Final Environmental Impact Statement Addendum

Whale Tail Pit - Expansion Project

Submitted to:

Nunavut Impact Review Board

Submitted by:

Agnico Eagle Mines Limited – Meadowbank Division

Prepared by:

Golder Associates Ltd.

Whale Tail Pit - Expansion Project

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PLAIN LANGUAGE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) would like to mine and mill for three to four more years by expanding the Whale Tail Pit Project (Approved Project), located on the Amaruq Exploration Property, approximately 50 km north of the Meadowbank Mine. Agnico Eagle is proposing to, expand the Whale Tail open pit, develop another open pit called the IVR Pit, and include underground mining operations. These new mining operations are referred to as the “Expansion Project” in this summary. Agnico Eagle is asking the Nunavut Impact Review Board to reconsider the Whale Tail Pit Project Certificate No. 008 to allow for the expansion.

The Whale Tail site currently has in place an open pit, camp for people, power plant, heli-pad, maintenance shop, tank farm, a place to store the ore and waste rock, a pond for mine site water (i.e., the water that comes into contact with various parts of the mine), a system to treat water and sewage, haul roads, access roads, and collection ponds, channels, dikes, dams, and culverts to manage on site water. Some of these facilities will be expanded to support the Expansion Project.

Initially, Agnico Eagle planned to mine ore, the rock containing the gold, over a three to four-year period or 8.3 million tonnes of ore. With the proposed expansion Agnico Eagle proposes to mine for an additional four years for an incremental of 15.2 million tonnes of ore. The total tonnage for the Approved and Expansion Project will be 23.5M tonnes of ore. During the mining process waste rock, which is the rock and soil removed to gain access to the ore, will be generated at the Whale Tail site and this rock and soil will be kept at the site. The ore, the rock containing the gold, will be transported by truck over a haul road to Meadowbank Mine to be milled and turned into gold. Waste generated from the milling process at the Meadowbank Mine will be stored at the Meadowbank Mine. The width of the haul road between the Meadowbank Mine and the Whale Tail Project site will be upgraded to double lanes from 9.5 metre wide to 15 metre wide for improved safety.

Agnico Eagle has in place the management, mitigation, and monitoring plans with the goal to manage water and waste in such a way as to limit the impact on the local environment. Agnico Eagle will continue to comply with the Project Certificate issued by the Nunavut Impact Review Board and any further direction they impose through their monitoring officer. The use and management of water and deposit of waste is regulated by the Nunavut Water Board. Agnico Eagle will continue to comply the measure put in place by the Board and as committed to by the company to have in place comprehensive monitoring programs.

A key goal of Agnico Eagle’s public consultation and engagement program has been to ensure that Agnico Eagle has the support of many interested parties who could be affected by the mine. Agnico Eagle has met with the community and with local stakeholders within the Kivalliq Region regularly to discuss the Approved Project and Expansion Project activities and will continue to do so. Agnico Eagle has documented when, where, how, why, and with whom it conducted consultation. In addition, Agnico Eagle has documented how the information collected from participants was used.

Much of the Inuit Qaujimajatuqangit (IQ) collected for the Project has been collected over time through consultation, formal IQ workshops, community meetings, and through informal acquisition of IQ by working with local field staff. The IQ collected included knowledge on the existing condition, concerns on the various project impacts, and recommendations for the Expansion Project. These concerns were taken into account in the effects assessment and recommendations were considered when developing mitigation and monitoring plans.

Agnico Eagle has continued to collect baseline information for the Project to continue to add the base of knowledge of existing conditions for the site prior to construction of Approved facilities or proposed Expansion facilities. An ongoing baseline data collection includes data related to: noise, terrain, soils and permafrost, wildlife and vegetation, geochemistry (describes the metals that are inside the rocks), groundwater (the water that is underground), surface water quantity, water quality, IQ, fish, and archeology (the study of old artifacts on the landscape and also known as heritage resources). Baseline studies are used to inform the environmental assessment for the proposed expansion. In general, the methods used for impact assessment have not changed from the original assessment approved by Nunavut Impact Review Board. Environmental significance of the Expansion Project effects where assessed based on the following criteria:

- how big, how far, and how long an effect will last;
- project design or mitigations to limit or avoid potential effects;
- environmental or socio-economic context/value, including the current “state of health” of ecosystems;
- historical, cultural, and archaeological significance of the geographic area likely to be affected by the Project; and
- value attached based on consultation with potentially affected communities and relevant individuals and organizations.

The Expansion Project will provide additional mine operational jobs until 2025 to the local population of Baker Lake and other Kivalliq communities, and indirect employment opportunities to others in Nunavut.

The Expansion Project is anticipated to have a number of positive effects, specifically a positive effect on the GDP, tax revenues, local business development, jobs and training, incomes, and well-being related to income to spend as people choose, community contributions, and the continuation of agreements between Agnico Eagle and the communities that are designed to help the communities. The most important income effect will be three to four more years of high paying wage employment from the Expansion Project.

Agnico Eagle plans to leave Whale Tail Pit Project, including the proposed Expansion Project, in a physically and chemically stable project footprint for the long-term protection of the environment and people of Nunavut. When the mine closes, all the dikes and water diversions will be removed and lakes will have similar amounts of water as they do now. The open pits will be flooded. Some waste rock will be returned to the underground mined out areas and other waste rock will be capped with clean rock. Most active on-site closure activities will occur over a three-year period with passive closure until around 2051. Monitoring will continue until it is confirmed that the water is safe for release to the natural environment and to ensure that the natural environment is protected.

Agnico Eagle strongly believes that considering its past performance and the current design of the Expansion Project, the company is able to complete the mining of the Whale Tail Pit and IVR Pit, to lessen any negative impacts, and to maintain and restore the site in the event of closure.

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ᐊᒡᓂᖑ ᐃᒍ ᐅᔭᕋᖕᓂᐊᖅᑐᓕᕆᔨᒃᑯᑦ - ᐊᐳᖅᑎᓈᖅᑐᒥ ᐱᓕᕆᐊᖅ (ᐊᒡᓂᒍ ᐃᒍᒃᑯᑎᒍᑦ) ᐅᔭᕋᖕᓂᐊᕈᒪᖕᒪᑕ ᐅᔭᕋᓕᕆᖅᑦᑕᕐᓗᑎᒡᓗ ᐱᖓᓱᒃᑲᓂᕐᓂᒃ ᓯᑕᒪᓄᑦ ᐅᑭᐅᓄᑦ ᐃᓚᒋᐊᕈᒪᐸᓗᒍ ᐱᓕᕆᐊᖓ ᐱᕐᑯᖕᒐᓕᐅᑉ ᐃᓱᐊᓄᑦ ᐱᓕᕆᐊᒃᑯᑦ (ᐊᖏᖅᑕᐅᓯᒪᔪᖅ ᐱᓕᕆᐊᒃᓴᖅ), ᐊᒪᕈᕐᒦᑦᑐᖅ ᐅᔭᕋᒃᓯᐅᕐᕕᐅᓯᒪᔪᒥᒃ, ᐃᒻᒪᕐᖃ 50 ᑭᓛᒥᑕᒥᒃ ᐅᖓᓯᖕᓂᓕᒃ ᐊᐳᖅᑎᓈᖅᑑᑉ ᐅᐊᖕᓇᖓᓄᑦ. ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᐃᓚᓯᕆᐊᕈᒪᔪᑦ ᐱᕐᑯᖕᒐᓂᐅᑉ ᐃᓱᐊᓂ ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓯᒪᔪᒥᒃ, ᓴᖅᑭᑎᑦᑎᒃᑲᓂᕐᓗᑎᒃ ᐊᓯᖓᓂᒃ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᒥᒃ ᐃᒪᓐᓇ ᑕᐃᔭᐅᓗᓂ IVR ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᖅ, ᐊᒻᒪᓗ ᐃᓚᐅᖃᑕᐅᓗᒍ ᓄᓇᐅᑉ ᐊᑖᓂ ᐅᔭᕋᖕᓂᐊᕐᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᖅ. ᑕᒪᒃᑯᐊ ᓄᑖᑦ ᐅᔭᕋᖕᓂᐊᕐᓂᒃᑯᑦ ᐊᐅᓚᑦᑎᔾᔪᑏᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᑦ ᐃᒪᓐᓇ "ᐃᓚᓯᕆᐊᕈᑎᑦ ᐱᓕᕆᐊᒧᑦ" ᓇᐃᓪᓕᑎᐊᖅᓯᒪᔪᒃᑯᑦ ᑐᑭᓯᑎᑦᑎᕆᐊᕈᑎᒃᑯᑦ. ᐊᒡᓂᖑ ᐃᒍᒃᑯᑦ ᐊᐱᕆᔪᑦ ᓄᓇᕗᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓄᑦ ᐃᓱᒪᒃᓴᖅᓯᐅᕈᑎᖃᒃᑲᓂᕐᑯᑉᓗᒋᑦ ᐱᕐᑯᖕᒐᓂᐅᑉ ᐃᓱᐊᓂ ᐱᓕᕆᐊᖑᔪᒃᑯᑦ ᐱᓕᕆᐊᕈᓇᖅᓯᓂᕐᒧᑦ ᓇᓗᓇᐃᒃᑯᑕᒃᑯᑦ 008-ᑯᑦ ᐃᓚᒋᐊᖅᑕᐅᔪᓐᓇᕐᑯᑉᓗᒍ.

ᐱᕐᑯᖕᒐᓂᐅᑉ ᐃᓱᐊ ᒫᓐᓇᐅᔪᖅ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᒥᒃ ᐱᑕᓕᒃ, ᐃᒡᓗᕐᑯᑎᖃᖅᓗᓂᓗ ᓴᓇᔩᓄᑦ ᐊᑐᖅᑐᓂᒃ, ᐅᒃᑳᓕᕆᕝᕕᖃᖅᓗᓂ, ᕐᑯᓕᒥᒨᓕᖕᒧᓕᓗ ᒥᑦᑕᕐᕕᑲᖅᓗᓂ, ᐋᖅᑭᒃᓯᐃᕝᕕᖕᒥ ᐱᓕᕆᕐᕕᑲᖅᓗᓂ, ᑯᕕᖅᑕᕐᕕᑲᖅᓗᓂ, ᐊᒻᒪᓗ ᓯᕐᓗᐊᑲᖅᓗᓂ ᐅᔭᖅᑲᓄᑦ ᐊᒻᒪᓗ ᐅᔭᖅᑲᓄᑦ ᐊᑐᖅᑕᐅᔪᓐᓃᖅᑐᓄᑦ, ᑕᓯᑲᖅᓗᓂᓗ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ ᐃᒪᕐᑯᑎᒋᔭᐅᔪᓄᑦ (ᐆᑦᑑᑎᒋᓗᒍ ᐃᒪᖅ ᐊᑐᖅᑕᐅᕙᒃᑐᖅ ᐱᓕᕆᑎᓪᓗᒋᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ), ᐃᒪᕐᒥᒡᓗ ᓴᓗᒻᒪᖅᓴᐃᕝᕕᑲᖅᓗᓂ ᐊᒻᒪᓗ ᐃᑎᑭᕐᓂᒃ ᑲᒪᒋᐊᕐᕕᒃ, ᐊᑉᕐᑯᑎᑲᖅᓗᓂ, ᐅᔭᕋᖕᓂᐊᕐᕕᐅᑉ ᓯᓚᑖᓄᑦ ᓇᐅᒃᑰᕐᕕᖕᓂᒃ ᐊᑉᕐᑯᑎᑲᖅᓗᓂ ᐊᒻᒪᓗ ᑲᑎᑦᑎᕝᕕᖕᒥ ᑕᓯᑲᖅᑐᖅ, ᐃᑎᖅᑕᓕᒃ, ᐃᒪᑲᕐᕕᒃ ᐊᒻᒪᓗ ᓱᐸᓗᓕᓕᒃ ᑰᕕᐅᓂᐊᖅᑐᓂᒃ ᑲᒪᑲᑦᑕᕈᓇᕐᑯᑉᓗᒋᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ ᐃᒪᕐᓂᒃ. ᑕᒪᒃᑯᐊ ᐃᓚᖏᑦ ᐱᕐᑯᑏᑦ ᐃᓚᒋᐊᖅᑕᐅᓂᐊᖅᑐᑦ ᐃᑲᔫᑕᐅᕐᑯᑉᓗᒋᑦ ᐃᓚᓯᕆᐊᕈᑎᒃᓴᒍᑦ.

ᐱᕆᐊᓕᓵᖅᑎᓪᓗᒋᑦ, ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᐸᕐᓇᐃᓚᐅᖅᑐᑦ ᐅᔭᖅᑭᓇᖅᑦᑕᕈᒪᓂᕐᒧᑦ, ᐅᔭᖅᑲᓂᒃ ᒎᓘᖅᑐᓂᒃ, ᐱᖓᓱᑦ ᓯᑕᒪᓪᓘᓐᓃᑦ ᐅᑭᐅᑦ ᐱᐊᓂᖕᒪᑕ ᐅᕝᕙᓘᓐᓃᑦ 8.3 ᒥᓕᔭᓐ ᑕᓐᓂᒃ ᐅᕐᑯᒪᐃᓐᓂᓕᖕᓂᒃ ᐅᔭᖅᑲᓂᒃ ᑲᓖᓂᖕᒪᑕ. ᐃᓚᒋᐊᕈᑕᐅᔪᒪᔪᖅ ᐊᒡᓂᒍ ᐃᒍᒃᑯᓐᓄᑦ ᐊᑐᓕᕐᑯᔭᐅᔪᖅ ᐅᔭᕋᖕᓂᐊᕐᓂᕐᒧᑦ ᓯᑕᒪᒃᑲᓂᕐᓄᑦ ᐅᑭᐅᓄᑦ ᑲᑎᓪᓗᒍ ᐅᔭᖅᑭᓇᔭᖅᓗᑎᒃ ᑲᑎᓪᓗᒋᑦ 15.2 ᒥᓕᔭᓐ ᑕᓐᓂᒃ ᐅᕐᑯᒪᐃᓐᓂᓕᖕᓂᒃ. ᐅᔭᕋᖕᓂᐊᖅᑎᓪᓗᒋᑦ ᐅᔭᖅᑲᑦ ᐊᑐᖅᑕᐅᙱᑦᑐᑦ, ᐅᔭᖅᑲᑦ ᐃᐸᔪᐃᓪᓗ ᐋᔭᖅᑕᐅᓃᑦ ᒎᓗᒍᑦ ᑎᑭᑦᑐᓇᕐᑯᑉᓗᒋᑦ, ᑲᑎᑕᐅᖅᑦᑕᕐᓂᐊᖅᑐᑦ ᐱᕐᑯᖕᒐᓂᐅᑉ ᐃᓱᐊᓂ ᐊᒻᒪᓗ ᑕᒪᓐᓇ ᐅᔭᕋᒃ ᐊᒻᒪᓗ ᐃᐸᔪᖅ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒦᑎᑕᐅᑐᐃᓐᓇᕐᓗᓂ. ᐅᔭᕋᒃ, ᐅᔭᕋᒃ ᒎᓘᖅᑐᖅ, ᓈᑕᐅᓇᔭᖅᑐᖅ ᓄᓇᒃᑰᕈᑎᒃᑯᑦ ᐊᑉᕐᑯᑎᒃᑯᑦ ᐊᐳᖅᑎᓈᖅᑐᒧᑦ ᐅᔭᖅᑭᓇᔭᐅᓕᕐᓗᓂ ᐊᒻᒪᓗ ᒎᓘᖕᒍᖅᑎᑕᐅᓗᓂ. ᐅᔭᖅᑲᑦ ᑲᑎᑕᐅᔪᑦ ᐅᔭᖅᑭᓇᓂᒃᑯᑦ ᐊᐳᖅᑎᓈᖅᑐᒥ ᑲᑎᑕᐅᖅᑦᑕᕐᓂᐊᖅᑐᑦ ᐊᐳᖅᑎᓈᖅᑐᒥ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥ. ᓯᓕᖕᓂᖑ ᐊᑉᕐᑯᑕᐅᔫᑉ ᐊᐱᖅᑎᓈᖅᑐᒥ ᐱᕐᑯᖕᒐᓂᐅᑉ ᐃᓱᐊᓄᑦ ᐋᖅᑭᒋᐊᖅᑕᐅᓂᐊᖅᑐᖅ ᒪᕐᑮᓕᖕᒐᔪᒃᑯᑦ ᐅᑎᖅᑕᕐᕕᐅᔭᓇᖅᑐᒃᑯᑦ 9.5 ᒦᑕᒥᒃ 15 ᒦᑕᒧᑦ ᓯᓕᖕᓂᓕᒃᑯᑦ ᐱᐅᓯᕚᓪᓕᕈᓇᕐᑯᑉᓗᒍ ᐊᑦᑕᓇᖅᑐᒦᙱᓐᓂᖅᓴᐅᔭᓇᕐᓂᖅ.

ᐊᒡᓂᖑ ᐃᒍᒃᑯᑦ ᐋᖅᑭᒃᓯᓯᒪᒧᑦ ᐊᐅᓚᑦᑎᔾᔪᑎᓂᒃ, ᐋᖅᑭᒋᐊᖅᓯᒍᑎᓂᒃ ᐊᒻᒪᓗ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓂᒃ ᑐᕌᒐᖅᓗᑎᒃ ᐊᐅᓚᑦᑎᔪᒪᓂᕐᒧᑦ ᐃᒪᕐᒥᒃ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᔾᔨᓇᓂᖅᑐᓂᒃ ᑭᒡᓕᖅᑎᑦᑎᔪᒪᓂᕐᒧᑦ ᐊᒃᑐᖅᓯᓂᐅᓇᔭᖅᑐᓂᒃ ᓄᓇᓕᖕᓂ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ. ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᒪᓖᓐᓇᕐᓂᐊᖅᑐᑦ ᐱᓕᕆᐊᕐᑯᓇᖅᓯᓂᕐᒧᑦ ᓇᓗᓇᐃᒃᑯᑕᒥᒃ ᖃᐃᑕᐅᓚᐅᖅᑐᒥᒃ ᓄᓇᕗᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓄᑦ ᐊᒻᒪᓗ ᐊᓯᖏᓐᓂᒃ ᐃᒪᓈᖅᑐᕈᑎᓂᒃ ᓴᖅᑭᓯᒪᔪᓂᒃ ᖃᐅᔨᓴᐃᔨᒃᑯᑦ. ᐊᑐᕐᓂᖅ ᐊᒻᒪᓗ ᐊᐅᓚᑦᑎᓂᖅ ᐃᒪᕐᒥᒃ ᐊᒻᒪᓗ ᐅᔭᖅᑲᓂᒃ ᐊᑐᖅᑕᐅᔾᔨᓇᓂᖅᑐᓂᒃ ᒪᓕᒐᑎᒍᑦ ᑲᒪᒋᔭᐅᔫᑦ ᓄᓇᕗᒥ ᐃᒪᕐᒧᑦ ᑲᑎᒪᔨᖏᓐᓄᑦ. ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᒪᓖᓐᓇᕐᓂᐊᖅᑐᑦ ᒪᓕᒃᑕᐅᔭᓇᐊᓕᖕᓂᒃ ᓴᖅᑭᑎᑕᐅᓯᒪᔪᓂᒃ ᑲᑎᒪᔨᓄᑦ ᐊᒻᒪᓗ ᐱᓕᕆᓂᐊᖅᓯᒪᑎᓪᓗᒋᑦ ᑲᒻᐸᓂᐅᔪᓄᑦ ᐱᑕᖅᑯᕐᑯᑉᓗᒍ ᓯᕗᑐᔪᒃᑯᑦ ᖃᐅᔨᓴᕐᑎᒥᒃ ᐊᑐᖅᑕᐅᔭᓇᖅᑐᒥᒃ.

ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᑐᕌᒐᖅᒥᔪᑦ ᐃᓄᖕᓂᒃ ᐅᖃᖃᑎᖃᖃᑦᑕᕐᓂᐊᕐᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐱᓕᕆᖃᑎᖃᖃᑦᑕᕐᓂᐊᕐᓂᕐᒧᑦ ᐃᑲᔪᖅᑐᖅᑕᐅᔭᓇᕐᑯᑉᓗᒋᑦ ᐊᒥᓱᓄᑦ ᐃᓄᖕᓄᑦ ᐊᑐᖅᑕᐅᓂᖃᕐᓇᖅᑐᓄᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᒃᑯᑦ. ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᑲᑎᒪᖃᑎᖃᖃᑦᑕᖅᓯᒪᔪᑦ ᓄᓇᓕᖕᓂ ᐊᒻᒪᓗ ᓄᓇᓕᖕᓂ ᓇᖕᒥᓂᖃᖅᑎᐅᔪᓂᒃ ᑭᕙᓪᓕᕐᒥ ᖃᑯᑎᒃᑯᑦ ᐅᖃᖃᑎᒌᒍᓐᓇᕐᑯᑉᓗᒋᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᓂᒃ ᐱᓕᕆᐊᖑᔪᑦ ᒥᒃᓵᓄᑦ ᐊᒻᒪᓗ ᐃᓚᒋᐊᖅᓯᔪᓕᒪᓂᒃ ᐱᓕᕆᐊᖑᔪᓕᒪᓂᒃ ᐊᒻᒪᓗ ᐅᖃᖃᑎᖃᐸᓪᓕᐊᑐᐃᓐᓇᕐᓂᐊᖅᑐᑦ. ᐊᒡᓂᖑ ᐃᒍᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᖃᖓ, ᓇᓂ, ᖃᓄᖅ, ᓱᖕᒪᑦ ᐊᒻᒪᓗ ᑭᒃᑯᓐᓂᒃ ᐱᓕᕆᖃᑎᖃᖅᓗᑎᒃ ᐅᖃᖃᑎᖃᖅᓯᒪᓐᒪᖔᑕ. ᐊᒻᒪᓗᑦᑕᐅᖅ, ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᖃᓄᖅ ᑐᑭᓯᕆᐊᕈᑎᖃᑦ ᑲᑎᑕᐅᓯᒪᔪᑦ ᐱᓕᕆᖃᑎᒋᔭᐅᔪᓐᓇᓚᖅᑐᑦ ᖃᓄᖅ ᐊᑐᖅᑕᐅᓚᐅᖅᓯᒪᖕᒪᖔᑕ.

ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ ᑲᑎᑕᐅᓯᒪᔪᑦ ᐱᓕᕆᐊᖑᔪᒃᑯᑦ ᑲᑎᑕᐅᓯᒪᔪᑦ ᐅᖃᖃᑎᒌᖕᓂᒃᑯᑦ, ᐋᖅᑭᒃᓱᖅᑕᐅᓯᒪᔪᒃᑯᓪᓗ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᕐᑎᒍᑦ ᑲᑎᒪᑎᑦᑎᑦᑕᕐᓂᒃᑯᑦ, ᓄᓇᓕᖕᓂ ᑲᑎᒪᖃᑦᑕᕐᓂᒃᑯᑦ, ᐊᒻᒪᓗ ᑲᑎᑦᑎᕙᓪᓕᐊᓂᒃᑯᑦ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᕐᑎᓂᒃ ᐱᓕᕆᖃᑎᒋᓗᒋᑦ ᓄᓇᓕᖕᓂ ᓄᓇᒥ ᐱᓕᕆᔨᓂᒃ. ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ ᐅᑯᐊᖑᔪᑦ ᖃᐅᔨᒪᔭᐅᔪᑦ ᖃᓄᐃᓐᓂᐅᖅᑐᓂᒃ, ᐃᓯᒪᓗᑕᐅᔪᒃᑯᑦ ᐊᕐᕿᒥᓐᓂᖅᑕᐅᔪᒃᑯᑦ ᐱᓕᕆᐊᒃᑯᑦ ᐊᑐᖅᓯᓂᐅᔪᒃᑯᑦ, ᐊᒻᒪᓗ ᐊᑐᓕᖁᔭᐅᔪᒃᑯᑦ ᐃᓚᓯᕆᐊᕈᑎᒃᓴᒃᑯᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᒃᑯᑦ.

ᑕᒪᒃᑯᐊ ᐃᓱᓖᓘᑕᐅᔪᑦ ᐃᓱᒪᕐᒋᔭᐅᓚᐅᖅᑐᑦ ᐊᒃᑐᖅᓯᓂᐅᔪᒃᑯᑦ ᖃᐅᔨᓴᐃᓂᖃᖅᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ ᐊᑐᓂᑦᑯᔭᐅᓯᒪᔪᑦ ᐃᓱᒪᒋᔭᐅᓚᐅᖅᑐᑦ ᓴᖅᑭᑎᑦᑎᕙᓪᓕᐊᑎᓪᓗᒋᑦ ᐋᖅᑭᒋᐊᕈᑎᒃᓴᓂᒃ ᐊᒻᒪᓗ ᖃᐅᔨᓴᐃᓂᒃᑯᑦ ᐸᕐᓇᐃᓂᒃᑯᑦ.

ᐊᓪᓂᒍ ᐃᒍᒃᑯᑦ ᑲᑎᑦᑎᕙᓪᓕᐊᕐᒋᓐᓇᖅᑐᑦ ᑐᑭᓯᒋᐊᕈᑎᒃᓴᓂᒃ ᐱᓕᕆᐊᕐᒎᔪᒃᑯᑦ ᐃᓚᒋᐊᕈᑕᐅᕐᑯᑉᓗᒋᑦ ᖃᐅᔨᒪᔭᐅᔪᓄᑦ ᖃᓄᐃᓕᖖᓕᕐᓂᕐᒋᓐᓄᑦ ᐱᓕᕆᕝᕕᐅᔪᒥ ᓇᐸᖅᑎᕆᖅᑳᖅᑎᓐᓇᒋᑦ ᐊᕐᒋᖅᑕᐅᓯᒪᔪᓂᒃ ᐱᓕᕆᕝᕕᕐᓂᒃ ᐅᕝᕙᓘᓐᓃᑦ ᐃᓚᒋᐊᕈᑕᐅᔪᒪᔪᓂᒃ ᐱᓕᕆᕝᕕᒃᑯᑦ. ᑲᔪᓰᓐᓇᖅᑐᑦ ᑐᙵᕕᒃᓴᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᑲᑎᑕᐅᔪᑦ ᐅᑯᐊᕐᒎᔪᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᐊᒃᑐᐊᓂᓪᓚᑦ ᐅᑯᓄᙵ: ᓂᐱᖃᕐᓂᐅᔪᓄᑦ, ᓄᓇᒧᑦ, ᐃᑉᔪᕐᒧᑦ ᐊᒻᒪᓗ ᕐᑯᐊᕐᒎᓂᐅᔪᒧᑦ, ᐆᒪᔪᓄᑦ ᐊᒻᒪᓗ ᐱᕈᖅᑐᓄᑦ, ᓄᓇᓕᕆᓂᕐᒧᑦ (ᐅᖃᐅᓯᖃᖅᑐᖅ ᓴᕕᕋᔭᙱᓂᒃ ᐅᔭᕋᙳᑦᑐᓂᒃ), ᓄᓇᒥ ᐃᒪᕐᓂᒃ (ᐃᒪᖅ ᓄᓇᐅᑉ ᐊᑖᓃᑦᑐᖅ), ᓄᓇᐅᑉ ᖄᙵᓂ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᙵ, ᖃᓄᖅ ᐊᕐᒋᑎᒋᔪᒥᒃ ᐃᒪᖃᕐᓂᙵ, ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᕐᒋᑦ, ᐃᖃᓗᐃᑦ, ᐊᒻᒪᓗ ᐃᑦᓴᕐᓂᑕᐃᑦ (ᖃᐅᔨᓴᐃᓂᖅ ᐱᑐᖃᐅᔪᓂᒃ ᓄᓇᒦᑦᑐᓂᒃ ᐊᒻᒪᓗ ᐃᑦᓴᕐᓂᑕᐅᔪᓂᒃ). ᑐᙵᕕᒋᔭᐅᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ ᐊᑐᖅᑕᐅᕚᒃᑐᑦ ᑐᓴᖅᑎᑦᑎᔪᒪᓂᕐᒧᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᖃᐅᔨᓴᕈᑕᐅᓯᒪᔪᓂᒃ ᐃᓚᒋᐊᕈᑕᐅᔪᒪᔪᒧᑦ. ᐃᓗᐃᑦᑐᒃᑯᑦ, ᖃᓄᐃᓕᐅᕈᑎᒃᓴᑦ ᐊᑐᖅᑕᐅᓯᒪᔪᑦ ᐊᒃᑐᖅᓯᓂᐅᓇᔭᖅᑐᒧᑦ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐊᓯᔾᔨᖅᓯᒪᙳᕐᑦᑐᑦ ᐱᒋᐊᕈᑕᐅᖅᑳᓚᐅᖅᑐᒥ ᖃᐅᔨᓴᕈᑎᒥ ᐊᕐᒋᖅᑕᐅᓚᐅᖅᑐᒥ ᓄᓇᕗᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᕐᒋᓐᓄᑦ. ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐱᒪᕆᐅᑎᑕᐅᔪᑦ ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐱᓕᕆᐊᕐᒎᔪᒥᒃ ᐊᒃᑐᖅᓯᓂᐅᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᒪᓕᒃᓗᑎᒃ ᐅᑯᓂᙶ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᙵᓂᒃ:

- ᖃᓄᖅ ᐊᕐᒋᑎᒋᙵᓖᑦ, ᖃᓄᖅ ᐅᙵᓯᒃᑎᒋᙵᓖᑦ, ᐊᒻᒪᓗ ᖃᓄᖅ ᐊᑯᓂᐅᑎᒋᔪᖅ ᐊᒃᑐᖅᓯᓂᐅᔪᖅ ᓴᖅᑮᔾᔭᕐᓂᐊᕐᓂᙵᓄᑦ;
- ᐱᓕᕆᐊᕐᒎᔪᒃᑯᑦ ᐋᖅᑭᐅᒪᓂᕐᒋᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐋᖅᑭᒋᐊᖅᓯᒍᑏᑦ ᑭᒡᓕᖃᖅᑎᑦᑎᓂᕐᒧᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐱᑕᖃᙱᑎᑦᑎᔪᓐᓇᕐᓂᕐᒧᑦ ᐊᒃᑐᖅᓯᓂᐅᓇᔭᖅᑐᓂᒃ;
- ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐃᓅᖃᑎᒌᙶᓂᒃᑯᑦ–ᐱᕙᓪᓕᐊᑎᑦᑎᓂᒃᑯᑦ ᐃᓗᓕᕆᔭᕐᒋᑦ/ᐱᒻᒪᕆᐅᑎᑕᕐᒋᑦ, ᐃᓚᐅᖃᑕᐅᕐᓗᒋᑦ ᓖᓐᓇᐅᔪᖅ "ᖃᓄᐃᓐᓂᙵᓄᑦ" ᓄᓇᐅᑉ;
- ᑕᐃᑉᓯᒪᓂᑐᖃᖅ, ᐃᓕᖅᑯᓯᑐᖃᑎᒍᑦ ᐊᒻᒪᓗ ᐃᑦᓴᕐᓂᑕᓕᕆᓂᒃᑯᑦ ᐱᒻᒪᕆᐅᑎᑕᐅᔪᑦ ᓄᓇᒥ ᐊᒃᑐᖅᑕᐅᓂᖃᑐᐃᓐᓇᕆᐊᓖᑦ ᐱᓕᕆᐊᕐᒎᔪᒃᑯᑦ; ᐊᒻᒪᓗ
- ᐱᒻᒪᕆᐅᑎᑕᐅᔪᑦ ᐊᒃᑐᐊᓂᓖᑦ ᐅᖃᖃᑎᒌᙶᓂᒃᑯᑦ ᓄᓇᓕᙵᓄᑦ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᒃ ᐊᒻᒪᓗ ᑕᐃᒪᐃᑦᑐᒃᑯᑦᑕᐅᖅ ᐃᓄᙵᓄᑦ ᐊᒻᒪᓗ ᑎᒥᐅᔪᓄᑦ.

ᐃᓚᒋᐊᖅᓯᔪᒪᑎᓪᓗᒋᑦ ᐱᓕᕆᐊᒥᒃ ᓴᓇᔭᒃᓴᖃᒃᑲᓂᕐᓂᐊᖅᑐᖅ ᐱᙳᓱᓂᒃ ᓯᑕᒪᓄᑦ ᐅᑭᐅᓄᑦ ᓄᓇᖅᑲᑎᒌᙶᓄᑦ ᖃᒪᓂ'ᑐᐊᕐᒥ ᐊᒻᒪᓗ ᐊᓯᙵᓐᓂᒃ ᑭᕙᓪᓕᕐᒥ ᓄᓇᓕᙵᓄᑦ, ᐊᒻᒪᓗ ᑐᕌᓪᓚᑦᑖᙱᑦᑐᒃᑯᑦ ᓴᓇᔭᒃᓴᖃᕐᓗᓂ ᐊᓯᙵᓐᓄᑦ ᓄᓇᕗᒥᐅᓄᑦ.

ᐃᓚᓯᒋᐊᕈᑎ ᓂᕆᐅᒋᔭᐅᔪᖅ ᐱᐅᔪᒃᑯᑦ ᐊᒃᑐᖅᓯᓂᖃᕈᓐᓇᕐᓂᙵᓄᑦ, ᐱᓗᐊᖅᑐᒥ ᐱᐅᔪᒃᑯᑦ ᐊᒃᑐᖅᓯᓂᖃᕐᑯᓐᓇᕐᓂᙵᓄᑦ GDP-ᑯᑦ, ᑖᒃᑰᔭᐃᓂᒃᑯᑦ ᑮᓇᐅᔭᖅᑖᕈᑎᒃᑯᑦ, ᓄᓇᓕᙵ ᓇᙱᓂᓖᑦ ᐱᕙᓪᓕᐊᔪᓇᕐᓂᕐᒋᓐᓄᑦ, ᓴᓇᔭᒃᓴᒃᑯᑦ ᐊᒻᒪᓗ ᐃᓕᓐᓂᐊᕐᓂᒃᑯᑦ, ᑮᓇᐅᔭᓕᐊᒃᑯᑦ ᐊᒻᒪᓗ ᐃᓅᑎᐊᕈᓐᓇᕐᓂᕐᒋᓐᓄᑦ ᑮᓇᐅᔭᓕᐅᕐᓂᒃᑯᑦ ᑮᓇᐅᔭᓕᐊᑦ ᐊᑐᖅᑕᐅᔫᓇᕐᓗᑎᒃ ᐃᓄᙵᓄᑦ ᐃᓱᒪᖅᓱᕐᓗᑎᒃ, ᓄᓇᓖᓪᓗ ᐃᑲᔫᓯᐊᖅᑖᖃᑦᑕᕐᓗᑎᒃ, ᐊᒻᒪᓗ ᑲᔪᓯᓗᑎᒃ ᐊᕐᒋᕈᑏᑦ ᐊᕐᒋᕈᑎᓕᐊᙳᓯᒪᔪᑦ ᐊᓪᓂᙶ ᐃᒍᒃᑯᓐᓄᑦ ᐊᒻᒪᓗ ᓄᓇᓕᙵᓄᑦ ᐃᑲᔫᑕᐅᔪᓄᑦ ᓄᓇᓕᙵᓄᑦ. ᐱᒻᒪᕆᐅᓂᖅᐸᒃᑯᑦ ᑮᓇᐅᔭᓕᐊᑦ ᐊᒃᑐᖅᓯᓂᖃᕐᓂᐊᖅᑐᑦ ᐱᙳᓱᓂᒃ ᓯᑕᒪᒃᑲᓐᓂᕐᓂᓪᓗ ᐅᑭᐅᓂᒃ ᑮᓇᐅᔭᓕᐅᑦᑎᐊᖅᑐᖃᕐᓗᓂ ᐃᓚᒋᐊᖅᑕᐅᔪᖅ ᑲᔪᓯᒃᐸᑦ.

ᐊᓪᓂᒍ ᐃᒍᒃᑯᑦ ᐸᕐᓇᐃᓯᒪᔪᑦ ᕿᒪᐃᔪᒪᐸᓪᓗᑎᒃ ᐱᕐᑯᙵᓂᐅᐸ ᐃᓱᐊᓂ ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓯᒪᔪᒥᒃ ᐱᓕᕆᐊᒥᒃ ᐋᖅᑭᐅᒪᑦᑎᐊᖅᑐᒃᑯᑦ ᑐᙵᕕᖃᖅᑎᑦᑎᓗᓂ ᐱᑦᑎᐊᕈᑕᐅᖅᑳᓚᐅᖅᑐᒧᑦ ᐅᑎᕐᓗᓂ ᓯᕗᓂᒃᓴᒥ ᓴᐳᓂᐊᖅᑕᐅᔾᔪᑎᒃᑯᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐊᒻᒪᓗ ᐃᓄᙵᓄᑦ ᓄᓇᕗᒥ. ᐅᔭᕋᙳᓂᐊᕐᕕᒃ ᒪᑐᒃᐸᑦ ᑕᒪᕐᒥᒃ ᐃᑎᖅᑕᐃᑦ ᐊᒻᒪᓗ ᐃᒪᖃᕐᕖᑦ ᐲᖅᑕᐅᓇᔭᖅᑐᑦ ᐊᒻᒪᓗ ᑕᓯᕐᒋᑦ ᑕᐃᒪᓐᓇᕐᓚᒃ ᐃᒪᖃᓕᕐᒥᓗᑎᒃ ᐃᒪᖃᕐᓂᓇᔭᕐᒋᑦᑎᑐᑦ ᓖᓐᓇᐅᔪᖅ. ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᑦ ᐃᒻᒥᖅᑐᖅᑕᐅᓇᔭᖅᑐᑦ. ᐃᓚᕐᒋᑦ ᐅᔭᖅᑲᑦ ᐊᑐᖅᑕᐅᔾᔮᙱᑦᑐᑦ ᐅᑎᖅᑎᑕᐅᓇᔭᖅᑐᑦ ᓄᓇᐅᑉ ᐊᑖᓄᑦ ᐅᔭᕋᙳᓂᐊᕐᕕᙳᒧᑦ ᐊᒻᒪᓗ ᐊᓯᕐᒋᑦ ᐅᔭᖅᑲᑦ ᐊᑐᖅᑕᐅᔾᔮᙱᑦᑐᑦ ᖃᓕᖅᑐᖅᑕᐅᓇᔭᖅᑐᑦ ᐅᔭᕋᑦᑎᐊᕙᙳᑦ. ᒪᑐᓯᕙᓪᓕᐊᑎᓪᓗᒋᑦ ᐅᔭᕋᙳᓂᐊᕐᕕᙵ ᐱᓕᕆᓂᖅᓴᐅᓇᔭᖅᑐᑦ ᐱᙳᓱᓂᒃ ᐅᑭᐅᓂᒃ ᒪᑐᔭᐅᑎᐊᓕᕐᓗᓂ 2051-ᒥ. ᖃᐅᔨᓴᐃᓂᖅ ᑲᔪᓰᓐᓇᕐᓂᐊᖅᑐᖅ ᓇᓗᓇᐃᖅᑕᐅᖅᑳᖅᑎᓐᓇᒍ ᐃᒪᖅ ᐊᑦᑕᓇᕈᓐᓃᕐᓂᖏᖅᑕᐅᓗᓂ ᓄᓇᒧᑦ ᐃᓕᔭᐅᔪᓐᓇᖅᓯᓗᓂ ᐊᕙᑎᑉᑎᓐᓄᑦ ᐊᒻᒪᓗ ᓄᓇ ᐊᕙᑎᑉᑎᓐᓂᒃ ᓴᐳᓐᓂᐊᖅᑕᐅᑎᐊᖅᓯᒪᓗᓂ.

