assessment approach. Update on Bernard Harbour status provided. Discussed baseline work prior to freshet.
September	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Overall project update; discussion of potential Schedule 2 implications based on predicted habitat losses
September	Fisheries and Oceans Canada – Executive Fisheries Protection	Ottawa	Project status update; discussion on Bernard Harbour direction
September	FEIS submitted to NIRB		
December	Federal Departments and Agencies	Teleconference	Review of FEIS structure
2016			
March	Fisheries and Oceans Canada – Central and Arctic Region	Teleconference	Discussed Final Submission to ensure understanding on technical issues related to fisheries. Feedback on Rascal Lake Realignment
May	Fisheries and Oceans Canada – Executive Fisheries Protection Headquarters	Ottawa	Discussed proposed approach to fisheries offset and banking
August	Fisheries and Oceans Canada – Executive Fisheries Protection Headquarters	Ottawa	Update on Bernard Harbour offsetting option.
2017			
February	Fisheries and Oceans Canada – Executive Fisheries Protection	Ottawa	Project status update; discussion on direction of Bernard Harbour offsetting option

3. Regional Setting

3.1 MARINE LAYDOWN AREA

Bathurst Inlet is a fjord that is long (approximately 165 km), narrow (2 to 15 km), and deep (greater than 300 m). This waterbody is divided into two major basins separated by a shallow sill. The outer inlet is the deeper of the two basins and contains many islands and a complex bathymetry. The inner inlet runs landward from the vicinity of Kingaok, has a relatively simple structure with few islands, and is shallower than the outer inlet, with depths between 100 and 150 m. The Western River discharges into the head of the inlet at the south, and the Mara River and Burnside River discharge into the western shoreline of the inlet. Numerous small streams discharge into the inlet along eastern and western shorelines. Bathurst Inlet cuts through the Bathurst Hills Ecoregion, which is characterized by strong relief built from massive granite rocks. The deeply indented, rocky shorelines lead to steep bathymetry with narrow nearshore areas.

Bathurst Inlet is typical of oligotrophic Arctic marine ecosystems, i.e., oxygenated throughout the water column, low in nutrients and metals, and low in phytoplankton biomass levels. Benthic invertebrates are both diverse and abundant in Bathurst Inlet, characteristics shared with other Arctic marine ecosystems. Mud and fine sediments dominate the benthic environment.

The marine fish community of Bathurst Inlet is characteristic of Arctic marine ecosystems and includes marine, anadromous, and freshwater/estuarine species. Thirteen species captured have been observed in freshwater, brackish or estuarine habitats during at least one part of their life history. Many fish species serve roles in the ecological and cultural health of the area.

Nineteen fish species are presumed to occur in waters in the immediate vicinity of the MLA in Bathurst Inlet (i.e., Local Study Area [LSA]) based on TK (KIA 2012; KIA 2014) and baseline sampling (Table 3.1-1) (also see Section 5.1.6 in Volume 7). None of the captured species are currently considered endangered, threatened, or are listed under Canada's *Species at Risk Act* (Government of Canada 2002). Fourhorn Sculpin were the most abundant species in 2001 and 2010, but were the third most abundant species in 2012. Capelin was the most abundant species in 2012, followed by Pacific Herring. Capelin were not captured on any previous sampling occasions, and their dominance in the community sampling is attributed to the date of sampling coinciding with the Capelin spawning period in 2012. During non-spawning periods, adult Capelin are generally associated with offshore habitat and are not expected to be present year-round in the nearshore areas of the LSA. Pacific Herring, Starry Flounder, Arctic Cisco, and Saffron Cod were captured in all years and on average comprised 10% or greater of the total catch.

Table 3.1-1. Fish Species Captured or Presumed to Occur in Bathurst Inlet

Common Name	Scientific Name	Primary Habitat	Depth Range
Arctic Char	*Salvelinus alpinus*	Freshwater/Anadromous	Benthopelagic
Arctic Cisco	*Coregonus autumnalis*	Freshwater/Brackish	Benthopelagic
Arctic Cod	*Boreogadus saida*	Marine	Bathypelagic
Arctic Flounder	*Pleuronectes glacialis*	Marine	Demersal
Bering Wolffish	*Anarhichas orientalis*	Marine	Demersal
Broad Whitefish	*Coregonus nasus*	Freshwater/Brackish	Benthopelagic
Capelin	*Mallotus villosus*	Marine	Pelagic
Fourhorn Sculpin	*Myoxocephalus quadricornis*	Marine/Brackish	Demersal
Lake Trout	*Salvelinus namaycush*	Freshwater/Anadromous	Benthopelagic
Least Cisco	*Coregonus sardinella*	Marine/Anadromous	Pelagic
Ninespine Stickleback	*Pungitius pungitius*	Freshwater/Estuarine	Benthopelagic
Pacific Cod	*Gadus marcocephalus*	Marine	Demersal
Pacific Herring	*Clupea pallasii*	Marine	Pelagic
Rainbow Smelt	*Osmerus mordax*	Anadromous	Pelagic
Round Whitefish	*Prosopium cylindraceum*	Freshwater/Brackish	Demersal
Saffron Cod	*Eleginus gracilis*	Marine/Brackish	Demersal
Slender Eelblenny	*Lumpenus fabricii*	Marine	Demersal
Sockeye Salmon	*Oncorhynchus nerka*	Anadromous	Pelagic
Starry Flounder	*Platichthys stellatus*	Marine/Brackish	Demersal

Note: Species highlighted in grey were not captured during Baseline sampling in 2010 and 2012, but they have an historic precedence of capture in Bathurst Inlet and are presumed to occur in Bathurst Inlet (reviewed in Volume 7, Chapter 5).

The community composition of fish species and the fish harvested (e.g., Arctic Char) by traditional user in the Regional Study Area reflects the influence of freshwater in the system (Figure 3.1-1). Traditional Knowledge of Arctic Char (locally known as Ekalukipik), a Valued Ecosystem Component in the environmental assessment and one of the main fish species for Ocean Inuit and Kiligiktolmiut (see Section 5.3, Volume 7, of the FEIS), was primarily discussed with reference to freshwater fishing (KIA 2012; KIA 2014). However, some coastal areas of char habitat (fishing grounds) were identified. Arctic Char occurrence was identified in the majority of rivers that flow to the ocean with the mouth of the Hiukkittak (River), the mouth of the Burnside River and the Mara River being important Arctic Char rivers for fishing.

Inuit uses of other marine fish species have also been described for tomcod (Arctic Cod or locally known as Hiughuktuk); both Arctic Char and Arctic Cod are the main fish species for Ocean Inuit and Kilikiktolmiut (KIA 2012; KIA 2014). TK information on the characteristics and uses of marine species also includes Saffron Cod, Capelin, smelt, flounder (i.e., turbot), herring, eels, wolfish, sculpin, crabs, oysters, and starfish. Arctic Cod and Saffron Cod are described as deep water, open ocean fish that are good for eating. Seasonal (summer) spawning migrations by Capelin in nearshore areas were observed and Capelin were used by drying them for eating or for dog food. Different eel species were identified in nearshore areas and considered potential food fish. Wolffish were described as strong tasting and as having thick skin. The occurrence of salmon and other unknown or new species (e.g., sharks) was also described.

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August 12 2015

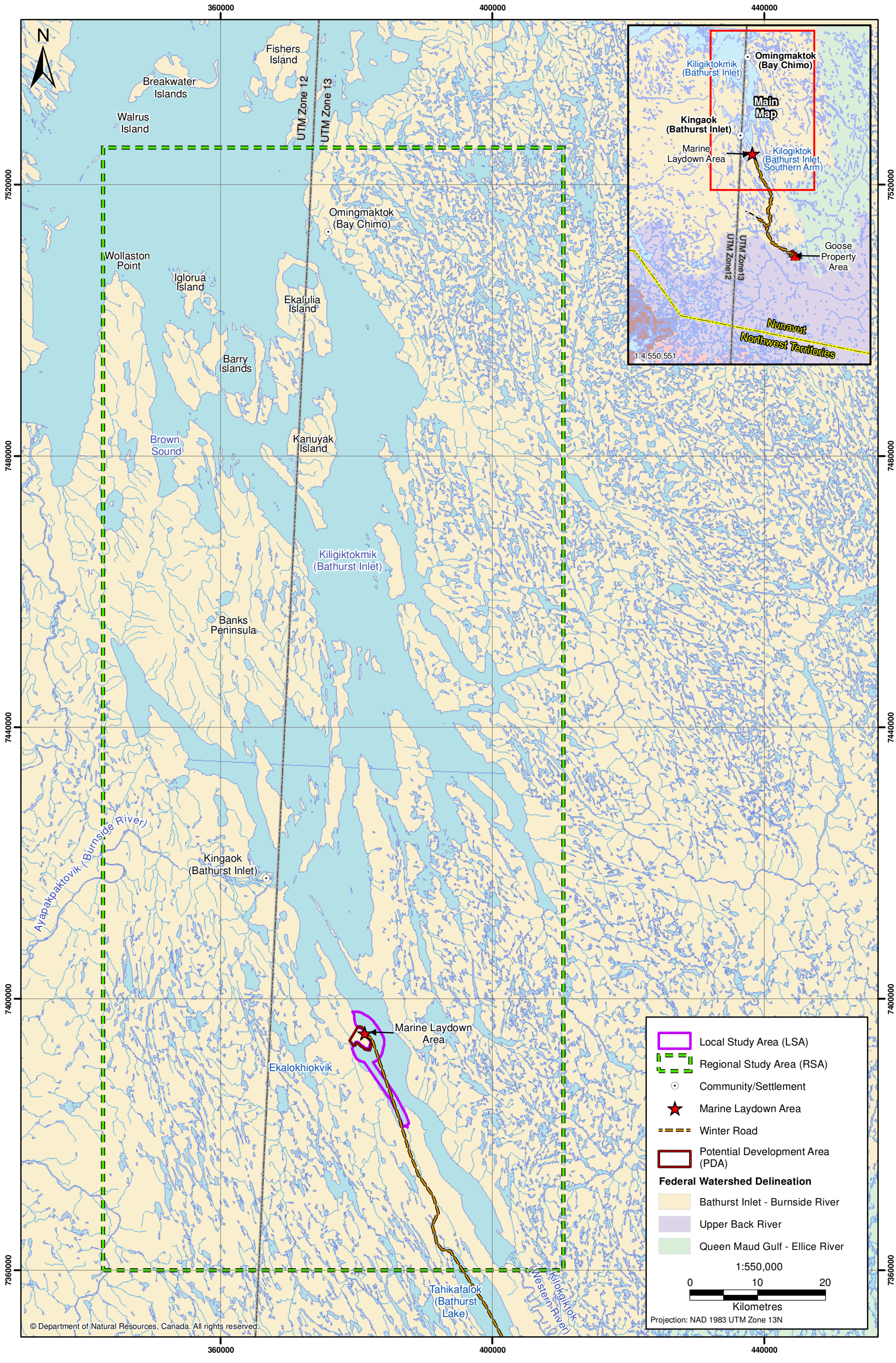

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Figure 3.1-1

Local Study Area and Regional Study Area for Arctic Char

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3.2 PROPERTY AREA

The Project is located in western Nunavut in the continuous permafrost zone of the continental Canadian Arctic. All proposed infrastructure at the Goose Property lies within the Ellis River Watershed. The Ellis River Watershed flows to the northwest, and enters the ocean on the west side of Bathurst Inlet. The Back River Watershed lies south of the proposed infrastructure in the Goose Property Area and flows to the east eventually entering the Arctic Ocean south of Gjoa Haven.

The region containing the Project is characterized by extensive networks of lakes and streams within a hummocky landscape with low elevation relief and exposed bedrock uplands. Winter is characterized by extreme cold (mean monthly temperatures -33°C), and ice cover is present on lakes between October and July. Air temperatures are highest in July, reaching a mean monthly temperature of 14°C. Regional meteorological stations report total annual precipitation between 125 mm (2009) to 344 mm (2007) for the interval 2006 to 2012 (see Volume 4, Chapter 3 for additional information). Ice depths on waterbodies are typically 1.5 to 2 metres (m) thick, and shallow waterbodies (< 1.5 m) freeze to the bottom. Hydrology in the Project area is snowmelt dominated, with peak flows occurring from early May to mid-June in most watersheds. Occasional rainfall-driven high flow events may occur between June and September.

The Goose Property is in the headwater region of its respective watersheds and has a relatively small upstream catchment. A few deep lakes provide the majority of year-round fish habitat (such as Propeller and Goose lakes), while shallow and ephemeral lakes and ponds provide seasonal habitat. Year-round habitat quality in lakes is primarily limited by depth, since overwintering by fish is only possible in lakes that do not freeze to the bottom or retain sufficient dissolved oxygen levels during ice cover. Streams in the Project area are generally small and shallow and do not provide overwintering fish habitat. Over the course of the summer, these streams tend to have low flow and low water depths. Many streams are ephemeral, flowing only during freshet, while others feature seasonal barriers such as boulder fields and seepages.

Fish distribution in the Goose Property Area is typical of inland, headwater regions of the Canadian Arctic. Lake Trout (*Salvelinus namaycush*) is the dominant freshwater fish species in the Local Study Area, followed by Round Whitefish (*Prosopium cylindraceum*), Arctic Grayling (*Thymallus arcticus*), Slimy Sculpin (*Cottus cognatus*), and Ninespine Stickleback (*Pungitius pungitius*). Other species reported in the study area include Burbot (*Lota lota*) and Lake Whitefish (*Coregonus clupeaformis*). No Arctic Char (*Salvelinus alpinus*) have been captured at the Goose Property; however, they have been captured nearer Bathurst Inlet approximately 76 km north of the Goose Property.

In the TK report (KIA 2012), the Inuit note that fish are present throughout the landscape surrounding and including the Project Area. While Goose Lake may be occasionally fished by traditional land users, they are not known to be destinations or key locations for fishing (Volume 8, Chapter 4).The TK reports also notes that freshwater fishing primarily takes place in the Back River Watershed, along the Western River, and nearby Bathurst Inlet. Lake Trout are found in lakes throughout the region; however, they are also found in rivers where large, deep pools do not freeze in winter. Whitefish and Cisco (*Coregonus artedi*) are also found in such lakes. Arctic Grayling are fished in several lakes, rivers, and streams in the Back River Watershed and along the Western River. The Inuit observe that Arctic Grayling spawn over shallow boulder fields, and that the juvenile fish are commonly found in shallow, sandy streams (KIA 2012).

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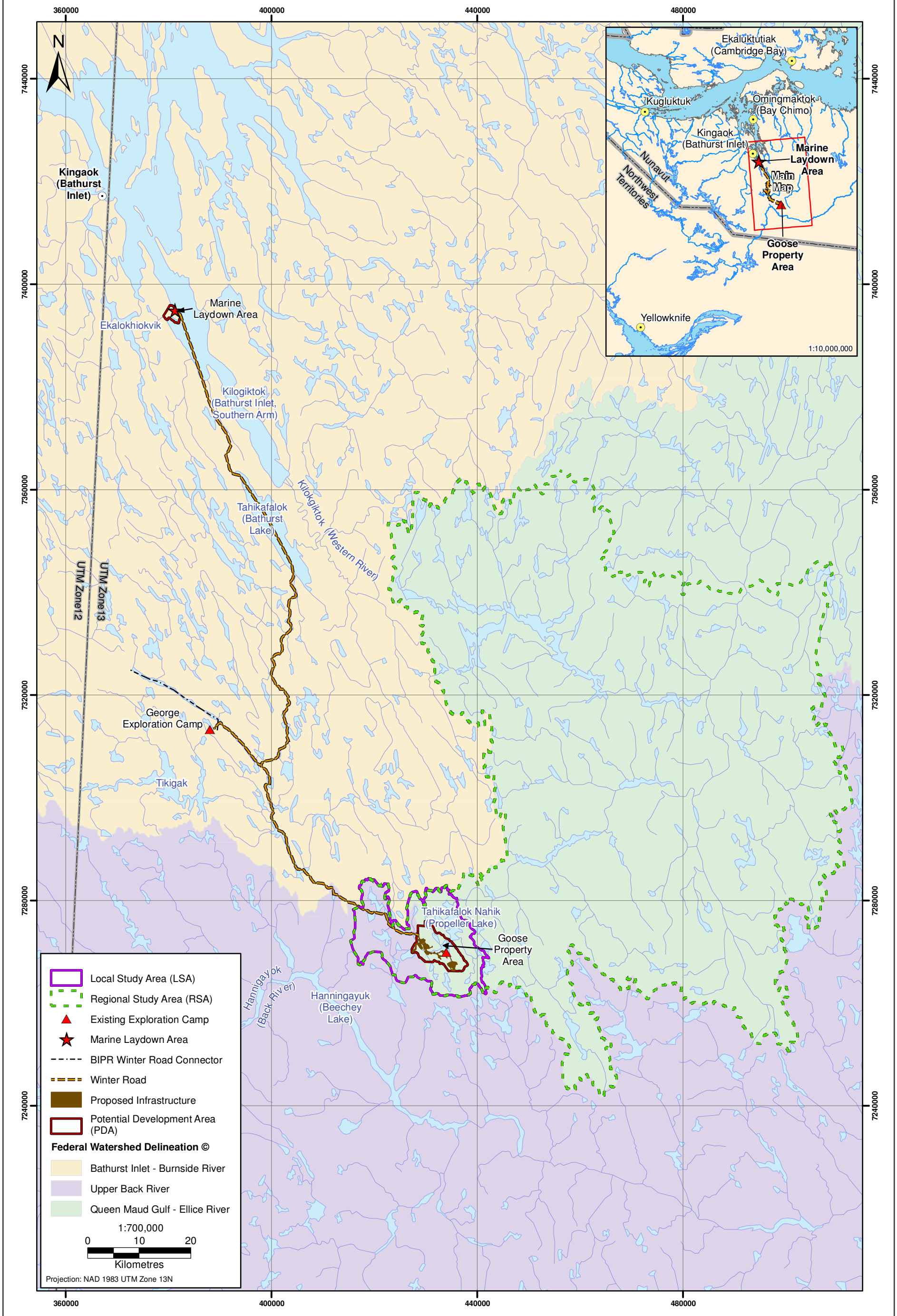
September 30 2015



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Local Study Area and Regional Study Area for Freshwater Fish/Aquatic Habitat

Figure 3.2-1

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4. Project Activities Affecting Surface Waters

4.1 MINE PLAN OVERVIEW

The Project involves the construction, operation, and closure of open pit and underground mines at the Goose Property. A MLA will be established on the western shore of Bathurst Inlet to deliver supplies, via a 160 km winter ice road connecting the MLA to the Goose Property. (Figure 1.1-1)

The MLA infrastructure includes a temporary Lightering Barge Terminal, water intake and desalination discharge pipes, and the winter road where it crosses the Bathurst Inlet from the MLA to the Goose Property Area (Figure 1.1-2). Here, the Project will sealift materials and supplies through Bathurst Inlet to the MLA annually during the open-water season only. Ships could travel via either the eastern or western portion of the Northwest Passage and then south in to Bathurst Inlet. It is estimated that between three and five ships will report to the MLA for annual resupply and fuel as part of the Project.

The Goose Property is composed of four open pits and underground mines (Umwelt, Llama, Goose Main, and Echo), four waste rock storage areas (WRSA) established close to each pit, a Tailings Storage Facility (TSF), the Umwelt Tailings Facility (TF), the Goose Main Tailings Facility (TF), underground mining pads, a stockpile, camp, process plant, airstrip, and roads (Figure 1.1-3). The life of mine ore production will be approximately ten years. The total mine life of the Project from construction to the end of closure is estimated to be approximately 21 years. The mine life was divided into four phases and three stages to describe key periods. Table 4.1-1 provides a summary of the four phases of the Project, with Phase 2 broken down into stages by the tailings deposition plan.

Table 4.1-1. Mine Phase and Stage

Phase	Stage	Description	Start	End	Comment
1	-	Construction	Year -3	Year -1	Building TSF and start Umwelt open pit mining and underground mining
2	1	TSF Operation	Year -1	Year 2	Begin milling and tailings deposition in TSF
	2	Umwelt TF Operation	Year 2	Year 6	Tailings deposition in Umwelt TF
	3	Goose Main TF Operation	Year 6	Year 10	Tailings deposition in Goose Main TF
3	-	Closure	Year 10	Year 18	Active site closure, continue water treatment and remove site infrastructure
4	-	Post-Closure	Year 18	Year 23	Site closed. Performance monitoring

The following sections provide a brief description of key pieces of infrastructure that directly or indirectly affect surface waters at the Goose Property (for more details see the Water and Load Balance Report, Appendix V2-7H in the FEIS).

4.1.1 Tailings Storage Facility (TSF)

Tailings deposition in the TSF, located approximately 300 m east of Rascal Lake, will last for two years of the Project life, resulting in 3.15 Mm^3 of deposited tailings. In addition to the tailings volume, the TSF was designed to contain site-wide contact water, mill process water, as well as saline groundwater from

Llama open pit dewatering. The capacity of the TSF up to the full supply level (FSL) is 4.4 Mm^3. After tailings deposition in the TSF ceases, the available water storage up to the FSL level is 1.3 Mm^3. Once tailings deposition in the TSF is complete, the remaining supernatant water in the TSF will be reclaimed to the Goose Process Plant.

The closure plan for the TSF is to cover the exposed tailings and the containment dam with waste rock originating from the Goose Main open pit and convert the TSF into a waste rock storage area (TSF WRSA). This WRSA will in turn be covered with a 5 m cap of non-potentially acid generating (NPAG) waste rock. The Goose Main open pit is located 2 km north, and downstream of the TSF. Development of the Goose Main open pit is scheduled to overlap for three months with active tailings deposition in the TSF. It is assumed that waste rock will be deposited on the tailings beaches and the upstream and downstream face of the TSF dam.

Following the dewatering of supernatant water in the TSF, a portion of the TSF containment dam will be used to store contact water until the start of Closure. The available capacity of the pond at this point is 1.2 Mm^3. At Closure, runoff from the Goose WRSA will naturally flow downstream into Goose Main open pit; now named Goose tailings facility (TF).

4.1.2 Umwelt Open Pit and Tailings Facility (TF)

The Umwelt open pit is the first pit to be mined at the Goose Property and is scheduled to start one year before milling begins. Pit dewatering flows will be pumped to the former Llama Lake (then called Llama Reservoir), followed by the TSF once milling operations begin. After completion of Umwelt open pit mining, the open pit will be used for storage of mine water, tailings deposition, and the Goose Process Plant reclaim water as the Umwelt tailings facility (Umwelt TF). Based on available pit shell information, the estimated total storage capacity of the Umwelt open pit is 7.8 Mm^3, measured below a discharge elevation of 299.7 metres above sea level (masl).

Tailings will be deposited in the Umwelt TF until the solids are at an elevation 5 m below the discharge elevation. A total of 7.1 Mm^3 of tailings will be deposited in the Umwelt TF over a period of about four years. Once the Goose open pit mining is complete, excess water from the Umwelt TF during Operations will be pumped to the Goose Main TF.

At Closure, 5.0 m of water will cover the tailings deposited in the Umwelt TF (total water volume of 0.7 Mm^3). After Closure and once site specific water quality discharge criteria are met, excess water from the Umwelt TF will be directed to Goose Lake.

4.1.3 Llama Open Pit and Reservoir Facility

The Llama open pit is expected to be developed and mined in just under three years. The Llama open pit is the only pit on the Property that will be developed in an open talik and where groundwater inflows are expected to be encountered during mining. Pit dewatering flows will be routed to the TSF, followed by the Umwelt TF once it becomes active.

Following the completion of Llama open pit mining, the pit will be used to store excess site-wide contact water during Operations (as the Llama Reservoir) and hypersaline water (creating a meromictic lake). At Closure, once site specific water quality discharge criteria are met, excess water will be routed to Goose Lake. The available storage capacity of the Llama open pit below a discharge elevation of 294.4 masl is 5.6 Mm^3.

4.1.4 Goose Main Open Pit and Tailings Facility (Goose Main TF)

The Goose Main open pit will be mined and developed within four years, and will be used in Year 7 as a tailings facility. Pit dewatering flows will be pumped to the TSF, followed by the Umwelt TF once it becomes active.

The available storage capacity of the Goose Main open pit after development is 10.8 Mm^3 below a discharge elevation of 279.2 masl. Based on the mine schedule and milling rate, approximately 6.2 Mm^3 of tailings will be deposited to an elevation of 247.9 masl, providing 4.6 Mm^3 of storage for process water and site-wide contact water, and 31 m of water cover above the tailings surface. Process water inventory from the Goose Main TF will be treated during Operations and Closure and pumped back to the Goose Main TF until water quality discharge criteria are met.

4.1.5 Llama Lake

As described in the Site Water Monitoring and Management Plan (Volume 10, Chapter 7), the intent is to initially dewater Llama Lake to 450,000 m^3 to provide adequate storage for site-wide contact water from the Umwelt open pit dewatering and waste rock runoff during the construction of the TSF. Based on available bathymetry, Llama Lake has a total storage capacity of 1.1 Mm^3.

4.1.6 Umwelt Lake and Saline Water Pond

During the underground development of Umwelt, Llama, and Goose Main, it is expected that a significant volume of groundwater will need to be dewatered as underground development will occur in open taliks. As chloride concentrations in the groundwater are expected to be high, it was determined that the saline groundwater from the underground workings would need to be separated from the site-wide contact and process water managed on site.

The Umwelt Lake will be dewatered and the Saline Water Pond will be constructed in its footprint. Intercepted groundwater from underground development will be stored in the Saline Water Pond until water can be pumped to the Llama Reservoir and into the Llama, Umwelt, and Goose Main underground workings once mining is complete. Based on available bathymetry, the Umwelt Lake and Saline Water Pond have total capacities of 362,480 m^3 and 1.1 Mm^3, respectively.

At Closure, once the Saline Water Pond is dewatered to the Llama Reservoir, the first 2 m of sediments (773,817 m^3) may be excavated and transferred to the Goose Main TF.

5. Mitigation and Adaptive Management Measures

5.1 OVERVIEW

Mitigation measures will be in place to avoid or minimize the potential effects of the Project on fish and fish habitat (summarized in Table 5.1-1; also see Section 6.5.3 in Volume 6). Mitigation measures are supplemented by the use of additional management measures, when needed. The primary mitigation measure to avoid potential effects on freshwater fish/aquatic habitat is the Project design of siting infrastructure to avoid freshwater fish habitat wherever feasible. The camp/plant site, stockpile location, and waste rock storage areas have been located to avoid fish-bearing waters. Another key mitigation measure is the establishment of maximum water volume uses which have been based on protecting critical life stages of fish in Goose, Propeller, and Big lakes. The proposed mitigation and management measures are considered to be technically, environmentally, and economically feasible. Unavoidable losses of fish habitat (e.g., loss of Llama Lake due to Llama Open Pit and loss of Umwelt Lake due to Saline Storage Pond) will be counterbalanced through the implementation of a Fish Offsetting Plan. Details on other mitigation and management measures are presented within the following plans in Volume 10 of the FEIS:

- Environmental Management Plan (Chapter 1);
- Environmental Protection Plan (Chapter 2);
- Fuel Management Plan (FEIS Addendum Chapter 4);
- Spill Contingency Plans (FEIS Addendum Chapter 5);
- Oil Pollution Emergency Plan (FEIS Addendum Chapter 6);
- Site Water Monitoring and Management Plan (Chapter 7);
- Mine Waste Management Plan (Chapter 9);
- Waste Management Plan (Chapter 10);
- Incineration Management Plan (Chapter 11);
- Road Management Plan (Chapter 14);
- Shipping Management Plan (Chapter 15);
- Borrow Pits and Quarry Management Plan (Chapter 16);
- Air Quality Monitoring and Management Plan (Chapter 17);
- Aquatic Effects Management Plan (FEIS Addendum Chapter 19);
- Tailings Management Plan (Chapter 22);
- Mine Closure and Reclamation Plan (Chapter 29); and,
- Conceptual Fish-out Plan (FEIS Addendum Chapter 31).

Table 5.1-1. Summary of Select Mitigation and Management Measures for Fish and Aquatic Habitat

Mitigation Category	Mitigation Measures
1. Mitigation by Project Design	• The Project has been designed to employ winter road only access corridors, thereby limiting dust emissions and hence the potential influence on fish and aquatic habitat. There are no all-weather roads connecting the MLA to the Goose Property. • Infrastructure, waste rock storage areas, and the TSF have been confined to the local watersheds where the deposits are located, and have stayed out of the regional Upper Back River Watershed, thereby confining potential influence on fish habitat and community to the local drainage areas. • The area of landscape disturbance will be minimized, and restoration will occur as soon as possible in order to minimize erosion potential. • Sabina proposed mitigation by design (Rascal Fishway) to ensure adequate fish passage between Goose Lake and upper RSE following DFO's preference to mitigate rather than offset (DFO 2013a). More information can be found in FEIS Addendum Appendix V6-6F.

2. Best Management Practices	• Construction, including winter road construction, will follow all applicable DFO's 'Measures to Avoid Causing Harm to Fish and Fish Habitat'.
	• Efforts will be made during the final design stage to have the right-of-way cross each stream as close to perpendicular as possible to minimize the amount of stream bank disturbance that may need to be disturbed during construction.
	• Where water will be withdrawn from fish-bearing lakes, reduction in water level and discharge will be below a threshold determined to have no significant residual effects on fish and fish habitat, as directed by DFO.
	• In-water work at the MLA will not take place from mid-July through mid-August during the Capelin spawning migration; in-stream work at the Goose Property will not take place within the spring spawning and incubation periods for Arctic Grayling in central Nunavut.
	• Where possible, buffers along existing natural surface flow features will be used to maintain native vegetation and aquatic conditions.
	• Silt fences will be used in areas of cuts and excavations, downslope from exposed or erodible areas to prevent sedimentation of waterbodies.
	• All water intakes will be screened to avoid entrainment of fish in accordance with the DFO Fresh Water Intake End of Pipe Screening Guideline.
	• All Project activities requiring the use of explosives in or near waterbodies will consider the Guidelines for Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopkey 1998) and other applicable and available best management practices.
	• Speed limits will be followed for vessel operations to minimize propeller wash and wake effects.
	• The dewatering of waterbodies, will follow an approved dewatering plan, whereby water will not be discharged to the receiving environment if it does not meet approved criteria. Any poor quality water will be retained, discharged to the TSF or other appropriate holding facility.
	• Fishing will be banned within all Project areas and, thus, will not result in fish mortality.
	• Fish removal from waterbodies prior to dewatering will follow the DFO's General Fish-Out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut (Tyson et al. 2011).
	• Guidelines for vessel discharges and anti-fouling surface treatments will be adhered to at the MLA. These guidelines include the following requirements:
	  o organotin compounds are prohibited for vessels in Canadian waters;
	  o vessels must treat sewage prior to discharge, or discharge offshore; and
	  o vessels travelling in international water must exchange ballast water offshore.

3. Adaptive Management	• The need for any corrective actions to on-site emission management or installation of additional control measures will be determined on a case-by-case basis. Indications of the need for corrective actions and additional control measures may include:
	  o if results from the Surveillance Network monitoring program (which will be outlined in the future Type A Water Licence) show non-compliance;
	  o if results from the Aquatic Effects Monitoring Program, which will monitor the receiving environment around the mine infrastructure and activities, show adverse effects to the freshwater environment; or
	  o if results from the Fish Offsetting Monitoring Program show that the offsetting program is not successful.

4. Monitoring	• The Aquatic Effects Monitoring Program will consist of the following components:
	  o water quality and sediment quality monitoring;
	  o monitoring primary producers and benthic invertebrates; and
	  o monitoring fish and shellfish populations, as well as fish and shellfish tissues.

5.2 SITE WATER MANAGEMENT

The Site Water Monitoring and Management Plan (Chapter 7, Volume 10 of the FEIS) was designed to mitigate potential negative effects from Project activities on the aquatic environment. In the Goose Property Area, site contact water (including runoff from WRSA and mine water) and treated sewage effluent will be directed to the tailings facilities and discharged to an approved site meeting applicable water licence criteria. At the MLA, greywater will be discharged on-land at an approved site and sewage will be collected by Pactos and incinerated.

Water management plans were prepared for each phase of the mine life: construction, operations, closure and post-closure. The operational period consists of open pit and underground mining, and will take place over a ten-year period. Three tailings facilities are operated in sequence, which are presented as three stages within the operations. The closure period will take place over an additional eight years, at which point the site enters post-closure and all remaining facilities are decommissioned.

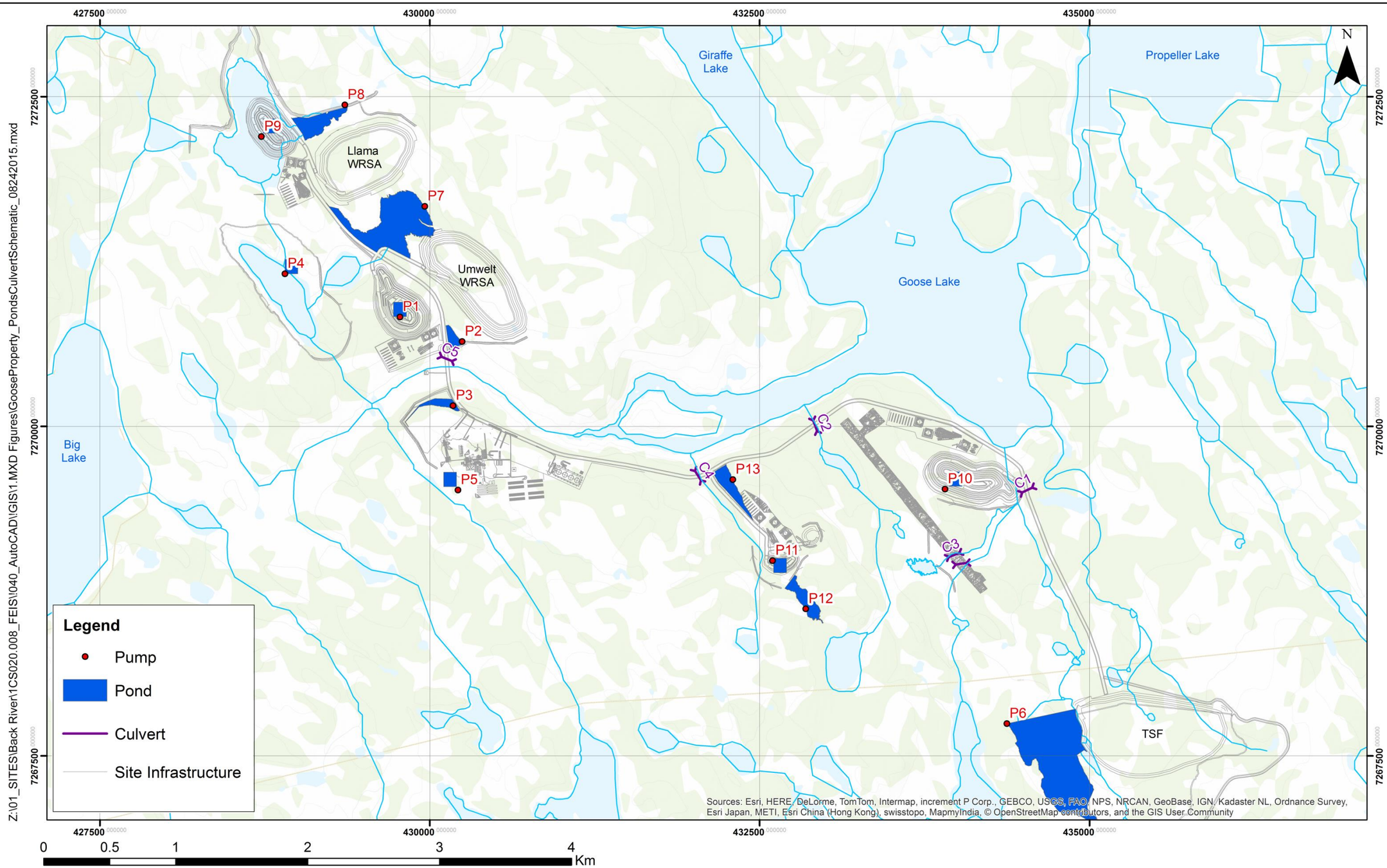
Water on site is categorized into three types, including contact water, which is affected by mine workings (waste rock, ore stockpile, pits, tailings, etc.), non-contact water, which is runoff from undisturbed areas, and saline water, which is the groundwater inflows to mining areas. Each type of water is managed separately throughout each Project phase.

Contact water is contained in event ponds and tailings facilities, and is transferred via diversions and pumped pipelines (Figure 5.2-1). Non-contact water is diverted off-site through event ponds, pumped pipelines, berms and culverts. Saline water is pumped from the underground facilities and stored in the Saline Water Pond, which is subsequently pumped back underground or into the bottom of the Llama Reservoir.

A water treatment plant will be operational in the open water season at the Goose Property in the construction phase to initially dewater Llama and Umwelt Lakes in order to create storage for contact water and saline water, respectively. Treatment is inactive between Years 1 and 5, but begins again year-round from the Goose Main TF in Year 6 to reduce metal and suspended solids loading in the facility. Once mining is complete in Year 10, water treatment continues during the open water season from the Goose Main TF, until Year 18, at which point the site is finally closed.

Five culvert crossings are required to maintain drainage patterns across the haul road and Goose airstrip at the Goose Property as illustrated on Figure 5.2-1. All crossings occur over small, ephemeral streams. One of these crossings will occur over a fish-bearing stream, the Gander Pond outflow stream located north of the airstrip, and therefore will be designed for passage of fish (i.e., Arctic Grayling). The remaining four crossings will occur over non-fish bearing streams. The culvert which requires fish passage will contain a 150 mm layer of cobble substrate material. Culvert sizing was done using the commercial code HY-8 (Federal Highway Administration 2015). Detailed design drawings of culverts will be provided to DFO during the regulatory phase of the Project.

Z:\01_SITES\Back River\1CS020.008_FEIS\040_AutoCAD\GIS\1.MXD Figures\GooseProperty_PondsCulvertSchematic_08242015.mxd



Coordinate System: NAD 1983 UTM Zone 13N

srk consulting	Sabina GOLD & SILVER CORP.	Site Wide Water Management Report
Job No: 1CS020.008 Filename: Fig3_Pumping_Culvert_Schematic.pptx	BACK RIVER PROJECT	**Goose Property Pumping & Culvert Schematic**
		Date: August 2015 / Approved: SAB / Figure: **5.2-1**

5.3 SEDIMENT AND EROSION CONTROL

Sediment and erosion control measures will be applied throughout construction and maintained for the life of the Project. Efforts will be made to minimize the disturbance of the landscape and natural vegetation cover, and to schedule ground preparation to maintain adequate cover and avoid activities during periods of expected rainfall. The Project has been designed to use winter road only access corridors thereby limiting stream crossing and instream works and hence the potential effects on water and sediment quality. Efforts will be made during the final design stage to have the right-of-way cross each stream as close to perpendicular as possible to minimize the amount of riparian vegetation that may need to be disturbed during construction. Depending on the site-specific requirements, civil design structures may be used to prevent erosion and the deposition of sediment in the aquatic environment (a list of potential structures and approaches shown in Table 6.1-1, Chapter 19, Volume 10 of the FEIS).

Runoff in the Project area occurs during a short period of June through September/October, due to the Arctic climate and permafrost ground conditions. Streams and rivers begin to flow in May, after freezing solid during the winter, and peak during freshet in June and July. The freshet period is typically short, and instantaneous flows can be quite large (see the Hydrology baseline information, Volume 6, Chapter 1 of the FEIS). Water control and erosion control structures will be designed to freshet peak flows, and areas and structures vulnerable to freshet flows will be identified. Water control structures will be monitored for ice and snow blockages, which will be cleared as necessary.

5.4 BLASTING PLAN

All Project activities requiring the use of explosives in or near waterbodies will consider the Guidelines for Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopkey 1998) and other applicable and available best management practices, as directed by DFO. The blasting management plan will be discussed with DFO prior to any blasting activities, and will be subject to adaptive management.

During the FEIS Final Hearing, Sabina and DFO jointly submitted the following Term and Condition (DFO-T-1):

> The Proponent shall engage with Fisheries and Oceans Canada in exploring possible Project specific thresholds, mitigation, and monitoring for blasting that would exceed the requirements of Fisheries and Oceans Canada's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998).

5.5 ROUTINE INSPECTION AND MONITORING

In addition to specific monitoring programs, including those required under regulatory approvals, routine inspections will be done on Project activities and components that could interact with the aquatic environment (Table 6.1-2 in Chapter 19, Volume 10 of the FEIS). These routine inspections will ensure mitigation and management goals are met, help identify if additional mitigation measures are required, and provide important information on the performance of the Aquatic Effects Management Plan.

6. Project-Related Serious Harm to Fish

6.1 INTRODUCTION

Serious harm to fish (as defined in the *Fisheries Act*) refers to the ways that the aquatic environment is changed as a result of unavoidable adverse impacts with the Project. This would include the unavoidable death of fish or permanent alteration to, or destruction of, fish habitat. Serious harm can result in residual serious harm, impacting the productivity of a CRA fishery. Thus, there are two key steps required for the assessment in the offsetting plan:

1) A screening assessment to determine whether serious harm to fish is likely to occur; and,
2) An assessment of residual serious harm to the productivity of the fishery if it has been determined that effects are likely to occur.

The Pathway of Effects models (or diagrams) developed by the DFO can be used to identify any serious harm, which can ultimately lead to reductions in fisheries productivity (DFO 2014b). The Pathway of Effects models are similar to the general method of the environmental assessment for the Project. Project activities, the expected cause-effect relationship, and the mechanisms by which stressors ultimately lead to effects in the aquatic environment are described within Chapter 6 and 7 of the FEIS. For additional detail on the assessment approach for fish and fish habitat, see the General Methodology for Project Effects Assessment (Volume 9, Chapter 1).

Although mitigation measures will be in place to avoid or minimize the potential effects of the Project on fish and fish habitat (see Section 5), adverse effects may remain and lead to residual serious harm to fish. The offsetting plan summarizes predicted adverse effects to occur for the MLA and Goose Property area, as concluded in the environmental assessment of Project effects on fish habitat (Volume 6, Chapter 6, and Volume 7, Chapter 4) and on the fish community valued ecosystem components (VECs) (Volume 6, Chapter 7, and Volume 7, Chapter 5). The offsetting plan focuses on Project infrastructure that may interact with the fish and fish habitat wherever the locations overlap with fish habitat (e.g., that may result in permanent alteration of habitat, or require a fish-out prior to the alteration of habitat). Any releases of potentially deleterious substances to freshwater habitat at the Goose Property will meet scheduled criteria and were determined to not measurably affect fish health (as stated in Volume 6, Chapter 7 of the FEIS), and water and sediment quality (as stated in two chapters in the FEIS: Volume 6, Chapters 4 and 5 for water and sediment quality, respectively).

6.2 MARINE LAYDOWN AREA

With consideration of the application of proposed mitigation and management measures, serious harm is predicted for Arctic Char and aquatic habitat VECs in the environmental assessment. Effects are summarized in Volume 7, Sections 4.5.4, and 5.5.4, all of which were classified as being Not Significant.

6.2.1 Aquatic Habitat Footprint

An adverse effect arising from the Project on the marine VEC fish/aquatic habitat is predicted due to habitat loss under the footprint of the Lightering Barge Terminal (Figure 1.1-2). At the MLA, the magnitude of effects on fish/aquatic habitat due to the footprint of the Lightering Barge Terminal is anticipated to be negligible. This conclusion is drawn from two lines of reasoning. First, the footprint affected by the Lightering Barge consists of the most common and abundant shoreline substrate and habitat along western Bathurst Inlet (sand and cobble). Second, the footprint area (equal to 0.038 ha and 14.6 m and of shoreline) is negligible when compared to the area within the LSA (2,100 ha) and the amount of shoreline within the LSA (2,800 m). The geographical extent of the effect is confined to the

Project footprint, entirely within the Potential Development Area and LSA (Figure 1.1-2, and Figure 3.1-2), and accounts for only 0.00001% of the LSA area and 0.005% of the LSA shoreline; therefore it is considered to be local within the Project footprint. The frequency of the effect will be sporadic (in place intermittently during the open-water season) during the construction and operation phases of the Project. The effect is anticipated to be immediately reversible following closure. The re-colonization of benthic invertebrates would likely be immediate following the permanent removal of the structure and the community will re-establish naturally with no intervention.

An adverse effect arising from the Project on the marine VEC fish/aquatic habitat is predicted due to habitat loss under the footprint of the in-water construction zone for the intake and discharge pipes (Figure 1.1-2). At the MLA, the magnitude of effects on fish/aquatic habitat due to the footprint of the pipe construction is anticipated to be negligible. This conclusion is drawn from two lines of reasoning. First, the footprint affected by pipe construction consists of the most common and abundant shoreline substrate and habitat along western Bathurst Inlet (sand and cobble). Second, the footprint area (equal to 0.55 ha) is negligible in magnitude when compared to the area within the LSA (2,100 ha). The geographical extent of the effect is confined to the Project footprint, entirely within the Potential Development Area and LSA, and accounts for only 0.0003% of the LSA area; therefore, the effect is considered local, within the Project footprint. The frequency of the effect will be once in the construction phase of the Project. The effect is anticipated to be immediately reversible following closure. The re-colonization of benthic invertebrates is likely to occur immediately following construction when the pipes and trench are covered with natural substrate or clean non-acid generating rock. The benthic invertebrate community will re-establish naturally with no intervention. Furthermore, the in-water work will take not take place from mid-July through mid-August during the spawning period of Capelin, an important forage fish for Arctic Char.

6.2.2 Residual Serious Harm to Fish

Although any permanent alteration or destruction of habitat may affect the distribution of Arctic Char and other species that are part of a CRA fishery, the relationship between habitat area and fisheries productivity is typically curvilinear where declines in productivity manifest beyond a certain threshold (DFO 2014a). The expectation is that this threshold is considerable higher than the aquatic footprint because the predicted absolute losses in habitat are small and because the affected habitat types are abundant in the region. Furthermore, any serious harm to fish will be immediately reversible following closure. Therefore, with the implementation of proposed mitigation measures and best available and applicable management practices, it is unlikely that the MLA will result in residual serious harm to fish. The on-going productivity of fisheries will be maintained within the Bathurst Inlet marine ecosystem.

6.3 GOOSE PROPERTY AREA

Although the majority of Project infrastructure has been sited to avoid fish bearing water, some of the Project infrastructure has the potential to interact with the VEC freshwater fish (Lake Trout and Arctic Grayling) and aquatic habitat wherever the locations overlap with freshwater (Figures 1.1-3 and 6.3-1). Any such interactions may result in permanent alteration to, or destruction of fish habitat (i.e., serious harm to fish). Direct mortality with subsequent decreases in population abundance is also predicted to occur as part of fish-outs prior to lake dewatering. Effects to fish and fish habitat are summarized in Volume 6, sections 6.5, and 7.5 of the environmental assessment, all of which were classified as being Not Significant.

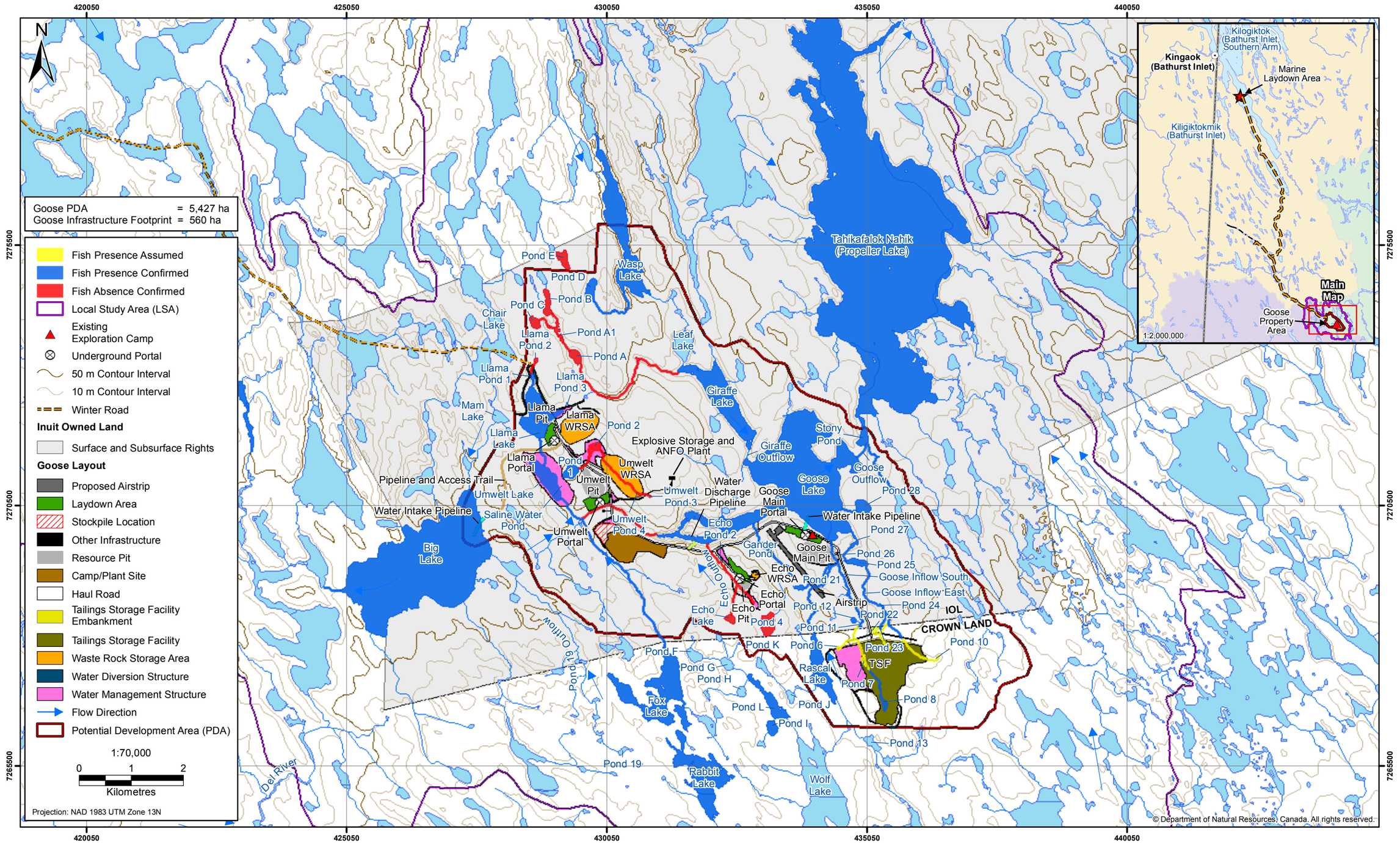


Figure 6.3-1

Fish Bearing Status within the LSA, Goose Property Area

Sabina GOLD & SILVER CORP.

Rescan an ERM company

6.3.1 Lakes

In fish bearing lakes, a direct loss of habitat will occur in Llama Lake because of the construction of the Llama Pit and in Umwelt Lake because of Saline Water Pond construction (Figures 6.3-1). These habitat losses will result from draining each of the lakes during the Construction Phase and will persist in perpetuity. Prior to the draining of each of these lakes, a fish-out will be performed as directed by DFO (FEIS Addendum Chapter 31).

At Llama Lake, the entire basin will be drained in preparation for the construction of the Llama Pit, which represents a complete loss of 36.6 ha of habitat used by Lake Trout, Arctic Grayling, Round Whitefish, and Slimy Sculpin (Figure 6.3-1; Table 6.3-1). The majority of the area of the lake is composed of shallow water (less than 4 m), with large, boulder-cobble substrate, followed by deep water areas (greater than 4 m) with fine substrates, and nearshore areas (less than 2.5 m deep) with fine substrates. Llama Lake was categorized as high quality habitat overall as it provides the majority of deepwater overwintering habitat in the northern section of the Llama Watershed and spawning habitat for Lake Trout and Round Whitefish.

Llama Pit will be decommissioned during Operations, when it will be used as a contact water storage facility (Llama Reservoir). From this point onwards, all saline groundwater from the Saline Water Pond will be pumped to the bottom of the partially flooded Llama Reservoir to create a meromictic lake. Llama Reservoir is predicted to overtop during the Reclamation and Closure phase, with water from the reservoir discharging towards the south and into the reclaimed Saline Water Pond catchment (formerly Umwelt Lake).

Umwelt Lake will be drained to construct a Saline Water Storage Pond, which represents a complete loss of 19.4 ha of habitat used by Lake Trout, Arctic Grayling, and Round Whitefish and likely Slimy Sculpin (Figure 6.3-1; Table 6.3-1). The majority of the area of the lake is composed of shallow water (less than 2 m) with mixed cobble and boulder and fine substrates, followed by a small area of slightly deeper water habitat (maximum depth 3 m). Umwelt Lake was categorized as medium quality habitat overall as it provides mainly summer rearing habitat with limited deep-water areas for overwintering Arctic Grayling. The Saline Water Pond will begin to be drained into Llama Reservoir during Operations. After draining is complete, the berms of the Saline Water Pond will be breached during the Reclamation and Closure Phase. After the Saline Water Pond closure and reclamation is complete, the diversion berms around the Llama Reservoir will be breached, and the reservoir will be allowed to fill with non-contact water. Details regarding the closure and reclamation of the area around the Saline Water Pond are presented in the Mine Closure and Reclamation Plan (Volume 10, Chapter 29).

The installation of water intake and discharge pipes during the Construction Phase in Goose Lake will affect 0.51 ha of fish bearing habitat (Figure 6.3-1; Table 6.3-1). In southeast Goose Lake, the dimensions of the in-water construction zone for the intake pipe are anticipated to be a maximum of 15 m wide by 129 m long for an approximate footprint of 3,563 m^2 (or 0.36 ha). In western Goose Lake, the dimensions of the in-water construction zone for the discharge pipe are anticipated to be a maximum of 15 m wide by 64 m long for an approximate footprint of 1,502 m^2 (or 0.15 ha). The natural substrate types found under both construction zones are common within Goose Lake and consist of predominantly cobble and boulder at the intake pipe location and predominantly boulder and bedrock at the discharge location. Construction of the intake and discharge pipelines will consist of placing the 4 inch pipe on the substrate surface, covering the pipe and construction zone with clean non-acid generating boulder/cobble riprap, and daylighting the end of pipe at approximately 5 m water depth. The use of a rock apron is expected to mitigate any potential changes in habitat resulting from the installation of the intake and discharge pipes. The pipes will be decommissioned by cutting to the substrate level and capping; rip rap will be permanently left in place.

The installation of a water intake pipe at the eastern shore of Big Lake during the Construction Phase will result in a loss of approximately 0.52 ha of fish bearing habitat (Figure 6.3-1). The dimensions of the in-water construction zone are anticipated to be a maximum of 20 m wide by 304 m long. The natural substrate type found under the intake pipe construction zone is common within Big Lake and consists of predominantly cobble and boulder. To construct the intake pipeline, a 4-inch pipe will be placed on the substrate surface then the pipe will be covered to the extent of the construction zone with clean non-acid generating boulder/cobble rip rap. The end of the pipe will be daylighted at approximately 5 m water depth. The use of a rock apron is expected to mitigate any potential changes in habitat resulting from the installation of the intake pipe. The pipes will be decommissioned by cutting at the substrate level and capping; rip rap will be permanently left in place.

6.3.2 Ponds

Several small, fish-bearing and non-fish-bearing ponds (n = 21) located in the Llama Watershed (associated with the Llama and Umwelt Pits) and the Goose and Wolf watersheds (associated with the Echo Pit and TSF) will be lost to infrastructure (Figure 6.3-1), representing a total wetted area loss of 25.7 ha (Figure 6.3-1; Table 6.3-1).

Within the Llama Watershed, Llama ponds 1 (0.71 ha north of Llama Lake) and 3 (0.57 ha east of Llama Lake) have the potential to provide summer rearing habitat for juvenile fish from Llama Lake and will be indirectly lost through isolation by the placement of water management structures. Both ponds are ephemerally connected to Llama Lake by short streams, which dry up in summer and are dominated by boulders nearshore and fine substrates in deeper regions. Llama Pond 1 may provide some overwintering habitat as it is estimated to be approximately 4 m deep, whereas Llama Pond 3 is less than 1 m deep and provides no overwintering capacity. These habitat and connectivity losses will be initiated during the Construction Phase and persist in perpetuity.

Pond 1 (located east of Umwelt Lake; Figure 6.3-1) will also be indirectly lost from the Llama Watershed due to disconnection and isolation from Umwelt Lake for the construction of the Saline Water Pond. Pond 1 provides approximately 6.3 ha of low quality rearing habitat for forage fish (Slimy Sculpin and Ninespine Stickleback) which may overwinter within its 3 m depth. This connectivity loss will be initiated during the Construction Phase and persist in perpetuity.

Three small ponds within the Echo Pit watershed will be modified because of the development of the Echo Pit. However, this system has been classified as non-fish bearing based on previous baseline studies (Rescan 2012a, 2014a, and 2015).

Fourteen ponds within the Goose and Wolf watersheds will be lost due to the placement of infrastructure: four within the boundary of the TSF (5.1 ha: ponds 6, 7, 8, and 9), and ten due to the loss of catchment discharge downstream of the TSF (9.4 ha: ponds 11, 12, 20, 21, 22, 23, 24, 25, 26, 27). One pond with overwintering potential (i.e., depths exceed expected maximum ice thickness of 2.0 to 2.5 m) may be affected through isolation from downstream waterbodies (0.56 ha: pond 10) (Figure 6.3-1, Table 6.3-1); however, this pond is naturally isolated from downstream populations because of the ephemeral outflow stream and distance from Goose Lake. Within the planned TSF boundary, ponds 6, 7, and 9 are shallow (less than 1 m maximum depth) and consist predominantly of boulder and fine substrate. Fish use of these ponds is expected to limited to spring and early summer. Within the potential TSF location overwintering habitat only exists in Pond 8. The remainder of the ponds downstream of the TSF are split into two groups based on seasonal connectivity; those ponds lower in the watershed that have good connectivity to Goose Lake throughout the summer, and those ponds higher in the watershed that have only ephemeral connectivity to Goose Lake during spring. Those ponds lower in the watershed (ponds 21, 25, 26, 27) provide medium quality summer rearing habitat for Arctic Grayling and forage fish. Ponds

located higher in the watershed (ponds 11, 12, 20, 22, 23, and 24) provide low quality summer rearing habitat for forage fish. In dry years, fish may become trapped and perish in ponds higher in the watershed if flow conditions prevent fish from accessing viable overwintering habitat. Pond habitat losses will be initiated during the Construction Phase and the loss of ponds directly underneath the TSF (ponds 6, 7, 8, and 9) will persist in perpetuity. All remaining ponds may receive an increase in discharge and potentially a return to fish bearing condition once the TSF is breached and decommissioned in post-closure.

Table 6.3-1. Fish-Bearing Lakes and Ponds with Total or Partial Habitat Losses, Resulting in Serious Harm to Fish

Name	Watershed	Project Effect	Effect Type	Area (ha)	Maximum Depth	Species Captured*	Data Source
Llama Lake**	Llama	Infrastructure (Llama Pit)	Loss	36.59	13.6	LKTR, RDWF, NSSB	1,2,3
Llama Pond 1**	Llama	Infrastructure (Water Diversion Structure)	Loss	0.71	>3		6
Llama Pond 3**	Llama	Infrastructure (Llama Pit)	Loss	0.57	0.8		6
Umwelt Lake**	Llama	Infrastructure (Saline Water Pond)	Loss	19.36	3.0	LKTR, ARGR, RDWF	1,2,3
Echo Lake	Goose	Infrastructure (Isolation)	Alteration	2.6	<2		2,4,6
Echo Pond 1	Goose	Infrastructure (Echo Pit Water Management)	Alteration	0.13	2.5		4,6
Echo Pond 2	Goose	Infrastructure (Downstream of Echo Pit)	Loss	0.33	<1		6
Pond 1**[a]	Llama	Infrastructure (Isolation)	Alteration	6.25	3.0	SLSC, NSSB	2,4,6
Pond 6	Wolf	Infrastructure (Tailings Storage Facility; TSF)	Loss	0.50	1.0		5,6
Pond 7**[a]	Wolf	Infrastructure (TSF)	Loss	1.66	<1		5,6
Pond 8**	Wolf	Infrastructure (TSF)	Loss	2.70	2.0	NSSB	5,6
Pond 9	Goose	Infrastructure (TSF)	Loss	0.22	0.4		5,6
Pond 10	Goose	Infrastructure (Isolation)	Alteration	0.56	>3		5,6
Pond 11	Wolf	Infrastructure (Downstream of TSF)	Loss	0.86	<1		5,6
Pond 12**[a]	Wolf	Infrastructure (Downstream of TSF)	Loss	0.24	<1	NSSB	5,6
Pond 20	Wolf	Infrastructure (Downstream of TSF)	Loss	0.19	NA		6
Pond 21**	Wolf	Infrastructure (Downstream of TSF)	Loss	0.73	0.7	NSSB	6
Pond 22	Wolf	Infrastructure (Downstream of TSF)	Loss	1.18	1.0		6
Pond 23**[a]	Goose	Infrastructure (Downstream of TSF)	Loss	0.07	0.4	NSSB	6
Pond 24**[a]	Goose	Infrastructure (Downstream of TSF)	Loss	0.22	0.7	NSSB	6
Pond 25**	Goose	Infrastructure (Downstream of TSF)	Loss	4.20	0.4	NSSB	6
Pond 26**	Wolf	Infrastructure (Downstream of TSF)	Loss	0.19	0.9		6
Pond 27**	Goose	Infrastructure (Downstream of TSF)	Loss	1.56	>2	ARGR, SLSC, BURB, NSSB	6
Goose Lake	Goose	Infrastructure (Water Intake /Discharge Pipes)	Partial Alteration	0.51	16.5	LKTR, ARGR, RDWF, BURB, SLSC, NSSB	2,3,4
Big Lake	Big	Infrastructure (Water Intake Pipe)	Partial Alteration	0.52	5.6	LKTR, ARGR, RDWF, LKWF, BURB, SLSC	3

** LKTR - Lake Trout, ARGR - Arctic Grayling, RDWF - Round Whitefish, LKWF - Lake Whitefish, SLSC - Slimy Sculpin, BURB - Burbot, NSSB - Ninespine Stickleback, where no species has been captured, fish presence assumed due to direct connectivity (no barriers) with fish bearing habitat; ** residual serious harm to fish may result from effects to these waterbodies; [a] waterbodies previously excluded from list of affected waterbodies resulting in residual serious harm to fish in FEIS.*
Data Sources: 1 – Rescan (2010); 2 – Rescan (2012a); 3 – Rescan (2012b); 4 – Rescan (2014a); 5 – Rescan (2014b); 6 – Rescan (2015)

6.3.3 Streams

Several small, fish-bearing or potentially fish-bearing streams will be lost to infrastructure (Figures 6.3-1; Table 6.3-2) and are located in three watersheds, the Llama watershed (associated with the Llama and Umwelt Pits), the Goose watershed (associated with the TSF), and the Wolf watershed (associated with airstrip construction, the Goose Pit, and the TSF), representing a total wetted area loss of 3.4 ha (Table 6.3-2). Stream sections downstream of Echo Lake and Echo Pond 1 will also be modified because of the development of the Echo Pit; however, this system has been classified as non-fish bearing (Rescan 2012a, 2014a, and 2015).

Within the Llama Watershed, four stream reaches will be lost totalling 0.6 ha of fish bearing habitat. Two streams are associated with the construction of the Llama Pit and the associated water management structures (Llama Inflow from Llama Pond 1 and Llama Outflow) and two streams are associated with the construction of the Saline Water Pond (Umwelt Inflow from Pond 1 and Umwelt Outflow). Llama Inflow from Llama Pond 1 contains overall medium quality habitat but offers good connectivity between Llama Lake and Llama Pond 1 for rearing Lake Trout and forage fish. Llama Outflow habitat is high quality habitat overall, consisting of fair to good quality spawning habitat for Arctic Grayling, good spawning habitat for forage fish and good quality juvenile rearing habitat. Umwelt Inflow from Pond 1 is of fair quality overall with good connectivity between Umwelt Lake and Pond 1 and fair to good rearing and spawning habitat for forage fish only. Umwelt Outflow habitat is high quality overall, consisting of fair quality spawning habitat for Arctic Grayling, good spawning habitat for forage fish and good quality habitat for juvenile rearing fish. All streams will experience a complete, or very nearly complete reduction of discharge from upstream waterbodies and will provide little to no habitat for fish. In addition, there is a potential for small amounts of runoff along the Umwelt Outflow providing the opportunity for fish to become stranded in its lower reaches; however, the potential for reduced flow in these channels to allow fish to enter and become stranded, perish or to spawn and strand eggs will be mitigated, details of which will be provided in Final Offsetting Plan. These habitat losses will be initiated during the Construction Phase when Llama and Umwelt lakes are drained. The loss of the upstream catchment will persist through operations and closure, after which the discharge will resume along the natural stream route.

Within the Goose and Wolf Watersheds, four streams will be lost, or partially lost totalling an approximate 2.9 ha of fish-bearing habitat (Table 6.3-1). Two streams will be lost due to the construction of the TSF and the lost upstream catchment area (Goose Inflow East [GIE: 1.55 ha loss] and Goose Inflow South [GIS: 0.63 ha loss]). Rascal Stream East (RSE: 0.45 ha loss) will be partially lost due to development of the airstrip and associated water management infrastructure (Figure 6.3-1), and Rascal Stream West (RSW: 0.27 ha) will be partially lost due to the diversion of flows below Rascal Lake into Rascal Stream East (F-DFO-TC-8).