ᐊᒻᓂᒍ ᐃᒍᒃᑯᑦ ᓴᖏᔪᒃᑯᑦ ᐅᒃᐱᕈᓱᒃᑐᑦ ᐃᓱᒪᒋᑉᓗᒋᑦ ᐱᓕᕆᓂᕆᖃᑦᑕᖅᓯᒪᔭᖏᑦ ᐊᒻᒪᓗ ᒫᓐᓇᐅᔪᖅ ᐋᖅᑭᐅᒪᓂᖓ ᐃᓚᒋᐊᕈᑎᒃᓴᒃᑯᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᒃᑯᑦ, ᑲᒻᐸᓂᐅᔪᖅ ᐱᐊᓂᒃᓯᔪᓐᓇᕐᓂᐊᕋᓱᒋᔪᖅ ᐅᔭᕋᖕᓂᐊᕐᓂᕐᒥᒃ ᐱᖁᖓᓂᐅᑉ ᐃᓱᐊᓂ ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓯᒪᔪᒥ ᐊᒻᒪᓗ IVR ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓯᒪᔪᒥᒃ, ᒥᑭᓪᓕᕚᓪᓕᕈᓐᓇᖅᑯᑉᓗᒋᑦ ᓈᒻᒪᖏᑦᑐᑦ ᐊᒃᑐᖅᓯᓂᐅᓇᔭᖅᑐᑦ, ᐊᒻᒪᓗ ᐸᐸᑐᕈᒪᓂᕐᒧᑦ ᓄᓇᓗ ᖃᓄᐃᓐᓂᕆᓚᐅᖅᑕᖓᓄᑦ ᐅᑎᖅᑎᑐᒪᓂᕐᒧᑦ ᒪᑐᓕᖅᐸᑦ.

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing an expansion to the approved Whale Tail Pit and Haul Road Project (referred to as the Expansion Project). The expansion and extension is proposed to include: a larger Whale Tail open pit, development of the IVR open pit, associated IVR Waste Rock Storage Facility and IVR Attenuation Pond, as well as underground operations while continuing to operate and process ore at the Meadowbank Mine. The project is located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km north of Meadowbank Mine in the Kivalliq Region of Nunavut.

The Expansion Project is subject to Environmental Assessment reconsideration under the *Nunavut Planning and Project Assessment Act* (NuPPA) and amendment of the Type A Water Licence under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA). Concurrent with the reconsideration of the Project Certificate (No. 008) by the Nunavut Impact Review Board, Agnico Eagle is seeking to amend the Type A Water Licence (2AM-WTP1826).

The Expansion Project will extend the extraction of ore to 2025 Construction upgrades to support the Expansion Project will begin as soon as approval and permits for the amendment applications are received (anticipated for mid 2020). The operational phase of the Approved and Expansion Project will span from Year 1 (2019) to Year 7 (2025). Mining activities are expected to end in Year 7 (2025) and ore processing is expected to end during Year 8 (2026). Closure will occur from Year 8 (2026) to Year 33 (2051) after the completion of mining and will include removal of the non-essential site infrastructure and flooding of the mined-out open pits and underground, as well as re-establishment of the natural Whale Tail Lake water level.

As an expansion of the approved Whale Tail Pit Project, the Expansion Project is designed to operate as a satellite of the main Meadowbank facilities and will be accessed by the existing approved haul road, which Agnico Eagle proposes to upgrade from 9.5 metres to 15 metres in width for safety reasons. Transportation to the mine site (marine barging, airstrip, and transportation along the all-weather access road), housing and handling will remain the same as authorized under Project Certificate No. 004 and/or Project Certificate No. 008.

The Expansion Project is an extension of mining operations for the Approved Project, that has existing and licensed waste and water management facilities. Consistent with the Approved Project, water management infrastructure includes: contact water collection ponds, freshwater collection ponds, diversion channels, retention dikes, dams, culverts, water treatment plants for effluent, potable water treatment plant, sewage treatment plant, and discharge diffusers. Additional Groundwater Storage Ponds, IVR dikes and diversions, as well as contact water collection systems will be put in place to effectively manage and mitigate impacts to water.

In addition, the approved Whale Tail Waste Rock Storage Facility will continue to be used for the expansion; however, the waste storage facilities will be expanded vertically and horizontally to the southeast. The newly proposed IVR Waste Rock Storage Facility will accommodate waste rock and overburden generated from the IVR Pit. The waste rock storage footprint, water management infrastructure, and camp have been designed consistent with the Approved Project and will accommodate growth of the project within the modified project footprint. The existing underground Waste Rock Storage Facility permitted under the Type B Water Licence 2BB-MEA1828 will have an increased footprint to accommodate additional waste storage and groundwater of the underground mine. Consistent with the approved Meadowbank and Whale Tail Pit operations, a classification system will be used to identify and safely store NPAG, PAG, and ML rock. PAG mine rock will be stored in the designated storage areas designed for long-term geochemical and geotechnical stability.

Upon approval of the expansion, the Meadowbank Mine facility will continue to operate as an approved mining and milling operation (Project Certificate No. 004 and Type A Water Licence 2AM-MEA1526); as a result, Agnico Eagle is looking to extend the milling and tailings storage at Meadowbank Mine, through the Expansion Project. No new infrastructure is required at the existing Meadowbank Mine to support the Expansion Project. Agnico Eagle proposes to process the Whale Tail ore and placement of the tailings slurry at the existing Meadowbank Mine Tailing Storage Facility as approved by NIRB Project Certificate No. 008 and Type A Water Licence 2AM MEA1526.

By extending the life of mine at Whale Tail Pit and Meadowbank, Agnico Eagle will progressively close portions of these sites while operating. The closure strategies for the Expansion Project are consistent with the approved Whale Tail Pit Project and securities for the expansion will be arranged with Crown-Indigenous Relations and Northern Affairs Canada and Kivalliq Inuit Association and posted in accordance with Type A 2AM-WTP1826.

Since 2016, Agnico Eagle has continued to collect baseline data, which has been incorporated into the updated environmental assessment to identify and assess potential environmental and social effects resulting from the Expansion Project. Data collection included physical environment (e.g., terrain and soils, permafrost, geochemistry, noise, and surface water quantity and quality), biological environment (e.g., vegetation, terrestrial wildlife and birds, and fish and other aquatic organisms), and the cultural environment (e.g., IQ, archaeology, and socio-economics) in support of the Final Environmental Impact Statement and Type A Water Licence Amendment Application filed in 2016. The results of the environmental assessment found that with mitigation, the Expansion Project will not cause long-term significant negative effects resulting from proposed construction, operations, and closure.

Agnico Eagle has developed monitoring and management programs required to mitigate, monitor, and report on its environmental performance against the regulatory requirements contained within its Whale Tail Pit, and Meadowbank operating authorizations, permits, licenses, and leases consistent with the legal requirements of applicable Acts and Regulations in Nunavut. Where appropriate, existing Meadowbank Mine plans or Whale Tail Pit stand-alone plans have been updated or addendums have been added to reflect the Expansion Project, and Whale Tail Project Certificate requirements. The existing and approved management, monitoring, and mitigation will focus on ensuring impacts to waste and water, are consistent with those predicted for the Approved Project. The accuracy of the environmental impact predictions and the effectiveness of the mitigation measures will be verified through monitoring and annual reporting. If unusual or unforeseen adverse environmental impacts are noticed, corrective action will be put in place. Through the adaptive management process, the existing mitigation measures will be adjusted or new mitigation measures implemented if necessary. External reporting will be completed, as required.

The Expansion Project represents the continuation of drivers to economic parameters into years beyond the end of mining of the Approved Project. The economic effects of the Expansion Project are substantial and are expected to be of significant benefit to the territory. The Expansion Project is expected to generate 99 new employment opportunities for Nunavummiut incremental to those created by the Approved Project, and extend employment and incomes for the Approved Project workforce until 2026.

The Expansion Project will continue to have positive effects in communities for an extended period, in terms of household incomes and associated access to nutritious food, recreation, education, and resources with which to conduct traditional activities. Similarly, the Expansion Project will continue support for community programming and educational initiatives, as well as IIBAs royalties and commitments. Health and safety training over the operational life of the Expansion Project is also expected to continue to be of benefit to communities.

Since operations of Meadowbank Mine began, Agnico Eagle has continued public consultation by annually meeting with the community and local stakeholders within the Kivalliq Region, regulatory agencies and local employees. This has allowed a better general understanding of the rights, interests, values, aspirations, and concerns of the potentially affected stakeholders, with particular reference to Baker Lake. Through this continued consultation, Agnico Eagle has developed an operational culture that recognizes and respects these relevant interests in the planning and executing processes. Agnico Eagle has consulted with local stakeholders and regulators regarding ongoing operations of the Whale Tail Pit and haul road development, as well as proposed Expansion Project.

Consultation and regulatory engagement discussions were also considered as part of the alternatives assessment. The alternatives that shaped the overall Project includes the Project Go/No-Go decision, deposit, mining method, and production rate, processed ore containment and tailing storage, overburden and waste rock disposal, water management (including Schedule II listing of pond A53), transportation access and quarry development, and infrastructure support.

ᐊᐅᓚᑦᑎᔨᒃᑯᑦ ᓇᐃᓪᓕᒋᐊᖅᓯᒪᔪᒃᑯᑦ ᑐᑭᓯᑎᑦᑎᒍᑎᖓ

ᐊᓂᒍ ᐃᒍ ᐅᔭᕋᖕᓂᐊᖅᑐᓕᕆᔨᒃᑯᑦ - ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐱᓕᕆᔨᑦ ᐃᓚᓯᒋᐊᕈᒪᓯᒪᔪᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᒥᒃ ᐱᕐᑯᖕᖓᓂᐅᑉ ᐃᓱᐊᓂ ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓯᒪᔪᒥᒃ ᐊᒻᒪᓗ ᐊᑉᑯᑎᓕᐊᖑᓯᒪᔪᒥᒃ (ᐃᒪᓐᓇ ᑕᐃᔭᐅᓲᖅ ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᖅ). ᐃᓚᓯᒋᐊᕈᑕᐅᔪᒪᔪᖅ ᐊᒻᒪᓗ ᑕᑭᓪᓕᒋᐊᕈᑕᐅᔪᒪᔪᖅ ᐅᑯᓂᖕᖓ ᐃᓚᐅᖃᑕᐅᑎᑦᑎᔪᒪᔪᖅ: ᐱᕐᑯᖕᖓᓂᐅᑉ ᐃᓱᐊᓂ ᐊᖏᔪᖅ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᖅ, ᐱᕙᓪᓕᐊᑎᑦᑎᔪᒪᓂᖅ IVR ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᒥᒃ, ᑕᐃᒪᓗ IVR-ᒥ ᐅᔭᕋᓄᑦ ᐊᑐᖅᑕᐅᙱᑦᑐᓄᑦ ᐃᓂᖃᕐᕕᒃᓴᖅ ᐊᒻᒪᓗ IVR ᑯᕕᖅᑕᕐᕕᖓ, ᐊᒻᒪᓗᑦᑕᐅᖅ ᓄᓇᐅᑉ ᐊᑖᓂ ᐊᐅᓚᑦᑎᕖᑉ ᐊᐅᓚᑦᑎᕙᓪᓕᐊᖏᓐᓇᕐᓗᑎᒃ ᐊᒻᒪᓗ ᑲᒪᐃᓐᓇᕐᓗᑎᒃ ᐅᔭᖅᑲᓂᒃ ᐊᐳᖅᑎᓐᓈᑎᒥ. ᐱᓕᕆᕝᕕᐅᔪᖅ ᐃᓄᐃᑦ ᓄᓇᕐᑯᑎᖓᓄᓪᓚᑦ ᐅᖓᓯᖕᓂᓕᒃ 150 ᑭᓛᒥᑕᓂᒃ ᖃᒪᓂ’ᑐᐊᑉ ᐅᐊᖕᓇᖓᓄᑦ ᐊᒻᒪᓗ 50 ᑭᓛᒥᑕᒥᒃ ᐅᖓᓯᖕᓂᓕᒃ ᐊᐳᖅᑎᓐᓈᖅᑑᑉ ᐅᐊᖕᓇᖓᑕ ᑲᓇᖕᓇᖅᐸᓯᖓᓄᑦ ᑭᕙᓪᓕᕐᒥ ᓄᓇᕗᒥ.

ᐃᓚᓯᒋᐊᕈᑕᐅᔪᒪᔪᖅ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᖃᕋᔭᖅᑐᖅ ᐃᓱᒪᒃᓴᖅᓯᐅᕈᑕᐅᒃᑲᓂᕐᓗᓂ ᓄᓇᕗᒥ ᐸᕐᓇᐃᔨᒃᑯᓐᓄᑦ ᐊᒻᒪᓗ ᐱᓕᕆᐊᖑᔪᒃᑯᑦ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐱᕐᑯᔭᒃᑯᑦ ᐊᒻᒪᓗ ᐋᖅᑭᒋᐊᖅᓯᓂᖃᕋᔭᖅᓱᑎᒃ ᓇᓗᓇᐃᒃᑯᑕᓕᒃᑯᑦ A-ᑯᑦ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᑖᕈᑎᒥᒃ ᓄᓇᕗᒥ ᐃᒪᕐᒧᑦ ᐊᒻᒪᓗ ᓄᓇᕗᒥ ᓄᓇᐅᑉ ᖄᖑᒍᑦ ᐱᔪᓐᓇᐅᑎᓕᒃᑯᑦ ᑭᒡᓕᓯᓂᐊᖅᑎᒃᑯᑦ ᐱᕐᑯᔭᖑᒍᑦ. ᒪᓕᒡᓗᓂ ᐃᓱᒪᒃᓴᖅᓯᐅᕈᑕᐅᒃᑲᓂᖃᔭᖅᑐᒧᑦ ᐱᓕᕆᒋᐊᕈᓐᓇᖅᓯᓂᒃᑯᑦ ᓇᓗᓇᐃᒃᑯᑕᒃᑯᑦ (ᓈᓴᐅᑎᓕᒃ 008) ᓄᓇᕗᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓄᑦ, ᐊᓂᒍ ᐃᒎᒃᑯᑦ ᐋᖅᑭᒋᐊᖅᓯᔪᒪᔪᑦ ᓇᓗᓇᐃᒃᑯᑕᓕᖕᒥᒃ A-ᒥ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒥᒃ (2AM-WTP1826).

ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐃᓚᓯᒋᐊᕋᔭᖅᑐᖅ ᐅᔭᖅᑲᓂᒃ ᐲᔭᐃᖅᑕᑦᑕᕐᓂᕐᒧᑦ ᐃᒻᒪᖅ ᓯᑕᒪᓄᑦ ᐅᑭᐅᓄᑦ. ᓇᐸᖅᑎᕆᓂᕐᒧᑦ ᐋᖅᑭᒋᐊᖅᓯᒍᑏᑦ ᐃᑲᔫᑕᐅᕐᑯᐸᓗᕆᑦ ᐃᓚᓯᒋᐊᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᒃᑯᑦ ᐱᓕᕆᐊᖑᕆᐊᕋᔭᖅᑐᑦ ᑏᓐᓇᑲᐅᑎᕆ ᐊᖏᖅᑕᐅᑐᐊᖅᐸᑕ ᐊᒻᒪᓗ ᐱᔪᓐᓇᐅᑎᑖᑐᐊᖅᐸᑕ ᐋᖅᑭᒋᐊᖅᓯᔪᒪᓂᕐᒧᑦ ᑐᒃᓯᕋᐅᑎᑦ ᖃᐃᑕᐅᑐᐊᖅᐸᑕ (ᓂᕆᐅᒋᔭᐅᔪᑦ2020ᕐᑭᑎᐊᓂ). ᐊᐅᓚᑦᑎᓂᖅ ᐊᒃᑐᐊᓂᖃᕋᔭᖅᑐᖅ ᓯᕗᓪᓕᖅᐋᒥ ᐅᑭᐅᒥ (2019) 7-ᖓᓄᑦ ᐅᑭᐅᒧᑦ (2025-ᒧᑦ). ᐅᔭᕋᖕᓂᐊᕐᓂᖅ ᐃᓱᓕᓐᓂᐊᕋᓱᒋᔭᐅᔪᑦ 7-ᒋᔭᖓᓂᒃ ᐅᑭᐅᒥ (2025-ᒥ) ᐊᒻᒪᓗ ᐅᔭᖅᑭᕆᓂᖅ ᐃᓱᓕᓐᓇᔭᖅᓱᓂ ᐅᑭᐅᒥ 8-ᒥ (2026-ᒥ). ᒪᑐᓕᕐᓗᓂ 8-ᒥ ᐅᑭᐅᖓᓂᒃ (2026-ᒥ) ᐅᑭᐅᒧᑦ 33-ᒧᑦ (2051-ᒧᑦ) ᐱᐊᓂᒃᐸᑦ ᐅᔭᕋᖕᓂᐊᕐᓂᖅ ᐊᒻᒪᓗ ᐃᓚᐅᖃᑕᐅᓇᔭᖅᓱᓂ ᐲᔭᐃᓂᖅ ᐊᑐᕆᐊᖃᙱᑦᑐᓂᒃ ᐱᕐᑯᑎᖑᐊᓂᒃ ᐊᒻᒪᓗ ᐃᒥᖅᑐᐃᓂᕐᒧᑦ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᓂᒃ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐊᑖᓂ, ᐊᒻᒪᓗᑦᑕᐅᖅ ᓄᓇ ᐅᑎᖅᑎᓪᓗᒍ ᖃᓄᐃᓐᓂᕆᓚᐅᖅᑕᖓᓄᑦ ᐱᕐᑯᖕᖓᓂᐅᑉ ᐃᓱᐊᓂ ᐃᒪᐅᑉ ᐃᑎᓂᕆᓚᐅᖅᑕᖓ ᒪᓕᒡᓗᒍ.