The Goose Inflow East and Goose Inflow South can be generally classified into two habitat types based on seasonal connectivity: sections lower in the watershed maintain good connectivity to Goose Lake throughout the summer and provide habitat for Arctic Grayling and forage fish (sections downstream of Pond 24 in GIE, and of Pond 21 In GIS; Figure 6.3-1), whereas sections higher in the watershed have only ephemeral connectivity to Goose Lake during the spring freshet and provide habitat only for forage fish. In sections of GIS and GIE lower in the watershed, the habitat is rated as high quality, providing good spawning and rearing habitat for Arctic Grayling and forage fish from Goose Lake and direct connection to overwintering habitat in Goose Lake. The lower section of GIS also provides part of the corridor that Arctic Grayling use to migrate between Goose and Rascal lakes (Figure 6.3-1). In sections of GIS and GIE higher in the watershed, the habitat is generally rated as low, with fair spawning and rearing habitat for forage fish, but often a discontinuous connection between ponds, of which only two provide overwintering capability (Pond 8 and 10). Stream habitat losses in Goose Inflow East and Goose Inflow

South will be initiated during the Construction Phase and the loss of higher watershed sections directly underneath the TSF will persist in perpetuity. All remaining downstream sections of GIE and GIS will receive reduced flows because of lost upstream catchment area resulting in channel discontinuity, increased periods of dry channel and fewer flow days. GIE and GIS may return to baseline discharge and potentially a return to fish bearing condition once the TSF is breached and decommissioned in post-closure. However, for the establishment of a fisheries offsetting plan, the entire length of GIE and GIS are considered losses in perpetuity.

The Rascal Stream East (RSE) was surveyed in 2012 and 2013, and is characterized by a heavily braided channel that is dominated by glide and riffle habitat. Boulders dominate the substrate, punctuated by patches of gravel and cobble substrate. The stream is heavily utilized by Arctic Grayling, and contains good quality spawning, rearing, and foraging habitat. The 1.1 km section of RSE upstream of the airstrip culverts, nearest Rascal Lake, will remain undisturbed and provide approximately 0.7 ha of habitat available for spawning, rearing and foraging Arctic Grayling and forage fish from Rascal Lake. Stream habitat losses in RSE will be initiated during the Construction Phase when the culverts for the airstrip are installed and a culvert diverting flow to GIE is established to realign discharge in RSE around the Goose Pit and under a haul road. The habitat losses will continue through post-closure, when the entire volume of RSE is diverted into the Goose TF to reduce filling time for the Goose Pit Lake. Once the Goose TF is full, the pit lake will be breached to allow flow to Goose Lake along the natural RSE alignment. Thus, the RSE will have habitat losses under two culverted areas and reduced flows during the filling of the Goose Pit. Reduced flow in the RSE may be sufficient to allow fish to enter and become stranded, perish or to spawn and strand eggs. RSE may return to baseline discharge and potentially a return to fish bearing condition once the culverts are removed and the Goose Pit Lake is breached in post-closure. However, for the establishment of a fisheries offsetting plan, the length of RSE downstream of the airstrip culverts is considered a habitat loss in perpetuity.

An approximately 740 m section of upper Rascal Stream West may be lost through the operation of the proposed 'fishway' (see FEIS Addendum Chapter 31). Operation may entail the diversion of flow away from this stream section to flow through upper Rascal Stream East. Rascal Stream West was previously characterized as a boulder garden during baseline studies (Rescan 2014a), deemed as poor to fair spawning habitat. This reach may become seasonally impassable to fish during low flow periods due to the abundance of large, closely packed boulders, dispersed flows, and may restrict upstream movements under natural flow conditions (Rescan 2012b).

Fish habitat loss related to Project infrastructure will also be incurred in Gander Outflow, which will be culverted during site road construction and result in the loss of 21 m^2 (or less than 0.01 ha) of fish bearing habitat underneath the culvert footprint. This section of Gander Outflow includes fair spawning and good rearing habitat for Arctic Grayling and was rated as important overall. Habitat loss will be mitigated with crossing structures that are properly sized and installed using best available and applicable management practices. At stream crossing sites, these impacts could reduce or eliminate spawning, rearing and feeding habitat for Arctic Grayling. However, the Gander Outflow crossing will be culverted with a closed bottom corrugated metal pipe designed to maintain Arctic Grayling passage by keeping water velocities under 1.5 m/s (Site Water Monitoring and Management Plan (Volume 10, Chapter 7). Furthermore, the culvert will be embedded to a depth of 0.4 m and filled with streambed material to promote fish passage and habitat suitability. Any habitat alteration will be initiated during the Construction Phase and persist until decommissioned in post-closure.

Table 6.3-2. Fish-Bearing Streams with Total or Partial Habitat Losses, Resulting in Serious Harm to Fish

Name	Watershed	Project Effect	Effect Type	Area (ha)	Length (m)	Width (m)	Species Captured*	Data Source
Goose Inflow East**	Goose	Infrastructure (Tailings Storage Facility [TSF] and downstream loss of catchment)	Loss	1.55	3,887	4	ARGR, SLSC, BURB, NSSB	4,5,6
Goose Inflow South**	Wolf	Infrastructure (TSF and downstream loss of catchment)	Loss	0.63	3,527	1.8	ARGR, SLSC, BURB, NSSB	4,5,6
Rascal Stream East**	Wolf	Infrastructure (airstrip and reaches downstream to Goose Inflow South)	Partial Loss	0.45	1,228	3.7	ARGR, SLSC, BURB, NSSB	1,2,4
Rascal Stream West**	Wolf	Infrastructure (flows between Rascal Lake and Gosling Pond 1 to be diverted to Rascal Stream East)	Partial Loss	0.27	740	3.7	ARGR, SLSC, BURB, NSSB	1,2,4
Llama Inflow from Llama Pond 1**	Llama	Infrastructure (water diversion structure)	Loss	0.02	99	1.8		6
Umwelt Inflow from Pond 1**	Llama	Infrastructure (isolation from connected waterbodies)	Loss	0.01	129	1.0		6
Llama Outflow**	Llama	Infrastructure (Llama Pit dewatering; loss of catchment)	Loss	0.08	436	1.8	ARGR, RDWF, SLSC, NSSB	3
Umwelt Outflow**	Llama	Infrastructure (Saline Water Pond dewatering; loss of catchment)	Loss	0.44	551	8.0	ARGR, NSSB	4
Gander Outflow-Rascal Stream West	Wolf	Infrastructure (culvert for Haul Road)	Alteration	<0.01	30	0.7	ARGR, NSSB	1,2,4

** LKTR - Lake Trout, ARGR - Arctic Grayling, RDWF - Round Whitefish, LKWF - Lake Whitefish, SLSC - Slimy Sculpin, BURB - Burbot, NSSB - Ninespine Stickleback, where no species has been captured, fish presence assumed due to direct connectivity (no barriers) with fish bearing habitat; ** losses potentially resulting in residual serious harm to fish.*

Data Sources: 1 – Rescan (2010); 2 – Rescan (2012a); 3 – Rescan (2012b); 4 - Rescan (2014a); 5 – Rescan (2014b); 5 – Rescan (2015)

6.3.4 Residual Serious Harm to Fish

The screening criteria for the assessment of losses followed the Fisheries Protection Policy Statement (DFO 2013a), where the potential for residual serious harm to fish was any potential Project-related effect on the productivity of a CRA fishery. An effect to productivity may include a direct impact to a potential CRA species (e.g., Lake Trout, Arctic Grayling, Round Whitefish) or an indirect impact to forage species that support a CRA fishery. A direct impact may include the death of a CRA species, or any permanent alteration to, or destruction of habitat supporting a potential CRA species; whereas an indirect impact may include the death of forage species that support a CRA fishery, or any permanent alteration to, or destruction of habitat supporting a potential CRA species.

Consistent with the Fisheries Protection Policy Statement, any Project-related effects to aquatic habitat that may support a CRA species or forage fish that may support the CRA fishery were screened. For example, any direct or indirect effects to shallow ponds that do not support small-bodied fish species and are characterized by limited hydrologic connectivity to waterbodies supporting large-bodied CRA species were determined to not result in serious harm to fish. This included Echo Lake, Echo Pond 1, Echo Pond 2, Pond 6, Pond 9, Pond 10, Pond 11, Pond 20, and Pond 22.

Residual serious harm to fish is also not expected at the Gander Outflow crossing where best management practices will be deployed to maintain fish passage to upstream locations. For example, the culvert will be embedded to a depth of 0.4 m and filled with streambed material to promote fish passage and habitat suitability.

Residual serious harm to fish is also not expected to result from the construction of the water intake and discharge pipe. The natural substrate types found under the pipe construction zones are common within the affected lakes and consists of predominantly cobble and boulder. Furthermore, pipes will be covered to the extent of the construction zone with clean non-acid generating boulder/cobble riprap. This use of a rock apron is expected to mitigate any potential habitat changes resulting from the intake pipe (i.e., similar lake-bottom substrates will be present after construction).

Some of the Project infrastructure is expected to result in residual serious harm to fish, specifically where infrastructure overlaps with habitat supporting CRA species, such as Arctic Grayling and Lake Trout, and with potential spawning/rearing and foraging habitat with discernible connections to habitat supporting CRA species. It is expected that residual serious harm to fish will occur within up to 14 lakes and ponds, and 8 streams (including Rascal Stream West), totalling up to 75.0 ha of lake and pond habitat and 3.4 ha of stream habitat. Most of the expected Residual Harm to fish will occur in Llama Lake (36.6 ha) and Umwelt Lake (19.4 ha).

The list of affected waterbodies resulting in serious harm to fish has expanded from that submitted with the earlier submissions of the environmental assessment. For greater clarity and conservatism the updated list now includes Pond 1, Pond 7, Pond 12, Pond 23, Pond 24, and Rascal Stream West. For the purposes of a Conceptual Fisheries Offsetting Plan, all fish-bearing ponds or ponds with fish-bearing potential that will be affected by the TSF were conservatively classified as losses resulting in residual serious harm to fish (Table 6.3-1); these include Ponds 23 and 24 and all downstream ponds (as part of Goose Inflow east), and Pond 8 and all downstream ponds (as part of Goose Inflow south). All streams, lakes and ponds listed in Tables 6.3-1 and 6.3-2 and their role in supporting the local fishery will receive further review in consultation with DFO and KIA during the permitting stage of the Back River Project.

6.4 LOSSES IN FISHERIES PRODUCTIVITY

Fisheries production (e.g., biomass), as a surrogate of fisheries productivity (Randall et al. 2013), was estimated for lakes and streams where residual serious harm to fish is expected. Where possible,

conservative inputs were considered such that losses were overestimated, reducing the uncertainty in the assessment that offsets would fully counterbalance the losses. For losses incurred within the Llama-Umwelt lake system, two approaches were considered. The first approach considered population sizes estimated for fish from hydroacoustic data (surveys completed in 2010) combined with catch data collected during baseline surveys, including body size measurements, for Llama and Umwelt lakes (see Appendices V6-6A to V6-6C). The second approach considered a biomass equation derived for lakes in the NWT (Samarasin et al. 2015; also see F-KIA-TC-17) combined with catch data, including body size measurements, for Llama and Umwelt lakes. The equation applied for estimating losses for lakes was as follows:

$$\log_{10}(biomass) = 0.402 + 1.332\ (\log_{10}(lake\ area)),$$

where biomass is measured in kg, and lake area in ha.

The above biomass equation was also applied to derive the calculation of losses associated with the Goose Lake tributary streams and ponds in the Goose and Wolf watershed, including Goose Inflow South/East, and Rascal Stream East streams. Losses within the tributaries to Goose Lake were based on the predicted total biomass of fish in Goose Lake derived from the biomass equation, combined with catch data for Goose Lake to determine species composition (Appendices V6-6A to V6-6C of FEIS; also see Golder 2007), and the estimated proportion of biomass of fish in Goose Lake that use the affected tributary streams and ponds as part of a species life history. The assumed life history functions of the affected tributary streams include foraging, rearing and spawning habitat; however, as a conservative assumption, the calculated proportion of fish in Goose Lake that use the affected tributary streams and ponds was assumed to be all individuals of the following species: Arctic Grayling, Ninespine Stickleback, and Slimy Sculpin, all of which have been recorded as frequent users of both Goose Lake and the affected streams. This assumption is conservative because it is expected that other tributary systems of Goose Lake (e.g., Giraffe Outflow, Gander Outflow) will continue to provide suitable habitat for species with the development of the Project and some proportion of the population of Goose Lake will be sustained.

6.4.1 Llama Lake-Umwelt Lake System

6.4.1.1 Species Composition

Hydroacoustic gear was used to estimate abundance of fish (age 1 or older) in Llama and Umwelt lakes in 2010. The total number of fish in each lake was estimated at 226 (95% CI 4 to 1,794) and 155 (95% CI 5 to 864), respectively. Based on concurrent sampling conducted with gillnets, roughly 78% of the fish in Llama Lake were estimated to be Lake Trout, while 22% were Round Whitefish. Based on the same kind of concurrent sampling, approximately 77% of the fish in Umwelt Lake were estimated to be Arctic Grayling, while the remainder of the fish in that waterbody were Round Whitefish. However, variation in species relative abundance was observed when taking into account all sampling years (2010, 2011, and 2012). For example, based on all gillnetting years, Lake Trout is the dominant species in Llama Lake, accounting for approximately 65% of the total number of fish, whereas Round Whitefish make up most of the remaining 35% of individuals. For Umwelt Lake, the dominant species is Arctic Grayling if considering data across all gill netting years (70%), followed by Round Whitefish (27%), and Lake Trout (3%). Thus, for the two lakes combined, the population size was predicted to be 381 fish, based on hydroacoustic surveys and to include a catch composition of 39% Lake Trout, 31% Round Whitefish, and 30% Arctic Grayling based on sampling efforts (Figure 6.4-1). Thus, species-specific population estimates include 147 Lake Trout, 120 Round Whitefish, and 114 Arctic Grayling (Figure 6.4-1).

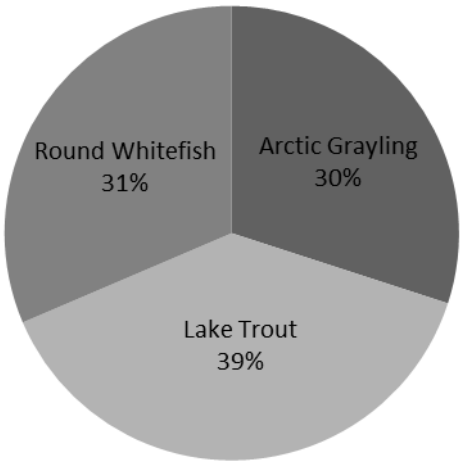


Figure 6.4-1. Species Composition of the Llama-Umwelt Lake System, Goose Property Area

6.4.1.2 Fish Biomass

The first approach for calculating biomass considered population sizes estimated from hydroacoustic data combined with catch data for Lake Trout, Round Whitefish, and Arctic Grayling, including body size measurements (e.g., weight), for Llama and Umwelt lakes. Given reported populations sizes in Section 6.4.1.1, and recorded mean weight of fish captured in Llama and Umwelt lakes, which were 0.236 kg for Arctic Grayling, 0.802 kg for Lake Trout, and 0.367 kg for Round Whitefish, the estimated biomass per species is 27 kg of Arctic Grayling in Umwelt Lake, 118 kg of Lake Trout in Llama Lake, and 44 kg of Round Whitefish in the two lakes combined. Total estimated biomass for the two lakes combined is approximately 189 kg.

The second approach for calculating biomass was based on an equation derived for lakes in NWT (Samarasin et al. 2015; F-KIA-TC-17) combined with baseline catch data, including body size measurements, for Llama and Umwelt lakes. This second approach also considers contributions of small-bodied species, such as Ninespine Stickleback and Slimy Sculpin. Equation inputs included 36.59 ha for area of Llama Lake, 19.36 ha for Umwelt Lake, 0.71 ha for Llama Pond 1, 0.57 ha for Llama Pond 3, and 6.25 ha for Pond 1. The total calculated biomass for the Llama-Umwelt lake system is 467.5 kg; however, the final biomass estimate to be used in the offsetting accounting will be verified using data collected from the fish-outs of Llama and Umwelt lakes.

6.4.2 Goose Lake and Tributaries

6.4.2.1 Species Composition

In general, Arctic Grayling and Slimy Sculpin were the most abundant species captured in streams, followed by Ninespine Stickleback, Burbot, Round Whitefish, and Lake Trout. The highest abundance of fish (CPUE) caught by electrofishing streams was recorded in the Rascal Stream East (connecting Rascal Lake to Goose Lake) where numerous young-of-year Arctic Grayling and Slimy Sculpin were captured. Arctic Grayling fry (over 1,000 individuals) were also observed in each of the Goose Inflow South and Rascal Stream East during fry surveys.

Goose Lake contains six fish species: Lake Trout, Round Whitefish, Arctic Grayling, Slimy Sculpin, Burbot, and Ninespine Stickleback. Based on four sampling years (2006, 2011, 2012, and 2013) and multiple gear

types (gill nets, electrofisher, and beach seines), the total catch included 202 fish, most of which were Round Whitefish (34% of total catch) and Lake Trout (26%), followed by Slimy Sculpin (22%), Ninespine Stickleback (14%), Arctic Grayling (2%), and Burbot (2%).

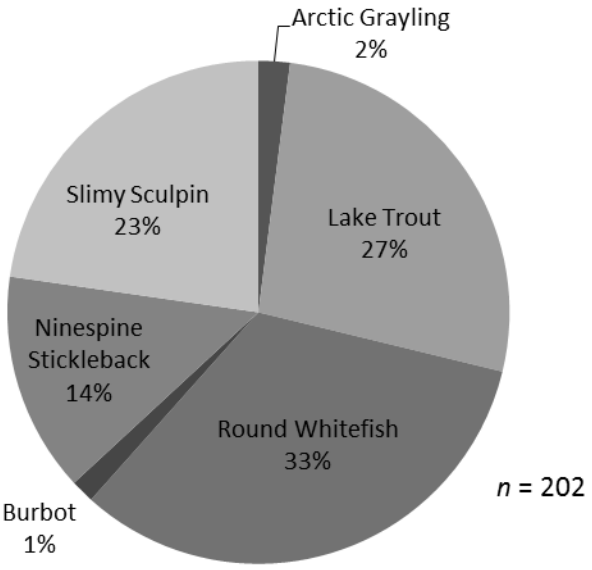


Figure 6.4-2. Species Composition of Goose Lake, Goose Property Area

6.4.2.2 Fish Biomass

To calculate biomass of fish that rely on affected tributary habitats (see Table 6.3-1 and 6.3-2), available biomass in Goose Lake was first estimated using a biomass equation derived for northern lakes (adapted from Samarasin et al. 2015; F-KIA-TC-17). The reported relative abundances of fish species in Section 6.4.2.1, combined with mean weights of fish captured in Goose Lake (0.183 kg for Arctic Grayling, 0.002 kg for Slimy Sculpin, and 0.001 kg for Ninespine Stickleback) were then applied to calculate biomass loss.

Equation inputs included 320.2 ha for area of Goose Lake, and the areas for Pond 7, 8, 12, 21, 23, 24, 25, 26, and 29 (11.57 ha in total). With the application of these inputs to the biomass equation, 5,424.3 kg of fish biomass was calculated for the Goose Lake fishery, and of this value, it was assumed that all biomass of Arctic Grayling, Ninespine Stickleback, and Slimy Sculpin was linked to the affected tributary streams and ponds. Thus, the calculation of proportional losses from the Goose Lake fishery include 88.2 kg of Arctic Grayling, 10.7 kg of Slimy Sculpin, and 3.3 kg of Ninespine Stickleback in Goose Lake, for a total of 102.3 kg of fish biomass.

7. Offsetting Option - Bernard Harbour

7.1 INTRODUCTION

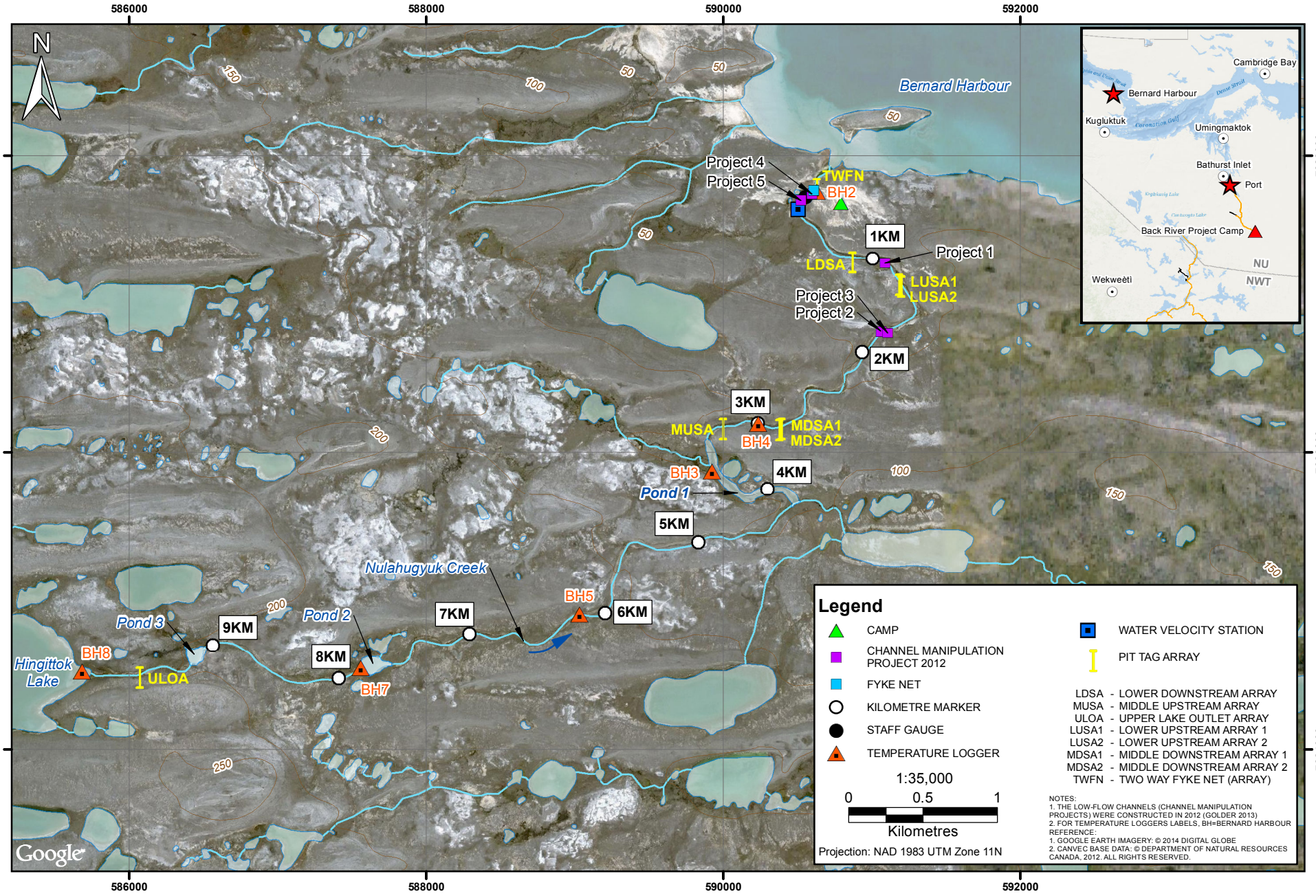
The Hingittok Lake-Nulahugyuk Creek (HLNC) system at Nulahugyuk (Bernard Harbour), Nunavut (Figure 1.1-1) was once the site of a traditional domestic fishery for Arctic Char (*Salvelinus alpinus*; char). Records from the Canadian Arctic Expedition indicate that the creek at Bernard Harbour supported a large migration of anadromous char in the early 1900s (Jenness and Jenness 1991). By the early 1990s, however, harvesters were reporting that the run was in decline and that the numbers of migrating char were much lower than those observed 30 or 40 years ago based on local knowledge (ANL and Golder 2005; Golder and ANL 2007). In response to these concerns, members of the Kugluktuk HTO, and Golder biologists, performed a preliminary assessment of the size and timing of the Arctic Char run, and habitat conditions for fish passage during 2004 and 2005 (ANL and Golder 2005; Golder and ANL 2007), and again in 2012 (Golder 2013a).

Although the previous work reflected only a short window (i.e., less than 2 weeks) within an assumed longer migratory window per study year, the results suggested a decline in the size of the char run. In addition, the timing of the upstream char migration appeared to have shifted to earlier in the summer. It was hypothesized that the char run was affected by lower flows and poor channel conditions in mid to late summer when char generally undertake a return migration from the sea.

During earlier investigations (ANL and Golder 2005; Golder and ANL 2007; Golder 2013a) site-specific blockages (e.g., channel crossover locations) at several sites, which appeared problematic for migrating adult Arctic Char, were identified. Upstream movements by char were particularly restricted during low flow periods (Plate 7.1-1) and primarily within the lower (approximately 3.5 km) section of the creek. As a possible corrective measure, it was proposed that 'low-flow channels' be constructed to facilitate fish passage during low discharge periods to extend the migration window; where a low-flow channel is characterized by an unobstructed flow path with sufficient depths within the larger channel. The low-flow channels would be particularly beneficial during drier than normal years.

Plate 7.1-1. Arctic Char struggling to migrate upstream through a shallow section of Nulahugyuk Creek, July 5, 2014.

In 2012, a stream enhancement and community stewardship project aimed at understanding and enhancing the use of the Bernard Harbour system by Arctic Char was successfully undertaken (Golder 2013a). Five low-flow channels, combined with directional weirs to aid fish navigation, were constructed with the guidance from local Traditional Knowledge to assess the feasibility of applying this approach on a wider scale to increase fish production in the HLNC system (Figure 7.1-1). The project was designed and executed by Golder in collaboration with local partners, including students and residents of Kugluktuk, Nunavut, the Kugluktuk HTO, and the Nunavut Department of Environment.



Sabina Gold & Silver Corp.

Figure 7.1-1

NULAHUGYUK CREEK BASELINE MONITORING, BERNARD HARBOUR, 2014

In 2014, Sabina initiated a comprehensive study of the migratory Arctic Char population at Bernard Harbour. The main goal was to provide rigorous baseline data in support of an offsetting plan for the Project. The baseline information would provide a reference for future quantification of the potential benefits of using "low-flow channel" methods. Specifically, the baseline study was designed to address four objectives:

1) Monitor the timing and size of the annual migratory char run in Nulahugyuk Creek using two-way fyke net traps installed for the duration of the migration period; data was collected for the three migratory phases in 2014, including:
    a. the downstream (seaward) outmigration of adults (assumed to be spawners from the previous fall), which were predicted to be the first migratory fish captured in the trap during the spring freshet;
    b. the adult upstream (lakebound) migration (consisting of char that would spawn in the year following the sampling year); and,
    c. the downstream (seaward) outmigration of juveniles, which were assumed to be 4 or 5 years old and migrating later in the summer as occurred in 2012 (Golder 2013a).
2) Monitor rates of movement and successful upstream passage to Hingittok Lake during the 2014 open water season using Passive Integrated Transponder (PIT) tag methods (e.g., Hering et al. 2010; Puffer et al. 2014); the movement data complement data on the size and timing of the run by providing a direct measurement of the effects of migrations conditions on Arctic Char in the creek for the study year under examination.
3) Assess fish habitat and the relative abundance of fish species in Hingittok Lake using standard inventory methods to gain some understanding of the carrying capacity of the lake for Arctic Char as it relates to enhancement efforts being made to improve fish access in the creek.
4) Collect habitat data to prepare a remediation plan for using low-flow channels to improve upstream passage for fish in Nulahugyuk Creek; this objective was performed in 2014 and 2015 and is a direct follow-up of work initiated by Golder in 2012 and includes:
    a. Assessments of the structural integrity and performance of low-flow channels previously constructed; and
    b. Scoping-level assessments of the number of problem locations and total length of the creek where low-flow channels could be constructed to effectively increase fish production.

In addition to the objectives outlined above, the 2014 and 2015 work was intended to complement and integrate objectives of the Kugluktuk HTO. This was to be achieved by incorporating students, organizations, and community members and by designing a study that fosters education, stewardship and community involvement in conservation initiatives. Past studies (e.g., Stern et al. 2008) have demonstrated a lasting positive change in environmental attitude, action, and knowledge following environmental education programs, such as the one implemented at Bernard Harbour.

A baseline study was also performed in 2016, with objectives similar to those described above. Results from that study are described in detail in FEIS Addendum V6-6H, and also summarized in Section 7.3.4.

7.2 STUDY AREA

The HLNC drainage at Bernard Harbour is located approximately 100 km directly north of the hamlet of Kugluktuk, Nunavut, along the south coast of Dolphin and Union Strait (Figure 7.1-1). The project site is about 4.5 hours (h) travel time by boat from the community. Nulahugyuk Creek, the outflow from Hingittok Lake (882 hectares [ha] in size), flows north for approximately 10 km before entering the sea

at 68°44'52"N, 114°45'27"W. The contributing basin area at the mouth of creek is approximately 125 square kilometres (km^2) in area, and may be characterized by limited groundwater derived flows punctuated by precipitation-driven peak flows. It is expected that most of the precipitation falls as rain during the open water season. Based on 1981 to 2010 Canadian climate normal station data for Kugluktuk, mean total precipitation is approximately 247 millimetres (mm), of which 144 mm falls during June, July, August, and September (see http://climate.weather.gc.ca). Daily maximum temperatures, on average, are above zero for June through September, peaking in July at 15.6 °C, and below zero for the remaining months of the year.

7.3 BERNARD HARBOUR BASELINE

The field study in 2014 began on June 13 and was strategically planned to allow the field team to capture the first Arctic Char moving through Nulahugyuk Creek once the ice had melted enough to allow passage for fish. The commencement date was selected based on data collected during 2012 (Golder 2013a), anecdotal information from the Canadian Arctic Expedition in 1916 (Jenness and Jenness 1991), as well as information from Kugluktuk residents. Field personnel remained on site until July 17, 2014 to capture the downstream outmigration of juvenile char.

A short field program was also performed from July 21 to 25 in 2015 to collect supplemental information on habitat (fish were not monitored in 2015), and a field program was also performed from July 5 to 25 in 2016 focusing on the later stages of the upstream migration of adult Arctic Char (see FEIS Addendum V6-6H). The below sections focus on the 2014 study, which characterized the Arctic Char migration for the three migration types (i.e., the downstream outmigration of adults, upstream migration of adults, and downstream outmigration of juveniles).

7.3.1 Methods

7.3.1.1 Fish Capture and Sampling

Fish were captured in Nulahugyuk Creek using a two-way fyke net trap installed on June 16, 2014, operating continuously until July 17, 2014 (Figure 7.3-1). The fyke net was installed 0.3 km upstream from the mouth of the creek (Figure 7.1-1) in a shallow run area with a mean width of about 18 m. The wings of the fyke net were installed across the creek such that all fish moving upstream or downstream would be directed into the opening. Once they had entered the trap they were directed through a series of funnels. Captured Arctic Char were directed for a total distance of about 6.4 m prior entering a holding basket at the base of the net. The trap was checked several times daily and fish were removed and processed accordingly. The frequency of checks increased with water temperature and capture success to reduce crowding and potential stress to fish.

In Hingittok Lake, multiple gill net sets (short-duration sets) and angling events were used to provide information on fish species composition and abundance. Gill net mesh size and configuration were based on Broad Scale Monitoring (BSM) techniques for North American (NA1) and Ontario small mesh (ON2) gill nets (Sandstrom et. al. 2013). A series of bottom-set gill nets were deployed over four days in July 2014 (July 8, 11, 13, and 14). Each set consisted of either two large (NA1) or two small (ON2) gangs joined for a double-gang configuration. The nets were checked frequently (maximum soak time was approximately four hours) to minimize mortalities. Angling at Hingittok Lake was also performed on July 11 and 13, 2014 using a variety of unbaited, spoon-type lures.

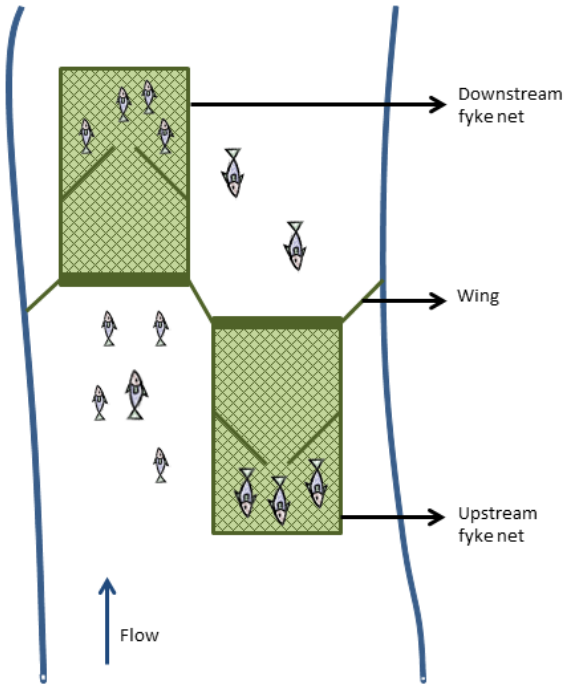


Figure 7.3-1. Conceptual Schematic Showing Two-Way Fyke Net Trap Configuration in Nulahugyuk Creek

Captured fish were enumerated, and identified to species, most of which were weighed (grams [g]) and measured (fork length [FL] [mm]), and a small number of representative individuals were photographed. To minimize stress during periods of warm water temperatures (>17°C), a small number of fish were enumerated but not processed at the fyke net trap (i.e., were immediately released on the side of the trap corresponding to their direction of travel). When possible, otoliths (the calcified structure from the inner ear) were removed from observed mortalities (e.g., from stranding at upstream locations), folded in parafilm, and stored in a labelled coin envelope for age analysis at a later date. For catch summaries, char smaller than 300 mm were classified as 'juveniles', fish between 300 and 550 mm were classified as 'immature' (or sub-adults), and fish larger than 550 mm were classified as adults (Golder 2013a).

Mortality Surveys

Mortality data was collected opportunistically as incidental observations, for example, during habitat assessments. When there was an opportunity, field crew members visually surveyed the creek for dead char and when located, carcass information was documented using a hand-held GPS, photographs, and field notes. Carcasses were scanned with a hand-held tag reader (see further below for a description of tags and readers).

7.3.1.2 Movement Monitoring

Upstream movements for a subset of captured Arctic Char were monitored using implanted PIT tags and Radio Frequency Identification (RFID) antenna-reader arrays installed at strategic locations on the creek (Figure 7.1-1) (similar to methods discussed in Hering et al. 2010; Puffer et al. 2014). PIT tag methods are ideal for monitoring movements of fish in shallow streams such as Nulahugyuk Creek (i.e., constricted environments) because of the low cost of the tags and a high number of individuals can be tracked to reliably describe movements. PIT tags are also ideal for long-term studies since they contain no battery and will be operational for the lifespan of the tagged fish.

Seven PIT tag antennae-reader arrays were installed strategically in relation to the location of the 2012 low-flow channel project areas and reference sections. An array was also installed near the outlet of Hingittok Lake (Figure 7.1-1). The arrays were configured using either a single antennae (Lower Downstream Array [LDSA], Middle Upstream Array [MUSA], Upper Lake Outlet Array [ULOA]) or paired antennas (i.e., Lower Upstream Array 1 [LUSA1], Lower Upstream Array 2 [LUSA2] and Middle Downstream Array 1 [MDSA1], Middle Downstream Array 2 [MDSA2]), each of which was constructed from bound T90 cable.

Boulder spurs or weirs were constructed to prevent fish from moving around the arrays and to direct fish through the arrays. Antennas were oriented vertically to increase PIT tag reception range. The bottom of the antenna loop was embedded in the creek substrate and the top of the loop was suspended approximately 5 centimetres (cm) above the water surface. This configuration ensured that Arctic Char passed through the loop perpendicular to the antenna field. Antennas were connected to individual tuner boxes located creek-side, with twinax cable extending from the tuner boxes to a multi antenna HDX-PIT tag reader box. The arrays were powered by deep-cycle 130-ampere marine batteries, which were kept continually charged using solar panels.

Statistical Analyses

Detection probabilities (*p*) were generated for individual antennae by assigning binary detection values for individual char based on whether they were detected (1) or not (0) at a given array. Detection probabilities were calculated for each array based on the mean detection value. Zero values above the furthest upstream detection were excluded from the detectability calculations because these fish were assumed to have been removed from the system. Therefore, detection values for each array were based only on data where detection occurred, or was known to occur further upstream. Detectability for the ULOA array was based on the mean detectability of the downstream arrays, with the exception of MUSA where a technical malfunction reduced detectability at that site.

Binary logistic regressions were used to explore relationships between upstream migration success (fish detected [1], or not detected [0] at the lake outlet) and environmental and biological parameters including migration date, stream discharge (daily and 4-day mean), water temperature (daily and 4-day mean), length, weight and condition factor. Various models were compared based on their Akaike Information Criterion (AIC) score, with lower values identifying models better representing the data analyzed, and Receiver Operating Characteristic (ROC), with higher values indicating greater sensitivity and specificity of the model (Hosmer and Lemeshow 2000).

Arctic Char movement speed (metres per hour [m/h]) was compared between arrays using analysis of variance (ANOVA). Movement speed was square root transformed to meet assumptions of normality. The significance level, alpha (α), was defined a priori as $\alpha = 0.05$. Normality was assessed graphically by examining the distribution of residuals using normal probability plots (Zar 1999). All analyses were conducted using Systat 13 (Systat Software, San Jose, CA).

7.3.1.3 Habitat Surveys

Water Temperature and Discharge Measurements

A stream discharge station with staff gauge was established approximately 0.5 km upstream from the mouth of Nulahugyuk Creek (Figure 7.1-1). Water velocities and water depths were measured at 0.75 m intervals along a transect set perpendicular to flow of water at the station. Each point velocity was measured at 0.6 times the depth from the creek bed, which is representative of the mean velocity at that vertical profile. Velocity was measured using a direct read-out Swoffer™ Model 2100 velocity meter and top-setting wading rod. Discharge was calculated across the wetted width of the channel based on

the point measurements of velocity, depth, and interval width represented by each point measurement. Stream discharge measurements were collected 22 times between June 13 and July 15, 2015; the staff gauge was read an additional 28 times between June 13 and July 16. Daily flows were also measured during the 2015 program (July 22 to 24).

Water temperatures were measured at 0.25 h intervals at six locations along Nulahugyuk Creek using Onset® HOBO Water Temperature Pro V2 Data Loggers in 2015 (Figure 7.1-1). The loggers collected data every 15 minutes and ran continuously for the duration of the field study.

Nulahugyuk Creek Habitat

Habitat was assessed along the entire length of Nulahugyuk Creek (approximately 10 km) between July 10 and July 14, 2014. Major habitat types within the sections were described in accordance with the classification system outlined in O'Neil and Hildebrand (1986). Supplemental information on problem locations (i.e., barriers) were then collected on July 16, 2014, and again on July 23 and 24, 2015, but with a focus on the lower 3.5 km of Nuluhugyuk Creek where most of the barriers are located on the creek (Golder and ANL 2007). The surveys for barriers were timed to coincide with both low flows and the upstream migration period of char. To prepare for future remedial works, global positioning system (GPS) coordinates were obtained for each problem location, and each problem location was rated according to level of adult char upstream impassibility. Field technicians assigned ratings (1 to 3) to all problem locations based on their knowledge of observations of mortalities and fish passage made in 2012 (Golder 2013a) and 2014 (Table 7.3-1), where higher rankings represent higher risks for fish strandings and barriers.

The highest risk locations (rank 3) were those where fish stranding and partial barriers to movement may be common during average-to below average conditions through most of the upstream migration period. These locations were characterized by dispersed flows and boulder fields at the reach-level, impeding upstream movements and may directly expose fish to terrestrial predators, such as gulls. Higher-risk locations were also characterized by significant barriers to movement during average to below-average flow conditions during the later stages of migration. Rank 2 locations were those that may be difficult for fish to pass during peak periods of migration under below average flow conditions and may also present a high potential for stranding and partial blockage of movements during the later stages of migration when water levels decline (even during average years). Rank 1 locations were those that are likely passable through most of the upstream migration period during average flow conditions, but present the potential for stranding and stressful conditions during below-average flow conditions and towards the later stages of migration when water levels decline in summer.

Table 7.3-1. Characterization of Barriers and Problem Locations for Fish Passage

Types of Barriers	Ranking of Expected Risk of Mortality and Failed Migration (Higher Rank = Higher Risk)	
	Average Flows	Below Average Flows
Small-scale partial barrier	Rank 1	Rank 2
Large-scale partial barrier	Rank 2	Rank 3
Small-scale full barrier	Rank 3	Rank 3
Large-scale partial blockage with complete barriers present	Rank 3	Rank 3

The integrity of previously completed low-flow channels was also visually assessed and photographed during low discharge conditions (July 18, 2014, and again on July 22, 2015). Supporting information on channel width, velocity and depth within the assumed thalweg (deepest area of channel) was collected

every 2 m for the length of each project. Mean values and standard deviations of channel characteristics are reported.

Hingittok Lake Bathymetry

Bathymetry at Hingittok Lake was determined while gill nets were in place as part of the lake fish inventory. Bathymetry transects were completed from July 8 to July 11, 2014 using a Garmin GPSMAP 298 sounder (Garmin, Olathe, KS) coupled with a GPS. Transect layout consisted of longitudinal transects in a north/south orientation along the lake, bisected by lateral transects across the width of the lake. Longitudinal and lateral transects were approximately equally spaced to provide as much coverage of the lake as possible. Data were stored in the boat-mounted sonar with a GPS enabled and downloaded onto a computer as 'gpx' file. Bathymetry data (i.e., depth and GPS position) were then transcribed onto a 1-m bathymetric contour map using the ArcGIS 'topo to raster' tool (ArcMapTM v9.3.1, 2009). Erroneous points were screened out by eliminating any unrealistic depths with the visual aid of georeferenced aerial imagery provided by Google Earth.

7.3.2 Results

7.3.2.1 Fish Capture and Sampling

Nulahugyuk Creek

The fyke net was in place for a total of 35 days, 16 hours and 17 minutes beginning the evening of June 12, 2014 (18:15) and ending July 17, 2014 (10:32). In total, 1,332 Arctic Char were captured from Nulahugyuk Creek with the first char captured moving downstream on June 16 (Figure 7.3-2). Three distinct groups of migratory char were described including adults moving downstream after overwintering in Hingittok Lake (n = 478), adults moving upstream (n = 332) to overwinter and potentially spawning first, and juveniles moving downstream from Hingittok Lake (n = 522). Downstream movement by adults was documented from the first day of the program and was largely completed by July 4 (Figure 7.3-2). Upstream movement attempts by adults began on June 25 and continued through to the completion of the field study. Downstream movement by juveniles began on June 25 and continued to the completion of the field study. Migration successes were quantified for adult Arctic Char migrating upstream from the ocean to Hingittok Lake (see below – Upstream Passage).

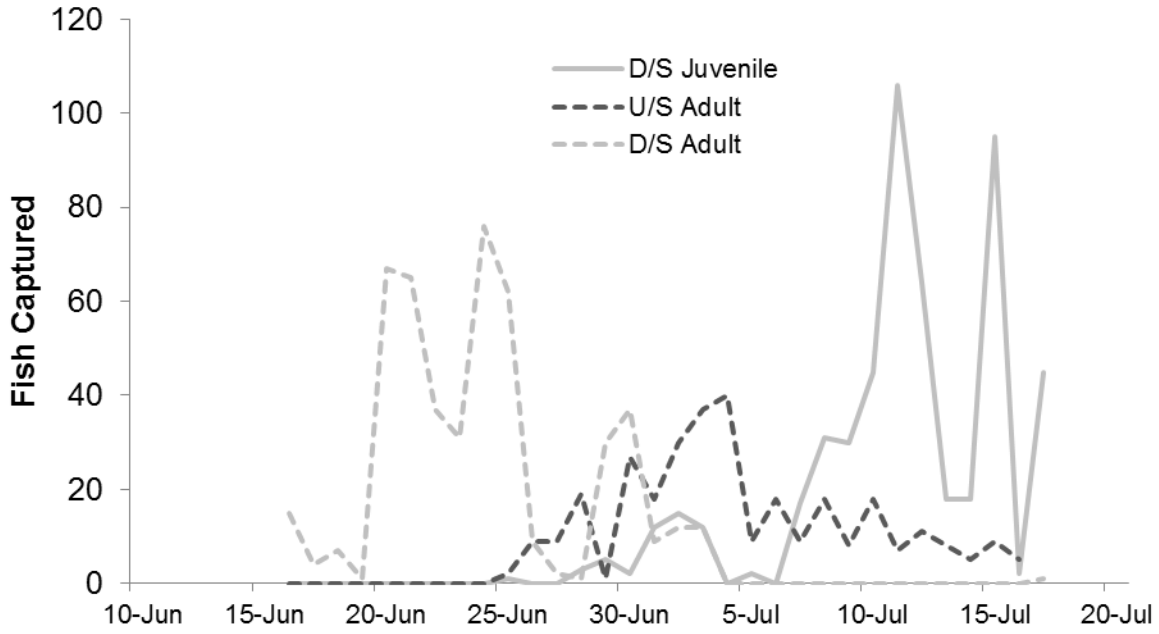


Figure 7.3-2. Daily Captures of Migratory Arctic Char in Nulahugyuk Creek, 2014

Note: D/S = downstream travelling fish and U/S = upstream travelling fish

Arctic Char catch-per-unit-effort (CPUE) for the upstream fyke net was 0.39 fish/hour, while CPUE for the downstream fyke net was 1.17 fish/hour. The combined CPUE for upstream and downstream fyke nets was 1.56 fish per hour. Three Ninespine Stickleback were also captured but not included in CPUE calculations. Maximum daily upstream CPUE for adults was 1.17 fish/hour on July 4, 2014; whereas maximum downstream CPUE for adults was 3.17 fish/hour on June 24, 2014; and maximum daily juvenile CPUE (migrating downstream) was 4.42 fish/hour on July 11, 2014.

Arctic Char length and weight measurements and condition factor for the three migratory groups and one immature individual are summarized and described in Table 7.3-2 and Figure 7.3-3 (not every individual was measured). The largest captured Arctic Char was 887 mm in length with a weight of 6,645 g. Adult char moving upstream had the highest average condition factor (± standard deviation [SD]) of the three migratory groups (K_{us} = 1.09 [± 0.1]); whereas, downstream-moving juveniles had lowest average condition factor (K_{juv} = 0.81 [± 0.1]). Adult char moving downstream had an average condition factor of 0.84 (± 0.1). Adult char moving downstream from Hingittok Lake were approximately 27% lighter in weight than char moving upstream from the ocean. It was noted by the field crew that although none appeared obviously ripe for spawning, many char moving upstream were developing spawning colours had better condition (visual judgment of weight to length ratio) than adults moving downstream.

Table 7.3-2. Summary of Arctic Char by Size Class Captured in Fyke Nets in Nulahugyuk Creek, June 12 to July 17, 2014

Migratory Group	Number of Char	Length Range (mm)	Mean Length (mm) ± SD	Weight Range (g)	Mean Weight (g) ± SD	Mean Condition Factor ± SD
Adults moving upstream	329	602 to 887	728.8 ± 53.9 *(n = 328)*	2,250 to 7,545	4,271.2 ± 991.3 *(n = 329)*	1.09 ± 0.1
Adults moving downstream	476	509 to 859	717.0 ± 54.3 *(n* = 475)	1,545 to 5,080	3,134.6 ± 747.6 *(n* = 473)	0.84 ± 0.1
Immature fish moving downstream	1	305	-	243	-	0.86
Juveniles moving downstream	521	145 to 261	192.5 ± 19.1 *(n = 347)*	25 to 140	60.3 ± 18.2 *(n = 313)*	0.81 ± 0.1

Note: mm = millimetres; ± = plus or minus; SD = standard deviation; g = grams; n = number of fish; - = no data

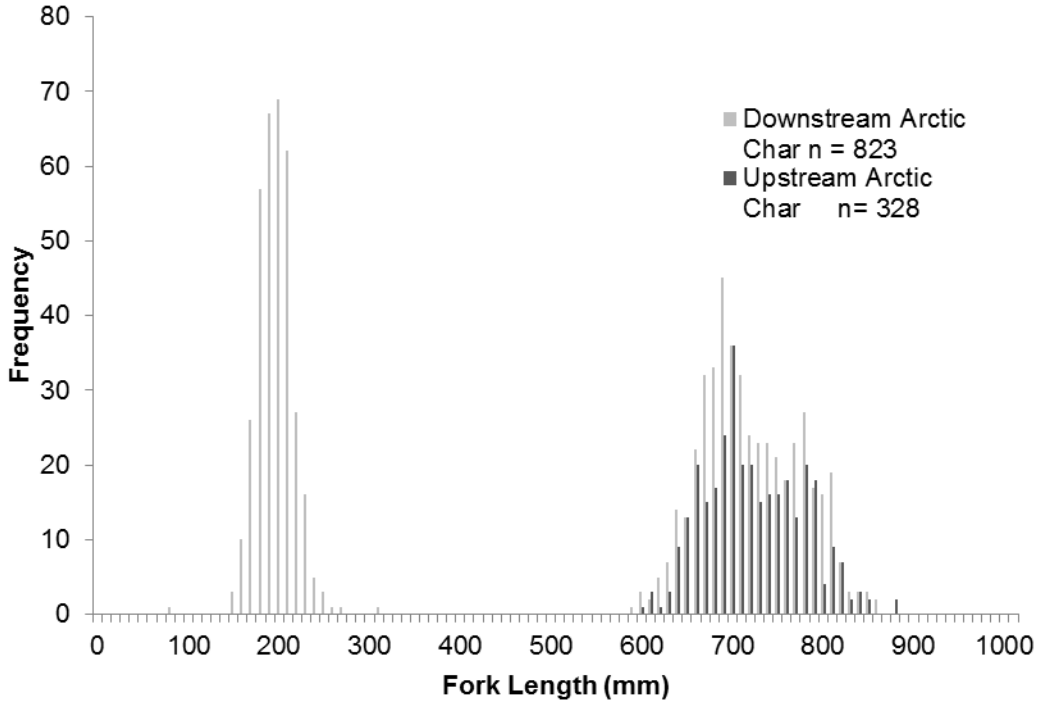
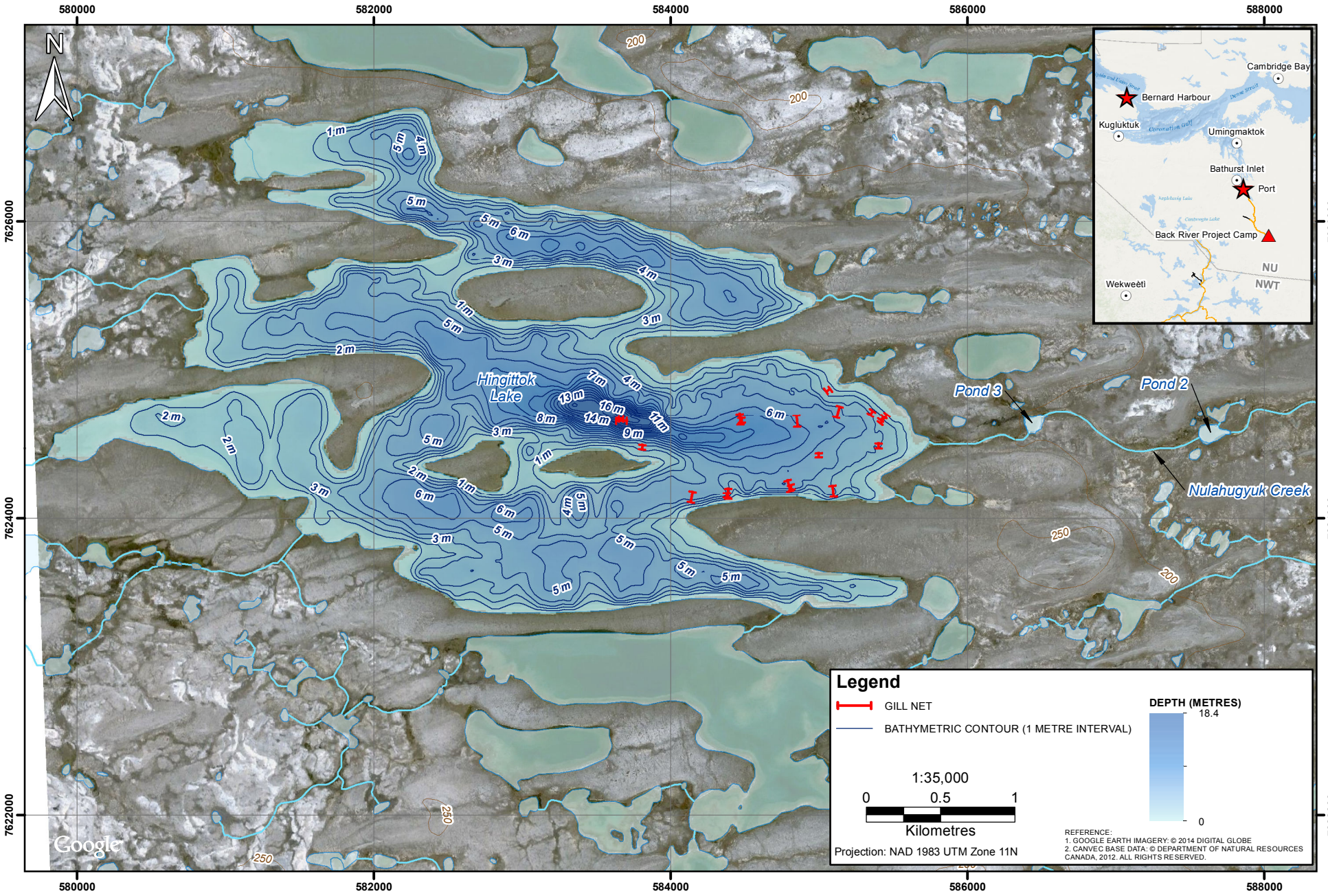


Figure 7.3-3. Length-Frequency Distribution of Arctic Char Captured in the Fyke Net Trap

Hingittok Lake

Twenty-nine short-duration gill net sets were deployed for a total of approximately 65 hours in Hingittok Lake in 2014 (Figure 7.3-4). Gill netting efforts in Hingittok Lake captured a total of 54 fish including 36 Lake Trout (*Salvelinus namaycush*), 10 Arctic Char, 7 Cisco (*Coregonus artedi*), and 1 Ninespine Stickleback (*Pungitius pungitius*). Of the 10 char captured, 7 were adults and 3 were juveniles. Mean CPUE for large mesh nets was 2.16 fish/h/100 m; approximately twice that of small mesh nets which was 1.07 fish/h/100 m. It is noteworthy that two of the captured char were PIT tagged earlier in the season in 2014.



Sabina Gold & Silver Corp.

Figure 7.3-4

HINGITTOK LAKE FISH BASELINE MONITORING, BERNARD HARBOUR, 2014

A total of 2.5 hours, mid to late afternoon, was spent angling by two crew members in the lake, resulting in the capture of eight Lake Trout (CPUE of 1.5 fish/angler hour). Overall, Lake Trout was the dominant species captured from Hingittok Lake (based on gill netting and angling combined), contributing 71% to the total catch (Figure 7.3-5).

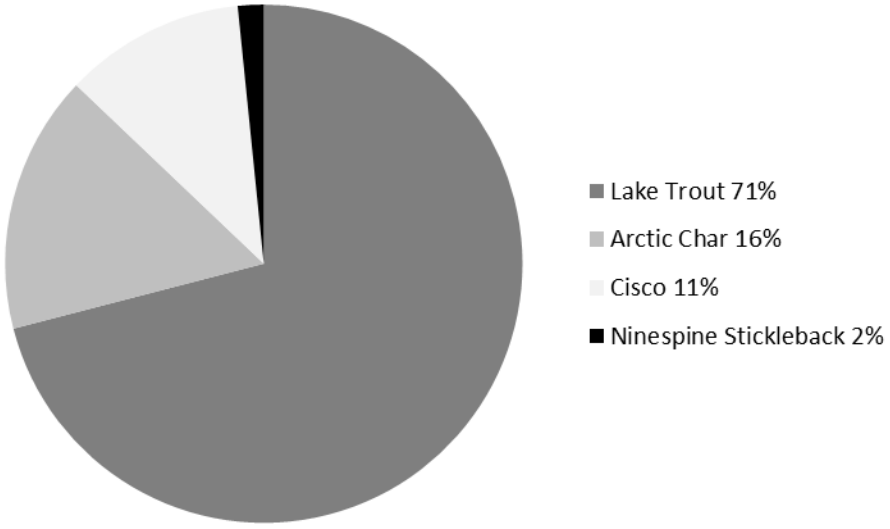


Figure 7.3-5. Fish Species Composition in Hingittok Lake, 2014

7.3.2.2 Upstream Passage

In total, 315 upstream migrating adult char were implanted with PIT tags with unique identification numbers. Selected Arctic Char for PIT tag monitoring were a representative sample of the population moving upstream, and characterized by an average length (± SD) of 726.8 (± 52.4) mm, weight of 4229.8 (± 949.8) g and condition factor or 1.09 (± 0.1).

A high degree of detectability was obtained at most antennae-reader arrays (Table 7.3-3). The only exception was MUSA which suffered from a series of technical issues including a malfunctioning battery from July 8 to July 9, and suboptimal tuning prior to July 11, resulting in reduced detectability.

Of the 315-tagged Arctic Char, 103 were detected at the ULOA indicating the completion of a successful upstream movement from the sea. Adjusted for array detectability, this equated to 110-tagged fish, or a success rate of 34.9% between June 25 and July 17, 2014 (Table 7.3-3). Although migratory success was relatively high early on in the study (93%), it declined rapidly over time with none of the fish tagged after July 6 detected at the ULOA (Figure 7.3-6). This indicates that a threshold was reached and stream conditions became impassable for char after this date. Any remaining fish either perished, likely from exhaustion, predation, or stranding, or remained in the ponds located in the middle and upper reaches of the creek. Twelve tagged char were incidentally confirmed as mortalities while field crews were working along the creek in July 2014; half of the mortalities were observed after July 6.

Table 7.3-3. Location of Radio Frequency Identification (RFID) Arrays and Detection Information

Array	Approximate Distance Upstream from Bernard Harbour (km)	Detection Probability	Detected Total	Corrected Total
Two-way fyke net (TWFN)	0.30	1.00	315	315
Lower Downstream Array (LDSA)	0.75	0.90	263	293
Lower Upstream Array 1 (LUSA1)	1.14	0.93	261	280
Lower Upstream Array 2 (LUSA2)	1.16	0.91	255	279
Middle Downstream Array 1 (MDSA1)	2.73	0.97	205	212
Middle Downstream Array 2 (MDSA2)	2.75	0.96	202	211
Middle Upstream Array (MUSA)	3.15	0.59	94	158
Upper Lake Outlet Array (ULOA)	9.43	0.93	103	110

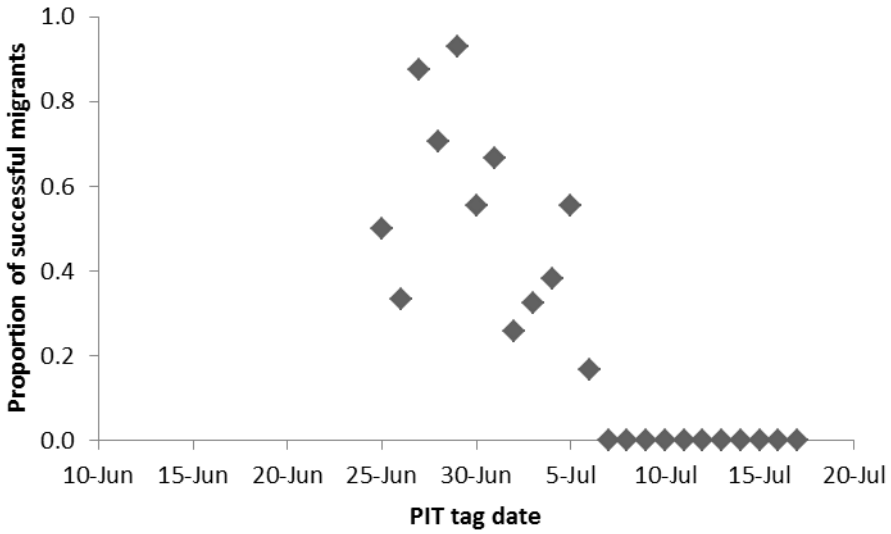


Figure 7.3-6. Proportion of Successful Migrants Detected at ULOA Plotted Against Passive Integrated Transponder (PIT) Tag Implantation Date

For those fish recorded as being successful migrants to Hingittok Lake, migration time between the farthest downstream array and the farthest upstream array (distance of 8.68 km) varied among individuals and throughout the study period with a mean migration time (± standard error) of 108.3 h (± 4.7). The fastest fish completed the migration in 34.2 h, and the slowest in 239.0 h. The migration time was generally faster from June 25 to June 30 (79.3 h [± 5.4]) than from June 30 to July 6 (123 h [± 5.8]).

Migration Success Model

The number of Arctic Char observed among the RFID arrays declined sequentially as the fish moved upstream. Prior to July 6, a considerable reduction in detected char occurred over a 0.35 km reach between MDSA2 (2.75 km) and MUSA (3.15 km) with a 24% reduction in individuals occurring in this area. After July 6, a 50% reduction in the number of char detected occurred over a 1.57 km reach between LUDS2 (1.16 km) and MDSA1 (2.73 km), with no fish detected after MUSA (>3.15 km).

Using a binary logistic regression, the primary factors influencing migratory success were determined to be four-day mean discharge and char weight (Table 7.3-4). Model fit was significant ($p < 0.001$) with an ROC value of 0.84. The output of the formula (when fish weight is held constant at 4.2 kg) is presented graphically in Figure 7.3-7. With respect to the four-day mean discharge, the probability of migration success ranged from a high of 85% at greater than 1.5 m^3/s, declining to a low of 0% at 0.5 m^3/s and lower discharge values. Regarding fish weight, the probability of migratory success ranged from a high of 95% for fish that weigh 2.5 kg to a low of 31% in fish that weigh 7.5 kg when discharge was held constant at 1.76 m^3/s.

Table 7.3-4. Parameter Estimates for Binary Logistic Model Predicting Migration Success

Parameter	Estimate	Standard Error	*Z*	p-Value	95% Confidence Interval	
					Lower	Upper
Constant	-8.398	2.417	-3.48	0.001	-13.134	-3.661
Four day mean discharge	15.714	4.134	3.8	<0.001	7.612	23.815
Four day mean discharge (squared)	-4.612	1.643	-2.81	0.005	-7.831	-1.392
Weight	-0.77	0.192	-4.02	<0.001	-1.146	-0.395

Note: Z = statistical score; p-Value = probability value; percentage = percent; < = less than; kg = kilograms.

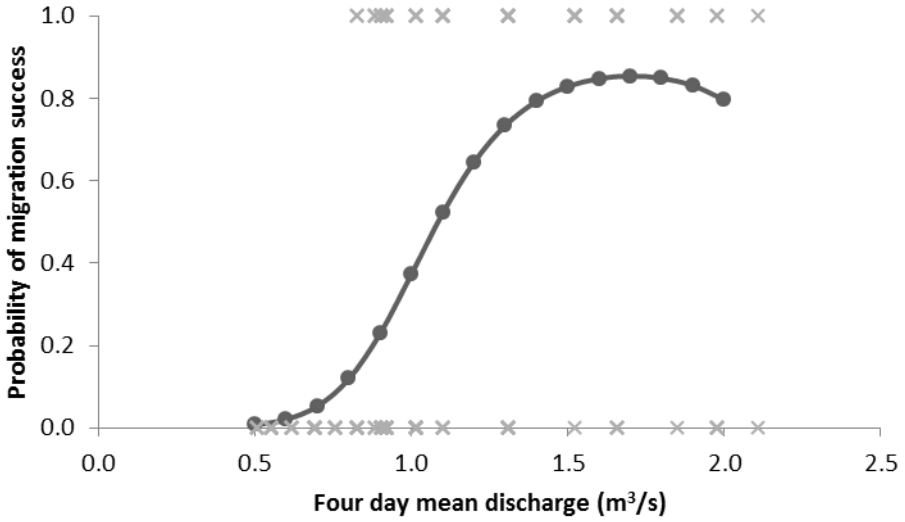


Figure 7.3-7. Results of Binary Logistic Regression Plotting the Probability of Migration Success Against Stream Discharge, Holding Arctic Char Body Weight Constant at 4.2 kg

Note: X symbols represent whether individual fish succeeded in migrating to ULOA (1) or not (0).

7.3.2.3 Fish Habitat

Nulahugyuk Creek

From the confluence with the sea, Nulahugyuk Creek transitions from faster moving riffles to run and pool habitats near Hingittok Lake. Approximately 82% of the lower section of the creek to the first pond was quantified as riffle habitat in July 2014 (Plate 7.3-1). The creek then transitions from riffle (44%) to run (53%) habitats in the middle section of the creek between the first and second ponds. It is largely shallow run habitat (90% or more) from the second pond to the outlet of Hingittok Lake.