ᐃᓚᓯᒋᐊᕈᑎᒧᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᒥᒃ ᐱᕐᑯᖕᖓᓂᐅᑉ ᐃᓱᐊᒍᑦ ᐱᓕᕆᐊᖑᔪᒃᑯᑦ, ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐋᖅᑭᒃᓱᖅᑕᐅᓯᒪᔪᖅ ᐊᐅᓚᓂᖃᕋᔭᖅᓱᓂ ᐊᑐᕐᓗᑎᒃ ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐱᓕᕆᕝᕕᖕᒥ ᐊᒻᒪᓗ ᖃᐅᔨᓴᖅᑕᐅᖃᑦᑕᕐᓂᐊᖅᑐᖅ ᐊᑐᖅᑕᐅᔪᒃᑯᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᒃᑯᑦ ᐊᑉᑯᑎᓕᐊᖑᓯᒪᔪᒥ, ᐊᓂᒍ ᐃᒎᒃᑯᑦ ᐋᖅᑭᒋᐊᕐᓂᐊᕐᓂᕋᖅᓯᒪᔭᖓ 9.5 ᒦᑕᒥᒃ 15 ᒦᑕᓄᑦ ᓯᓕᖕᓂᖓᒍᑦ. ᐃᖏᕐᕋᓂᖅ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒧᑦ (ᐃᒪᒃᑯᑦ ᐅᑭᐊᒃᑯᑦ, ᑎᖕᒥᓃᒃᑯᑦ, ᐊᒻᒪᓗ ᐊᔾᔭᖅᑐᐃᖃᑦᑕᕐᓂᖅ ᐃᖏᕐᕋᖃᑦᑕᕐᓂᖅ ᐊᕐᖁᑎᒃᑯᑦ), ᐃᓪᓗᑦ ᐊᒻᒪᓗ ᑲᒪᔨᐅᔪᑦ ᑕᐃᒪᐃᓴᐃᓐᓇᕐᓂᐊᖅᑐᑦ ᐊᖏᖅᑕᐅᓯᒪᔫᒃᑯᑦ ᐱᓕᕆᔪᓐᓇᖅᓯᓂᕐᒧᑦ ᓇᓗᓇᐅᒃᑯᑕᒃᑯᑦ 004-ᑯᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᑦ ᒪᓕᒡᓗᒋᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᐱᓕᕆᐊᕈᓐᓇᖅᓯᓂᕐᒧᑦ ᓇᓗᓇᐃᔭᐅᑎᒃᑯᑦ ᓈᓴᐅᑎᓕᒃᑯᑦ 008-ᑯᑦ.

ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᒧᖅ ᐃᓚᓯᒋᐊᕈᒪᓂᐅᔪᖅ ᐅᔭᕋᖕᓂᐊᕐᕕᒃᑯᑦ ᐊᐅᓚᑦᑎᕐᔪᑕᐅᔪᓂᒃ ᐊᖏᖅᑕᐅᓯᒪᔪᒧᑦ ᐱᓕᕆᐊᖑᔪᒧᑦ, ᓴᖅᑭᐅᒪᐃᓐᓇᖅᑐᒧᑦ ᐊᒻᒪᓗ ᓚᐃᓴᓐᓯᓕᖓᒧᑦ ᐊᒃᑕᑯᓄᑦ ᐊᒻᒪᓗ ᐃᒪᓕᕆᓂᒃᑯᑦ ᐱᓕᕆᕝᕕᒃᑯᑦ. ᒪᓕᒃᑐᖅ ᐊᖏᖅᑕᐅᓯᒪᔪᒥᒃ ᐱᓕᕆᐊᒥᒃ, ᐃᒪᕐᒥᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᕐᑎᕐᓗᐊᒃᑯᑦ ᐃᓚᐅᖃᑕᐅᑉᓗᑎᑦ ᐅᑯᐊ: ᐃᒪᑦ ᐊᑐᖅᑕᐅᔪᑦ ᑲᑎᑕᐅᓂᖏᑦ ᑕᓯᕐᒧᑦ, ᐃᒪᑦᑎᐊᕙᖕᓂᒃ ᑲᑎᑦᑎᖃᑦᑕᕐᓂᖅ ᑕᓯᒃᑯᑦ, ᓇᐅᒃᑰᕐᕖᑦ, ᐸᐸᑦᑎᕖᑦ ᐃᑎᖅᑕᐃᑦ, ᐃᒪᖅᑲᕐᕖᑦ, ᓱᐸᓗᒃᑯᑦ ᑰᒡᕖᑦ, ᐃᒪᕐᒥᒃ ᑲᒪᓂᐊᕐᓂᕐᒧᑦ ᐱᓕᕆᕖᑦ ᐊᑐᖅᑕᐅᔫᒃᑯᑦ, ᐃᒪᖅᑲᕐᕕᖓᓄᑦ ᑲᒪᒋᐊᕐᕕᖓᓄᑦ, ᐃᑎᕈᕐᓄᑦ ᑲᒪᒋᐊᕐᕖᑦ, ᐊᒻᒪᓗ ᑯᕕᖅᑕᕐᕖᑦ. ᐊᓯᖏᓪᓗ ᓄᓇᒥ ᐃᒪᐃᑦ ᐸᐸᑦᑎᕕᖏᑦ ᑕᓲᑦ, IVR ᐃᑎᖅᑕᐃᑦ ᐊᒻᒪᓗ ᖃᓄᖅᑑᕈᑏᑦ, ᐊᒻᒪᓗ ᐃᒪᐃᑦ ᐊᑐᖅᑕᐅᔪᑦ ᑲᑎᑦᑎᕙᖓᑕ ᖃᓄᐃᓕᐅᕈᑎᖏᑦ ᐃᓕᐅᖅᑲᖅᑕᐅᓂᐊᖅᑐᑦ ᐊᑑᑎᓕᖓᓄᑦ ᐊᐅᓚᑦᑎᕙᖓᓄᑦ ᐊᒻᒪᓗ ᐋᖅᑭᒋᐊᖅᓯᒍᑎᓄᑦ ᐊᒃᑐᖅᑕᐅᓂᖃᖅᓯᒪᔪᓄᑦ ᐃᒪᕐᓄᑦ.

ᐊᒻᒪᓗᑦᑕᐅᖅ, ᐊᖏᖅᑕᐅᓯᒪᔪᖅ ᐱᕐᑯᖕᖓᓂᐅᑉ ᐃᓱᐊᓂ ᐅᔭᖅᑲᓂᒃ ᐊᑐᖅᑕᐅᙱᑦᑐᓂᒃ ᐃᓂᖅᑲᕐᕕᒃ ᐊᑐᖅᑕᐅᙱᓐᓇᕐᓂᐊᖅᑐᖅ ᐃᓚᒋᐊᕈᑎᒃᑯᑦ; ᑭᓯᐊᓂᓕ, ᐅᔭᖅᑲᓂᒃ ᐊᑐᖅᓯᒪᔪᓂᒃ ᐃᓂᖅᑲᕐᕕᒃ ᐃᓚᒋᐊᖅᑕᐅᓂᐊᖅᑐᖅ ᓂᒋᐊᑕ ᐱᖓᖕᓂᖅᓯᖓᓄᑦ. ᓄᑖᖅ ᓴᖅᑭᑎᑕᐅᔪᖅ ᐅᔭᕋᖅᑲᕐᕕᒃ ᐃᓗᓕᖅᑲᖅᑲᑦᑕᕐᓂᐊᖅᑐᖅ ᐅᔭᖅᑲᓂᒃ ᐊᑐᖅᑕᐅᓯᒪᔪᓂᒃ ᐊᒻᒪᓗ ᐅᖓᑖᒍᑦ ᑲᑎᑕᐅᓯᒪᔪᓂᒃ IVR-ᒥ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᒃᑯᑦ. ᐅᔭᖅᑲᑦ ᐊᑐᖅᑕᐅᙱᑦᑐᑦ ᐃᓂᖅᑲᕐᕕᖓ ᐱᒋᐊᕈᑕᐅᖅᑳᓚᐅᖅᑐᖅ, ᐃᒪᕐᒧᑦ ᐊᐅᓚᑦᑎᕕᒃ, ᐊᒻᒪᓗ ᐃᒡᓗᖃᕐᕕᒃ ᐋᖅᑭᒃᓱᖅᑕᐅᓯᒪᔪᑦ ᒪᓕᒃᓱᑎᒃ ᐊᖏᖅᑕᐅᓯᒪᔪᒥᒃ ᐱᓕᕆᐊᖑᔪᒃᑯᑦ ᐊᒻᒪᓗ ᐊᖏᓪᓕᒋᐊᕈᓐᓇᕐᓂᐊᖅᓱᓂ ᐱᓕᕆᐊᖑᔪᖅ ᒪᓕᒡᓗᒍ ᐱᒋᐊᕈᑕᐅᓚᐅᖅᑳᖅᑐᒥ ᐊᑐᕐᓗᑎᒃ. ᓄᓇᐅᑉ ᐊᑖᓂ ᐅᔭᕋᖅᑲᕐᕕᒃ ᐱᕕᒃᓴᖅᑎᑕᐅᓯᒪᔪᖅ ᓇᓗᓇᐃᒃᑯᑕᓕᒃᑯᑦ B-ᑯᑦ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒃᑯᑦ 2BB-MEA1828 ᐃᓚᒋᐊᖅᑕᐅᓂᖃᕐᓂᐊᖅᑐᖅ ᐃᓗᓕᖅᑲᖅᑲᓐᓂᕈᓐᓇᕐᑯᑉᓗᒍ ᐊᓯᖏᓐᓂᒃ ᐅᔭᖅᑲᓂᒃ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐊᑖᒍᑦ ᐅᔭᕋᖕᓂᐊᕈᑎᓂᒃ. ᒪᓕᒡᓗᑎᒃ ᐊᖏᖅᑕᐅᓯᒪᔪᒥᒃ ᐊᐳᖅᑎᓐᓈᖅᑐᒃᑯᑦ

ᐱᖁᖕᒐᓂᐅᑉ ᐃᓱᐊᒍᓪᓗ ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓯᒪᔪᒃᑯᑦ ᐊᐅᓚᑦᑎᔾᔪᑎᓂᒃ, ᓇᓗᓇᐅᒃᑯᑦᑎᖅᑎᕈᑎ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᓇᓗᓇᐃᔭᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐊᑦᑕᓇᖅᑐᖃᙱᑦᑐᒃᑯᑦ ᐸᐸᑦᑎᔩᓇᕐᓂᕐᒧᑦ NPAG, PAG, ᐊᒻᒪᓗ ML ᐅᔭᖅᑲᓂᒃ. PAG-ᑯᑦ ᐅᔭᖅᑲᑦ ᐸᐸᑐᖅᑕᐅᓂᐊᖅᑐᑦ ᐃᓂᖃᕐᕕᐅᔪᒥ ᐋᖅᑭᒃᓱᖅᑕᐅᓯᒪᔪᒥᒃ ᐅᔭᕋᓕᕆᓂᒃᑯᑦ ᑐᙵᕕᖃᑦᑎᐊᕐᑯᐸᓗᒍ.

ᐊᖏᖅᑕᐅᓯᒪᓕᖅᐸᑦ ᐃᓚᒋᐊᕈᑕᐅᔪᒪᔪᖅ, ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐅᔭᕋᓂᐊᕐᕕᒃ ᐊᐅᓛᖏᓐᓇᕐᓂᐊᖅᑐᖅ ᐊᖏᖅᑕᐅᓯᒪᔪᒃᑯᑦ ᐅᔭᕋᓂᐊᕐᓂᒃᑯᑦ ᐊᒻᒪᓗ ᐅᔭᖅᑭᓇᕝᕕᐅᔩᓇᖅᑐᒃᑯᑦ (ᐱᓕᕆᐊᕈᓐᓇᖅᓯᓂᒃᑯᑦ ᓇᓗᓇᐃᒃᑯᑕᒃᑯᑦ 004-ᑯᑦ ᐊᒻᒪᓗ ᓇᓗᓇᐃᒃᑯᑕᓕᒃᑯᑦ A-ᒥ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᑖᕈᑎᒃᑯᑦ 2AM-MEA1526); ᑕᐃᒪᐃᒻᒪᑦ, ᐊᒡᓂᖑ ᐃᒍᒃᑯᑦ ᐃᓚᓯᒋᐊᕈᒪᔪᑦ ᐅᔭᖅᑭᓇᕝᕕᖕᒥ ᐊᒻᒪᓗ ᑯᕕᖅᑕᕐᕕᖕᒥ ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐅᔭᕋᓂᐊᕐᕕᖕᒥ, ᐃᓚᓯᒋᐊᕐᓂᒃᑯᑦ ᐱᓕᕆᐊᒃᑯᑦ. ᓄᑖᓂᒃ ᐱᕐᑯᑎᕐᔪᐊᓂᒃ ᐱᔭᕆᐊᖃᙱᑦᑐᑦ ᐊᑐᖅᑕᐅᓯᒪᔪᖅ ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐅᔭᕋᓂᐊᕐᕝᒃ ᐃᑲᔫᑕᐅᓂᐊᕐᒪᑦ ᐃᓚᒋᐊᕈᑎᒧᑦ. ᐊᒡᓂᖑ ᐃᒍᒃᑯᑦ ᐊᑐᕈᒪᔪᑦ ᐅᔭᖅᑲᑦ ᐱᖁᖕᒐᓂᐅᑉ ᐃᓱᐊᓂᙶᖅᑐᑦ ᑲᒪᒋᔭᐅᖃᑦᑕᕐᑯᓪᓗᒋᑦ ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐊᒻᒪᓗ ᑯᕕᖅᑕᖃᑦᑕᕐᓗᑎᒃ ᑕᐃᑲᓂᑦᑕᐃᓐᓇᖅ ᑯᕕᖅᑕᕐᕕᖕᒥ ᒪᓕᒡᓗᑎᒃ ᐊᖏᖅᑕᐅᓯᒪᔪᓂᒃ ᓄᓇᕗᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓄᑦ ᐱᓕᕆᐊᕐᑯᓐᓇᖅᓯᓂᒃᑯᑦ ᓇᓗᓇᐃᒃᑯᑕᒃᑯᑦ 008-ᑯᑦ ᐊᒻᒪᓗ ᓇᓗᓇᐃᒃᑯᑕᓕᒃᑯᑦ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒃᑯᑦ 2AM MEA1526.

ᑕᑭᓪᓕᒋᐊᕐᓗᒍ ᐅᔭᕋᓂᐊᕐᕕᐅᑉ ᐊᑐᖅᑕᐅᔩᓇᕐᓂᖕᒐ ᐱᖁᖕᒐᓂᐅᑉ ᐃᓱᐊᓂ ᐊᒻᒪᓗ ᐊᐳᖅᑎᓐᓈᖅᑐᒥ, ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᒪᑐᓯᕙᓪᓕᐊᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᐃᓚᖏᓐᓂᒃ ᐱᓕᕆᕝᕕᐅᔪᓂᒃ ᐊᐅᓚᑦᑎᓂᖃᖅᑎᓪᓗᒋᑦ. ᒪᑐᓯᓂᐊᕐᓂᕐᒧᑦ ᖃᓄᖅᑑᕈᑏᑦ ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᒥᒃ ᒪᓕᖕᓂᓖᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᒧᑦ ᐱᖁᖕᒐᓂᐅᑉ ᐃᓱᐊᒍᑦ ᐱᓕᕆᐊᖑᔪᒃᑯᑦ ᐊᒻᒪᓗ ᓴᐳᓐᓂᐊᕈᑏᑦ ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐋᖅᑭᒃᓱᖅᑕᐅᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᐱᓕᕆᖃᑎᖃᕐᓗᑎᒃ ᒐᕙᒪᑐᖃᒃᑯᑎᒍᑦ ᓄᓇᖃᖅᑳᖅᓯᒪᔪᓕᕆᓂᐊᒃᑯᖏᓐᓄᑦ ᐊᒻᒪᓗ ᐅᑭᐅᖅᑕᖅᑐᓕᕆᓂᐊᒃᑯᓐᓄᑦ ᐊᒻᒪᓗ ᑭᕙᓪᓕᕐᒥ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᒃᑯᖏᑦ ᐊᒻᒪᓗ ᐃᓕᔭᐅᖃᑦᑕᕐᓗᑎᒃ ᓇᓗᓇᐃᒃᑯᑕᓕᖕᒧᑦ A-ᒧᑦ 2AM-WTP1826.

ᑕᐃᒪᙵᓂ 2016-ᒥ, ᐊᒡᓂᖑ ᐃᖑᒃᑯᑦ ᑲᑎᑦᑎᕙᓪᓕᐊᖏᓐᓇᖅᑐᑦ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ, ᐃᓕᔭᐅᖃᑕᐅᓯᒪᔪᑦ ᐅᐸᓗᒥᒧᑦ ᒪᓕᓕᖅᓯᒪᔪᒧᑦ ᐃᓚᓯᒋᐊᕈᑎᒃᓴᒧᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᖃᐅᔨᓴᕈᑎᒧᑦ ᓇᓗᓇᐃᔭᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᐃᓂᖃᕐᓂᕐᒧᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐃᓅᖃᑎᒌᖕᓂᒃᑯᓪᓗ ᐊᒃᑐᖅᓯᓂᐅᓇᔭᖅᑐᓄᑦ ᓴᖅᑭᑦᑐᓄᑦ ᐱᓕᕆᐊᒃᑯᑦ. ᑎᑎᕋᖅᓯᒪᔪᑦ ᑲᑎᑕᐅᓯᒪᔪᑦ ᐱᖃᑕᐅᑎᑦᑎᔪᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᑐᕌᖓᔪᓂᒃ (ᐆᒃᑑᑎᒋᓗᒍ ᐃᑉᔪᐃᑦ, ᖁᐊᖑᐃᓐᓇᖅᑐᐃᑦ, ᓄᓇᒥᙵᖅᑐᑦ, ᓂᐱᖃᕐᓂᐅᔪᑦ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᖃᖓᓂ ᐃᒪᐅᑉ ᖃᓂᐃᓐᓂᖕᒐᓄᑦ ᐊᒻᒪᓗ ᖃᓄᖅ ᐊᖏᑎᒋᓂᖕᒐᓄᑦ ᑐᕋᖕᒐᓂᓖᑦ), ᐊᕙᑎᑉᑎᓐᓂᙵᖅᑐᑦ (ᓲᕐᓗ ᐱᕈᖅᑐᑦ, ᓄᓇᒥ ᐆᒪᔪᑦ ᐊᒻᒪᓗ ᑎᖕᒥᐊᓚᓚᐃᑦ, ᐊᒻᒪᓗ ᐃᖃᓗᐃᑦ ᐊᓯᖏᓪᓗ ᐃᒪᕐᒥᐅᑕᑦ), ᐊᒻᒪᓗ ᐃᓕᖅᑯᓯᑐᖃᕐᓂᒧᑦ ᐊᕙᑎᑉᑎᓐᓂᙵᖅᑐᑦ (ᓲᕐᓗ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ, ᐃᑦᓴᕐᓂᑕᐃᑦ ᐊᒻᒪᓗ ᐃᓅᖃᑎᒌᖕᓂᒃᑯᑦ ᐹᓇᐅᔾᔭᒃᓴᕈᑎᒃᓴᒃᑯᑦ ᑐᙵᕕᔪᑦ) ᐃᑲᔪᖅᑑᑎᒃᓴᑦ ᓯᕗᓪᓕᖅᐸᒃᑯᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐊᒃᑐᖅᓯᓂᐅᓇᔭᖅᑐᓄᑦ ᐅᖃᐅᓯᒃᓴᓕᐊᒧᑦ ᐊᒻᒪᓗ ᓇᓗᓇᐃᒃᑯᑕᒃ A-ᒥ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯ ᐋᖅᑭᒋᐊᖅᓯᒍᑎ ᑕᑕᑎᖅᓯᒪᔪᖅ ᓴᖅᑭᑎᑕᐅᓚᐅᖅᑐᖅ 2016-ᒥ. ᓴᖅᑭᓯᒪᔪᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᖃᐅᔨᓴᐃᓂᒃᑯᑦ ᓇᓂᓯᓯᒪᔪᑦ ᐋᖅᑭᒋᐊᖅᓯᓂᒃᑯᑦ, ᐱᓕᕆᐊᖅ ᐊᑯᓂ ᐱᒻᒪᕆᐊᓗᒃᑯᑦ ᓈᒻᒪᙱᑦᑐᒃᑯᑦ ᓴᖅᑭᑦᑎᑦᑎᓂᖃᔅᓵᙱᒻᒪᑦ ᓴᖅᑭᓯᒪᔪᓄᑦ ᓇᐸᖅᑎᕈᑕᐅᔪᒪᔪᓄᑦ, ᐊᐅᓚᑦᑎᔾᔪᑕᐅᔪᒪᔪᓄᑦ, ᐊᒻᒪᓗ ᒪᑐᓯᕙᓪᓕᐊᓇᔭᕐᓂᖕᒐᓄᑦ.

ᐊᒡᓂᒍ ᐃᒍᒃᑯᑦ ᓴᖅᑭᑦᑎᓯᒪᔪᑦ ᖃᐅᔨᓴᕈᑎᓂᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᓪᓗ ᖃᓄᐃᓕᐅᕈᑎᓂᒃ ᐊᑐᖅᑕᐅᔭᕆᐊᓕᖕᓂᒃ ᐋᖅᑭᒋᐊᖅᓯᓂᒃᑯᑦ, ᖃᐅᔨᓴᐃᓂᒃᑯᑦ ᐊᒻᒪᓗ ᐅᓂᖀᓕᐅᖃᑦᑕᕐᓂᐊᕐᓂᕐᒧᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐱᓕᕆᐊᖑᔪᒃᑯᑦ ᒪᓕᒡᓗᑎᒃ ᒪᓕᒐᓇᔭᐅᔪᓂᒃ ᐊᑐᖅᑕᐅᔭᕆᐊᓕᖕᓂᒃ ᐱᖁᖕᒐᓂᐅᑉ ᐃᓱᐊᒍᑦ ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓯᒪᔪᒃᑯᑦ, ᐊᒻᒪᓗ ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐊᐅᓚᑦᑎᓂᒃᑯᑦ ᐊᖏᖅᑕᐅᔭᕆᐊᖃᖅᑕᖅᑐᒃᑯᑦ, ᐱᔪᓇᐅᑎᑖᕈᑕᐅᖃᖅᑕᖅᑐᒃᑯᑦ, ᓚᐃᓴᓐᓯᑖᕈᑕᐅᖃᖅᑕᖅᑐᒃᑯᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑐᐊᕈᑕᐅᖃᖅᑕᖅᑐᒃᑯᑦ ᒪᓕᒡᓗᑎᒃ ᒪᓕᒐᓇᔭᐅᔪᓂᒃ ᐊᑐᖅᑕᐅᔭᕆᐊᓕᖕᓂᒃ ᐱᖁᔭᒃᑯᑦ ᒪᓕᒐᒃᑯᓪᓗ ᓄᓇᕗᒥ. ᐱᔭᕆᐊᖃᕐᓂᖓᓚᑦ ᐊᐳᖅᑎᓐᓈᖅᑐᒥ ᐅᔭᕋᓂᐊᕐᕕᒃᑯᑦ ᐸᕐᓇᐅᑎᑦ ᐅᕙᓗᓐᓂᑦ ᐱᖁᖕᒐᓂᐅᑉ ᐃᓱᐊᒍᑦ ᐸᕐᓇᐅᑎᑦ ᐋᖅᑭᒋᐊᖅᑕᐅᖃᑦᑕᖅᓯᒪᔪᑦ ᐅᕙᓗᓐᓂᑦ ᐃᓚᒋᐊᖅᑕᐅᖃᑦᑕᖅᓯᒪᔪᑦ ᒪᓕᓕᕐᑯᐸᓗᒋᑦ ᐃᓚᒋᐊᕈᑕᐅᔪᒪᔪᒧᑦ ᐱᓕᕆᐊᒃᑯᑦ, ᐊᒻᒪᓗ ᐱᖁᖕᒐᓂᐅᑉ ᐃᓱᐊᓂ ᐱᓕᕆᐊᕈᓐᓇᖅᓯᓂᕐᒧᑦ ᓇᓗᓇᐃᒃᑯᑕᒃᑯᑦ ᐱᓕᕆᐊᖑᔭᕆᐊᖃᖅᑐᒃᑯᑦ. ᓴᖅᑮᔭᓕᐊᓂᒃᑐᖅ ᐊᒻᒪᓗ ᐊᖏᖅᑕᐅᓯᒪᔪᖅ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ, ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐋᖅᑭᒋᐊᖅᓯᔾᔪᑎᓄᑦ ᑐᙵᕕᔪᑦ ᐊᒃᑐᐊᓂᖃᕐᓂᐊᖅᑐᑦ ᐊᒃᑐᖅᓯᓂᐅᔪᑦ ᐅᔭᖅᑲᑎᒍᑦ ᐊᑐᖅᑕᐅᙳᕆᑦᑐᒃᑯᑦ ᐊᒻᒪᓗ ᐃᒪᒃᑯᑦ ᒪᓕᖁᑉᐸᓗᕆᑦ ᓂᕆᐅᖕᒋᔭᐅᔪᓄᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᒃᑯᑦ ᐱᓕᕆᐊᒃᑯᑦ. ᓴᖅᑭᐸᒡᓕᐊᖃᑦᑕᖅᑐᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐊᒃᑐᖅᓯᓂᐅᓇᔭᖅᑐᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐊᒻᒪᓗ ᖃᓄᖅ ᐋᑎᖃᕋᔭᕐᓂᖕᒋᑦ ᐋᖅᑭᒋᐊᖅᓯᒍᑏᑦ ᓇᓗᓇᐃᖅᑕᐅᓂᐊᖅᑐᑦ ᖃᐅᔨᓴᕈᑎᒃᑯᑦ ᐊᒻᒪᓗ ᐊᕋᒍᑕᒫᒃᑯᑦ ᐅᓂᖀᓕᐊᖑᖃᑦᑕᖅᑐᒃᑯᑦ. ᓴᖅᑭᒐᔪᙱᑦᑐ ᓂᕆᐅᓇᙱᑦᑐᓪᓗ ᓈᒻᒪᙱᑦᑐᑦ ᐊᕙᑎᓕᕆᓂᒃᑯᑦ ᐊᒃᑐᖅᓯᓂᐅᔪᑦ ᐅᔾᔨᕆᔭᐅᒃᐸᑕ, ᐋᖅᑭᒋᐊᖅᓯᒍᑏᑦ ᓴᖅᑭᑎᑕᐅᓇᔭᖅᑐᑦ. ᓯᖏᐅᑎᖅᑕᑦᑕᕐᓂᒃᑯᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᑯᑦ, ᓴᖅᑮᔭᓕᐊᓂᒃᑯᑦ ᐋᖅᑭᒋᐊᖅᓯᒍᑏᑦ ᐋᖅᑭᒋᐊᖅᑕᐅᓂᐊᖅᑐᑦ ᐅᕙᓗᓐᓂᑦ ᓄᑖᑦ ᐋᖅᑭᒋᐊᖅᓯᒍᑏᑦ ᐊᑐᓕᖅᑎᖅᑕᐅᓗᑎᒃ ᐱᔭᕆᐊᖃᕈᑎᒃ. ᓯᓚᑖᓂ ᐅᓂᖃᓕᐅᕈᑏᑦ ᐱᐊᓂᒃᑕᐅᖃᑦᑕᕐᓂᐊᖅᑐᑦ, ᐱᔭᕆᐊᖃᓕᕿᖕᒐᑕ.

ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᑲᔪᓯᑎᑦᑎᓂᐅᔪᒪᔪᖅ ᑮᓇᐅᔾᔭᒃᓴᕈᑎᒃᓴᓂᒃ ᐅᑭᐅᓂᒃ ᖃᐃᔪᓂᒃ ᐅᖓᑖᓄᑦ ᐅᔭᕋᓂᐊᕐᓂᐅᑉ ᐃᓱᓕᓐᓂᕆᓇᔭᖅᑕᖓᑕ ᐊᖏᖅᑕᐅᓯᒪᔪᒃᑯᑦ. ᑮᓇᐅᔾᔭᒃᓴᕈᑏᑦ ᐃᓚᓯᒋᐊᖅᓯᓂᒃᑯᑦ ᐱᓕᕆᐊᒥᒃ ᐱᒻᒪᕆᐊᓗᔪᑦ ᐊᒻᒪᓗ ᓂᕆᐅᒋᔭᐅᔪᑦ

ᐱᒻᒪᕆᐊᓗᒃᑯᑦ ᐱᕚᓪᓕᕈᑕᐅᓂᐊᕐᓂᖏᓐᓄᑦ ᓄᓇᕗᒥ. ᐃᓚᓯᒋᐊᕈᒪᓂᒃᑯᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᓂᕆᐅᒋᔭᐅᔪᖅ ᐃᓚᓯᒋᐊᕐᓂᐊᕐᓂᖓᓄᑦ 99-ᓂᒃ ᓄᑖᓂᒃ ᓴᓇᔾᔭᓂᒃ ᓄᓇᕗᒥᐅᓄᑦ ᐃᓚᒋᐊᕈᑏᑦ ᑕᐃᑉᑯᓄᙵ ᐊᖏᖅᑕᐅᓯᒪᔫᒃᑯᑦ ᐱᓕᕆᐊᖑᔫᒃᑯᑦ, ᐊᒻᒪᓗ ᐃᓚᓯᒋᐊᖅᓯᓯᒪᔪᖅ ᓴᓇᔾᔭᓂᒃ ᑮᓇᐅᔭᓕᐊᕆᔾᔭᓂᒡᓗ ᐊᖏᖅᑕᐅᓯᒪᔪᓄᑦ ᐱᓕᕆᐊᖑᔪᓄᑦ 2026-ᒧᑦ.

ᐃᓚᓯᒋᐊᕈᒪᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᖅ ᐱᐅᔫᒃᑯᑦ ᐊᒃᑐᖅᓯᓂᖃᐃᓐᓇᕐᓂᐊᖅᑐᑦ ᓄᓇᓕᖕᓄᑦ ᐃᓚᒋᐊᖅᓯᒪᔫᒃᑯᑦ ᐱᓕᕆᓐᓇᐅᔫᒃᑯᑦ, ᐃᒡᓗᒥᐅᖃᑎᒌᑦ ᑮᓇᐅᔭᓕᐊᖏᑦᑎᒧᑦ ᐊᒻᒪᓗ ᓂᕿᖃᑦᑎᐊᕐᑯᓐᓇᖅᓯᓂᕐᒧᑦ, ᐱᙳᐊᖅᑐᓕᕆᓂᒃᑯᑦ, ᐃᓕᓐᓂᐊᕐᓂᒃᑯᑦ, ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᔪᓐᓇᖅᑐᒃᑯᑦ ᐱᓕᕆᔪᓐᓇᕐᓂᕐᒧᑦ ᐃᓕᖅᑯᓯᑐᖃᑎᒍᑦ ᖃᓄᐃᓕᐅᕈᑎᒃᑯᑦ. ᑕᐃᒪᓐᓇᕐᓚᒃ, ᐃᓚᓯᒋᐊᕈᑎ ᐱᓕᕆᐊᒧᑦ ᐃᑲᔪᖅᑑᑕᐅᖏᓐᓇᕈᓐᓇᕐᓂᐊᖅᑐᖅ ᓄᓇᓕᖕᓄᑦ ᖃᓄᐃᓕᐅᕈᑎᒃᑯᑦ ᐊᒻᒪᓗ ᐃᓕᓐᓂᐊᕐᓂᒃᑯᑦ ᐱᓕᕆᐊᖑᔪᒪᔫᒃᑯᑦ, ᐊᒻᒪᓗᑦᑕᐅᖅ ᐃᓄᐃᑦ ᐱᕚᓪᓕᕈᑎᒃᓴᖏᓐᓄᑦ ᐊᖏᕈᑎᓕᐊᒃᑯᑦ ᓂᖏᖅᑕᐅᑎᒃᑯᑦ ᐊᒻᒪᓗ ᐱᓕᕆᐊᖑᔪᒪᔫᒃᑯᑦ. ᐋᓐᓂᐊᖅᑐᓕᕆᓂᒃᑯᑦ ᐊᑦᑕᓇᖅᑐᒦᑎᑦᑎᑦᑕᐃᓕᒪᓂᒃᑯᓪᓗ ᐃᓕᓐᓂᐊᕈᑏᑦ ᐊᐅᓪᓘᕐᓂᖅᖅᑎᓪᓗᒍ ᐅᔭᕋᖕᓂᐊᕐᕕᒃ ᐃᓚᒋᐊᖅᑕᐅᓯᒪᑎᓪᓗᒍ ᓂᕆᐅᒋᔭᐅᖏᔪᖅ ᐃᑲᔫᑕᐅᓂᐊᕐᓂᖓ ᓄᓇᓕᖕᓄᑦ.

ᑕᐃᒪᙵᓂ ᐊᐳᖅᑎᓈᖅᑐᒥ ᐅᔭᕋᖕᓂᐊᕐᓂᖅ ᐱᒋᐊᓚᐅᖅᑎᓪᓗᒍ, ᐊᒃᓂᒍ ᐃᒍᒃᑯᑦ ᐅᖃᖅᑎᖃᐃᓐᓇᖅᑐᑦ ᐃᓄᖕᓂᒃ ᐊᕐᕌᒍᑕᒫᒃᑯᑦ ᑲᑎᒪᑎᑦᑎᕙᒃᓗᑎᒃ ᓄᓇᓕᖕᓂ ᐊᒻᒪᓗ ᓄᓇᓕᖕᓂᒃ ᓇᖏᓂᖅᖅᑎᐅᔫᒃᑯᑦ ᑭᕙᓪᓕᕐᒥ, ᒪᓕᒐᓕᕆᔩᑦ ᑎᒥᐅᔪᑦ ᐊᒻᒪᓗ ᓄᓇᓕᖕᓂ ᓴᓇᔩᑦ. ᑕᒪᓐᓇ ᑐᑭᓯᑎᑦᑎᑦᑎᐊᖅᓯᒪᓂᖅᓴᐅᔪᖅ ᐱᔪᓇᐅᑎᒋᔭᐅᔪᓂᒃ, ᐱᔩᒥᒋᔭᐅᔪᓂᒃ, ᐱᒻᒪᕆᐅᑎᑕᐅᔪᓂᒃ, ᐱᔪᒪᔭᐅᔪᓂᒃ ᐊᒻᒪᓗ ᐃᓯᒫᓘᑕᐅᔪᓂᒃ ᐊᒃᑐᖅᓯᓂᐅᓇᔅᑐᒃᑯᑦ ᓇᖏᓂᓕᖕᓄᑦ, ᐱᓗᐊᖅᑐᒥ ᖃᒪᓂʼᑐᐊᕐᒧᑦ. ᑖᒃᓱᓇ ᐅᖃᖃᑎᖃᖃᑦᑕᕐᓂᒃᑯᑦ, ᐊᒃᓂᖑ ᐃᒍᒃᑯᑦ ᓴᖅᑭᑎᑦᑎᓯᒪᔪᑦ ᐊᐅᓚᑦᑎᓂᒃᑯᑦ ᐃᓕᖅᑯᓯᑐᖃᑎᒍᑦ ᐃᓕᑕᖅᓯᓂᒃᑯᑦ ᐊᒻᒪᓗ ᐃᒃᐱᒍᓯᑦᑎᐊᕐᓂᒃᑯᑦ ᐱᐋᒥᒋᔭᐅᔪᓂᒃ ᐸᕐᓇᐃᓂᒃᑯᑦ ᐊᒻᒪᓗ ᐱᕙᓪᓕᐊᑎᑦᑎᓂᒃᑯᑦ ᐱᓕᕆᐊᖑᔭᕆᐊᓕᖕᓂᒃ. ᐊᒃᓂᒍ ᐃᒍᒃᑯᑦ ᐅᖃᖃᑎᖃᖅᓯᒪᔪᑦ ᓄᓇᓕᖕᓂ ᓇᖏᓂᖅᖅᑎᐅᔪᓂᒃ ᐊᒻᒪᓗ ᒪᓕᒐᓕᕆᔨᒃᑯᓐᓂᒃ ᐱᔾᔪᑎᒋᐸᒡᓗᒋᑦ ᑲᔪᓲᓐᓇᖅᑐᑦ ᐊᐅᓚᑦᑎʼᔪᐃᑦ ᐱᖁᖓᓂᐅᐸ ᐃᓯᐊᓂ ᐃᓗᑦᑐᖅᑎᖅᓯᒪᔪᒥ ᐊᒻᒪᓗ ᐊᑉᖁᑎᒥᒃ ᐱᕙᓪᓕᐊᑎᑦᑎᓂᕐᒧᑦ, ᐊᒻᒪᓗᑦᑕᐅᖅ ᐃᓚᒋᐊᕈᑕᐅᔪᒪᔫᒃᑯᑦ.

ᐅᖃᖃᑎᒋᒍᑏᑦ ᐊᒻᒪᓗ ᒪᓕᒐᓕᕆᓂᒃᑯᑦ ᐅᖃᖃᑎᒋᒍᑏᑦ ᐃᓯᒪᒋᔭᐅᓚᐅᕐᕿᔪᑦ ᐃᓚᐅᖃᑕᐅᖁᑉᓗᒋᑦ ᐋᖅᑭᒋᐊᕈᑎᒃᓴᒃᑲᓂᕐᓄᑦ. ᖃᓄᖅᑑᕈᑎᒃᑲᓃᑦ ᐋᖅᑭᒃᓯᒍᑏᑦ ᐱᓕᕆᐊᖑᓂᐊᖅᑐᒥᒃ ᐅᑯᓂᙵ ᐃᓗᓕᖃᖅᑐᑦ ᐱᓕᕆᐊᖑᔪᒥᒃ ᐱᒋᐊᖅᑎᑦᑎᔪᓇᕐᓂᕐᒧᑦ/ᐱᒋᐊᖅᑎᑦᑎᔪᓐᓇᙱᓐᓂᕐᒧᑦ ᐃᓯᒪᓕᐅᕈᑕᐅᔪᒥᒃ, ᐅᔭᕋᖃᕐᕕᖕᓂᒃ, ᐅᔭᕋᖕᓂᐊᕐᓂᕐᒧᑦ ᖃᓄᐃᓕᐅᕈᑎᓂᒃ, ᐊᒻᒪᓗ ᐱᕙᓪᓕᐊᑎᑦᑎᓂᕐᒧᑦ ᐊᑭᓕᔭᐅᓇᔭᖅᑐᓂᒃ, ᐅᔭᕋᓕᕆʼᔪᑕᐅᔪᑦ ᐃᓗᓕᖏᑦ ᐊᒻᒪᓗ ᑯᕚᖅᑕᕐᕖᑦ, ᐅᔭᕋᖅᕐᕖᑦ ᐊᒻᒪᓗ ᐅᔭᖅᑲᑦ ᐊᑐᖅᑕᐅʼᔭᕈᓐᓃᖅᑐᑦ ᐃᓂᖃᕐᕕᖓ, ᐃᒪᕐᒥᒃ ᐊᐅᓚᑦᑎᕖᒃ (ᐃᓚᐅᖃᑕᐅᓗᒍ ᓇᓗᓇᐃᒃᑯᑕᖅ II ᑎᑎᕋᖅᓯᒪᔪᖅ ᐃᒪᓐᓇ ᑕᓯᖅ A53), ᐃᖏᕐᕋᔾᔪᑎᓄᑦ ᐊᑐᖅᑐᒃᓴᑦ ᐊᒻᒪᓗ ᐅᔭᖅᑲᓂᒃ ᐱᕙᓪᓕᐊᑎᑦᑎᓂᖅ, ᐊᒻᒪᓗ ᐱᖁᑎᕐᔪᐊᓄᑦ ᐃᑲᔫᑏᑦ.