Substrate was predominantly cobble (60% or more) and boulder (approximately 5 to 19%) and gravel (approximately 5 to 13%) with small amounts of sand and silt typically occurring in pool habitats. The maximum depth in the creek (excluding the three ponds on the creek) was less than 0.75 m.

In general the habitat characteristics of flowing sections of the creek indicate little cover for large fish with only small patches of intermittent (or discontinuous) cover provided by large boulders and undercut banks, and associated small pools. Where this habitat was provided (e.g., Plate 7.3-1), Arctic Char were often incidentally observed holding.

Plate 7.3-1. Riffle habitat with small pool provided near bank (left), looking upstream, approximately 1.3 from mouth of Nulahugyuk Creek, July 16, 2014.

Potential barriers to fish passage were identified at 13 sites in total (Table 7.3-5). These locations were characterized as difficult for adult Arctic Char to migrate upstream because of boulder barriers, 'broken' thalwegs and lack of water depth, resulting in possible strandings and mortalities (for example, see Plates 7.3-2a, 7.3-2b, 7.3-3a, and 7.3-3b). The problem sites are where low-flow-channel (enhancement) projects may benefit production of Arctic Char (Table 7.3-5). Three sites were identified as the highest the priority for site remediation, as a rank 3, followed by five rank 2 locations, and five rank 1 locations where remediation efforts are needed. Five of the problem sites were identified within a sharp bend in the lower section of the creek, starting 1.3 km from the mouth of Nulahugyuk Creek and for an upstream distance of approximately 800 m. Many strandings and mortalities were incidentally observed along this section during 2012 and 2014. Furthermore, most of the problem sites where remediation work is proposed (approximately 77%) are within the lower 3 km of the creek, which is consistent with previous habitat assessments of the creek (Golder and ANL 2007).

Table 7.3-5. Summary of Potential Locations for Fish Passage Enhancement Projects

Site Identification	Approximate Distance Upstream of Bernard Harbour (km)	Ranking Based on Expected Risk of Mortality and Blockage (Higher Ranking = Higher Risk)	Minimum Required Low-Flow Channel Length to Improve Passage (m)
Site 1*	1.3	Rank 3	41
Site 2	1.5	Rank 2	42**
Site 3	1.6	Rank 2	34***
Site 4	2.0	Rank 2	30
Site 5	2.1	Rank 3	22
Site 6	2.4	Rank 3	45
Site 7	2.9	Rank 2	14
Site 8	4.8	Rank 1	20
Site 9	5.7	Rank 1	40
Site 10	7.8	Rank 1	15
Site 11****	2.6	Rank 1	38
Site 12****	2.8	Rank 1	19
Site 13****	3.0	Rank 1	15

Note: km = kilometres; m = metre; extended rock weirs are recommended for most sites, for example, to direct migrating fish upstream through the low-flow channel.
** the site was initially described as two separate problem locations in 2014 but was later characterized in 2015 as one problem site requiring an extended low-flow channel (versus two separate consecutive channels); ** two parallel low-flow channels recommended (length represents combined length of parallel channels);*** requires further evaluation; a directional weir may be a viable alternative for this location; and **** problem sites identified in 2015.*

Plate 7.3-2a. Looking upstream towards barriers at Site 5, July 16, 2014.

Plate 7.3-2b. Looking downstream towards barriers at Site 5, July 16, 2014.

Plate 7.3-3a. Looking upstream towards barriers at Site 6, July 16, 2014.

Plate 7.3-3b: Looking downstream towards barriers at Site 6, July 16, 2014.

Water Temperature and Flows

The water temperatures in 2014 in Nulahugyuk Creek increased steadily as the season progressed with mean daily temperatures rising from 2.7°C on June 14 to 12.3°C on July 17 (Figure 7.3-8). The warmest temperatures occurred during the latter half of the study period exceeding 17°C at the downstream site (BH2) for 24.3 hours. Diurnal variation in water temperature was evident with a mean difference of 8.8°C between daily minimum and maximum values. A temperature gradient was also observed between the upstream and downstream sites (BH2 and BH7; Figure 7.1-1) with a consistent mean difference of 2.4°C across the sampling period, indicating a rate of change of 0.3°C/km in downstream direction.

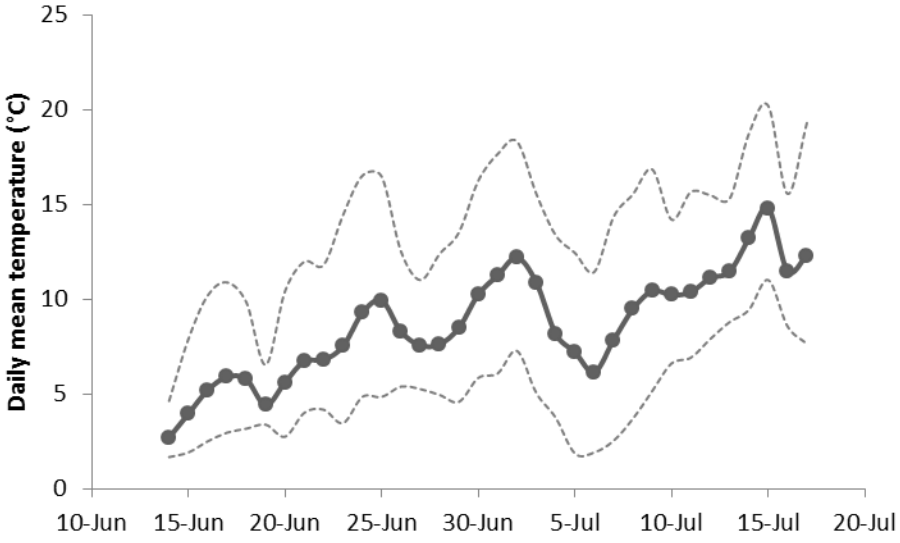


Figure 7.3-8. Daily Mean Temperature (°C) Recorded at Nulahugyuk Creek from June 10, 2014 to July 17, 2014

Note: Maximum and Minimum Daily Values Indicated by Upper and Lower Dotted Lines Respectively.

In 2014, creek discharge declined over the study period ranging from a high of 6.0 cubic metres per second (m^3/s) on June 15 to a low of 0.5 m^3/s on July 15 (Figure 7.3-9). Discharge was also low on July 22, 2015 (0.4 m^3/s). A 5.5 m^3/s decline in discharge corresponded to a 29 cm decrease in water depth over the 2014 study period, based on the following relationship between the gauge water level and creek discharge:

$$water\ level\ (cm) = 56.012 + \left(5.2795 \times creek\ dischage\ (m^3/s)\right), \qquad R^2 = 0.97.$$

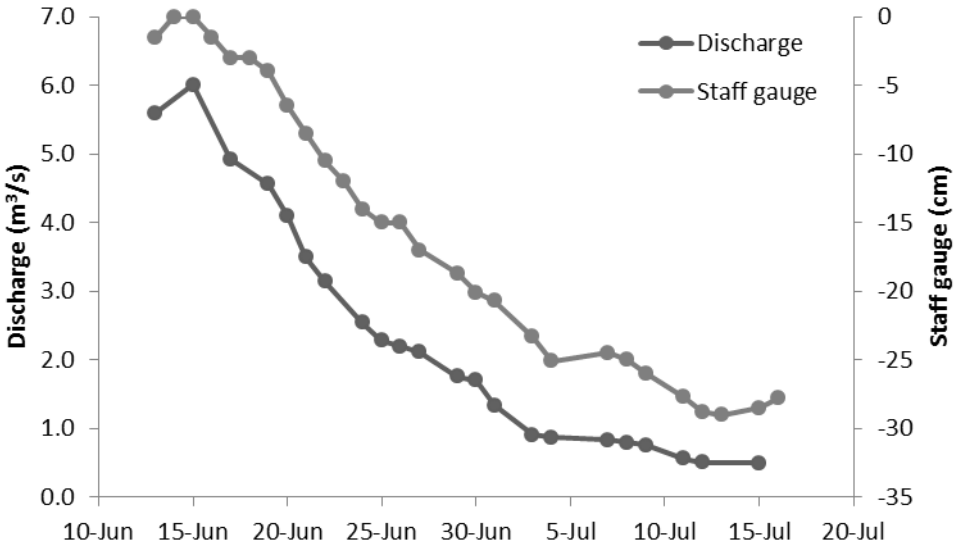


Figure 7.3-9. Stream Discharge (m^3/s) and Staff Gauge Depth (cm) Recorded at Nulahugyuk Creek Between June 13, 2014 and July 15, 2014

Hingittok Lake

Based on 1:50,000 CanVec data, Hingittok Lake is 982.3 ha in area and features numerous peninsulas and bays around three large islands in the centre of the lake (Figure 7.3-4). Shoreline length (38,085 m including island shorelines) was extensive relative to the size of the lake and the shoreline development factor was approximately 12.3, the ratio of lake perimeter to surface area. The higher the ratio, the more irregular the shoreline, resulting in potentially more shoreline habitat for spawning and rearing (a perfect circle would have a shoreline development factor of 1).

The bathymetry data derived a lake volume of approximately 30,553,000 m^3 (Table 7.3-6). The maximum depth was approximately 18 m and mean depth was 3.7 m.

Table 7.3-6: Approximate Lake Area and Volume for Various Depth Intervals in Hingittok Lake, July 10 to 14, 2014

Depth (m)	Volume (m^3)	Area (ha)	Depth (m)	Volume (m^3)	Area (ha)
>0	30,553,274	982.3	>10	553,638	14.7
>2	15,767,454	607.7	>12	308,168	10.2
>4	6,214,620	352.4	>14	138,401	6.9
>6	2,002,020	95.6	>16	32,068	3.7
>8	964,592	28.9	>18	335	0.2

Note: m = metres; m^3 = cubic metres, ha = hectares; > = greater than.

7.3.3 2014 Baseline Summary

Three distinct Arctic Char migration types were recorded at Bernard Harbour. The first adult char captured were those migrating downstream (June 16 to July 4). The migration of the second adult group (adults moving upstream towards Hingittok Lake) began June 25 and peaked around July 5. Although adults were still captured, attempting to migrate upstream near the end of the study period, PIT tag data indicated that adults attempting migration after July 7 would be unsuccessful. The window for the juvenile downstream migration may extend through July, due to downstream travel being less problematic than upstream travel, and the small size of juveniles, allowing movement through shallow water.

The primary factors affecting char migration success at Nulahugyuk Creek in 2014 were discharge and fish weight. Discharge was strongly correlated with water depth, and as depth declined over time, new impediments to fish passage were created until fish passage was no longer possible. Larger fish were less likely to overcome these impediments to fish passage, presumably due to an increased probability of stranding and predation. Unfortunately, larger fish are generally the most productive in a spawning population (Jeuthe et al. 2013), producing greater numbers of viable offspring, and loss of these individuals could have significant effects on recruitment potential.

A significant barrier to fish passage was created on July 7, 2014 as stream discharge declined to approximately 0.8 m^3/s and water depths declined by 25 cm at the staff gauge over the monitoring period. Afterward, fish passage was no longer possible; indicating a brief and discrete window of opportunity exists for the char migration at Nulahugyuk Creek. Between the time fish were initially detected moving upstream (June 25) and passage was no longer possible (July 7), the migration window in 2014 was 13 days. While some of the unsuccessful migrants may have taken temporary shelter in upstream pools eventually retreating to the sea, the majority of the remaining char likely perished through stranding, exhaustion or predation, with only four fish successfully exiting the system by July 17, 2014.

It is expected that the char that successfully reach Hingittok Lake either overwinter, then spawn during the fall of the next year, or spawn then overwinter, migrating downstream to Bernard Harbour the following spring. Both Hingittok Lake and the connectivity with the ocean through Nulahugyuk Creek are critical to the local char population, and possibly to the larger fishery in the Coppermine River region. The maximum depth of Hingittok Lake is over 18 m deep, providing overwinter habitat, and there are at least two prey species (Cisco and Ninespine Stickleback) available to adult Arctic Char. Importantly, shoreline length is extensive relative to the size of the lake potentially providing an abundance of shoal habitat for spawning.

7.3.4 2016 Baseline Summary

The results of the 2016 study support previous descriptions of Bernard Harbour Arctic Char, and contribute to a multi-year dataset of baseline conditions for evaluating future changes in the local stock (FEIS Addendum Appendix V6-6H). Although the 2016 characterization applies to above average flow conditions in early July based on climate data normals for the region, the monitoring period coincided with flows below the previously identified discharge threshold at which adult char can successfully migrate to Hingittok Lake (see Section 7.3.2.2).

Even under the low-flow conditions, 33 adult char were captured in the fyke trap moving upstream from the ocean to spawn in Hingittok Lake (FEIS Addendum Appendix V6-6H). Only three char (10.3% of tagged char) were detected 2.83 km upstream, and using 2014 and 2016 data combined, the estimated discharge at which there is a 50% probability of an adult Arctic Char successfully navigating the lower reach of the creek was 0.8 m^3/s. The probably of any char successful migrating past this point to Hingittok Lake is

expected to be very low, in part, because of the stress incurred while navigating shallow water in the lower sections of Nulahugyuk Creek (also see 2014 results in Section 7.3.2.2).

Observations of creek habitat and the physical dimensions of previously constructed low-flow channels were similar to previously collected data (FEIS Addendum Appendix V6-6H). The low-flow channels constructed in 2012 (Golder 2013a) were deemed structurally intact, providing char with suitable depths, velocities, and an unobstructed path for migration to upstream locations. Thirteen remaining problem locations were confirmed in 2016 where low-flow channels are recommended to improve upstream passage of fish. Remediation of these problem locations are expected to benefit the production of Arctic Char stock at Bernard Harbour (i.e., increase available biomass for harvesting through increased survival, access, and recruitment).

7.3.5 Baseline Synthesis

Sabina is confident that the baseline characterization in the Conceptual Offsetting Plan is reliable (collected during appropriate sampling periods) to inform future monitoring methods and the successful implementation of the Bernard Harbour offsetting option (also see response to F-KIA-TC-14). The baseline characterization of Arctic Char in the Hingittok Lake-Nulahugyuk Creek system relies on field programs summarized in detail in this chapter (also see Golder 2013a), a Traditional Knowledge study (FEIS Volume 3, Appendix V3-3D), and a recently completed field program (2016) summarized in FEIS Addendum Appendix V6-6H. There are three years of data on the migration success rate of adult Arctic Char, which will be used as a measurement indicator for the post-remediation evaluation of the success of the Bernard Harbour offsetting option. Furthermore, the 2014 dataset provides a suitable benchmark for the upstream migration period because of average spring flow conditions during that year (see reply to F-KIA-IR-50). It is also clear that most, if not all, of the upstream adult migration occurs in late spring/early summer, and that there is no juvenile upstream migration in Nulahugyuk Creek.

The Bernard Harbour population of Arctic Char displays a unique life history as part of a diversity of previously described Arctic Char life histories across localities (e.g., Vollestad and L'Abee-Lund 1994; Power et al. 2008). Consistent with life history theory, anadromous species such as Arctic Char that live in a dynamic Arctic environment are adaptable to changes in site-specific conditions (i.e., behaviours must be phenotypically plastic otherwise populations would not exist). At Bernard Harbour, an early-season migration period for spawning adults is advantageous for the overall fitness of the population because stream conditions later in the open water season (e.g., low water depths) preclude access to spawning habitats in Hingittok Lake (Golder 2013a; FEIS Volume 3, Appendix V3-3D). Similarly, non-spawning fish from Hingittok Lake that are foraging in the ocean are expected to overwinter in more accessible systems such as the Coppermine River rather than risk injury or death in Nulahugyuk Creek in late summer. This strategy of using two separate watersheds has been described for anadromous species, including Arctic Char (Jensen et al. 2015).

The baseline characterization of Arctic Char in the Conceptual Offsetting Plan is also supported by data collected in summer 2004 and 2005 when members of the Kugluktuk Hunters and Trappers Organization (HTO) and Golder Associates Ltd. (Golder) carried out a fish and fish habitat assessment on the Hingittok Lake-Nulahugyuk Creek system (e.g., Golder and ANL 2007). The peak period of the upstream migration of Arctic Char begins in late June, and continues for approximately two weeks, overlapping with a reduction in stream flows such that late arrivals face poor conditions and a low chance of successfully migrating to the spawning lake. Migration conditions in the creek generally get worse later in the summer, and remain very difficult to navigate or impassable for char based on all recent visits to Bernard Harbour in mid-July through September (Table 7.3-7). Most of the measured discharge values for mid to late summer flows are below the calculated discharge threshold of 0.8 m^3/s required for upstream migration, with the exception of a 1.07 m^3/s record on July 12, 2012.

Table 7.3-7. Summary of mid-July to September Flow Conditions at Nulahugyuk Creek, Nunavut (2004-2016)

Summer Dates	Discharge	Habitat Conditions	Reference
August 19-23, 2004[1]	0.106 to 0.122 m^3/s	Impassable	Golder and ANL 2005
July 15-September 13, 2005[2]	0.098 to 0.756 m^3/s	Difficult to impassable	Golder and ANL 2007
July 8-16, 2012	0.34 to 1.07 m^3/s	Difficult to impassable	Golder 2013a
August 8-12, 2013	0.04 to 0.06 m^3/s	Impassable	Golder 2013b
July 8-16, 2014[3]	0.5 to 0.79 m^3/s	Difficult to impassable	Section 7.3.2.3
July 22-24, 2015	0.29 to 0.42 m^3/s	Impassable	Golder 2015
July 8-25, 2016	0.17 to 0.51 m^3/s	Impassable	FEIS Addendum V6-6H

[1] 7 adult char captured moving upstream over 3 days of continuous trap net operation at the mouth of the creek

[2] high flow event recorded on August 28, 2005; this was of short duration (1- 2 days) with flows quickly returning to low levels (below 0.2 m^3/s) such that there was no opportunity for fish to move upstream to the lake

[3] discharge available from June 13 to July 16, see Section 7.3.2.3

7.4 REMEDIATION PLAN

7.4.1 Low-Flow Channels

Existing habitat and fish passage conditions in Nulahugyuk Creek are poor, a combination of boulder fields and dispersed flows are preventing many char from accessing spawning locations in Hingittok Lake, as confirmed by local knowledge (Golder and ANL 2007; Appendix V3-3D of the FEIS) and by the previously collected fisheries data at Bernard Harbour (Golder 2013a; including 2014 baseline data reported in this plan, and 2016 data provided in FEIS Addendum Appendix V6-6H. Thus, the goal of remediation is to improve passage for fish migration in Nulahugyuk Creek by removing boulder barriers in the creek and by increasing water depths within specified paths or movement corridors within the channel. 'Soft' engineering methods (without the use of heavy machinery) will be deployed. Upon remediation of fish passage conditions, benefits to the local fishery are predicted through increased adult survival and increased fecundity.

The methods will follow those successfully developed by the Kugluktuk HTO and Golder in 2012 (Golder 2013a; see Plate 7.4-1), which are based on local knowledge of traditional fishing activities at Bernard Harbour (Golder and ANL 2007; Golder 2013a; Appendix V3-3D of the FEIS). Specifically, the methods will include the construction of low-flow channels and the use of directional rock weirs at problem locations in Nulahugyuk Creek; where a low-flow channel is characterized by a manipulation of substrates to direct the flow such that there is an unobstructed flow path with sufficient depths (greater than approximately 20 cm) within the larger channel for fish passage. Small boulders within the larger channel will be relocated to form the low-flow channel within the area of the assumed thalweg of the problem sections of the creek. Where needed, weirs above the low-flow channel will be constructed to direct and concentrate flows through the low-flow channel. Weirs below the low-flow channel may also be created to direct Arctic Char migrating upstream, such that fish avoid adjacent shallow boulder gardens where stranding may occur (Plate 7.4-2). It is expected that each problem location will be remediated by a field crew of approximately five people and one supervisor (Golder 2013a). This cost-effective method can increase water depths by up to 102% (or up to 10 cm) relative to the natural dispersed flow conditions during the latter part of the upstream migration period when water levels are in decline (Golder 2013a).

Field personnel will be resourced through the Kugluktuk HTO, who will be a partner in completing the remediation work, as well as future monitoring and maintenance of the low-flow channels. The accessibility of Bernard Harbour, which can be reached by a four-hour boat ride from Kugluktuk during open water conditions, provides a logistical advantage over less accessible options in the Canadian Arctic.

Furthermore, local enthusiasm for the Project is well documented, and the many residents in Kugluktuk who still maintain a camp at Bernard for hunting and fish will be engaged while there are opportunities through the life of the offsetting option. The integration of local and traditional knowledge will continue during subsequent field programs, workshops, and meetings.

Plate 7.4-1. A Low-Flow Channel Previously Created in 2012 ('Project 2'), Looking Upstream, July 18, 2014

Plate 7.4-2. Directional Weir (Kugluktuk HTO Students in Background) for Migrating Arctic Char in Nulahugyuk Creek, June 24, 2015

7.4.2 Benefits to Fisheries Productivity

To estimate the potential increases in fisheries production (as a surrogate of fisheries productivity) following the remediation of Nulahugyuk Creek, the effects of the low-flow channels on migration success was estimated and then related to changes in the number and biomass of adult Arctic Char in in Nulahugyuk Creek and Hingittok Lake. The effects of remediation on migration success was estimated using hydrologic data collected in 2012 and 2014, combined with the migration success results from 2014. Using the same dataset, a water level target in the low-flow channels that maximizes the migration success was also identified.

7.4.2.1 Predicted Changes in Migration Success

An understanding of flow conditions that determine water depths at the low-flow channel locations is needed as part of predicting changes in migration success based on increasing water depth. Using the pre-manipulation depths of the pilot projects in 2012, which was, on average, 12.5 cm when discharge was approximately 0.4 m^3/s (Golder 2013a), and the relationship between stream discharge and stream depth at the staff gauge presented in Section 7.3.2.3, a 12.5 cm depth equates to a level of 58.1 cm at the staff gauge. Furthermore, creating an increase in depth from 12.5 cm to 22.5 cm with the construction of a low-flow channel would be equivalent to an increase in pre-manipulation water levels from 58.1 to 68.1 cm at the staff gauge, assuming the wetted width of the creek at the staff gauge location was equal to or less than the wetted width at the location of the low-flow channel projects. A water level of 68.1 cm at the staff gauge to achieve a 10 cm increase in water depth would be equivalent to a stream discharge of 2.3 m^3/s, based on the relationship between gauge water level and creek discharge.

With an understanding of how changes in water depths at the low-flow channel locations (prior to remediation) relate to flows in the creek, changes in the probability of migration success were estimated using the logistic equation provided in Section 7.3.2.2. For example, when discharge is 0.4 m^3/s, the probability of migration success prior to remediation is predicted to be very low (0.002), whereas when discharges is 2.3 m^3/s, the probability of migration success prior to remediation is maximized (0.85), assuming fish weight is held constant at 4.2 kg. Therefore, a 10 cm increase in depth at the selected problem locations would equate to an increase in the probability of migration success from 0.002 to 0.850 during low-flow periods of the upstream migration, once remediation activities are completed.

Based on the logistic equation, Arctic Char reached the greatest probability of migration success when discharge reached 1.6 m^3/s or greater (See Figure 7.3-7). This equates to a staff gauge level of 64.5 cm, 6.4 cm greater than the depth initially observed at the enhancement location. This would suggest an 'optimal' channel depth of greater than 19 cm to maximize the migration success for an Arctic Char of average size, and confirms that the methods deployed in 2012 can improve fish passage. Indeed, a behavioral response of Arctic Char to increased flows was noted in Golder (2013a). Field crews observed successful upstream movements of adult char shortly after the completion of the low-flow channels in 2012 (within 1 h of completion), suggesting lack of depth and defined flow path were a limiting factor to upstream movements.

7.4.2.2 Predicted Changes in Fish Biomass

Sabina utilized a conservative approach in developing a simplified model of biomass gains to ensure that gains were not overestimated. Furthermore, expanding the model to include additional demographic complexity, such as variable marine survival rates over time, was determined to not provide any obvious value in the quantification of gains for the Conceptual Offsetting Plan. Additional complexity to the biomass model (e.g., fish production related to 'added' juveniles and immature adults, stage-specific

demographic rates) will be considered during continued discussions with the KIA and DFO during the permitting stage of the Project.

In brief, changes in fish abundance and biomass for the Arctic Char run in Nulahugyuk Creek and Arctic Char arriving in Hingittok Lake were predicted (Figure 7.4-1; Table 7.4-1) using baseline data on the 2014 upstream migration and the following steps and assumptions provided below (also see the reply to F-KIA-TC-15):

Step 1) Select Arctic Char run data for a year that best represents average flow conditions, and a run size that may be smaller than sizes estimated for other years (as a conservative input to the biomass model), specifically 332 adults captured during the 2014 baseline study;

Step 2) Calculate upstream migration success rate for the baseline year, determined to be 34.9% during the 2014 baseline study;

Step 3) Calculate the number of fish that successfully migrated to Hingittok Lake for the baseline year, specifically 332 fish multiplied by 34.9% (which equates to 116 fish);

Step 4) Develop a migration model relating probability (*P*) of upstream migration success to flow conditions in Nulahugyuk Creek (Table 7.3-4):

$$P = \frac{e^{-8.398+15.714x-4.612x^2-0.77y}}{1+e^{-8.398+15.714x-4.612x^2-0.77y}}$$

, where x = four day mean discharge (m^3/s), and y = adult char weight in kilograms (kg);

Step 5) Develop a hydraulic model relating changes in the gauge water levels to creek discharge (page 59, Section 7.3.2.3):

$$water\ level\ (cm) = 56.012 + \left(5.2795 \times creek\ dischage\ (m^3/s)\right);$$

Step 6) Apply models assuming water depths will increase by 10 cm (as per Section 7.4.1) to predict upstream migration success with the implementation of proposed remediation (i.e., low-flow channels), calculated to be 85.0%;

Step 7) Assuming baseline run sizes are constant across years (which also means that 'marine' survival rates are held constant), calculate the number of fish that can successfully migrate to Hingittok Lake with the implementation of creek remediation for offsetting years 1 and 2 (calculated to be 282 fish per years 1 and 2);

Step 8) Assuming that the return rate of spawners is 50% (which includes a 'marine' survival rate component; Klemetsen et al. 2003), and that fish spawn every second year (Babaluk et al. 1998), calculate run sizes for offsetting years 3 to 8 (calculated to increase from 332 adults to 415 adults);

Step 9) Repeat step 7 for offsetting years 3 to 8;

Step 10) Assuming that Hingittok Lake is below carrying capacity for the duration of the monitoring period and that there is a high capacity for population growth, consider an increase in the number of juvenile outmigrants such that that two offspring per added

spawner return to Bernard Harbour at offsetting year 9 and 10 (i.e., the run size increases from 415 to 747 adult char);

Step 11) Convert annual run sizes to annual biomass by multiplying abundances by the expected mean weight of migrating adult fish (Table 7.4-1); and,

Step 12) Calculate cumulative biomass gains (Table 7.4-1).

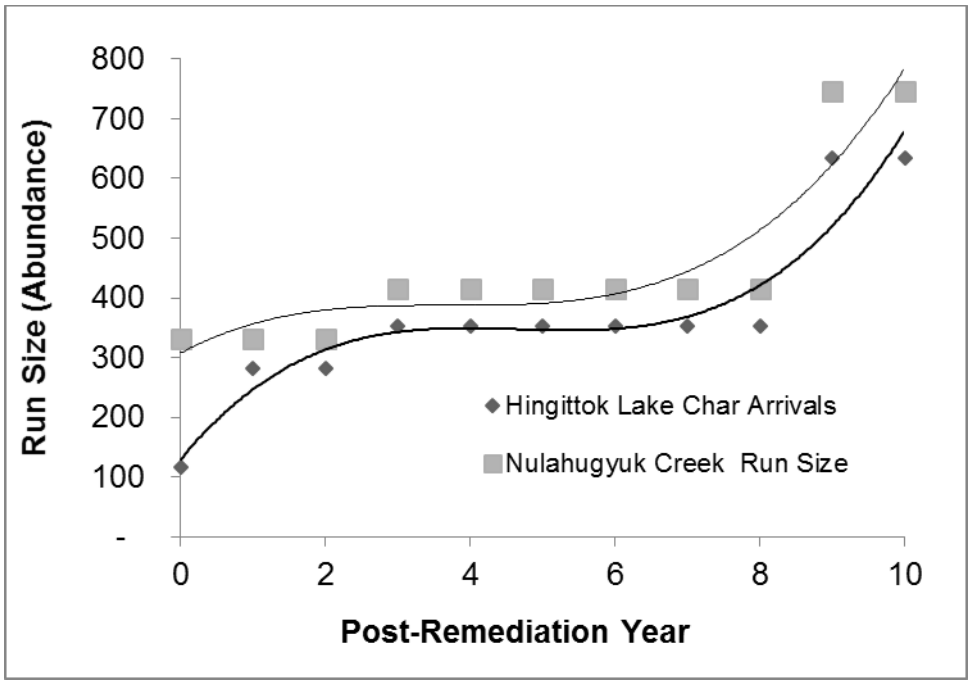


Figure 7.4-1. Post-Remediation Predictions for Arctic Char Abundance in Nulahugyuk Creek and Hingittok Lake (Bernard Harbour)

Table 7.4-1. Predicted Run Size, Annual Biomass, and Cumulative Biomass for Bernard Harbour Arctic Char for the Evaluation Monitoring Period

Offsetting Year	Nulahugyuk Creek Run Size (No.)	Hingittok Lake Arrivals (No.)	Nulahugyuk Creek Biomass (kg)[11]	Hingittok Lake Biomass (kg)[11]	Hingittok Lake Annual Gains (kg)	Hingittok Lake Cumulative Gains (kg)[12]
0 (Baseline)	332[1]	116[2,3]	1,394	487	-	-
1	332	282[4,5,6,7]	1,394	1,185	699	699
2	332	282[4,5,6,7]	1,394	1,185	699	1,397
3	415[8]	353[4,5,6,9]	1,743	1,482	995	2,392
4	415[8]	353[4,5,6,9]	1,743	1,482	995	3,387
5	415[8]	353[4,5,6,9]	1,743	1,482	995	4,382
6	415[8]	353[4,5,6,9]	1,743	1,482	995	5,377
7	415[8]	353[4,5,6,9]	1,743	1,482	995	6,372
8	415[8]	353[4,5,6,9]	1,743	1,482	995	7,367
9	747[10]	635[4,5,6,9]	3,137	2,667	2,180	9,547
10	747[10]	635[4,5,6,9]	3,137	2,667	2,180	11,727

[1] see Step 1; [2] see Step 2; [3] see Step 3; [4] see Step 4; [5] see Step 5; [6] see Step 6; [7] see Step 7; [8] see Step 8; [9] see Step 9; [10] see Step 10; [11] see Step 11; [12] see step 12.

It is important to note that the actual increases in fish abundance and biomass post-remediation will be greater if the average size of the Arctic Char run at Bernard Harbour is greater than the selected model inputs. For the purposes of the offsetting plan, the modelled changes conservatively used the 2014 upstream migration abundance data, versus the downstream migration abundance data, as an approach to reduce uncertainty in predictions. The 2014 abundance data for the downstream migration of adult Arctic Char, which would reflect the upstream migration in 2013, was approximately 1.4-times higher than the upstream migration in 2014 (478 adults captured downstream versus 332 adults capturing upstream in 2014).

As a conservative measure, the model input assumes only biomass of the spawning adult Arctic Char population contributes to the biomass gains at Bernard Harbour as a direct result of the offsetting measures. Additional gains to fisheries production would be realized from juvenile offspring and immature adults that would be added to the population as an outcome from the increase in the number of spawning adults, and is expected to be a substantial contribution of biomass to the total population. In contrast to the calculation of gains which focus on a single life stage, losses at the Back River Project were calculated for both standing stock losses (i.e., from the fish-out) and related annual production losses over a 9 year period. Furthermore, the calculation of gains focused on the primary migration period during late spring/early summer. If including small numbers of adult fish that may try to migrate upstream later in the summer (i.e., consideration of higher use of Nulahugyuk Creek as a migration corridor), the result would be higher gains than those reported in the Conceptual Offsetting Plan.

7.4.2.3 Offsetting Accounting

The potential losses and gains in fisheries productivity were projected across time using fish production as a surrogate measure of fisheries productivity (Randall et al. 2013). Fish production provided a transferable unit for the calculation of both losses at the Goose Property Area and gains at Bernard Harbour. As stated in the reply to F-KIA-IR-53, the approach to offsetting accounting was developed through engagement with DFO. Furthermore, offsetting accounting methods will be reviewed during continued discussions with the KIA and DFO during the permitting stage of the Project.