Table of Contents

TABLES

FIGURES

APPENDICES

LIST OF ACRONYMS

AER	Alberta Energy Regulator
Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
Approved Project	Whale Tail Pit and Haul Road
ARD	Acid Rock Drainage
AWAR	All-Weather Access Road
BSA	Baseline Study Area
CAC	Criteria Air Contaminants
CCME	Canadian Council of Ministers of the Environment
CDWQG	Canadian Drinking Water Quality Guidelines
CEQG	Canadian Environmental Quality Guidelines
CO	Carbon Monoxide
COPC	Constituents of Potential Concern
COSEWIC	Committee on Status of Endangered Wildlife in Canada
CRA	Commercial, Recreational, and/or Aboriginal (fishery)
CREMP	Core Receiving Environment Monitoring Program
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
Expansion Project	Whale Tail Pit – Expansion Project
ELC	Ecological Land Classification
FEIS	Final Environmental Impact Statement
FTPCCCEA	Federal/Provincial Territorial Committee on Climate Change & Environmental Assessment
GC	Government of Canada
GHG	greenhouse gas
GHGRP	Greenhouse Gas Emissions Reporting Program
GN	Government of Nunavut
Golder	Golder Associates Ltd.
H^+	hydrogen ion
HC	Health Canada

HTO	Hunters and Trappers Organization
IIBA	Inuit Impact Benefit Agreement
IPCC	Intergovernmental Panel on Climate Change
IQ	Inuit Qaujimajatuqangit
IR	Information Request
ISEE	International Society of Explosives Engineers
ISO	International Organization for Standardization
ISQG	Interim Sediment Quality Guideline
KivIA	Kivalliq Inuit Association
LFN	Low Frequency Noise
LOM	Life of Mine
LSA	Local Study Area
MAA	Multiple Accounts Analysis
MDMER	Metal and Diamond Mining Effluent Regulations
MECP	Ontario Ministry of Environment, Conservation, and Parks
ML	Metal Leaching
NAD	North American Datum
NH_3	ammonia
NIRB	Nunavut Impact Review Board
NPAG	Non-potentially Acid Generating
NTI	Nunavut Tunngavik Incorporated
NWB	Nunavut Water Board
NO_2	nitrogen dioxide
NO	nitrogen monoxide
NPRI	National Pollutant Release Inventory
PAG	Potentially Acid Generating
PEL	Probable Effect Level
PM_{10}	particulate matter smaller than 10.0 micrometres in aerodynamic diameter
$PM_{2.5}$	particulate matter smaller than 2.5 micrometres in aerodynamic diameter
PPL	Peak Pressure Level

PPV	Peak Particle Velocity
PRISM	Program for Regional and International Shorebird Monitoring
PSL	Permissible Sound Level
Rmax	that point on the Local Study Area boundary with maximum predicted Project noise level
RMMS	Responsible Mining Management System
RSA	Regional Study Area
SO_2	sulfur dioxide
T&C	Term and Condition
TAG	Terrestrial Advisory Group
TDS	Total Dissolved Solids
TEMP	Terrestrial Ecosystem Management Plan
TLRU	Traditional Land and Resource Use
TK	Traditional Knowledge
TSF	Tailings Storage Facility
TSP	Total Suspended Particulate Matter
TSS	Total Suspended Solids
VC	Valued Component
WRSF	Waste Rock Storage Facility
ZOI	Zone of Influence

LIST OF UNITS

%	percent
+/-	plus or minus
<	less than
>	greater than
°C	degrees Celsius
dB	decibel
dBA	A-weighted decibel
dBC	C-weighted decibel
dBZ	unweighted or linear decibels

$g/m^2/yr$	grams per square metres per year
eq $H^+/m^2/yr$	equivalent hydrogen per square meters per year
hr	hour
kg-N/ha/yr	kilograms of nitrogen per hectare per year
km	kilometre
kt CO_2e/yr	kilotonnes of carbon dioxide equivalents per year
$mg/cm^2/30days$	milligram per square centimetre per 30 days
$mg/dm^2/day$	milligrams per squared decimetre per day
m	metre
mm	millimetre
mm/s	millimetres per second
Mt	million tonne
ppb	parts per billion
ppbv	parts per billion, volumetric
ppmv	parts per million, volumetric
t CO_{2e}/yr	tonnes of carbon dioxide equivalents per year
t/d	tonnes per day
$\mu g/m^3$	micrograms per cubic metre

1.0 PROJECT DESCRIPTION

1.1 Introduction

On November 6, 2017, the Nunavut Impact Review Board (NIRB) provided a positive decision on the Whale Tail Pit Project and on March 15, 2018 Agnico Eagle Mines Limited (Agnico Eagle) gained approval to further extend the life of mine (LOM) by constructing and operating the Whale Tail Pit and associated facilities as permitted by Project Certificate No. 008 (herein referred to as the Approved Project). On July 11, 2018, the Minister approved the Type A Water Licence 2AM-WTP1826 to begin construction and operation of the Whale Tail Pit, hauling of ore to the Meadowbank Mill, and continued milling at the Meadowbank Mill and operation of the tailings storage facility (TSF) under an amended Meadowbank Mine Type A Water Licence 2AM-MEA1526. As a satellite operation, the Whale Tail Pit is approved to operate and will continue to feed the Meadowbank Mill, TSF, and use associated Meadowbank Mine infrastructure under Project Certificate No. 004 and Type A Water Licence 2AM-MEA1526.

As set out in the Final Environmental Impact Statement (FEIS) Addendum, Agnico Eagle is proposing certain changes to the Approved Project. Specifically, Agnico Eagle is seeking approval to expand and extend the Approved Project to include the:

- IVR Pit;
- IVR Waste Rock Storage Facility (WRSF);
- IVR Attenuation Pond; and
- Underground mine.

Collectively, this is referred to as the Whale Tail Pit Expansion Project and often referred to in the FEIS Addendum as “the Expansion”.

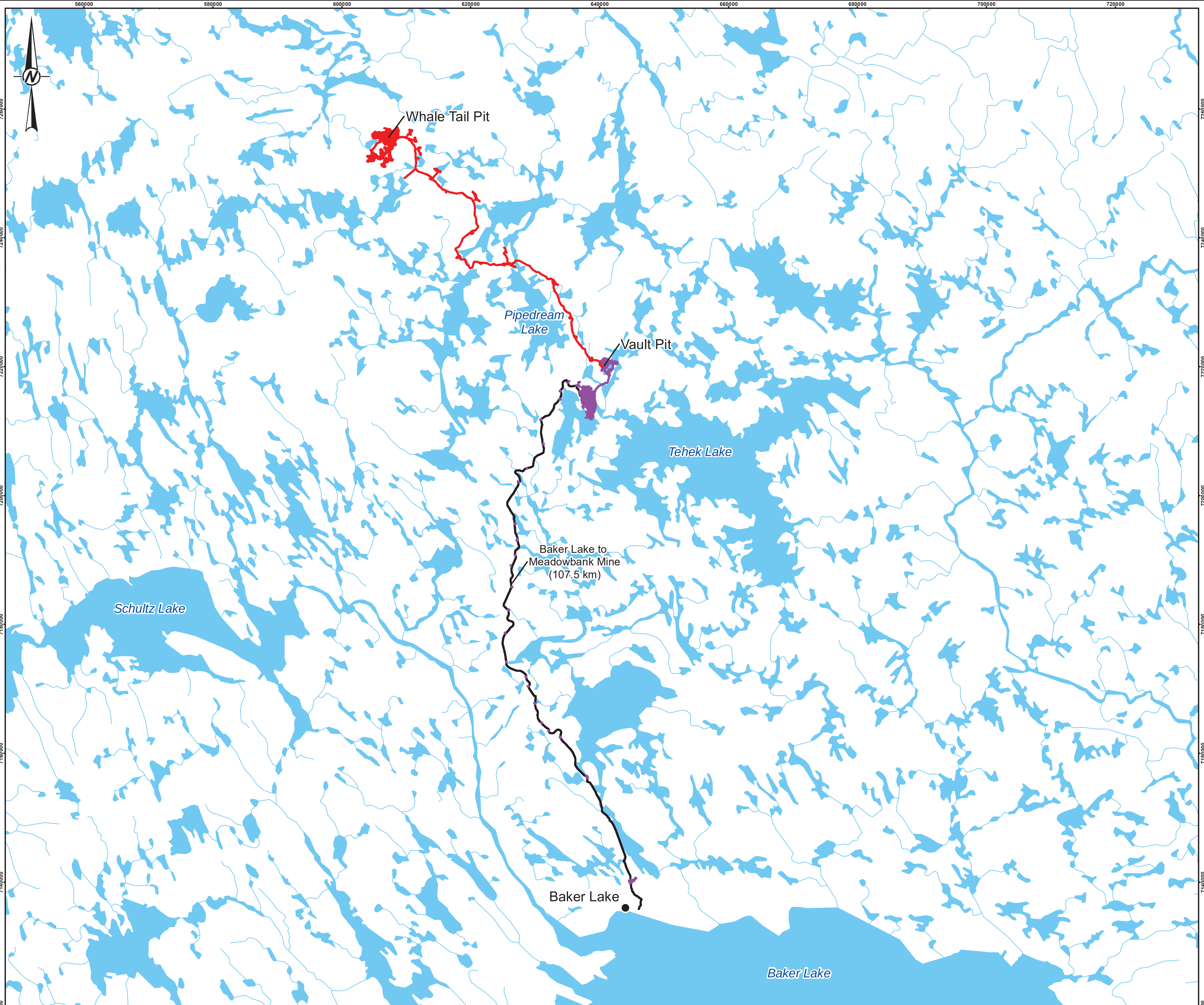
The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km north of Meadowbank Mine in the Kivalliq region of Nunavut (Figure 1.1-1).

As an expansion to the existing operations at Whale Tail Pit, the proposal is subject to an Environmental Assessment (EA) reconsideration established by the *Nunavut Planning and Project Assessment Act* and the Water Licence authorities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*. Agnico Eagle requests the NIRB reconsider Project Certificate No. 008 where appropriate to account for the Expansion Project.

Concurrent with the reconsideration of the Project Certificate by the NIRB, Agnico Eagle is seeking an amendment to the Type A Water Licence 2AM-WTP1826 to include mining of the expansion components and associated infrastructure from the Nunavut Water Board (NWB). In support of the Project Certificate reconsideration Agnico Eagle has provided this stand-alone FEIS Addendum to guide the review process. The FEIS Addendum has been developed to conform to recent guidance issued by the NIRB or completion of FEIS addendums (NIRB 2018a) where applicable and is provided in Volume 2.

1.1.1 Project Definition

Table 1.1-1 provides a summary of the Expansion Project as a comparison to the Approved Project FEIS. Agnico Eagle believes the scope of the Project defined in the Approved Project FEIS (Agnico Eagle 2016c) has not changed significantly with the proposed expansion.



LEGEND

- COMMUNITY
- HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

0 12 24

1:600,000 KILOMETRES

REFERENCE(S)

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
3. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

PROJECT LOCATION

CONSULTANT

GOLDER

YYYY-MM-DD	2018-11-22
DESIGNED	JR
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	1300/1340	0	1.1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

Table 1.1-1: Definition of Scope

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
Location/ Land Tenure	The Amaruq property located approximately 150 km north of the Hamlet of Baker Lake and approximately 50 km north of the Meadowbank Mine.	No change. Project Development Area boundaries expanded.
Resource	The total gold resource for the Whale Tail Pit will extend the LOM of Meadowbank for three to four years.	The total gold resource for the Expansion Project will expand and extend the LOM of Meadowbank to 2026.
Life of Mine	This Whale Tail Pit resource will be extracted over approximately three to four-year period from 2019 through 2022. Construction and pre-stripping is scheduled to begin in 2018 and mining in October 2018 with mill feed expected to begin in third quarter of 2019. Dewatering is currently scheduled to occur between the first and third quarters of 2019. Infrastructure/activities at Meadowbank Mine that support the Project will be extended for another three years and will remain the same as authorized under Project Certificate No. 004.	This expanded resource will be extracted over approximately four-year period from 2020 thru 2025. In total, the resource extraction for the Whale Tail Project will be expanded and extended over approximately a seven-year period from 2019 to 2025. Mining activities at Whale Tail Pit are expected to end in Year 7 (2025) and ore hauling and processing is expected to end during Year 8 (2026). Construction and pre-stripping for the IVR Pit is scheduled to begin in September 2020; mining of the expanded pits and underground will begin in 2021. Infrastructure/activities at Meadowbank Mine that support the Expansion Project will be extended for another four years and will remain the same as approved under Project Certificate No. 004.
Site Access	Existing airstrip used during exploration phase will be reclaimed. The Approved Project is designed to operate as a satellite of the main Meadowbank facilities, and will be accessed by the existing exploration access road, which will be upgraded to accommodate haul trucks and increased traffic. Transportation to site (marine barging, airstrip, and transportation along the all-weather access road), housing and handling will remain the same as authorized under Project Certificate No. 004.	Existing airstrip used during exploration phase will be used as a construction access road for Whale Tail Dike. A section of the expanded haul road near the Whale Tail Pit site will be used as an airstrip during the operation of the expansion. The Expansion Project is designed to operate as a satellite of the main Meadowbank facilities, and will be accessed by the approved haul road, which Agnico Eagle proposes to upgraded from 9.5 m to 15 m in width to ensure safe passage of haul trucks. Refer to Section 1.2.8 of the FEIS Addendum. The design parameters to allow for caribou crossing of 4:1 slope will be adhered to. Additional borrow/quarry material will be needed to undertake Expansion of the haul road. Refer to Section 1.2.15 of the FEIS Addendum. Transportation to site (marine barging, airstrip, and transportation along the all-weather access road), housing and handling will remain the same as

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
		authorized under Project Certificate No. 004 and/or Project Certificate No. 008, where applicable.
Laydown Facilities and Baker Lake Marshalling Area	Existing Meadowbank facilities will be used. A small laydown area will be constructed on the Whale Tail Pit site.	No change. Refer to Section 1.2.12 of the FEIS Addendum.
On-site Facilities	Construction of on-site facilities at Whale Tail Pit: power plant, maintenance facilities, tank farm, water treatment plant, water management infrastructure, sewage treatment plant, heli-pad, and accommodation for 210 people at the main camp. Continued use of the existing Amaruq exploration camp on the property for exploration activity. All milling will be done at Meadowbank Mine at a mill rate consistent or lower than the current mill rate (9,000 to 12,000 tonnes per day). Power generation for the Mill and camp at Meadowbank will remain the same as authorized under the current Project Certificate (No. 004).	On-site, existing facilities and infrastructure will continue to be utilized including: a personnel camp (i.e., Main Camp), landfill, power plant, heli-pad, maintenance shop, tank farm, a WRSF, an ore stockpiling facility, an attenuation pond, a water and sewage collection and treatment system, haul roads, access roads, water management infrastructure (e.g., collection ponds, channels, dikes, dams, and culverts), and the Whale Tail Pit. No change related to use of existing Amaruq exploration camp on the property for exploration activity (Type B Water Licence 2BB-MEA1828). No changes related to milling to be done at Meadowbank Mine. Expansion to include: • Expansion of on-site facilities at Whale Tail Pit to accommodate a maximum of 390 persons. • Installation of a larger maintenance shop and additional wings to the Main Camp, to support additional personnel. • Installation of an incinerator, compost site, and landfarm to support waste management activities. Refer to Section 1.2.13 of the FEIS Addendum. • For expansion of mining and water management infrastructure see below. All other on-site facilities for the Whale Tail Project will remain the same as authorized under the current Project Certificate No. 008.

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
Mine Infrastructure	Open pit mining for the Approved Project is planned to occur in one area, Whale Tail Pit. Flow of surface water into the pit will be limited through construction of two dikes. Whale Tail Dike will be constructed to divide the pit area from the southern portion of Whale Tail Lake, and Mammoth Dike is required for dewatering the pit area and to limit the water flow from Mammoth Lake into the pit during important flood events. To limit the impact of dike construction, turbidity barriers will be installed. Only NPAG and low metal leaching (LML) material will be used for the construction of infrastructure. Low permeability rockfill dikes with a geomembrane will be constructed. As needed, sodium bentonite will be mixed in place with aggregate or in a slurry to reduce the permeability of the construction material.	Expansion of Whale Tail Pit; mining an additional open pit, IVR Pit; underground mining below Whale Tail and IVR pits. Flow of surface water into the Whale Tail Pit will continue to be controlled by Whale Tail Dike and Mammoth Dike. Flow of surface water into IVR Pit will be controlled by IVR Diversion and IVR-D1, IVR-D2, and IVR-D3 dikes. Construction mitigation measures and methods of IVR-D1, IVR-D2, and IVR-D3 dikes are consistent with measures and methods for dike construction of Approved infrastructure. No significant changes to dike design are anticipated; although the Northeast Dike (within the IVR Pit footprint) will be removed once the IVR Pit is initiated. Dewatering of IVR Pit is currently scheduled to begin in 2020. Dewatering of Lake A53 is currently scheduled to begin in 2021. Underground mining will be mainly, long hole mining (95%) with some mechanized cut and fill in flat areas. The configuration will be a mix of transverse and longitudinal stoping. Waste rock will be temporarily stored on surface in the Underground WRSF until it is used for underground backfill. Stopes will be filled with cemented rock fill and rock fill. Ore will be extracted by truck and scoop and hauled to surface through main access ramp.
Ore Processing	Ore processing, handling, treatment, and disposal will continue at the Meadowbank Mill and tailings will be stored in the footprint of the existing approved tailings storage facility consistent with the current Project Certificate No. 004. Operations for the approved tailings facility addressed under Type A Water Licence 2AM-MEA1526.	No change.
Tailings	No tailings to be treated or disposed of on the Whale Tail Pit site. The existing tailings facility at Meadowbank Mine will continue to be used for tailings disposal. All tailings treatment and placement will remain consistent with the current Project Certificate No. 004.	No change.

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
Process Water	Mine process water reclamation will remain the same as authorized under the current Project Certificate No. 004 and Type A Water Licence 2AM-MEA1526.	No change.
Ore Stockpile	Three ore-stock pile areas are approved under Project Certificate No. 008 and Type A Water Licence 2AM-WTP1826.	Consistent with the Approved Project, ore will be stockpiled in a series of stockpiles located adjacent to the pits as shown on Figure 1.2-1. Refer to Section 1.2.2.2 of the FEIS Addendum for additional information.
Waste Rock	Waste rock and overburden generated at Whale Tail will be placed in the Whale Tail Waste Rock Storage Facility. Consistent with Meadowbank a classification system will be used to identify and safely store PAG and ML (leachable) rock in a designated storage area designed for long-term stability; and to stockpile NPAG and NML rock for use in construction and as cover material for the WRSF facility. Run-off will be appropriately handled.	The approved Whale Tail WRSF will continue to be used for the Whale Tail Pit expansion and the Whale Tail WRSF will be expanded vertically and horizontally to the southeast. Refer to Section 1.2.3 and Volume 5, Appendix 5-E of the FEIS Addendum. Expansion includes: • A new IVR WRSF to accommodate waste rock and overburden generated from the IVR Pit. The waste rock storage footprint, water management infrastructure and camp have been designed and considers up to eight years storage capacity to allow for expected resource growth. • The Underground WRSF that is permitted under the Type B will be expanded. Agnico Eagle will increase the footprint of the underground exploration area to the north to accommodate additional waste rock storage. Consistent with Meadowbank and Whale Tail Pit operations, a classification system will be used to identify and safely store PAG and ML rock. PAG mine rock will be stored in the designated storage areas designed for long-term stability. NPAG and NML rock will be either stockpiled or used in construction, including for WRSF cover material. Run-off will be appropriately handled. Thermal encapsulation of the PAG and ML rocks was selected as a reclamation strategy to verify long-term stability of the waste rock storage facilities. The Expansion Project will generate approximately 15.2 Mt of tailings to be stored at Meadowbank TSF, 121.7 Mt of mine waste rock, and 5.7 Mt of overburden soil to be stored at Whale Tail, with very limited organic material.

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
Freshwater	The freshwater and potable water supply for the Whale Tail Camp will be pumped from Nemo Lake during most of construction and all of operations and treated at the on-site water treatment plant. Freshwater and potable water will be required from Whale Tail Lake, for construction and closure. Water supply for milling will continue to be sourced from the reclaim pond located near the Meadowbank Mill and freshwater will continue to be taken from Third Portage Lake as approved by the Nunavut Water Board.	No change in source for potable use, mining (including drilling) and dust suppression as approved under Type A Water Licence 2AM-WTP1826. Freshwater and potable water use will extend to 2025 (during operations) and additional freshwater will be required from Whale Tail Lake (South Basin) for closure. Preliminary water use estimates have been provided and will be further refined in the Type A Water Licence amendment application. Expansion facilities includes construction of second intake in Mammoth Lake to support emulsion plant operations. No change in water supply authorized under Type A Water Licence 2AM-MEA1526 for continued operation of Meadowbank Mill.
Water Management	Water management infrastructure at Meadowbank Mine tailings facility will remain the same as authorized under the current Project Certificate (No. 004) and Type A Water Licence 2AM-MEA1526. Construction of the Whale Tail Pit Attenuation Pond and related infrastructure. Construction of a series of dewatering and diversion dikes for water management of Whale Tail Pit. Construction of a contact water collection system around the Whale Tail WRSF to capture contact water and convey it to the Attenuation Pond. Other contact water will be directed to the Whale Tail Attenuation Pond. Sewage at Whale Tail Pit will be treated using a treatment system similar to the system used at Meadowbank Mine. Treated sewage effluent will be discharged to the Whale Tail Attenuation Pond and discharged as effluent with other site contact water. Effluent from the Whale Tail Attenuation Pond will be treated and discharged to Mammoth Lake via an effluent diffuser.	No change to water management infrastructure at Meadowbank Mine. Water management infrastructure includes contact water collection ponds, freshwater collection ponds, diversion channels, retention dikes, dams, culverts, water treatment plants for effluent, potable water treatment plant, sewage treatment plant, and discharge diffusers. Three water management ponds will support operations at surface (GSP-1, GSP-2, and GSP-3). Total Dissolved Solids (TDS) and associated treatment, if required, will be provided at the associated ponds. Note, GSP-1 is approved under 2BB – MEA1828 as Stormwater Pond. **Contact Water:** • All contact water on-site will be directed to an Attenuation Pond. • Two attenuation ponds are planned to capture surface water and include the approved Whale Tail Pit Attenuation Pond and the IVR Attenuation Pond at Lake A53 to support the Expansion Project operational activities. • Operation of the Whale Tail Pit Attenuation Pond will continue during construction and a new IVR Attenuation Pond is proposed to be

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
	Non-contact water will be diverted from site through channels and dikes. Dewatered flows from Whale Tail Lake (North Basin) will either be pumped to Whale Tail Lake (South Basin) or discharged to Mammoth Lake through a diffuser. Any water requiring treatment will be pumped to the water treatment plant prior to discharge through the diffuser in Mammoth Lake. Raising of the water level of Whale Tail Lake (South Basin) to discharge into Mammoth Lake through a southwest diversion channel. Refilling of Whale Tail Lake (North Basin). Breaching of dikes to reconnect flow between the South Basin and North Basin of Whale Tail Lake and Mammoth Lake.	constructed and operated between the camp and the IVR WRSF as part of the Expansion Project. • Flow of surface water into the Whale Tail Pit will continue to be controlled by Whale Tail Dike and Mammoth Dike with new infrastructure to manage surface water into IVR Pit controlled by of IVR-D1, IVR-D2, and IVR-D3 dikes and IVR Diversion. Note the Northeast Dike will be removed once the IVR Pit is initiated. No significant changes to dike design are anticipated. • Additional water management infrastructures around IVR Pit and IVR WRSF Contact Water Collection Systems. • Underground groundwater and contact water will be managed separately from surface infrastructure contact water. o The Groundwater Storage Ponds will be used to: ▪ Collect saline water from shallow underground development where mining through the permafrost requires brine drilling water and receive brine concentrate. ▪ Collect the lower salinity naturally brackish groundwater from underground inflows below the base of the permafrost. o Treated water from TDS treatment plant will be discharged via diffuser to Mammoth Lake or Whale Tail Lake South Basin. o At the end of underground mining, any remaining water in the Groundwater Storage Ponds will be pumped underground for flooding of the underground workings. **Non-contact Water:** • Non-contact water will be diverted from site through a combination of channels, dikes, and pumps. • A series of diversion dikes and channels will continue to be used for water management of Whale Tail Pit expansion. • A new diversion channel, IVR Diversion, is proposed to divert clean runoff from the upper watershed of the IVR Pit to the Nemo Lake watershed. • An additional non-contact water discharge point in Whale Tail Lake South Basin upstream of the Whale Tail Dike will be required to

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
		discharge dike seepage captured in Whale Tail Dike Collection Pond and pumped to Whale Tail Lake (South Basin). Sewage wastewater will continue to be treated using a New Terra System. Treated sewage effluent will be discharged to the Attenuation Pond and discharged with other site contact water. Any water requiring treatment will be pumped to the water treatment plant prior to discharge through the diffuser in Mammoth Lake, Whale Tail Lake (South Basin), or other alternatives. For the amendment to the Type A Water Licence, Agnico Eagle will require an additional discharge point into Whale Tail Lake (South Basin). Conceptual design for the Expansion Project based on updated modelling results will be provided to the NWB during the regulatory review process. Additional alternatives under consideration by Agnico Eagle are outlined in Section 1.10.6 of the FEIS Addendum. Agnico Eagle is committed to maintaining discharge criteria according to the Type A Water Licence 2AM-WTP1826. The water level of Whale Tail Lake (South Basin) will be raised from July 2020 to May 2026 (i.e., an additional four years beyond May 2022 from the Approved Project to support the Expansion Project activities) and will discharge into Mammoth Lake through a southwest diversion channel during this period. Refilling of Whale Tail Lake (North Basin) by diversion of site runoff, consistent with the Approved Project.
Fuel and Hazardous Wastes	A Bulk Fuel Storage Facility will be constructed on the Whale Tail Pit site. All hazardous waste will be hauled to Meadowbank and disposal will remain the same as authorized under the current Project Certificate No. 004.	The approved Whale Tail Bulk Fuel Storage Facility will be expanded. Refer to Section 1.2.12 of the FEIS Addendum for additional information. Expansion facilities will include construction of a landfarm on-site for the treatment of hydrocarbon contaminated material.

	Whale Tail Pit and Haul Road – Approved Project	Expansion of the Whale Tail Pit Operations (November 2018)
	Use, transportation, handling and storage of fuel, hazardous materials, concrete, and aggregates will remain the same as authorized under the current Project Certificate.	Use, transportation, handling and storage of fuel, hazardous materials, concrete, and aggregates will remain the same as authorized under the current Project Certificate.
Closure	Closure and reclamation activities at Meadowbank Mine will remain the same as authorized under the current Project Certificate. However, closure of the Meadowbank Mill, maintenance shop, powerhouse, and camp will be delayed by three years. The Whale Tail site will be closed and reclaimed in a manner consistent with the FEIS and as recommended under the current Project Certificate. Water management at closure for Whale Tail Lake will require flooding of Whale Tail Pit, refilling of Whale Tail Lake (North Basin), breaching of Northeast, Mammoth, and Whale Tail dikes, and decommissioning of North, East, and South Whale Tail diversion channels. The open pit will be filled with natural runoff and water pumped from Whale Tail Lake (South Basin). Post-closure the Whale Tail WRSF dike will be breached.	Closure and reclamation activities at Meadowbank Mine will remain the same as authorized under Project Certificate No. 004 and Type A Water Licence 2AM-MEA1526. With mill feed ending in 2026, closure of the Meadowbank Mill, maintenance shop, powerhouse, and camp will be delayed until approximately 2030. The Whale Tail Pit operations will be closed and reclaimed in a manner consistent with the Approved Project and as required under Project Certificate No. 008 and Type A Water Licence 2AM-WTP1826. Expansion facilities, the IVR Attenuation Pond, and Groundwater Storage Pond(s) are planned to be filled with NPAG rock at closure The underground mine, Whale Tail Pit, and IVR Pit, will be filled with a combination of natural runoff and contact water from the site, and water pumped from Whale Tail Lake (South Basin). Refilling of Whale Tail Lake (North Basin) is estimated to take between 16 and 17 years, from 2026 to 2041. Lake reconnection will be completed when the water quality monitoring results meet water quality discharge criteria as per NWB Type A Licence conditions.
Employment	The total work force employed by Agnico Eagle will increase during construction and operations of the Project. The current workforce located at Meadowbank Mine for the operational phase will remain similar for the Whale Tail Pit development and with employees stationed at Meadowbank camp for milling and at Whale Tail Pit for mining of the satellite pit.	The camp will be expanded to support a maximum of 390 employees. Refer to Section 7.4.1 of the FEIS Addendum.

LOM = life of mine; NPAG = non-potentially acid generating; PAG = potentially acid generating; ML = metal leaching

1.1.2 The Proponent

The Amaruq property is owned and managed by Agnico Eagle Mines Limited (NYSE:AEM, TSX:AEM), a Canadian publicly traded mining company listed on the Toronto and New York Stock Exchange, trading symbol AEM, with head offices in Toronto, Ontario.

Agnico Eagle is a long established, Canadian headquartered, gold producer with operations located in Canada, Finland, and Mexico, and exploration and development activities in Canada, Finland, Mexico, and the United States. Agnico Eagle currently has one operating gold mine (i.e., Meadowbank) and one gold mine under construction (i.e., Meliadine) in Nunavut.

Key contacts within Agnico Eagle for the Project are provided in Table 1.1-2. A summary of Agnico Eagle is available on-line at: 2017 Annual Financial Information.

Table 1.1-2: Agnico Eagle Key Contacts

Agnico Eagle – Meadowbank Division	Agnico Eagles Mines Limited CP 87, 765 Chemin de la mine Goldex Val-d'Or (Qc) J9P 4N9 Ph. 819 -874-5980
General Manager	Luc Chouinard 93, Arseneault, Suite 202 Val d'Or, QC, Canada, J9P 0E9 T: 819-759-3555 Ext. 4606896 M: 819.355.9348
Project Superintendent – Whale Tail	Julie Belanger P.Eng, M.Sc.A Meadowbank Division Baker Lake, Nunavut, Canada, X0C 0A0 M: 819.856.1667 julie.belanger@agnicoeagle.com
Superintendent - Permitting and Regulatory Affairs - Nunavut	Jamie Quesnel Meadowbank Division Baker Lake, Nunavut, Canada, X0C 0A0 T: 819.759.3555 Ext. 4606838 M: 819.856.0821 jamie.quesnel@agnicoeagle.com
Nunavut Permitting Lead	Michel Groleau Meadowbank Division Baker Lake, Nunavut, Canada, X0C 0A0 T: 819.759.3555 Ext. 4608169 M : 418.670.6590 michel.groleau@agnicoeagle.com
Nunavut Permitting Lead	Ryan Vanengen, Meadowbank Division Baker Lake, Nunavut, Canada, X0C 0A0 M: 819-651-2974 ryan.vanengen@agnicoeagle.com
Environmental Compliance Counselor	Manon Turmel Agnico Eagle - Nunavut Office 11600 rue Louis-Bisson Mirabel, Quebec, Canada J7N 1G9 T: 819.759.3555 Ext. 4608172 manon.turmel@agnicoeagle.com

A list of consultants and contractors who provided assistance and support in preparation of the Addendum are consistent with those provided in the Approved Project FEIS with the addition of ERM (Environmental Resource Management). For additional information refer to the Approved Project FEIS Volume 1, Table 1.1-3.

1.1.3 Sustainable Development and the Precautionary Principle

Agnico Eagle is committed to creating value for their shareholders by operating in a safe, socially, and environmentally responsible manner while contributing to the prosperity of their employees, their families, and the communities in which they operate. This is imbedded into the four fundamental values that make up the keystones of Agnico Eagle's Sustainable Development Policy: Operate Safely, Protect the Environment, and treat Employees and Communities with Respect. This commitment is reflected in Agnico Eagle's published Sustainable Development Policy (English, French, and Inuktitut), which includes environment and health and safety. In addition, Agnico Eagle monitors accountability to sustainable development by completing an Annual Sustainable Development Report, which is also available on the website (Agnico Eagle 2015). The commitments made in this Sustainable Development Policy are extended to all of Agnico Eagle operations world-wide, and apply to the Meadowbank Mine and the Project. For additional information related to Agnico Eagle's policies refer to the Approved Project (FEIS Volume 1, Section 1.1.3).

1.1.4 Regional Context

The Project falls within the boundaries of the Keewatin Regional Land Use Plan (Nunavut Planning Commission 2000) administered by the Nunavut Planning Commission. The issues considered in the Approved Project FEIS (Agnico Eagle 2016c) within a regional context remain unchanged as a result of the Expansion Project. Baseline reports representing new data collected since the filing of the Approved Project FEIS are appended to the appropriate FEIS Addendum volumes.

1.1.5 Regulatory Regime

All current, applicable, and active permits are the sole ownership and responsibility of Agnico Eagle - Meadowbank Division. For additional information related to regulatory and EA requirements refer to Volume 2 of the Approved Project FEIS.

The regulatory organizations have not changed since the FEIS (Agnico Eagle 2016c). Refer to Volume 1, Appendix 1-A.

1.1.6 Consultation

Public consultation and engagement are a legal requirement in Nunavut, an industry best practice, and an important corporate commitment. For additional information related to Agnico Eagles goals and objectives for Consultation refer to the Approved Project FEIS Volume 1, Section 1.1.11 and Volume 2, Section 2.3 (Agnico Eagle 2016c).

During the regulatory review process and upon receipt of the Project Certificate No. 008 and Type A Water Licence 2AM-WTP1826 for Whale Tail Pit, Agnico Eagle has continued public consultation by meeting with local employees that live throughout the Kivalliq, meeting in the community and local stakeholders, and regulatory agencies routinely which has allowed a better general understanding of the rights, interests, values, aspirations, and concerns of the potentially affected stakeholders, with particular reference to the local population. Through this continued consultation Agnico Eagle has developed an operational culture that recognizes and respects these relevant interests in the planning and executing processes. For the Expansion Project consultations, hearings, community round-table, and meetings that were completed as part of the Approved Project have been integrated into the Addendum. Although feedback from interveners, stakeholders, and community members since 2014 is integrated into this application, only an updated record of consultation including government engagement undertaken since June 2016 is provided in Addendum Volume 2. Agnico Eagle has, and will continue to, engage with the Kivalliq Inuit Association (KivIA) and other stakeholders. Volume 2, Appendix 2-D also includes a summary of Project concerns raised by community members and approved project references to mitigation measures.

1.2 Project Description and Alternatives

1.2.1 Project Justification

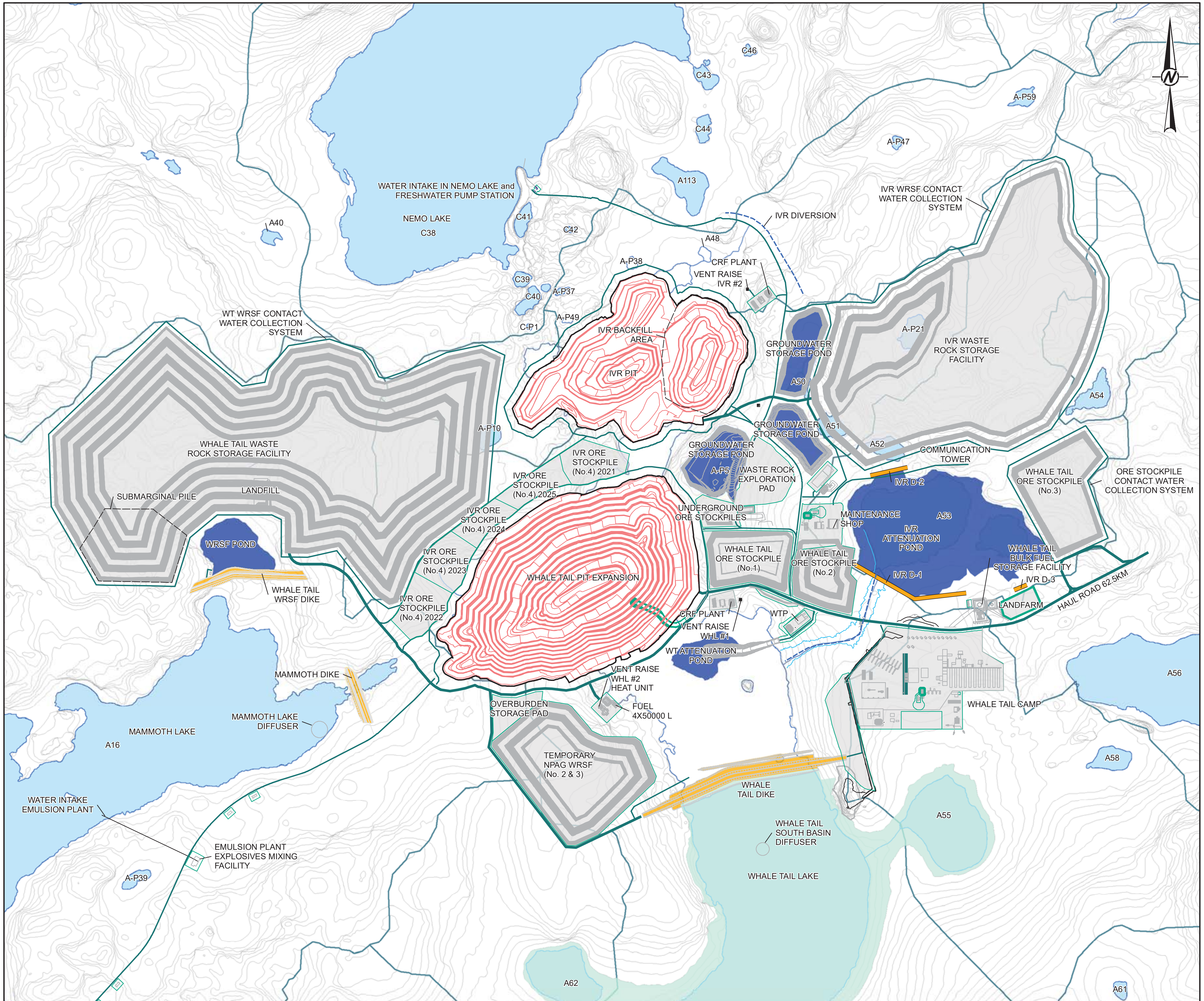
1.2.1.1 Project Purpose and Rationale

Since 2009, Agnico Eagle has operated the Meadowbank Mine. Components of the Meadowbank Mine include a marshalling facility in Baker Lake and the 110 km All-Weather Access Road (AWAR) between Baker Lake and Meadowbank (Figure 1.1-1).