Residual serious harm to fish (i.e., losses) will be incurred with the temporary drawdown of Llama and Umwelt Lakes, and the construction of related infrastructure, affecting Goose Lake tributary streams and ponds in the Goose and Wolf watersheds. The fish-out and subsequent drawdown of Llama and Umwelt lakes will result in an estimated biomass loss of 467.5 kg in total for the Llama-Umwelt lake system (Section 6.4.1). With construction of the airstrip extension and Tailings Storage Facility, and subsequent reduction in downstream flows, the calculated biomass loss for Rascal Stream East, Goose Inflow South/East and other waterbodies in the Goose and Wolf watersheds will be 102.3 kg of fish biomass (Section 6.4.2). Thus, the total loss of biomass (standing stock) at the Goose Property Area during construction is predicted to be 569.8 kg. These losses in biomass will be verified through the implementation of fish-outs, and future evaluation of collected data.

Annual production losses associated with the removal of habitats from contributing to the ongoing productivity of the fishery were also considered (e.g., Randall and Minns 2000). Annual production was estimated to be 21% of total biomass for affected habitats (based on the production:biomass ratio calculated in De Beers [2015]), which will be confirmed using data from the fish-out of Llama and Umwelt lakes. This was projected as additional losses that accumulate across time as a conservative approach to the offsetting accounting. In other words, it was assumed that when all residual serious harm to fish are realized during construction within the Goose Property Area, there is a loss of annual loss of 119.7 kg of biomass that would have otherwise been available for harvest without the Project development. Over a ten-year period, total cumulative losses include the initial 569.8 kg of biomass due to construction of infrastructure and removal of fish during the fish-outs plus the hypothetical annual loss of production of

119.7 kg in the nine years that follow (for a total of 1,076.9 kg), which all together is equivalent to 1,646.7 kg of lost biomass (Figure 7.4-2).

Substantial gains in fish biomass are predicted at Bernard Harbour, which will counterbalance losses incurred at the Goose Property Area (Figure 7.4-2). Gains in biomass of Arctic Char are predicted to range from almost 700 kg during year 1 and 2 post-remediation to over 2,180 kg by year 9 post-remediation. Over a ten-year period, the offsetting option may generate a total cumulative gain of 11,727 kg of Arctic Char, over 7-times the predicted losses over the same period. Furthermore, predicted gains are expected to magnify over time until char abundance (e.g., juvenile densities) approach the carrying capacity of Hingittok Lake.

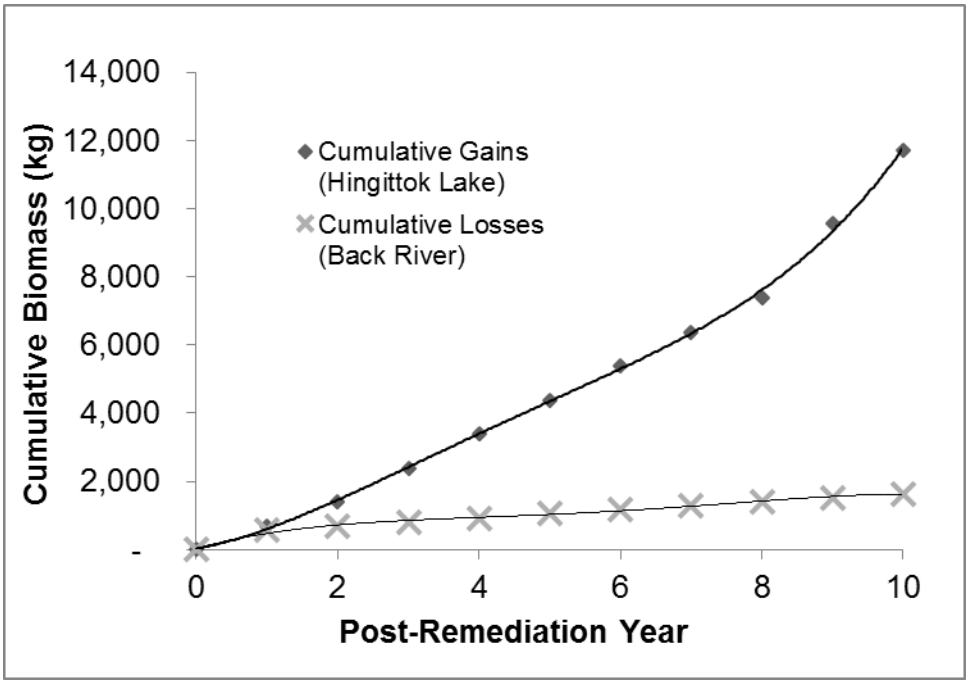


Figure 7.4-2. A Comparison of Predicted Cumulative Gains in Fish Production Versus Cumulative Losses Over Time

It is important to note that if only considering the direct biomass gains from predicted increases in migration success to Hingittok Lake from 35% to 85% (i.e., not accounting for any gains of additional juvenile production or returning offspring from the adults 'added' to Hingittok Lake), the trajectory of cumulative gains in biomass by year 1 post-remediation exceeds that of losses related to the fish-out (569.8 kg), and by year 3, estimated cumulative gains exceeds that of losses calculated for a 10-year period of operation for the Back River Project (total of 1,646.7 kg). This prediction of biomass gains assumes a consistent run size of 332 adults, and that the low-flow channels will add a minimum of 166 additional adults surviving to the lake and spawning each year, where each fish weighs, on average, 4.2 kg.

Modest increases in the population over the duration of the offsetting option are ecologically realistic and within the capacity of Hingittok Lake to support an increase in fish density (see reply to F-KIA-TC-16). There is sufficient evidence to conclude that Hingittok Lake is well below carrying capacity. The local Arctic Char fishery has been in decline for the past 40 years, and stream migration conditions have also deteriorated over approximately the same period, which have been identified as the underlying

cause of the decline by both Traditional Knowledge (FEIS Volume 3, Appendix V3-3D), and baseline studies performed by both Sabina, Golder Associates Ltd. and the Kugluktuk Hunters and Trappers Organization (e.g., this chapter; FEIS Addendum Appendix V6-6H, and Golder 2013a). Any uncertainty related to the carrying capacity of Hingittok Lake is related to whether the spawning population in Hingittok Lake can increase 7-fold or higher (beyond offsetting year 8 post-remediation) and is not related to whether the Bernard Harbour offsetting option will achieve equivalency.

The projected increases in biomass of 'added' Arctic Char through the implementation of low-flow channels in Nulahugyuk Creek will offset losses to be incurred at the Back River Project. The trajectory of annual biomass gains achieved through the offsetting is much greater than the annual production losses and is sufficient to fully counterbalance the residual serious harm caused by the Project. The magnitude of the difference in predicted gains versus losses is substantial providing confidence that equivalency can be achieved, a determination that will ultimately be made by DFO during the permitting stage of the Back River Project (DFO 2013a, b) and will be verified through monitoring.

7.4.3 Schedule

The planned scope of the proposed offsetting program at Bernard Harbour will occur from 2014 to 2025 (Table 7.4-2). The proposed monitoring program is planned for a period of no more than 10 years post-enhancement and will include up to four years of monitoring the Arctic Char run. This length of time and level of effort are expected to be adequate to demonstrate that the offsetting objectives have been achieved, where the goal of monitoring will be to support model assumptions and demonstrate that fish production follows a projected trajectory of cumulative gains that will eventually exceed cumulative losses (Section 7.4.2.3). Annual monitoring and reports over a 10-year period will allow for the following (DFO 2013a):

- Biological or physical changes to be reflected in the data collected;
- Possible adjustments to the monitoring to better estimate changes in fishery productivity; and
- The restored habitat to reach full ecological functionality.

Sabina would conduct annual field monitoring and maintenance, working with community members. Biological monitoring and reporting to DFO would occur in offsetting year 1, 4, 9, and 10 (as needed) of the monitoring period. The final monitoring schedule will also consider feedback from DFO, and other interested parties (e.g., KIA) during the permitting stage of the Back River Project, to meet the requirements of the Fisheries Protection Policy Statement (DFO 2013b)

Table 7.4-2. Overview of Activities in Support of the Conceptual Fish Offsetting Plan for the Back River Project (2014 to 2025)

Phase	Offsetting Year	Annual Activities / Deliverables
Baseline	2014	Monitor adult and juvenile migrations, and passage conditions
		DFO/community engagement
	2015	DFO/community engagement
		Follow-up field investigation of habitat conditions
		Conceptual Fish Offsetting Plan
Remedial Works	Summer 2016 (Year 0)	DFO/community engagement
		Construct habitat offsetting enhancements
	Winter 2016 - 2017	Remediation report
Application Submission	Fall 2017	Submit Fisheries Act Authorization Application
Post-Remediation Monitoring	2017 or 2018 (Year 1 or 2)*	Monitor adult and juvenile migrations, and passage conditions
		Annual Report
	2018 – 2019 (Year 2 – 3)	Sabina/Kugluktuk HTO inspection years; inspect each year and repair channels (as needed)
		Annual field summary memo
	2020 (Year 4)	Monitor adult and juvenile migrations, and assess passage conditions
		Annual Report
	2021 – 2024 (Year 5 – 8)	Sabina/Kugluktuk HTO inspection years; inspect each year and repair channels (as needed)
		Annual field summary memo
	2024 (Year 9)	Monitor adult and juvenile migrations, and assess passage conditions
		Annual Report
		Offsetting Project Synthesis Report
		DFO/community engagement
	2025 (Year 10)	Final monitoring program (as needed)
		Technical memo update to synthesis report

** schedule may shift if, for example, remediation efforts require additional efforts and extend beyond one open water season.*
DFO = Fisheries and Oceans Canada; HTO = Hunters and Trappers Organization

7.4.4 Monitoring

The purpose of the proposed monitoring plan included with the Conceptual Offsetting Plan is to provide an outline that will be included with the application for Authorization under the Fisheries Act. Additional details will be included in the final monitoring plan beyond what is presented in this section; however, the intent of this outline is to provide DFO and KIA with a framework for a comprehensive monitoring program of similar qualities to a well-designed experimental research program. The intention is also to provide sufficient background information to support discussions during upcoming engagement sessions planned with the DFO and KIA on the offsetting plan for the Back River Project.

The proposed methodology and criteria for monitoring the Bernard Harbour offsetting option will consider Traditional Knowledge and will be selected to best evaluate the success of the offsetting measure, specifically to confirm that the offsetting measure has been effective in counterbalancing the residual serious harm to fish (DFO 2013a,b). Monitoring may include two types: functional monitoring (e.g., physical conditions of low-flow channels), and effectiveness monitoring (e.g., migration success rate)

(Smokorowski et al. 2015). A multi-year monitoring effort will also be implemented (see Table 7.4-2) with considerations of lessons learned during previous monitoring years. During any given year, monitoring will be adaptable to reflect the seasonal timing of migration (e.g., related to trends in seasonal flows), and inter-year variability in the Arctic Char migration. For example, an unusually wet (i.e., high flow) or late spring may warrant a monitoring period that extends into late July or August.

Monitoring metrics or indicators will be selected to demonstrate that the offsetting objectives have been achieved, where a goal of monitoring will be to demonstrate that fish production follows a projected trajectory of cumulative gains that will eventually exceed cumulative losses. Data collection will be similar to methods outlined for the 2014 baseline monitoring study, and will be consistent across years and phases of the offsetting plan, where possible, to allow for a reliable assessment of gains.

Functional monitoring may include data on the physical integrity of the remediated sections of the creek under spring and summer conditions. Measurements may include depths, channels widths, composition of streambed substrate, and channel stability, and would be at both remediated and non-remediated (reference) sections of the creek. Sabina and the Kugluktuk HTO will also conduct annual observational monitoring (e.g., inspections of signs of erosion, sedimentation) and address any minor maintenance problems, if needed, working with community members throughout the monitoring period. Activities will include qualitative visual assessments and photographs of the remediated sections of the creek. Inspection reports will be submitted to DFO by December 31 of any given year that observation monitoring is carried out.

It is expected that detailed habitat measurements (functional monitoring) will be collected concurrently with monitoring of the Arctic Char run (effectiveness monitoring), which would include a tagging program to monitor movements of char in Nulahugyuk Creek, and a two-way trap-net installed at the mouth of the creek to monitor the upstream and downstream migrations. It is also expected that the primary focus of the effectiveness monitoring will be on upstream migration success and survival of migrating adults to confirm the assumptions of the biomass model. Collection of data on run size for the three migration types will also be incorporated into the monitoring plan; results of which will contribute to an understanding of self-sustaining properties of the offset, but not necessarily be linked to a quantitative target for determining effectiveness. Monitoring reports will be submitted to DFO by December 31 of any given year that monitoring is carried out.

Following each year of monitoring, the success of both monitoring efforts and the offsetting measure will be evaluated and discussed in the monitoring report. It may be determined that additional efforts are required to describe seasonal fish-use of Nulahugyuk Creek in subsequent years (e.g., monitoring movements that may occur in late summer), which would only demonstrate additional gains for the offsetting option. Also, at any point within the monitoring period should it be determined that the performance of the project is not meeting expectations, either through channel design modifications not providing passage, insufficient flow conditions or lack of fish utilization, alternate channel design options or additional habitat enhancements will be investigated and applied, if appropriate, in order to meet the expectations under DFO's Policy (DFO 2013a,b). If it is determined by Sabina, in consultation with the KIA and DFO, that the proposed offsetting project may not meet the offsetting objectives for the Back River Project, an alternate project will be explored and implemented, if necessary, to achieve the offsetting commitments for fisheries losses at the Back River Project.

7.5 CONTINGENCIES

Sabina will evaluate the success of the offsetting option after each year of monitoring to determine if the proposed offsetting project is performing to expectations within the specific timeframe of the project. At any point within the monitoring period, should it be determined that the performance of the

offsetting option is not meeting expectations, either through channel design modifications not providing passage, insufficient flow conditions or lack of fish utilization, alternate channel design options or additional habitat enhancements will be investigated and applied, if appropriate, in order to improve the performance of the offsetting option to meet the expectations under DFO's Policy (DFO 2013a,b). If it is determined by Sabina, in consultation with DFO, that the proposed offsetting project will not meet the offsetting objectives for the Back River Project, an alternate offsetting option will be identified and implemented, with an associated monitoring plan, to achieve the offsetting commitments for fisheries losses at the Project. Other contingencies may include those listed in the Draft Conceptual Fish Offsetting Plan (DEIS Volume 10, Chapter 21), for example, the Canyon Lake Berm Option and Bathurst Lake Arctic Char Passage Option. For additional information on those contingency options, see DEIS Volume 10, Chapter 21, Section 3.2.

8. Complementary Measures

In remote areas where there are low levels of human development, such as the Canadian Arctic, there are not only limited opportunities for offsetting fisheries productivity losses, but there is also a general lack of knowledge on fisheries populations beyond that generated from baseline monitoring programs. Thus, an investment in data collection and scientific research may also be considered as a Complementary Measure for an offsetting plan when it takes into account the guiding principles outlined in the Fisheries Productivity Investment Policy. Research must relate to improving the state of knowledge around maintaining or enhancing the productivity of commercial, recreational, or Aboriginal fisheries to be considered as a Complementary Measure. A suite of Complementary Measures for the Back River Project will be considered. As Complementary Measures, the research investments may contribute up to 10% of gains to offset losses and reduce uncertainty associated with predicted gains from the offset option.

8.1 FISH-OUT LIFE HISTORY DATABASE

As described for the Conceptual Fish-Out Plan (FEIS Addendum Chapter 31), the fish out of Llama and Umwelt lakes will follow the sampling framework and protocols described in DFO's General Fish-Out Protocol (Tyson et al. 2011). Under DFO's protocol, life history information (i.e., lengths and weights) on all fish and species in Llama and Umwelt lakes will be collected. Laboratory analyses will be performed on a subset of captured fish. Aging structures will be collected and analyzed from a subset of captured species (e.g., Lake Trout) to characterize the age structure and growth characteristics of populations. Tissue samples (e.g., muscle) from a subset of captured species will also be collected and prepared for analyses of metal concentrations at an accredited laboratory. The combined dataset on life history, population, and environmental variables will then be provided to DFO, contributing to a regional fisheries database on lakes in Nunavut.

The proposed level and type of data collection follows DFO's General Fish-Out Protocol and is in support of the development of a regional database for managing fisheries in Arctic lakes. This level of effort is in excess of what would otherwise be required in support of a fish-out program; therefore, this work qualifies for consideration as a Complementary Measure for the Back River offsetting plan. This Complementary Measure will represent an important contribution to fisheries science and the management of stocks of fish species in the region. The details on data collection and reporting will be confirmed in the Final Fish-Out Plan.

8.2 BERNARD HARBOUR TK STUDY

As noted previously, a TK study was conducted in 2014-2015 in an effort to develop a better understanding of the Arctic Char fishery in the Bernard Harbour area (and related historic and contemporary environmental conditions). The TK study was carried out by Sabina in partnership with the Kugluktuk HTO and was intended to complement the scientific baseline studies that have also been conducted for the Bernard Harbour remediation project. The TK study involved one-on-one interviews with 11 Bernard Harbour land users from Kugluktuk and Cambridge Bay, who were selected by the Kugluktuk HTO for inclusion in the study. The TK study also made use of various secondary sources (e.g., historic records, land use reports, academic publications) and a Bernard Harbour site visit to provide additional information on the Arctic Char fishery. The TK study was led by a qualified social scientist using proven qualitative TK research methods. Further information on the TK study can be found in Section 2.1.3., while a copy of the TK study report can be found in Appendix V3-3D of Sabina's FEIS.

Considering the remote, pristine area of Bernard Harbour and the lack of existing scientific information and documented TK on the local Arctic Char fishery, Sabina considers the Bernard Harbour TK study a Complementary Measure. For one, the TK study provides a significant amount of new environmental baseline information related to the Arctic Char fishery at Bernard Harbour. This includes information on Arctic Char harvesting, migration, spawning, health, response to changing environmental conditions, and other topics. This information will be useful for assessing the relative success of any future remediation activities that are undertaken at Bernard Harbour, while helping to address existing knowledge gaps related to the management and conservation of the Arctic Char fishery in the Coronation Gulf. Second, the TK study describes recent environmental changes observed by Inuit in the area and the negative implications these changes have had on the Arctic Char fishery in the region. This highlights the potential benefit stream remediation activities may have on the Arctic Char population at Bernard Harbour, while also contributing to the growing literature on environmental change in the Canadian Arctic.

The TK study also presents detailed information on an area of historic and contemporary importance to Inuit, and on a species readily harvested by Inuit (i.e., Arctic Char). The contributions the TK study makes to the local historic and cultural record are thus notable. Finally, the TK study demonstrates how the proposed approach to stream remediation (i.e., using low-impact stream channel manipulation methods) is grounded in historic Aboriginal fisheries management strategies that have been used at Bernard Harbour (i.e., seasonal stream channel manipulation and rock weir construction). This 'made in the north' approach represents a unique opportunity for fisheries offsetting and community benefits to be realized simultaneously, while also serving as a potential model for future project proponents.

While the results of the TK study are to remain the property of the Kugluktuk HTO, the data and results of the study are intended to be freely shared with other Nunavut organizations that may benefit from its use (as per the terms of the Bernard Harbour Restoration Project Agreement Between: The Kugluktuk Hunters and Trappers Organization and Sabina Gold & Silver Corp. signed by both parties in June 2014). For example, the KIA has been provided with copies of the data obtained from the TK study, so that it may be incorporated into their NTKP database. As noted by the KIA (2012), the NTKP is the foundation for recorded and geo-referenced Inuit TK in the western Kitikmeot Region. The NTKP covers Inuit land use, and fish and wildlife ecological data within a 750,000 km² study area, the Slave Geological Province. As well as being a repository of Kitikmeot Inuit TK, the NTKP was designed as a land-use planning tool, designed to inform and improve the quality of environmental assessments for proposed developments in the Kitikmeot Region.

8.3 ARCTIC CHAR MOVEMENT STUDY

Research on the migratory movements of Arctic Char was conducted in 2014 in an effort to develop a better understanding of the ecology of Arctic Char at Bernard Harbour (i.e., the Nulahugyuk Creek-Hingittok Lake system). The research was carried out by Sabina in partnership with the Kugluktuk HTO and was intended to supplement previously completed scientific baseline studies at Bernard Harbour. It is expected that the Arctic Char movement studies will continue as part of a complementary measure when monitoring the Bernard Harbour Offsetting Option into the future.

The research will address questions on how Arctic Char move within Nulahugyuk Creek, and on where Arctic Char from Bernard Harbour move within the broader region of the Coronation Gulf. The first question is being addressed by quantifying upstream movements for the duration of the migration period for a subset of capture Arctic Char using implanted PIT tags and Radio Frequency Identification (RFID) antenna-reader arrays installed at strategic locations on the creek. In 2014, a total of 315 upstream migrating adult char were implanted with PIT tags, each of which has a unique identification number that can be tracked by a handheld reader or remotely deployed antennae-reader array. Seven PIT-tag antennae-reader arrays were installed strategically in relation to the location of the 2012 low-flow

channel project areas and reference sections to monitor the speeds and rates of successful passage across a range of conditions in the creek. An antennae-reader array was also installed near the outlet of Hingittok Lake to quantify the rate of successful upstream passage from the mouth of Nulahugyuk Creek to the spawning lake. Further information on the results of the PIT-tagging study completed in 2014 can be found in Section 7.3.2.3.

A Floy-tag program was also initiated in 2014 and included the use of external (Floy) tags for a subset of adult char moving downstream from Hingittok Lake such that char captured by local community members (e.g., later in the season in the Coppermine River) could be identified as individuals originating from Bernard Harbour. The external tags were implanted through the dorsal surface of the char lateral to the dorsal fin. The tags were orange, and each tag had a visible identification number for tracking the fish. A total of 475 adult char captured moving downstream were implanted with Floy tags. Resulting data from recaptures by domestic and recreational anglers, as well as future research teams, will be collected over time through tag return programs initiated by Sabina and the Kugluktuk HTO. This program will contribute valuable information on 'large-scale' movements of Arctic Char in the Coronation Gulf, and possibly the location of overwintering sites. Data collection is ongoing and the analysis of the return information will supplement the information collected on 'small-scale movements' of Arctic Char in Nulahugyuk Creek.

Considering the remote, pristine area that Bernard Harbour is located in and the lack of existing scientific information on the local Arctic Char fishery, Sabina considers information generated from the Arctic Char movement study a Complementary Measure. The study will provide a significant amount of new environmental baseline information related to the migratory ecology of Arctic Char, an area of fisheries science where there is currently a paucity of data to support any new management or conservation initiatives. This includes information on Arctic Char migration speeds, migration survival, environmental factors that influence the migration of Arctic Char, and the distribution or home ranges of Arctic Char from Bernard Harbour. This information will be useful for assessing the relative success of any future remediation activities that are undertaken at Bernard Harbour, while helping to address existing knowledge gaps related to the management and conservation of the Arctic Char fishery in the Coronation Gulf.

9. Summary

The purpose of this Conceptual Fish Offsetting Plan is to summarize anticipated serious harm to fish based on the assessment provided in the Final Impact Statement (FEIS), and to describe the offsetting option to counterbalance the unavoidable serious harm to fish, as defined in the *Fisheries Act*. The plan was constructed as per the guiding policies of Fisheries and Oceans Canada (DFO), with the goal of maintaining or improving the productivity of the commercial, recreational, or Aboriginal (CRA) fishery. In addition to the offsetting plan, a number of mitigation measures will be in place for the Back River Project (Project) to avoid or minimize the potential effects on the productivity of the CRA fishery. These mitigation measures will be supplemented by the use of adaptive management, as required. For any lakes that are lost as a result of the Project (i.e., Umwelt and Llama lakes), a fish-out will be conducted (FEIS Addendum Chapter 31) and will offer an opportunity to gather information on lake productivity and the fish community, as well as avoid any "wastage" by making the fish available for traditional use by local communities.

The Conceptual Fish Offsetting Plan for the Project is the result of continued community and regulatory engagement associated with the Project. The outcome of engagement activities developed an offsetting measure or option focused on improving the productivity of an Arctic Char fishery at Bernard Harbour (i.e., the Hingittok Lake-Nulahugyuk Creek system), located approximately 100 km directly north of the hamlet of Kugluktuk, Nunavut, along the south coast of the Dolphin and Union Strait. Bernard Harbour was once the site of a traditional domestic fishery for Arctic Char.

Developing a remediation plan for Bernard Harbour was first discussed in response to reports by local harvesters in the 1990s that the traditional fishery was in decline. Follow-up investigations concluded that conditions of the creek may be deteriorating because of natural causes (e.g., changes in climate, resulting in low water depths, and boulder barriers), affecting the upstream migration success of adult Arctic Char to spawning areas in Hingittok Lake. These early investigations also provided evidence that migration conditions could be remediated at problem locations by creating low-flow channels using low-impact construction methods.

During 2014 to 2015, a Traditional Knowledge study combined with environmental monitoring provided a better understanding of the Arctic char fishery at Bernard Harbour (and related historic and contemporary environmental conditions). The baseline studies, all of which included Kugluktuk Hunters and Trappers Organization as full partners, demonstrated how the proposed approach to stream remediation is grounded in historic Aboriginal fisheries management strategies that have been used at Bernard Harbour (i.e., seasonal stream channel manipulation and rock weir construction). This 'made in the north' approach represents a unique opportunity for fisheries offsetting and community benefits to be realized simultaneously. To estimate the potential benefits of the offsetting option to fisheries biomass production (as a surrogate of fisheries productivity), post-remediation changes in migration success were estimated and then related to changes in the biomass of adult Arctic Char in Nulahugyuk Creek. The predicted gains in biomass following remediation may be substantial, magnifying over time when offspring return as adults (by offsetting year 8 or 9). It is also predicted that gains in biomass at Bernard Harbour will exceed losses in fisheries production resulting from temporary drawdowns of small lakes (Llama and Umwelt lakes), and related infrastructure (e.g., Tailings Storage Facility) at the Goose Property Area.

The magnitude of the difference in predicted gains versus losses is substantial providing confidence that equivalency can be achieved for the Bernard Harbour offsetting option, a determination that will ultimately be made by DFO during the permitting stage of the Back River Project (DFO 2013a, b). As part

of the offsetting plan, a robust monitoring framework over a 10-year period will be implemented, and will address the inherit challenges of monitoring in a remote setting and unpredictable environment. The monitoring plan will include post-remediation monitoring and reporting of the offsetting measures for a period sufficient to allow for the benefit of the offsetting measures to be effectively evaluated. Sabina is also committed to actively involve the KIA in evaluating early outcomes from monitoring (as per commitment KIA-08), and is committed to actively involve the KIA in the adaptive management of the offsetting plan and monitoring plan (as per commitment KIA-07).

The Conceptual Fish Offsetting Plan will be finalized and presented as a Final Fish Offsetting Plan during the permitting phase of the Project and submitted as part of the Application for Authorization under the *Fisheries Act*. Sabina will continue to work with DFO, and the impacted communities through this regulatory approval stage to develop the final offsetting plan, as per commitments DFO-C2 and KIA-06. The final plan will be based on feedback from both the KIA and DFO and would ultimately be approved by DFO as a condition of the Authorization required for the development of the Back River Project.

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Appendix A: Bernard Harbour Restoration Project Agreement Between: The Kugluktuk Hunters and Trappers Organization and Sabina Gold & Silver Corp.

BERNARD HARBOUR RESTORATION PROJECT

AGREEMENT BETWEEN:
THE KUGLUKTUK HUNTERS AND TRAPPERS ORGANIZATION AND
SABINA GOLD & SILVER CORP.

Purpose of the Agreement:

The purpose of this Agreement is to outline the relationship between the Kugluktuk Hunters and Trappers Organization (HTO) and Sabina Gold & Silver Corp. (Sabina) in executing the Bernard Harbour Restoration Project.

Background:

Stream restoration activities in the Nulahugyuk Creek - Hingittok Lake area (also known as Bernard Harbour) were initially proposed in the early 2000s by the Kugluktuk HTO. These activities were proposed with the goal of restoring a traditional Inuit Arctic char fishery, which has suffered from significant harvesting declines in recent years. The Kugluktuk HTO has worked closely with Golder Associates (Golder) to advance early stages of the project (e.g. initial environmental baseline and stream restoration work), and the two have recently applied to the Canadian Northern Economic Development Agency (CanNor) for additional project funding. The two organizations have also been seeking an industry partner to help advance the project to completion. Sabina has now been identified as this industry partner, who will support stream restoration work in the Nulahugyuk Creek - Hingittok Lake area in order to satisfy Fisheries Act offsetting requirements for its Back River Project while supporting the desires of the Kugluktuk HTO and the community members of Kugluktuk.

Objectives of the Agreement:

There are two primary objectives of this agreement:

1. ***Short term objective (2-3 years)***: To enable Sabina to satisfy a Department of Fisheries and Oceans (DFO) requirement to offset fisheries habitat effects at the Back River Project. This objective would be achieved by improving the viability of the Nulahugyuk Creek - Hingittok Lake traditional Arctic char fishery. To the greatest extent practicable, local community members will be involved throughout the process to help support this objective. Selected local high school students will also be involved in the project where possible, so that skills and knowledge may be transferred to them.

2. ***Long term objective (3+ years)***: To enable the Kugluktuk HTO and Sabina to restore a historic, locally-utilized Arctic char fishery, for the benefit of Kugluktuk residents. This will be accomplished, in part, by the provision of resources and training by Sabina.

Structure of the Relationship between the Kugluktuk HTO and Sabina:

The Bernard Harbour Restoration Project is envisioned as a partnership between the Kugluktuk HTO and Sabina. This partnership will be structured in the following ways:

- The Bernard Harbour Restoration Project is to remain a Kugluktuk HTO-led initiative. Sabina will support the Kugluktuk HTO in achieving their objectives for the Bernard Harbour Restoration Project, but control and ownership of the project will ultimately reside with the Kugluktuk HTO.
- A Traditional Knowledge (TK) study on the Arctic char fishery in the Nulahugyuk Creek - Hingittok Lake area (see following section) will be conducted to support the objectives of this agreement. This study will be coordinated and executed by Sabina, although the Kugluktuk HTO will remain the owners of all TK data that is collected and reports that are issued. The Kugluktuk HTO and Sabina are currently exploring options for the funding of this TK study. In the event third party funding cannot be obtained, Sabina will provide all necessary resources for the TK study to be completed.
- Environmental baseline work, stream restoration work, and DFO-required follow-up monitoring and reporting will all be funded by Sabina. However, these particular work areas will be coordinated and executed by Golder (or other similar consultant), who will act as the Kugluktuk HTO / Sabina representative onsite at Bernard Harbour.
- The Bernard Harbour Restoration Project will, to the greatest extent practicable, provide opportunities for the involvement of summer students hired by the Kugluktuk HTO.
- Once the Bernard Harbour Restoration Project's short term objective has been met (see above), Sabina intends to phase-out its involvement in the project. In the long-term, full management of this project will be turned over to the Kugluktuk HTO. The timing of this phase-out will be determined in consultation with DFO, Sabina, the Kugluktuk HTO, and possibly other organizations like the KIA. As a rough estimate, this phase-out would likely occur 3 years after all stream restoration work has been completed (e.g. 4-6 years after the signing of this agreement).
- Sabina acknowledges the Kugluktuk HTO's strong desire to learn the skills and knowledge necessary in order to manage all future stream restoration and monitoring work themselves. Sabina will work with the Kugluktuk HTO to provide this training and will help develop a management plan/document and workshop that addresses these objectives.

Traditional Knowledge Study

In an effort to develop a better appreciation of historic and contemporary environmental conditions in the Nulahugyuk Creek - Hingittok Lake area, a TK study will be conducted. While additional details on the TK study are included in the TK study proposal document that was shared with the Kugluktuk HTO in early April 2014 (see Appendix A), the following points are of particular relevance to this Agreement:

- All TK data and reports that result from the TK study will be owned by the Kugluktuk HTO. However, all TK data collection, analysis, and reporting activities will be conducted by Sabina on behalf of the HTO.
- Opportunities for youth involvement in the TK study (e.g. as research assistants) will be investigated on an ongoing basis.
- All TK data and reports that result from the TK study will be made available to the Kitikmeot Inuit Association (KIA) for inclusion in their Naonaiyaotit Traditional Knowledge Project (NTKP) database, with the

understanding the KIA may utilize and distribute this data and information for their own purposes. The data and results of the TK study are also intended to be freely shared with other Nunavut organizations that may benefit from its use.

- Sabina reserves the right to publish the final TK study report in the Back River Project Final Environmental Impact Statement (FEIS) and / or in other regulatory submissions. TK study results may also be presented by Sabina and / or its representatives in other public forums (e.g. conferences, company publications and presentations).

Implementation Schedule

This Agreement will be implemented over three periods:

1. ***2014 - 2015***
    - TK study (to be conducted by Sabina in Kugluktuk)
        - Potential Bernard Harbour site visit with selected TK study participants
    - Baseline fieldwork (to be conducted by Golder at Bernard Harbour)
        - Potential Bernard Harbour site visit with partners and DFO
2. ***2015 - 2016***
    - Fisheries offsetting plan to be drafted by Golder for Sabina's FEIS (submission of this plan will initiate the DFO approval process)
3. ***Future considerations***
    - Conduct stream restoration work, pending DFO approval of offsetting plan. This work will include:
        - Identifying main stream channels
        - Removal of fish passage barriers
        - Relocation of in-stream boulders to create low-flow channels
    - Project monitoring requirements to be determined in consultation with DFO; Sabina will follow all monitoring requirements as set out by DFO
    - At this time, it is expected that monitoring programs will be conducted by Sabina (or a consultant) at *Year 1* and *Year 7* following initial stream restoration activities. Sabina will also negotiate appropriate funding with the Kugluktuk HTO, so that interim monitoring activities (i.e. monitoring during the years when Sabina / a consultant are not present) can be conducted directly by the Kugluktuk HTO. Longer-term funding arrangements may also need to be arranged in the future.
    - Sabina to eventually phase out corporate involvement in Bernard Harbour Restoration Project; role of HTO in long-term management of stream restoration activities to be determined in consultation with DFO and Sabina.

Duration of the Agreement

This Agreement will be effective as of the signing date in the Endorsement section below. The initial term of this Agreement will be for two years, but the Agreement will be subject to renewal after this time. During the two years of this initial Agreement a number of tasks will be completed by Sabina to better define long-term project requirements. These will include:

- Collection of baseline data.
- Analysis of baseline data and development of plans in Sabina's Final Environmental Impact Statement (FEIS) to determine specifically what will be required for Sabina to meet its fisheries offsetting obligations.
- Finalization of fisheries offsetting terms and conditions with DFO (Note: project plans may change somewhat as a result of this process).

Upon completion of this initial two-year Agreement, it is anticipated that Sabina and the Kugluktuk HTO will negotiate a new, longer-term project agreement.

Endorsement

The following parties endorse this agreement:

For the Kugluktuk Hunters and Trappers Organization:
David Nivingalok
Chairperson
Kugluktuk Hunters and Trappers Organization
P.O. Box 309
Kugluktuk, Nunavut, X0B 0E0
kugluktukhto@qiniq.com

Signature _____ Date June 5/2014

For Sabina Gold & Silver Corp.:
Matthew Pickard
Vice President, Environment & Sustainability
Sabina Gold & Silver Corp.
202 - 930 West First Street
North Vancouver, British Columbia, V7P 3N4
mpickard@sabinagoldsilver.com

Signature _____ Date June 3, 2014

30. VEGETATION MONITORING PLAN (NEW)

BACK RIVER PROJECT:
Vegetation Monitoring Program

February 2017

BACK RIVER PROJECT
VEGETATION MONITORING PLAN

Table of Contents

Table of Contents i
List of Figures ii
List of Tables ii
1. Introduction 1
1.1 PURPOSE 1
2. Incorporation of Inuit Qaujimajatuqangit Principles 6
3. Community Engagement and Traditional Knowledge 7
4. Existing Environment and Baseline Information 8
5. Objectives 10
6. Monitoring Approach 11
6.1 VEGETATION MONITORING 11
6.1.1 Vegetation Health 11
6.1.2 Invasive Plants 11
6.1.3 Dust Monitoring 12
7. Roles and Responsibilities 13
8. Mitigation and Adaptive Management 14
9. Quality Assurance and Quality Control 16
10. Reporting 17
11. References 18

List of Figures

FIGURE **PAGE**

Figure 1: Potential Development Area and Layout – Marine Laydown Area 3

Figure 2: Potential Development Area and Infrastructure Areas – Goose Property 4

Figure 3: Winter Ice Road Corridor Overview 5

List of Tables

TABLE **PAGE**

Table 4-1. Ecosystem Classes in the Local Study Area 9

Table 4-2. Ecosystem Classes in the Local Study Area 9

Table 6-1. Vegetation Monitoring: Vegetation Health 11

Table 6-2. Vegetation Monitoring: Invasive Plant Species 12

Table 6-3. Vegetation Monitoring: Dust Fall 12

1. Introduction

The proposed Back River Project (the Project) lies in western Nunavut in the continuous permafrost zone of the continental Canadian Arctic. It is composed of two main areas: the Marine Laydown Area (MLA) (Figure 1) and the Goose Property Area (Figure 2), with a winter ice road (WIR) connecting the two (Figure 3).

The MLA is located on the western shore of Southern Bathurst Inlet, approximately 130 kilometres (km) north of the Goose Property (Figure 2). Here, the Project will sealift materials and supplies through Bathurst Inlet to the MLA annually during the open-water season only.

The Goose Property includes four open pits and four underground developments and the Project has an estimated mine life of 10 years with a total production of 19.8 million tonnes (Mt) of ore. Key Project infrastructure at the Goose Property includes:

- four open pits, and four underground mines (Umwelt, Llama, Goose Main, and Echo);
- four waste rock storage areas;
- tailings storage facility;
- underground mining pads;
- a stockpile;
- camp;
- process plant; and
- airstrip and roads, including a culvert for the haul road crossing.

A WIR will be utilized between the MLA and Goose property to allow the movement of supplies during the winter months.

This Plan represents an adaptive approach to understanding the effects of the Project on the landscape and the species that live there. In this context, the Plan is part of a continually evolving process that relies not only on the efficacy of data collection and analytical results, but is also dependent on feedback from the communities, government, Aboriginal groups, and the public. Having an adaptive and flexible program allows for appropriate and necessary changes to the design of monitoring studies, and the mitigation and monitoring plans. Some changes may come about through the observation of unanticipated effects or inadequacies in the sampling methods to detect measurable effects. Other changes may result from ecological knowledge acquired through working with Aboriginal community members and discussions with elders, both in the field and through workshops.

1.1 PURPOSE

During the FEIS Final Hearings, Sabina and GN jointly submitted the following commitment (GN-C-25):

> In consultation with the KIA, GN, and other relevant parties the Proponent shall develop and implement a vegetation monitoring plan for the winter road that is designed to quantify the potential impacts on vegetation. The plan shall be submitted to the NIRB prior to winter road

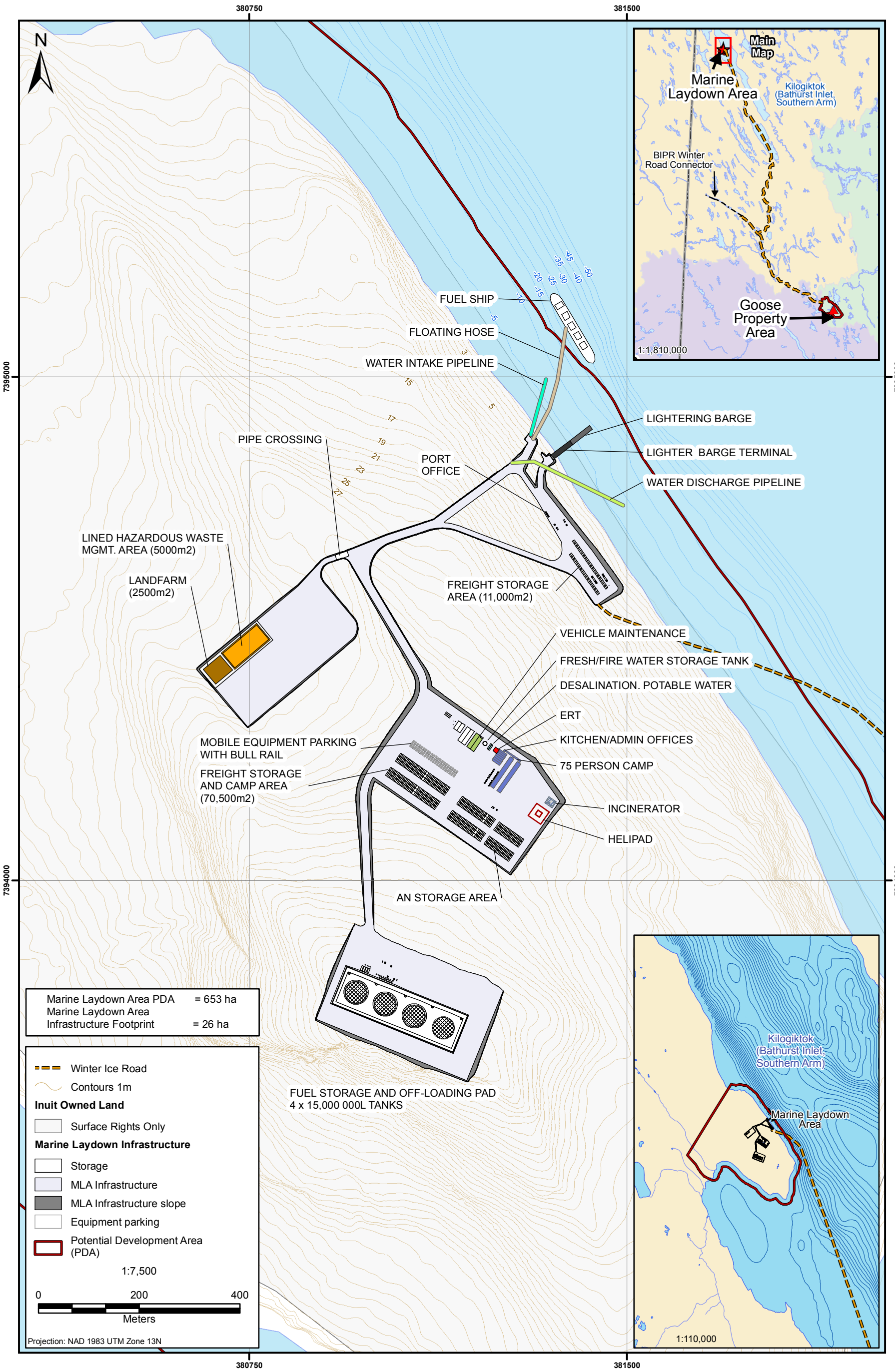
construction. Findings from these studies will be used to inform reclamation planning as appropriate.

Subsequently, the Nunavut Impact Review Board (NIRB) Final Hearing Report encouraged Sabina to consider additional mitigation and monitoring for the protection of vegetation and additional measures to limit potential impacts due to the introduction of invasive species from construction and clearing operations.

Since the FEIS Final Hearing, and in recognition of the NIRB's concerns, Sabina has developed this Vegetation Monitoring Plan (the Plan) which is in line with commitment GN-C-25.

GIS # BR_FEIS_NA_tab_MLASiteLayout_v1

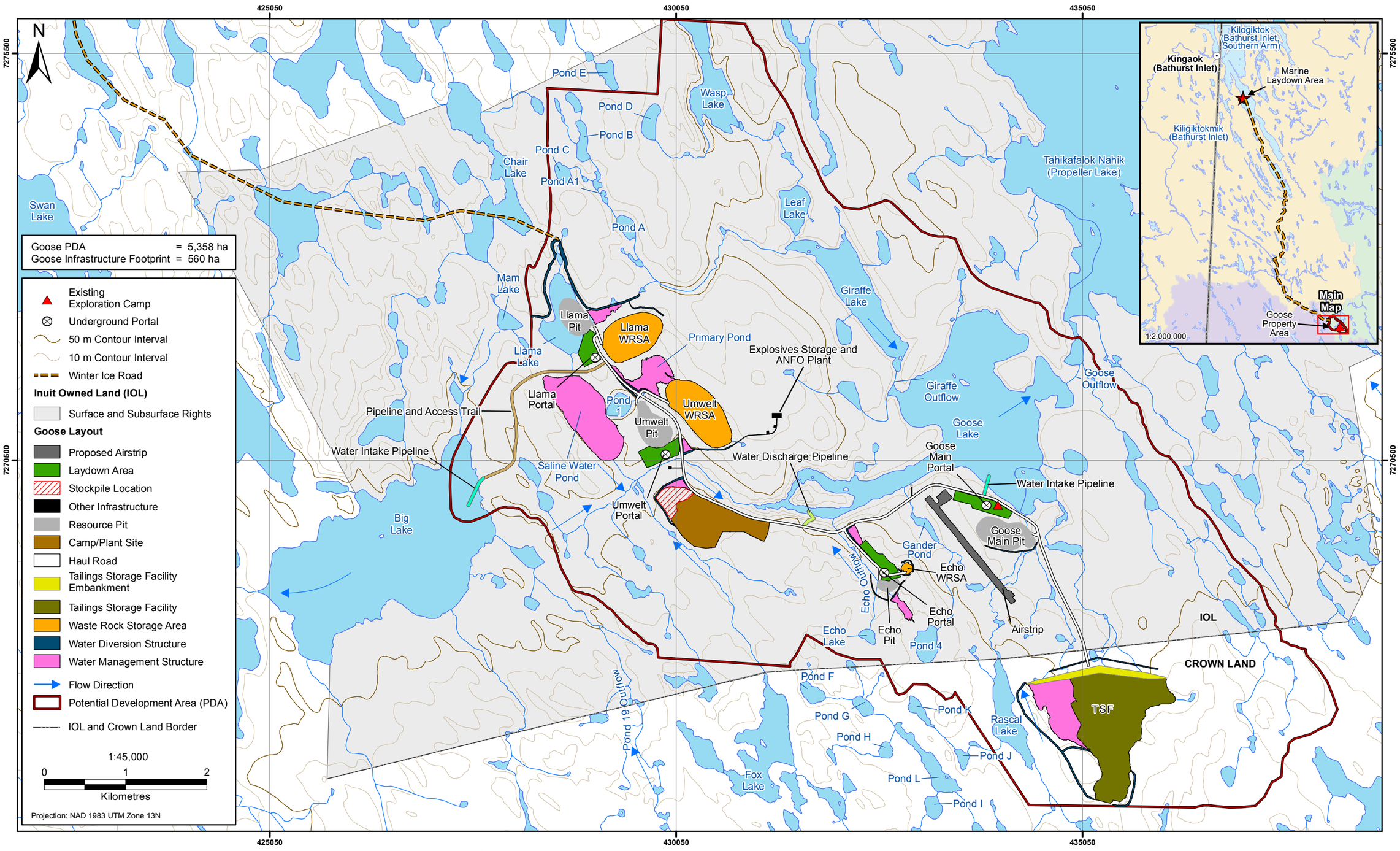
October 21 2015



Sabina GOLD & SILVER CORP.

Figure 1

Potential Development Area and Layout
Marine Laydown Area



Sabina GOLD & SILVER CORP.

Figure 2

Potential Development Area and Infrastructure Areas - Goose Property

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October 13 2015

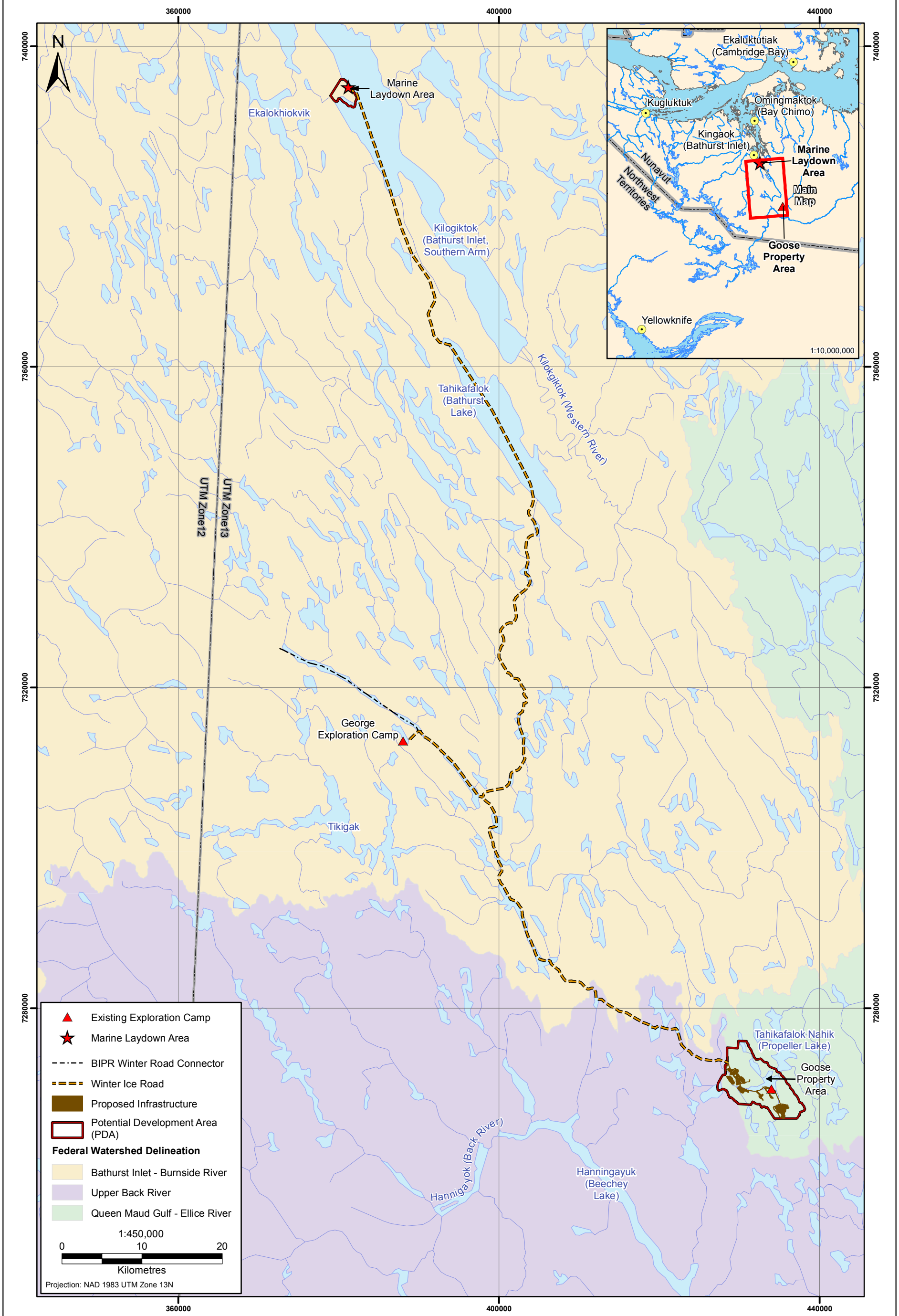

Figure 3

Sabina
GOLD & SILVER CORP.

Winter Ice Road Corridor Overview

2. Incorporation of Inuit Qaujimajatuqangit Principles

Sabina acknowledges the following Inuit Qaujimajatuqangit (IQ) principles, as described by the Government of Nunavut:

1. Inuuqatigiitsiarniq - Respecting others, relationships, and caring for people.
2. Tunnganarniq - Fostering good spirit by being open, welcoming, and inclusive.
3. Pijitsirniq - Serving and providing for family and/or community.
4. Aajiiqatigiinniq - Decision making through discussion and consensus.
5. Pilimmaksarniq/Pijariuqsarniq - Development of skills through practice, effort, and action.
6. Piliriqatigiinniq/Ikajuqtigiinniq - Working together for a common cause.
7. Qanuqtuurniq - Being innovative and resourceful.
8. Avatittinnik Kamatsiarniq - Respect and care for the land, animals, and the environment.

IQ values have helped guide Sabina's decision making for the Project and have been incorporated into the design of the Company's overall Project management approach. Table 3.1-2 in FEIS Volume 3, Chapter 3 outlines the ways in which IQ values have been incorporated into the Project. Furthermore, Sabina actively worked to collect and incorporate regional and Project-specific TK in addition to scientific knowledge throughout the FEIS. This information has also been used to inform Sabina's approach to the terrestrial environment section of the FEIS.

3. Community Engagement and Traditional Knowledge

Sabina initiated a comprehensive community engagement program in the Kitikmeot Region to ensure all regional residents were provided with opportunities to learn about the Project and provide feedback. Likewise, a considerable amount of TK was collected by Sabina and integrated into the FEIS submission. The following reports were prepared by Sabina and later reviewed for TK specific information related to Valued Ecosystem Component (VEC) features:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project; Naonaiyaotit Traditional Knowledge Project (NTKP)* (KIA 2012) (FEIS Appendix V3-3A);
- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014)* (KIA 2014) (FEIS Appendix V3-3B);
- *Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (FEIS Appendix V3-3C); and*
- *Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut (FEIS Appendix V3-3D).*

Example, in response to TK and a request by the KIA, the WIR north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones identified during two local focus group workshops (Cambridge Bay Hunter Focus Group 2012; Kugluktuk Hunter Focus Group 2012). This request was made during review of the DEIS and was captured, and honoured, in commitment (KIA-5 from PHC Report).

Sabina is committed to considering and incorporating TK into the Plan. The incorporation of TK will occur throughout all stages of the Plan, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs to obtain feedback.

4. Existing Environment and Baseline Information

Vegetation was considered a VEC in the FEIS (Volume 5, Chapter 4). Baseline studies to characterize the baseline vegetation present within the regional and local area of the Project were carried out in 2012. The focus of these studies was on ecosystems, habitat, and vegetation identified by Inuit, scientists, regulators, or the public as ecologically, socially or culturally important. Vegetation information (e.g., rare plant species/communities) was used to inform the operations footprint with the objective to avoid sensitive species-rich plant communities, and areas with high rare plant potential, where possible. For example, as previously mentioned, the WIR north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones in response to TK and a request by the KIA.

The vegetation Local Study Area (LSA) that was established for the baseline study compromises a total of 134,370 ha. The LSA was divided into the following three sub-areas:

- Goose Property Sub-area (32% of LSA);
- Winter Road Sub-area (62% of LSA);
- Marine Laydown Sub-area (6% of LSA);

This information is provided in the 2012 Ecosystems and Vegetation Baseline report (Rescan 2013a, FEIS Appendix V5-4a) and forms the basis for evaluating potential effects of the Project on ecosystems, vegetation, and special landscape features. As outlined in the 2012 Ecosystems and Vegetation Baseline Report (FEIS Appendix V5-4A), extensive baseline studies were conducted; some highlights include:

- Conducting soils and vegetation mapping of a very large local study area of 134,370 ha defined by the local the watersheds;
- Developed an ecological classification system for the area that links soil types with vegetation communities;
- Classified terrain, soils and ecological communities for the entire LSA;
- Conducted 817 field plots to ground truth the mapping, including the project development area, marine laydown area, winter road and control sites; and
- Conducted rare and invasive plant surveys using a qualified botanist.

Table 4-1 provides a summary of ecosystems mapped within the LSA. Table 4-2 provides a list of terrestrial vegetation identified through TK.

Table 4-1. Ecosystem Classes in the Local Study Area

Ecosystem Class	Area (ha)	% of Total LSA
Bedrock	10253	7.6
Disturbed/Barren	190.7	0.1
Esker	1337.1	1.0
Freshwater	24425.1	18.2
Marine	539.9	0.4
Riparian	1445.4	1.1
Riparian (marine)	439.6	0.3
Tundra	74393.6	55.4
Tundra (marine)	7278.4	5.4
Wetland	12760.7	9.5
Wetland (marine)	1305.6	1.0
TOTAL	**134369.1**	**100**

Table 4-2. Ecosystem Classes in the Local Study Area

Inuinnaktun Name(s)	English Name	Latin Name(s)	Specific Use/Part of Plant
Kublak[2]	Bear Berry	*Arctous rubra, A. alpina*	Fruit
Kabluk	Bear Berry	*Arctous rubra, A. alpina*	Fruit
Kublakot	Bear Berry	*Arctous rubra, A. alpina*	Leaves
Akpik; Aaukpik[1]	Cloudberry	*Rubus chamaemorous*	Fruit
Paungak; Paungan[1]; Paurnngait[2]	Crowberry; Blackberries	*Empetrum nigrum*	Fruit
Mahok	Liquorice root	*Hedysarum alpinum*	Root
Qunguliit[2]	Mountain Sorrel	*Oxyria digyna*	Leaves
Kimminait[2]	Bog cranberry	*Vaccinium vitis-idaea*	Fruit
Kigutangirnait[2]	Blueberries	*Vaccinium uliginosum*	Fruit
	Willow	*Salix* spp.	Bark
Qijuktaaqpait[2] (Baffin)	Northern Labrador tea	*Ledum palustre* subsp. *Decumbens*	
Kangayot[1]	Cottongrass	*Eriophorum* spp.	Seed heads
Kablakot[1]	Unknown; plant used for tea	Unknown	
Avalakiak[1]	Unknown; low-growing plant for starting fires	Unknown	
Eehoktin[1]	Unknown; small plant for starting fires	Unknown	
Aatogoayak[1]; igloohoutinnik[1]	Unknown; mushrooms eaten by caribou	Unknown	

[1] From the vocabulary in Section 11 of the NTKP report (KIA 2012). Where only the Inuinnaqtun names are provided, it is difficult to correlate them with corresponding English or Latin names; [2] Inuktitut names from Mallory and Aiken (2004)

5. Objectives

The main objectives of the Vegetation Monitoring Plan are:

- To measure plant species abundance and diversity at vegetation plots along the WIR, MLA, and Goose site;
- Measure direct loss of plant communities as result of the construction and operations of Project infrastructure at Goose Property, the MLA, and WIR;
- Measure plant health (vigour) as part of the vegetation monitoring program;
- Measure distribution and abundance of non-native invasive plant species;
- Monitor and evaluate the effectiveness of mitigation measures;
- Identify unanticipated effects; and
- Provide an early warning of undesirable change in the environment and to inform adaptive management measures.

6. Monitoring Approach

6.1 VEGETATION MONITORING

Vegetation monitoring will occur during Construction, Operations, and Closure of the Project. It will be performed every three years during the flowering period (i.e., July–August) for identification purposes, and for contaminant analysis (presence of berries). The program will focus on objectives noted in Section 5, with heavy focus on vegetation health and invasive plant species. Fugitive dustfall will be documented as part of the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) and its relevance considered in the Vegetation Monitoring Plan.

6.1.1 Vegetation Health

Vegetation health monitoring will include two components:

1. Vegetation abundance, richness (diversity), vigour (health); and
2. Contaminant (metal) levels in vegetation.

The first will be conducted through permanent monitoring plots in a variety of habitat types (minimum two plots per habitat type) within the Project area and in control areas within the Regional Study Area. Within each of the plots species richness (diversity), and abundance (percent cover), and vigour of each species (in each strata) will be estimated, in addition to the documentation of any rare plants (if present). The second part of vegetation health monitoring will involve the collection of vegetation samples (lichen and berry-producing plants) which will be sent to accredited laboratories for chemical analysis (Table 6-1).

Table 6-1. Vegetation Monitoring: Vegetation Health

Indicator	Vegetation Health
Measurable Parameter	1) Vegetation diversity (richness), and abundance, and 2) Contaminant (metal) levels in lichen and berry-producing plants.
Key Project Interaction	Effluent, dust and emissions released into the environment have the potential to impact vegetative health. Dust affects the survival of certain plant species (leading to changes in species diversity and abundance). The deposition of contaminants (metals) in the dust, which are absorbed by plants, can enter the food chain via ingestion by animals and humans, and may have an effect on health.
Goal	The project will not result in a significant increase in contaminant uptake in vegetation.
Objective	To quantify through continued monitoring throughout the duration of the Project: 1) vegetation abundance (percent cover), diversity (richness) and vigour (vegetation health), and 2) Contaminant (metal) levels in lichen (caribou forage) and berry-producing plants (traditional use); through continued monitoring throughout duration of the Project.
Threshold	Thresholds for vegetation diversity and abundance to be determined.
Scope of Monitoring Work	Regional Monitoring: Assess baseline vegetation composition/species richness, abundance, and vigour, and contaminant (metal) levels in lichen and berry-producing plants

6.1.2 Invasive Plants

Invasive plant species monitoring will occur during Construction and Operations of the Project. Monitoring will be completed within the Goose Property, MLA and WIR footprint and adjacent habitats to ensure that no invasive plant species are introduced to the Arctic environment. Invasive plant observations will be conducted every three years in conjunction with the vegetation monitoring, and informal observational surveys will occur on an ongoing basis and additional surveys may be triggered by

observations of invasive species (Table 6-2). Prior to Project initiation, staff will be trained on invasive plant establishment pathways, species identification (e.g., photos of common invasive plants in Nunavut) and mitigation measures (see Section 8). Should invasive plant species be found, these will be immediately reported to environment department and be destroyed and, if the pathway of entry can be determined, changes will be made to reduce/eliminate the possibility of further introductions.

Table 6-2. Vegetation Monitoring: Invasive Plant Species

Indicator	Invasive Plant Species
Measurable Parameter	Occurrence of invasive plant species
Key Project Interaction	Introduction of invasive plant species
Goal	The Project will not introduce invasive plant species to the RSA
Objective	To prevent the occurrence/establishment of invasive plant species
Threshold	No introduction of invasive plant species as a result of Project activities
Scope of Monitoring Work	Local monitoring: Surveillance of Project footprint and adjacent habitat, surveys to be conducted every 3 years in conjunction with vegetation monitoring or triggered by observations invasive plants

6.1.3 Dust Monitoring

The Mine is expected to create fugitive dust through various sources, primarily by blasting and crushing rock, and road construction and traffic. As part of the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) dustfall monitoring will be conducted via sampling between June and September for a number of experimental and control areas within the LSA to determine the level of dust deposition associated with the mine site and WIR (Table 6-3).

Dust monitoring will be carried out during the Construction and Operation phases of the Project. Sampling locations will be situated at varying distances from the Project site to determine spatial extent of dust fall. Additional details can be found within the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).

Table 6-3. Vegetation Monitoring: Dust Fall

Indicator	Dust fall
Measurable Parameter	Surveillance and monitoring
Key Project Interaction	Dust fall has potential to affect vegetation health, as well as forage palatability for caribou
Goal	The Project will not have a significant effect on palatability of vegetation for caribou
Objective	Quantify: The magnitude of dust fall on vegetation surrounding mine infrastructure and WIR; distance from point sources and roadway at which dustfall is measured; and seasonal variation in dust fall through continued monitoring of Project.
Threshold	Refer to Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17)
Scope of Monitoring Work	Refer to Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17)

7. Roles and Responsibilities

Sabina's Environmental Department is responsible for monitoring compliance with applicable regulations and permit requirements. The responsibility of implementation of mitigation measures rests with the VP Operation.

Compliance is achieved through ongoing monitoring, and development and implementation of operational standards, procedures, and employee training.

8. Mitigation and Adaptive Management

The following mitigation measures and best management practices will reduce the potential for loss of vegetation:

- The Project has been designed to employ winter road-only access corridors that travel primarily over lakes and rivers, thereby minimizing potential negative effects on terrestrial vegetation and limiting dust emissions.
- Minimize the Project footprint, thus minimizing the disturbance to the terrestrial environment.
- The clearing of vegetation and removal of soil from unique landscape features will be minimized, including eskers, wetlands, exposed bedrock, cliffs, etc., which often provide high value habitat to wildlife and may support sensitive vegetation communities and growth forms. Exceptions to this management will only be considered after assessing and weighing all implications.

The following mitigation measures and best management practices will reduce the potential for degradation of vegetation:

- The design of the WIR has been optimized to minimize the distance travelled which will minimize emissions.
- All vehicles and machinery will restrict travel to designated road surfaces; thus avoiding creation of ruts in vegetated ecosystems.
- Loads carried by vehicles will be enclosed or covered when possible.
- Regular wheel-cleaning will be undertaken of vehicles travelling around and leaving the site.
- Equipment being brought to site will be inspected for any invasive plant species and be cleaned before being brought on to site.
- Vehicles will be driven at designated speeds on the WIR.

The following mitigation measures will be implemented to prevent the establishment of invasive species:

- Staff education on how invasive plant species can be introduced into an area.
- Staff education on how to identify common invasive plant species.
- Staff education on their individual roles in preventing invasive plant establishment.
- Ensuring vehicles and machinery are clean prior to entry on-site.
- Minimizing ground disturbance, where possible.
- Maintaining a healthy vegetation cover to prevent unwanted vegetation establishment.
- Immediate reporting of any invasive plant sightings to the environmental department.

The need for any corrective actions to on-site management or installation of additional control measures will be determined on a case-by-case basis. Indications of the need for corrective actions and additional control measures may include:

- If vegetation monitoring threshold limits are reached;

- If results from the Site Water Monitoring and Management Plan show non-compliance related to tundra discharges; or
- If results from the Wildlife Mitigation and Monitoring Program Plan, which will monitor select wildlife species and habitat around the mine infrastructure and activities show adverse effects to wildlife or wildlife habitat.

9. Quality Assurance and Quality Control

Quality assurance and quality control will include the following:

- field plant ecologists will be familiar with identification of subarctic plants and plant sampling techniques. Examples of estimating plant cover will be reviewed and rules applied consistently;
- data are to be downloaded from the field immediately upon returning to camp and manually checked by qualified personnel; and
- data will be downloaded consistent with detailed written operating instruction from qualified.

Data analysis will focus on evaluating trends and determining if there are statistical differences in plant species composition and abundance as a function of distance from the Mine and from construction through closure. The variables measured will include the following:

- plant species composition, as defined by plant species richness; and
- plant species abundance, as defined by mean percent species cover.

10. Reporting

An annual Vegetation Monitoring Summary Report for the Project will be completed for the mine, WIR, and associated infrastructure. The purpose of this report is to summarize the annual data collected from the Plan, and to identify and communicate natural variation and potential mine-related changes in vegetation populations and health.

The annual report will provide the objectives, methodology, historical and current year results, as well as a comparison to impact predictions, mitigation and management recommendations of each monitoring program. As the accumulation of data increases, trends will also be reported. The report will be submitted to the KIA, GN, and the NIRB.

11. References

Cambridge Bay Hunter Focus Group. 2012.

Kugluktuk Hunter Focus Group. 2012.

Mallory, C. and S. Aiken. 2004. *Common plants of Nunavut.* Nunavut Department of Education.

31. CONCEPTUAL FISH-OUT PLAN (NEW)

BACK RIVER PROJECT:
Conceptual Fish-out Plan

February 2017

BACK RIVER PROJECT
CONCEPTUAL FISH-OUT PLAN

Table of Contents

Table of Contents i
List of Figures ii
1 Introduction 1
1.1 PURPOSE 1
2 Objectives 4
3 Incorporation of IQ Principles 5
4 Community Engagement and Traditional Knowledge 6
5 Scientific Methods 8
5.1 STUDY DESIGN 8
5.1.1 Fish Community 8
5.1.2 Aquatic Biology/Limnology 9
5.1.3 Physical Habitat Inventory 9
5.2 FISHING METHODS 9
5.3 BIOLOGICAL DATA COLLECTION 10
5.3.1 Marking Phase 10
5.3.2 CPUE and Final Removal Phases 10
5.4 FISH TRANSFERS 10
5.5 DIVING BIRD AVOIDANCE 10
5.6 POTENTIAL OPTIONS FOR COMMUNITY INVOLVEMENT 11
5.6.1 Fishing Crew Members 11
5.6.2 Fish Processing Crews 11
5.6.3 Fish Camps 11
5.7 PROCESSING AND DISTRIBUTION 11
5.7.1 Processing 11
5.7.2 Storage 12
5.7.3 Distribution 12
6 Proposed Work Plan 13

6.1 TENTATIVE SCHEDULE 13
6.1.1 Phase 1 (Marking) 13
6.1.2 Phase 2 (Catch-Per-Unit-Effort) 13
6.1.3 Phase 3 (Final Removal) 14
6.2 ROLES AND RESPONSIBILITIES 14
7 Reporting 15
8 References 16

List of Figures

FIGURE **PAGE**

Figure 1. Project Overview 2
Figure 2. Goose Property – Lakes to be Dewatered 3

1 Introduction

The proposed Back River Project (the Project) lies in western Nunavut in the continuous permafrost zone of the continental Canadian Arctic. It is composed of two main areas: the Marine Laydown Area (MLA) and the Goose Property Area (Figure 1).

The MLA is located on the western shore of Southern Bathurst Inlet, approximately 130 kilometres (km) north of the Goose Property. Here, the Project will sealift materials and supplies through Bathurst Inlet to the MLA annually during the open-water season only. Ships could travel via either the eastern or western portion of the Northwest Passage and then south in to Bathurst Inlet. It is estimated that between three and five vessels will report to the MLA for annual resupply and fuel as part of the Project. Key Project infrastructure for the Back River MLA includes the following:

- a temporary Lightering Barge Terminal;
- water intake pipe and desalination discharge pipe; and
- the winter road where it crosses the Bathurst Inlet from the MLA to the Goose Property Area.

Mining will be completed using both open pit and underground methods. The Goose Property includes four open pits and four underground developments and the Project has an estimated mine life of 10 years with a total production of 19.8 million tonnes (Mt) of ore. Key Project infrastructure at the Goose Property includes:

- four open pits, and four underground mines (Umwelt, Llama, Goose Main, and Echo);
- four waste rock storage areas;
- tailings storage facility;
- underground mining pads;
- a stockpile;
- camp;
- process plant; and
- airstrip and roads, including a culvert for the haul road crossing.

1.1 PURPOSE

The current mine plan development will involve the dewatering of Llama Lake and Umwelt Lake (Figure 2); a fish-out program will be carried out prior to dewatering. The fish-out program will follow Fisheries and Oceans Canada (DFO's) General Fish-out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut (Tyson et al. 2011). This Conceptual Fish-out Plan (the Plan) provides a preliminary overview of Sabina's proposed fish-out program. It is important to note that this plan will be refined after further engagement with communities and DFO. During the FEIS Final Hearing, Sabina and DFO jointly submitted the following commitment (DFO-C-2):

> The Proponent will continue to work with Fisheries and Oceans Canada (DFO) and the impacted communities at the regulatory approval stage to develop a detailed fish-out and offsetting plan.

GIS # BR_FEIS_NA_tab_WinterIceRoadCorridor_v1

May 20 2015

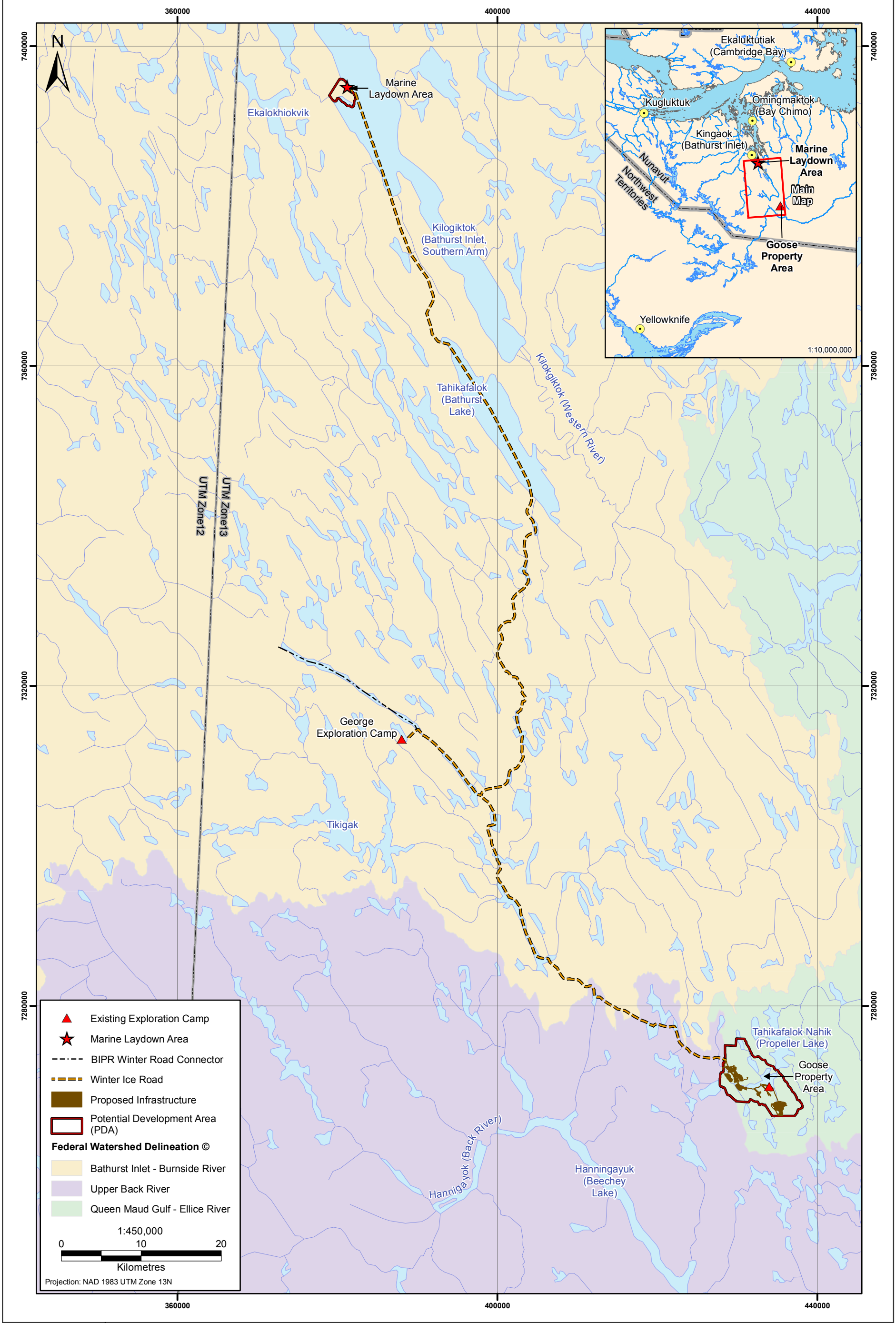

Figure 1

Project Overview

Sabina
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N

427500 430000 432500

7272500 7270000

Goose PDA = 5,358 ha
Goose Infrastructure Footprint = 560 ha

- Culvert
- Lakes to be dewatered
- Goose Layout
- Existing Exploration Camp
- Treated Effluent Water Discharge * Construction Phase Only
- Underground Portal
- 10 m Contour Interval
- Service Road
- Haul Road
- Water Diversion Structure
- Winter Ice Road
- Water Intake Pipeline
- Water Discharge Pipeline
- Flow Direction
- Potential Development Area (PDA)
- Inuit Owned Land (IOL)

1:20,000
0 0.5 1
Kilometres

Projection: NAD 1983 UTM Zone 13N

Mam Lake
Llama Pit
Llama Lake
Llama WRSA
Primary Pond
Llama Portal
Giraffe Lake
Giraffe Outflow
Pipeline and Access Trail
Umwelt Lake
Umwelt WRSA
AN Storage and AN Facility
Umwelt Pit
Attituq (Goose Lake)
Saline Water Pond
Umwelt Portal
Water Intake Pipeline
Effluent Discharge Pipeline
Goose Portal
Ore Stockpile
Goose Main Pit
Goose Plant Site
Echo WRSA
Gander Pond
Treated Effluent Water Discharge *
Echo Outflow
Airstrip
Echo Portal
Echo Pit

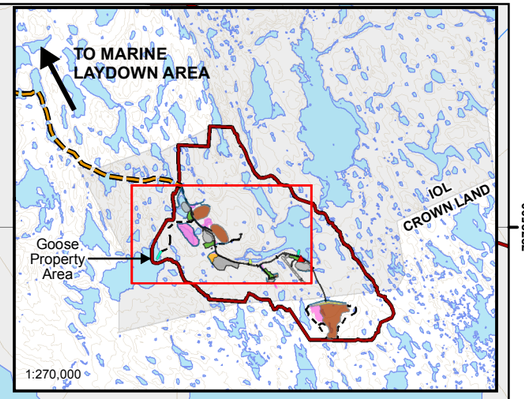

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Figure 2

Goose Property - Lakes to be dewatered

2 Objectives

The main objectives of the Conceptual Fish-out Plan are to remove and use as many fish as practical from both Llama and Umwelt lakes, and to collect data to fulfill DFO's requirement to provide detailed information on fish communities and ecological conditions of Arctic lakes. The General Fish-out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut (General Fish-out Protocol; Tyson et al. 2011) identifies the following guiding objectives:

- To engage local communities and ensure that fish harvested during the fish-out are fully utilized by traditional resource users; and
- To collect relevant ecological information (biological, limnological, and habitat) on Arctic lakes in the Northwest Territories and Nunavut to increase the level of understanding of this ecosystem.

While addressing these guiding objectives, the main goals of the Project fish-out are to:

- collect and incorporate community input into the Plan, and use local community members as part of the fish-out crew, where feasible;
- remove and utilize the fish from Llama and Umwelt lakes according to criteria set out in DFO's General Fish-out Protocol; and
- conduct the fish-out by collecting appropriate data in a manner consistent with the General Fish-out Protocol.

3 Incorporation of IQ Principles

Sabina acknowledges the following Inuit Qaujimajatuqangit (IQ) principles, as described by the Government of Nunavut:

1. Inuuqatigiitsiarniq - Respecting others, relationships and caring for people.
2. Tunnganarniq - Fostering good spirit by being open, welcoming and inclusive.
3. Pijitsirniq - Serving and providing for family and/or community.
4. Aajiiqatigiinniq - Decision making through discussion and consensus.
5. Pilimmaksarniq/Pijariuqsarniq - Development of skills through practice, effort and action.
6. Piliriqatigiinniq/Ikajuqtigiinniq - Working together for a common cause.
7. Qanuqtuurniq - Being innovative and resourceful.
8. Avatittinnik Kamatsiarniq - Respect and care for the land, animals and the environment.

IQ values have helped guide Sabina's decision making for the Project and have been incorporated into the design of the Company's overall Project management approach. Table 3.1-2 in FEIS Volume 3, Chapter 3 outlines the ways in which IQ values have been incorporated into the Project. Furthermore, Sabina actively worked to collect and incorporate regional and Project-specific Traditional Knowledge (TK) in addition to scientific knowledge throughout the FEIS. This information has also been used to inform Sabina's approach to the freshwater aquatic environment section of the FEIS.

4 Community Engagement and Traditional Knowledge

Sabina initiated a comprehensive community engagement program in the Kitikmeot Region to ensure all regional residents were provided with opportunities to learn about the Project and provide feedback. Likewise, a considerable amount of TK was collected by Sabina and integrated into the FEIS submission. The following reports were prepared by Sabina and later reviewed for TK specific information related to Valued Ecosystem Component (VEC) features:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project, Naonaiyaotit Traditional Knowledge Project (NTKP)* (KIA 2012) (FEIS Appendix V3-3A);
- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014)* (KIA 2014) (FEIS Appendix V3-3B);
- *Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (FEIS Appendix V3-3C); and*
- *Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut (FEIS Appendix V3-3D).*

Throughout these engagement activities, communities provided comments and expressed interest in the planned fish-out and dewatering of waterbodies. Their interest led to a number of suggestions and a discussion of ideas on how to best utilize the fish resource and conduct dewatering activities. A summary of topics raised during public consultation and engagement can be found in the FEIS Appendix V3-1G.

Ideas raised during the community meetings included, but were not limited to, the following:

- Harvest fish during times when the fish can be used by the communities, and will stay fresh longer.
- Have a community member participate in both the Bernard Harbour offsetting and the planned fish-out.
- Use all fish for communities. Fish of lower quality (fish waste and small fish) can be provided to trappers and dog handlers for bait and food.
- Involve community members in all phases of the fish-out.
- Use methods that have been proven to work.
- Continue to involve communities during detailed design of the fish-out plan and provide adequate time for notification.

This Plan represents an adaptive approach to understanding the effects of the Project on the landscape and the species that live there. In this context, the Plan is part of a continually evolving process that relies not only on the efficacy of data collection and analytical results, but is also dependent on feedback from the communities, government, Aboriginal groups, and the public. Having an adaptive and flexible program allows for appropriate and necessary changes to the design of monitoring studies, and the mitigation and monitoring plans. Some changes may come about through the observation of unanticipated effects or inadequacies in the sampling methods to detect measurable effects. Other changes may result from ecological knowledge acquired through working with Aboriginal community members and discussions with elders, both in the field and through workshops.

Sabina is committed to considering and incorporating TK into the Plan. The incorporation of TK will occur throughout all stages of the Plan, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs to obtain feedback.

5 Scientific Methods

5.1 STUDY DESIGN

The fish-out will follow the framework and general protocols described in the General Fish-out Protocol (Tyson et al. 2011). An overview of the conceptual study design is provided below. Detailed methods, sampling protocols, and schedules will be determined in consultation with local communities and DFO, and provided in a detailed fish-out plan before the program is initiated.

At completion of the fish-out, through baseline studies and additional work conducted during the fish-out, there will be sufficient information collected within the affected area to describe the following:

1) fish community;
2) aquatic biology/limnology; and
3) physical habitat inventory.

Baseline information for each of these three components was collected as part of FEIS baseline reporting for the Project, which includes the following;

- *Back River Project: 2010 Fish and Fish Habitat Baseline (Rescan 2010, FEIS Appendix V6-6A);*
- *Back River Project: 2011 Fish and Fish Habitat Baseline (Rescan 2012a, FEIS Appendix V6-6B);*
- *Back River Project: 2012 Fish and Fish Habitat Baseline (Rescan 2012c, FEIS Appendix V6-6C);*
- *Back River Project: 2010 Lake Water and Sediment Quality Baseline Report (Rescan 2011, FEIS Appendix V6-3A);*
- *Back River Project: 2011 Freshwater Baseline Report (Rescan 2012, FEIS Appendix V6-3B);*
- *Back River Project: 2012 Freshwater Baseline Report (Rescan 2013a, FEIS Appendix V6-3C); and*
- *Back River Project: 2013 Freshwater Baseline Report (Rescan 2013b).*
- *Back River Project: 2015 Freshwater Baseline Report (Rescan 2015b)*
- *Back River Project: 2015 Fish and Fish Habitat Baseline Report (Rescan 2015c)*

5.1.1 Fish Community

The goal of the marking and catch-per-unit-effort (CPUE) phases is to estimate the population size and biomass of the fish community using CPUE and is intended to remove a substantial proportion of the large bodied fish biomass prior to and dewatering activity in Llama and Umwelt lakes. Sampling locations during the CPUE phase will be chosen randomly, or using a stratified random sampling design.

The final removal phase will begin immediately following the CPUE phase and will consist of a targeted, non-random sampling program that will target habitats likely supporting fish as determined during the CPUE phase with the goal of removing fish remaining in the lakes. Additional fish capture methods (e.g., electrofishing, angling, set lines, minnow traps, seine nets, fyke net traps) will be deployed where necessary to also target small-bodied fish and species not effectively captured using gill nets. The final removal may include fishing efforts concurrent with initial phases of dewatering and is expected to be completed by mid to late summer.

5.1.2 Aquatic Biology/Limnology

The Aquatic Biology and Limnology component of the fish-out program includes physical limnology measurements (dissolved oxygen profiles and Secchi depth), water quality (including phosphorous, nitrogen, total dissolved solids, nutrients, and organic carbon), chlorophyll *a*, and zooplankton community samples. Samples described above will be collected before the fish-out (late spring/early summer) and during the fish-out program. Benthic invertebrate sampling will be collected once from four different depth intervals late-summer and sampling methods will be the same as those outlined in the Aquatic Effects Management Plan (FEIS Addendum Volume 10, Chapter 19). Information on habitat (e.g., substrate, depth) will be collected at all sampling locations.

5.1.3 Physical Habitat Inventory

A habitat inventory of the lake was conducted as part of the multiple fish and fish habitat baseline studies from 2010 through 2014. Habitat inventories included bathymetric surveys, shoreline and deep water substrate characterization, and qualitative shoreline habitat mapping. The habitat maps and classifications will be used to confirm all habitat types are sampled during the CPUE phase, and may be used to develop a stratified random sampling design for fishing gear deployment. No additional habitat inventory surveys will be required to satisfy the fish-out requirements. Additional studies may be considered to support complementary offsetting measures.

5.2 FISHING METHODS

For the marking phase, angling is the preferred capture method over gillnetting. Angling using single barbless hooks will minimize capture and marking mortality, reduce gear shyness for the CPUE and final removal phases and reduce sampling bias associated with gillnetting. Based upon past mark-recapture studies in the Arctic, fisheries biologists have observed greater success capturing fish by angling over gillnetting. Angling has been shown to be less labour- and gear-intensive, capture target species more efficiently, and enable captured fish to be released in better condition. The marking phase is essential because a mark-recapture population estimate is a key metric in the determination of fish-out progression and success.

Based on the General Fish-out Protocol and data from other Arctic fish-outs, the CPUE phase will use standardized multi-panel gill nets as the primary method for fish capture with standard sized Gee minnow traps to capture any smaller bodied fish. Previous fish-outs have shown that these methods are the most effective for capturing adult and large-bodied fish, which will be processed and distributed as food (see Section 5.7 Processing and Distribution).

All gillnets will be equipped with a sinking line and constructed of six panels of monofilament with stretched mesh-sizes of 102 mm (4”), 76 mm (3”), 51 mm (2”), 38 mm (1½”), 25 mm (1”), and 13 mm (0.5”). Gee minnow traps are constructed of 1/4" (6.4 mm) square galvanized wire mesh and measure 16" (42 cm) long and 9" (23 cm) wide with a 7/8" (22 mm) entrance hole and may be baited. The locations of the gear will be chosen at random, or using a design where the lake is split into habitat units and then gear is placed randomly within each of those habitat units (stratified random design). The quantity of sampling gear may vary through the CPUE phase depending on catch rates, as long as the size, panel order, bait and type of gear remains the same throughout this phase. The sampling will follow a random or stratified random design to allow for later calculation of population sizes, as per the General Fish-out Protocol.

During the final removal phase, gill nets will continue to be used, and the mesh sizes of nets may be adjusted to target the strongest size classes of fish remaining in the lake. Other methods, such as angling, baited traps, fyke nets, beach seines, set-lines, or electrofishing may also be used to capture as many of the remaining fish as practical, depending on conditions during sampling. Where possible and agreed upon with DFO, feedback on fishing methods and community involvement will be considered and incorporated into the fish sampling design for each phase of the fish-out.

5.3 BIOLOGICAL DATA COLLECTION

5.3.1 Marking Phase

During the marking phase, each fish captured will be identified to species, and measured for fork length to the nearest 1 mm to minimize handling/processing time. All target species greater than 250 mm in length will be marked with a uniquely numbered T-bar anchor tag (30 mm in length) inserted through the musculature under the dorsal fin. A fin punch will also be applied to all captured fish to provide a secondary mark in the event of tag loss, and to mark fish less than 250 mm. Attempts will be made to minimize stress to fish and to return the marked fish to the water as soon as possible. Photographs will be taken of representative members of the fish populations.

The fate of each fish – marked and released live, killed by capture or handling (and not marked), or captured but lost before it could be marked – will be recorded as part of a fate table to be constructed for each phase of the program.

Additional data may be collected from any fish mortalities during capture and handling, including ageing structures (otoliths, fin rays and/or scales, depending on the fish size and fate), sex, sexual maturity, reproductive status, gonad weight (for calculation of gonadosomatic index), liver weight (for calculation of hepatosomatic index) and the presence of external deformities, erosions, lesions and tumours (DELT).

5.3.2 CPUE and Final Removal Phases

All fish captured during the CPUE and final removal phases will be counted, identified to species, length and weight measured and distributed as described in Section 5.7. Additional life history data will be collected on all large fish and from a sub-sample of small, younger fish. The data recorded from fish will include length (total or fork; to nearest millimeter), weight (to nearest gram), and where applicable, the sex, maturity, and ageing structure (otoliths and the first four leading pectoral fin rays) and the presence of external deformities, erosions, lesions and tumours (DELT). Tissue samples (e.g., muscle for metal concentrations, stomachs for diet analysis) may also be collected during fish-outs to gather additional biological data in the study area. Whether or not tissue samples will be collected and analyzed for the Project fish-out will be discussed with DFO and local communities before the final detailed fish-out plan is prepared.

Details of any additional studies to be considered for complementary offsetting measures will be developed as part of the detailed fish-out plan.

5.4 FISH TRANSFERS

In accordance with the objective to fully utilize fish harvested during the fish-out, it is expected that all large fish captured will be sacrificed, and distributed to the communities. Although the catch from fish-outs can potentially be transferred alive to another waterbody, this method of fish disposal is the least desirable, as it may cause adverse effects to the remaining population in the lake where the fish are transferred. According to the General Fish-out Protocol, live transfer should only be considered when the fish-out is conducted in a small, isolated portion of a lake and fish are transferred to a much larger waterbody (>1000 ha). Since neither Llama or Umwelt lakes fit this criteria, nor is there a lake of significant size close to them, a fish transfer will not be utilized.

5.5 DIVING BIRD AVOIDANCE

Mitigation measures for minimizing mortalities of diving birds will include increasing the visibility of gill nets, use of visual or auditory deterrents to prevent birds from landing on the lake during active gill-netting, monitoring migratory bird usage of the lake and determining high use feeding areas prior to setting gill nets and avoiding these areas, and reporting of by-catch to adjust mitigation measures.

5.6 POTENTIAL OPTIONS FOR COMMUNITY INVOLVEMENT

5.6.1 Fishing Crew Members

Local community members would have the opportunity to participate in fish capture and data collection throughout the fish-out and as field leaders and technicians, based on experience.

During the marking phase, many community members can take part in the three day angling event and receive training on fish mark-recapture methods. During the CPUE and final removal phases, a potential scenario consists of a three-person fishing crew, where the crew lead would be an experienced technician that would operate the boat and record the data, and two local community members would assist with setting and retrieving the fishing gear, and then processing the catch to collect the necessary biological data. Specific staffing of the fish-out crews will depend on the interest and availability of community members with the necessary skills, experience, and safety training.

5.6.2 Fish Processing Crews

Processing fish is a key way to utilize the skills of traditional resource users. Local community members would be responsible for filleting large-bodied, consumable fish captured during the fish-outs. Biological information would be collected by the fishing crews on the boats, but fish would be transferred to processing stations for filleting and packaging as described in Section 5.7. The details of fish processing stations will be developed based on site conditions as part of the detailed fish-out plan.

5.6.3 Fish Camps

Fish camps are a potential component of the fish-out that would allow greater involvement of local communities, especially for youth, Elders, and less experienced fishers. Fish camps would provide an opportunity for traditional resource users to harvest fish. The camps would also create opportunities for education and knowledge transfer among Elders and youth from local communities. Fish caught during the camps could be prepared and consumed at the camp, or transferred to the processing station for packaging and distribution.

If determined to be feasible, the fish camps would be conducted during the early phases of the fish-out, when densities of fish are highest and most of the large fish are being removed (potentially at ice-out of first year). The feasibility of fish camps will be examined by Sabina during the development of the detailed fish-out plan based on logistical details at the Project and through continued engagement on how fish camps can best be incorporated while still satisfying the phased fishing effort requirements of the DFO fish-out protocols.

5.7 PROCESSING AND DISTRIBUTION

5.7.1 Processing

In accordance with DFO criteria, methods for processing the fish will be determined in discussion with the local communities that will use the fish. Large-bodied fish of species that are desired for consumption could be filleted, vacuum-sealed, and then frozen, although alternate options for processing will be considered based on community preferences. Fish not desirable for human consumption (e.g., Slimy Sculpin, Ninespine Stickleback, juvenile fish) could be packaged whole and distributed for use as dog food or trapping bait. Disposal of wastes from fish processing (e.g., guts, un-usable trimmings) will be determined in discussion with DFO and described in the detailed fish-out plan. Wastes from fish processing may be used for dog food, trapping bait, or disposed of within the lake.

Fish will be processed at a designated station. One option is for floating processing stations, which would reduce the potential for wildlife attraction and conflicts, and also facilitate clean-up and waste disposal. Alternatively, a shore-based station could be constructed, which may require protection from wildlife, but would simplify fish storage and transport. Location(s) for the facilities would be determined as part of the detailed fish-out plan in coordination with the construction activities occurring at the site.

5.7.2 Storage

Storage will be determined in discussion with the local communities that will use the fish. A proposed method is to flash-freeze vacuum-sealed fish using dry ice and then transfer the fish to freezers for storage until distribution.

5.7.3 Distribution

Fish will be distributed to communities as soon as practical after processing. Flights that normally fly to communities could carry fish. The fish would then be delivered to a designated distribution facility that may include a storage freezer or shelves for storage of dry or preserved fish. Details of distribution of fish for eating and/or dog food or trapping bait will be determined closer to fish-out implementation to best meet community requests.

6 Proposed Work Plan

6.1 TENTATIVE SCHEDULE

Based on the Site Wide Water Management Report (FEIS Appendix V2-7I) the fish-out may begin once the lakes have been isolated. Both lakes are relatively small and are estimated to contain relatively few fish; as such, it is expected that the fish out will take the duration of one open water season.

In accordance with the General Fish-out Protocol, the fish removal aspects of the fish-out will proceed in three phases:

1. a marking phase;
2. a CPUE phase; and
3. a final removal phase.

The number of days of sampling and specific timing of the CPUE and final removal phases will depend on the catches of fish, as well as on the construction schedule. An estimated schedule based on the anticipated catches from population estimates will be included in the detailed, final fish-out plan. It is currently expected that the fish-out sampling phases and associated limnology and physical habitat data collection will be conducted during the open-water season likely between June and October.

6.1.1 Phase 1 (Marking)

The start of the fish-out marking phase will be contingent on the isolation of the lakes to be dewatered, the ability to safely navigate the lake after ice melt, and the timing of permitting and construction activities. The isolation of both lakes should occur prior to ice melt such that fish cannot move into streams connecting Llama to Umwelt Lake and downstream from Umwelt Lake. This will prevent the stranding of fish in streams connected to Llama and Umwelt lakes during the fish-out.

The initial marking phase will be carried out by a lead biologist and multiple community members for approximately three days. The goal of the marking phase is to mark a minimum of 10% of the fish populations to provide more accurate and precise estimates of the population size during the CPUE phase. Community members will be invited to participate in the angling event which will provide training in the methods of mark-recapture to determine current fish population sizes and allow communities to examine the quality of fish that will be available following the completion of the fish-out.

6.1.2 Phase 2 (Catch-Per-Unit-Effort)

The start of the fish-out CPUE phase will occur after the lakes are allowed to rest for 48 hrs following the marking phase. The CPUE phase generates fish population estimate for each fish species using the recapture of marked fish and CPUE data. The CPUE phase typically represents the period where most of the large-bodied individuals (most biomass) are removed prior to any Project development begins (i.e., prior to dewatering).

Community members will participate in the work and will be trained in the appropriate fish out methods, involved in sampling programs and potentially setting up fish camp for the process during early summer. Other opportunities for community involvement in the fish out program have been identified in Section 4 and may be included in the detailed fish out plan if deemed appropriate.

The closure of the CPUE phase is dependent on capture rates and declines and is anticipated to differ between Llama and Umwelt lakes due to difference in their size and fish communities. The CPUE phase is assessed as complete when no fish are captured for 24-48 hrs of continuous netting, nets are removed for 48 hrs and then redeployed with no (or virtually no) fish captures for 24-48 hrs. However, because

this objective is not always practical in low biomass Arctic lakes, the completion of the CPUE phase can be revised with DFO if the time required is unachievable.

6.1.3 Phase 3 (Final Removal)

The final removal phase is anticipated to start during mid to late summer with timing dependent on the completion of the CPUE phase. The final removal phase may occur prior to, during, or after partial dewatering has occurred. The transition from the CPUE phase to the final removal phase will be based on the General Fish-out Protocol and will be developed with DFO as part of the detailed fish-out plan.

This phase would consist of a gill netting and minnow trapping program during the open-water season. Additional fish capture methods may be used in order to obtain the goal of removing all (or nearly all) fish within the lakes (e.g., angling, electrofishing, set lines, seine nets, etc.). Community members will participate in the work.

The schedule, sampling effort, and methods will consider input from communities and DFO.

6.2 ROLES AND RESPONSIBILITIES

The Project Manager will be Sabina's representative for the fish-out and will be responsible for approving and coordinating the detailed fish-out plan, schedule and budget, staffing, communicating with DFO, and providing deliverables. The Project Manager will also ensure that community representatives are appropriately involved in the planning, field work, and reporting.

A Project Biologist will be involved in developing the work plan and will be responsible for training field staff, supervising field activities and data collection, quality assurance and quality control, conducting data analysis, and preparing deliverables.

Field Crew Leads will work under the supervision of the project biologist and will be in charge of fishing, data collection, and health and safety for each field crew. Field crew technicians will conduct the fish-out and data collection under the supervision of the crew leads and project biologist. If possible, field leaders and technicians will be members of local communities with experience in gill netting, fish handling, and processing.

7 Reporting

A reporting protocol will be established as part of the detailed fish-out plan. The reporting is expected to include a weekly or daily report, including total fish catch and effort, which will be submitted electronically to the DFO habitat biologist. This information will be used to determine when to transition from CPUE to final removal phase, and when the final removal phase will be complete. A summary data report will be provided after the fish-out is completed. The report will meet the requirements for deliverables described in the General Fish-out Protocol and will include the following:

- biological, aquatic, limnological and physical habitat data;
- data analysis;
- community participant view on fish quality and other relevant information;
- population size estimates;
- comparison of results to baseline, assessments, and predictions;
- quality assurance and quality control results; and
- discussion relating the data to the fish-out objectives.

At completion of the fish-out, DFO will also be provided with copies of photographs, copies of field notes and data, and an electronic database of collected data.

8 References

Tyson, J. D., Tonn, W. M., Boss, S., & B.W. Hanna. (2011). General Fish-out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut. Yellownife: Fisheries and Oceans Canada.