As the economics of the Meadowbank Mine have improved and Meadowbank Mine operations are optimized, mine engineers began considering the feasibility of expanding Meadowbank operations. As a result, mining of open pits at the Meadowbank Mine (more specifically Portage Pit and Vault Pit) will continue until Q1 of 2019.

With approval of Whale Tail Pit Project in 2018, the initial extension of the Meadowbank LOM helped to bridge the production gap between the end of production at Meadowbank and the approved start of production of the Whale Tail Pit.

During the two-year permitting process, the resource at Whale Tail Pit continued to expand, which resulted in an economic expansion and extension further extending the LOM for the Meadowbank Mine. The deposits will be mined as open pits (expanded Whale Tail Pit and IVR Pit) and underground, and ore will be stockpiled then hauled to the approved infrastructure at Meadowbank Mine for milling (Figure 1.2-1). As a result of development, Agnico Eagle is also proposing to further expand the width of the haul road to accommodate traffic and haul truck safety. Refer to Section 1.2.8 of the FEIS Addendum.



LEGEND

- WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ROAD
- WATERCOURSE
- WATERBODY

REFERENCE(S)
1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM AMQ_2025Q4V7.DWG
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
SITE LAYOUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-01
DESIGNED	JR
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	1300/1340	0	1.2-1

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1.2.1.2 Project Need

With approval of the Whale Tail Pit and Haul Road Project (Approved Project), as a satellite deposit to the Meadowbank Mine, mineable reserves have been extended until 2022. As described in the previous section, the Expansion Project further extends the minable reserves until 2025.

The Kivalliq region of Nunavut offers limited, and usually seasonal, employment opportunities. The population is predominately young with a high level of unemployment. Elders have stated that the young must find jobs in the wage economy as they will not be able to live off the land as Inuit did in the past. Agnico Eagle will continue exploration activities with the objective to extend the LOM beyond 2025. Inuit employment opportunities will be maximized throughout the LOM.

The Government of Nunavut (GN; 2009) describes the vision for Nunavut to the year 2030 and lists an improved standard of living; active, healthy, and happy individuals and families; self-reliant communities with strong Inuit societal values, and recognition for Nunavut's unique culture. Nunavut's economic and social development plans focus on the economic sectors that can provide the most growth and employment potential, without harming the environment. These sectors are mining, tourism (and arts and crafts), and commercial fishing (GN 2009).

As stated in the Approved Project (Agnico Eagle 2016c), the current Meadowbank Mine is an important contributor (through employment income and training opportunities) to the economy of Baker Lake and to the economy of the Kivalliq region, especially to the communities of Arviat and Rankin Inlet. The Expansion Project would mean opportunities for continued employment, as well as forthcoming benefits and revenue stream to Nunavut Tunngavik Incorporated (NTI) and KivIA, from direct taxes paid to governments, personal income tax, and sales tax from employment.

Continued operations of Meadowbank Mill through operations of the Expansion Project will reduce dependence on government, without compromising the health of the people or the land, through the creation of stable private sector employment that will both contribute to a better standard of living for the residents of Kivalliq, as well as reducing dependence on social assistance programs. The continued operation will also contribute to the economic vision of a more self-reliant Nunavut as a key contributor to the future economic well-being of Canada as projected by the Government of Canada (GN 2009).

The continued expansion and extension of the Approved Project will support the vision and contribute to the goals of Inuit Beneficiaries of Nunavut as expressed by NTI and KivIA. Benefits will accrue to Inuit from the Inuit Impact and Benefit Agreement (IIBA), and also from royalties paid to NTI over the extended operating LOM. The IIBA is available publicly on-line at the following website http://aemnunavut.ca/wp-content/uploads/2017/06/Whale-Tail-IIBA2017-06-15-.pdf

The goals and contributions of the Expansion Project are consistent with the Approved Project. For additional information refer to the Approved Project (FEIS Volume 1, Section 1.2.1).

The proposed development of the Expansion Project will be financed by Agnico Eagle from its own operating revenue stream.

1.2.2 Project Components and Activities

The Approved Project facilities already assessed under Project Certificate No. 008 and permitted under Type A Water Licence 2AM-WTP1826 include: a personnel camp (i.e., Main Camp), power plant, heli-pad, maintenance shop, tank farm, a WRSF, an ore stockpiling facility, an attenuation pond, a water and sewage collection and treatment system, haul roads (including haul road from Whale Tail Pit to the Meadowbank Mine), access roads, water management infrastructure (e.g., collection ponds, channels, dikes, dams, and culverts), and the Whale Tail Pit.

The general mine site layout of the Expansion Project is provided in Figure 1.2-1. The Expansion Project comparative to the Approved Project FEIS (Agnico Eagle 2016c) is defined in Table 1.1-1. A list of updated engineering figures is provided in Volume 1, Appendix 1-B.

1.2.2.1 Deposit, Mining Methods, and Production of Whale Tail Pit Approved and Expansion

As approved under the Project Certificate No. 008 and Type A Water Licence 2AM-MEA1525, approximately 8.3 million tonnes (Mt) of ore will be mined from the Whale Tail Pit and processed from 2019 to 2022. The Approved Project mine operations will generate approximately 8.3 Mt of ore, 46.1 Mt of mine waste rock, and 5.7 Mt of overburden soil, with very limited organic material, as shown in Table 1.2-1A.

Table 1.2-1A: Approved Project – Summary of the Approved Project Materials Balance

Year	Ore Mined (t)	Ore Processed (t)	Waste Rock Excavated (t)	Overburden Excavated (t)
2017	*0*	0	461,625	199,454
2018	179,003	0	1,087,633	1,236,488
2019	2,196,993	1,642,500	17,238,276	4,111,005
2020	3,070,121	3,040,090	27,316,859	71,412
2021	2,833,027	3,596,554		
2022				
2023				
2024				
2025				
2026				
Total	**8,279,144**	**8,279,144**	**46,104,393**	**5,618,359**

The Expansion Project mine operations will generate approximately 15.2 Mt of ore, 121.7 Mt of mine waste rock, and 5.7 Mt of overburden soil, with very limited organic material (refer to Table 1.2-1B). Approximately 43.1 Mt of non-potentially acid generating (NPAG) waste rock may be used for construction activities.

Table 1.2-1B: Expansion Project – Summary of the Expansion Project Materials Balance

Year	Ore Mined (t)	Ore Processed (t)	Waste Rock Excavated (t)	Overburden Excavated (t)
2017				
2018				
2019				
2020			2,384,454	2,875,737
2021	1,082,536	233,331	31,461,155	1,342,271
2022	4,674,860	3,070,030	31,707,096	281,150
2023	3,970,053	3,224,997	31,075,034	1,226,057
2024	4,793,044	3,238,079	24,002,432	0
2025	720,634	2,063,214	1,090,886	0
2026[a]		3,411,477		
Total	**15,241,127**	**15,241,127**	**121,721,057**	**5,725,215**

a) Assumed balance of ore in stockpile is processed in 2026.

The updated mine life material balance for the Approved and Expansion Project are presented in Table 1.2-1C.

Table 1.2-1C: Approved and Expansion Project – Updated Summary of Mine Life Materials Balance

Year	Ore Mined (t)	Ore Processed (t)	Waste Rock Excavated (t)	Overburden Excavated (t)
2017	0	0	461,625	199,454
2018	179,003	0	1,087,633	1,236,488
2019	2,196,993	1,642,500	17,238,276	4,111,005
2020	3,070,121	3,040,090	29,701,313	2,947,149
2021	3,915,563	3,829,885	31,461,155	1,342,271
2022	4,674,860	3,070,030	31,707,096	281,150
2023	3,970,053	3,224,997	31,075,034	1,226,057
2024	4,793,044	3,238,079	24,002,432	0
2025	720,634	2,063,214	1,090,886	0
2026[(a)]		3,411,477		
Total	**23,520,271**	**23,520,272**	**167,825,450**	**11,343,574**

a) Assumed balance of ore in stockpile is processed in 2026.

The Whale Tail Pit is an open pit that extends across the northern edge of Whale Tail Lake and IVR is an open pit is located northeast of Whale Tail Pit (Figure 1.2-1). Whale Tail Pit will be expanded to extract an additional 100.4 Mt of ore and waste rock (refer to Table 1.2-1D).

Table 1.2-1D: Whale Tail Open Pit Expansion

Waste Type	Whale Tail Pit Project		Whale Tail Pit Expansion Project - Whale Tail Open Pit Only		Difference
	Total (t)	Total (%)	Total (t)	Total (%)	Total (t)
Total PAG and/or Moderate to High Arsenic Leachability Waste	33,449,865	56%	82,590,189	51%	49,140,324
Total NPAG and/or Low Arsenic Leachability Waste	12,654,528	21%	55,387,227	34%	42,732,699
Waste Rock Excavated	46,104,393	77%	137,977,416	85%	91,873,023
Total Ore	8,279,144	14%	16,835,533	10%	8,556,389
Total (t)	54,383,537	100%	154,812,949	100%	100,429,412
Total Overburden	5,618,359	9%	7,619,698	5%	2,001,339

The expanded construction upgrades to support the Expansion Project will begin as soon as approval and permits for the Type A Water Licence 2AM-WTP1826 amendment are received (anticipated for mid-2020). The full operational phase for the approved Whale Tail Pit Haul Road and Expansion Project will span from Year 1 (2019) to Year 8 (until 2026). Mining activities at Whale Tail Pit are expected to end in Year 7 (2025) and ore hauling and processing is expected to end during Year 8 (2026). Closure will begin in approximately Year 8 (2026) to Year 33 (2051) after the completion of mining and will include removal of the non-essential site infrastructure and flooding of the mined-out open pits and underground, as well as re-establishment of the natural Whale Tail Lake water level.

Agnico Eagle is committed to active rehabilitation activities including progressive reclamation, such as removal of surface infrastructure, and commencement of pit flooding, and restoration of Whale Tail Lake water levels as approved. Active closure will be consistent with the Approved Project FEIS (Agnico Eagle 2016c) and current Type A Water Licence 2AM-WTP1826. However, open pit reflooding of Whale Tail Pit will be postponed to Year 8. The IVR Pit will be filled with natural runoff and water pumped from Whale Tail Lake (South Basin) and the underground will be flooded naturally. During the closure period the pits and underground have flooded, Whale Tail Lake and IVR Pit water levels are restored, and flooded pit and runoff from the WRSFs are shown to be suitable for uncontrolled release.

Consistent with the Approved Project, the pit design and geotechnical stability for the Expansion Project operations will be monitored using the same best practices currently applied at the approved Whale Tail Pit operations and Meadowbank Mine. The geological setting of the ore body is important for open pit slope design and underground mine development. The Whale Tail Pit expansion considered comments received from interested parties during the technical review phase for the Approved Project. The design considerations for the expanded open pit slopes and typical cross-sections of the deposits will be provided during the NWB regulatory review process. Agnico Eagle will use the same equipment currently in use at for Whale Tail Pit operations. Project design considerations are discussed in Section 1.3 of the FEIS Addendum.

Common and well-known underground mining methods will be used by Agnico, mainly, long hole mining (95%) with some mechanise cut and fill in flat areas. The configuration will be a mix of transverse and longitudinal stoping. The underground mine will use a ramp as the main connection to surface for haulage of ore. Truck and scoop equipment will be used for ore extraction. Stopes will be filled with cemented rock fill and rock fill.

The main lithologies encountered at the Project are summarized in Volume 5, Appendix 5-E. As outlined in the FEIS (Agnico Eagle 2016c), there are some rock types, specifically intermediate intrusive and southern greywacke waste rock (during early mine development) from the Whale Tail Pit that are suitable for construction. There is no acid rock drainage (ARD) or metal leaching (ML) concern from the esker material tested; indicating that this material can be used for road construction. The report titled Evaluation of the Geochemical Properties of Waste Rock, Ore, Tailing, Overburden and Sediment from the Whale Tail Pit and Road Aggregate Materials (Volume 5, Appendix 5-E) provides detailed assessment of geochemical properties for the Expansion Project. Segregation of waste rock will be important to the operation and closure of the Project and is outlined in the addendum to the approved Operational ARD/ML Sampling and Testing Plan (Volume 8, Appendix 8-E.5).

Explosives management and blasting practices will be consistent with practices in place for the Approved Project. Refer to the addendum to the Ammonia Management Plan (Volume 8, Appendix 8-D.1) for additional details. For additional information on explosives production and storage, refer to Section 1.2.11 of the FEIS Addendum.

1.2.2.2 Processed Ore Containment (and Tailings Storage Facility)

Ore from the Whale Tail Pit, IVR Pit, and underground will be segregated by grade and temporarily stored in one of four primary stockpiles at the Whale Tail Pit site (Figure 1.2-1), before being transported to the Meadowbank Mine for milling. Ore will primarily be stockpiled adjacent to the Whale Tail Pit (No.1 & 4), the additional stockpiles (No. 2 and 3) are proposed to facilitate blending of ore types. Agnico Eagle would like to reiterate that our intent is to store ore efficiently and with minimal impact to the environment.

Excavated ore material will be hauled to the ore stockpile facilities, or if needed to the crushing facility. using mine trucks. Material that needs to be crushed will either be dumped into a chute, which feeds the jaw crusher, or dumped on the ground and then dumped into the chute using a wheel loader. The throughput for the crusher will be approximately 9,000 to 12,000 t/day. Refer to the Approved Project FEIS Volume 1, Appendix 1-C (Agnico Eagle 2016c) for the conceptual layout of the crushing facility.

Consistent with the Approved Project, Agnico Eagle proposes to process the ore resulting from the expansion at the existing Meadowbank Mine and dispose of the tailings in the approved TSF, authorized under Project Certificate No. 004 and Type A Water Licence 2AM-MEA1526. The mill rate is not expected to change and remain on average 9,000 t/day and up to a peak mill throughput of 12,000 t/day (which is the current rate capacity at Meadowbank Mill). No consequential amendments to Project Certificate No. 004 are needed at this time (Addendum Volume 2). The updated Meadowbank Tailings Storage Facility Management Plan for Whale Tail Pit is provided in Volume 8, Appendix 8-A.2, and Agnico Eagle will review the plan as required by changes in operation and/or technology and modify the Plans accordingly in the form of an addendum to be included in the Annual Report.

1.2.3 Overburden and Waste Rock Disposal

The Expansion Project will include Whale Tail Pit, IVR Pit, and underground operations that will extract a total of 121.7 Mt of waste rock plus approximately 5.7 Mt of overburden (see Table 1.2-1B). Approximately 40.3 Mt of waste rock available for construction activities such as roads, pads, and water management facilities (i.e., dike, berm, rip rap, etc.). The remaining waste rock and overburden material will be hauled to the WRSFs, as shown on Figure 1.2-1. The approved Whale Tail WRSF will continue to be used for the Expansion Project. The Whale Tail WRSF is proposed to be expanded vertically and horizontally to the southeast to accommodate an additional 91.9 Mt. In addition, waste rock and overburden generated from IVR Pit is proposed to be stored in the new IVR WRSF (i.e., 27.6 Mt), and the currently approved underground WRSF (Licence No. 2BB-MEA1828) will be expanded to the north to accommodate additional waste rock approximately 2.2 Mt from the underground operations. A second, temporary overburden storage facility for staging purposes is located west of Whale Tail Lake (Figure 1.2-1).

Waste rock stored in the Underground WRSF will be returned underground as backfill, with no waste rock remaining on surface at the end of mine life.

A summary of the geochemical properties of the overburden and waste rock including a summary of waste rock management including use of construction material is provided in the Whale Tail Pit Waste Rock Management Plan (Volume 8, Appendix 8-A.1) and detailed geochemical properties are presented in Volume 5, Appendix 5-E. Thermal encapsulation of the potentially acid generating (PAG) and ML rocks was selected as the reclamation strategy to verify long-term stability of the waste rock storage facilities.

Overburden will mainly be produced during the construction phase (i.e., stripping of the Whale Tail Pit and IVR Pit) of the Project. Waste rock will be produced during both construction and operations. Waste rock and overburden will be co-disposed together in one of the piles constituting the storage facility.

The approved Whale Tail WRSF is currently designed to be approximately 80 m high, with bench heights of 20 m and an overall slope of 23 degrees. Similar design parameters proposed for the IVR WRSF. A typical cross-section of the facilities was provided in the Approved Project FEIS Volume 1, Appendix 1-C (Agnico Eagle 2016c). Agnico Eagle may increase overall height of the WRSFs in consideration of engineering optimization for increasing capacity.

1.2.4 Freshwater Supply

Freshwater to support the Meadowbank Mill, TSF, and Meadowbank Camp is authorized under the existing Type A Water Licence 2AM-MEA1526.

An updated summary of freshwater source requirements is provided in provided in Table 1.2-2. Freshwater source requirements may be refined in the pending application for amendment to the Type A Water Licence to support expansion activities.

The current Type A Water Licence provides for a maximum quantity of water use not to be exceeded at 240,000 m^3 annually during construction and operation. As well as 10,655,000 m^3 annually during closure.

Table 1.2-2: Summary of Freshwater Source Requirements

Water Use	Construction (2018)			Operations (2019 - 2025)			Closure (2026 - 2051)			Total for All Phases
	Daily	Annual	Total Construction	Daily	Annual	Total Operations	Daily	Annual	Total Closure	
	(m^3/d)	(m^3/yr)	(m^3)	(m^3/d)	(m^3/yr)	(m^3)	(m^3/d)	(m^3/yr)	(m^3)	(m^3)
Whale Tail Lake (North Basin)										
Dewatering (dewatering North Basin to South Basin)	38,400	3,147,120	3,147,120	-	-	-	-	-	-	**3,147,120**
Whale Tail Lake (South Basin)										
Camp Use	84	20,360	20,360	-	-	-	12	4,392	68,697	89,057
Truck Shop	103	25,053	25,053	-	-	-	-	-	-	25,053
Drilling Water - Pits	24 - 48	7,668	7,668	-	-	-	-	-	-	7,668
Transfer/Reflooding Whale Tail Pit - (Whale Tail South Basin to Open Pit and Whale Tail North)	-	-	-	-	-	-	-	8,280,000[(a)]	47,531,041	47,531,041
Total Whale Tail Lake (South Basin)	*211 - 235*	*53,081*	*53,081*	-	-	-	*12*	*8,284,392*	*47,599,738*	***47,652,819***
Nemo Lake										
Camp Use	84	10,222	10,222	84	30,681	183,656	-	-	-	193,878
Truck Shop	103	12,578	12,578	103	37,657	263,627	-	-	-	276,205
Drilling Water - Pits	24 - 48	5,496	5,496	24 - 96	8,766 - 35,064	215,220	-	-	-	220,716
Makeup Water Underground	4.4 - 12	826	826	-	-	-	-	-	-	826
Cement Mixing	-	-	-	24 - 65	8,766 - 23,741	80,769	-	-	-	80,769
Industrial/Miscellaneous – dust suppression	-	45,750	45,750	-	45,750	-	-	45,750	732,000	777,750
Total Nemo Lake	*211 - 235*	*74,872*	*74,872*	*235 - 348*	*131,620 - 172,893*	*743,272*	-	*45,750*	*732,000*	***1,550,144***

Water Use	Construction (2018)			Operations (2019 - 2025)			Closure (2026 - 2051)			Total for All Phases
	Daily	Annual	Total Construction	Daily	Annual	Total Operations	Daily	Annual	Total Closure	
	(m^3/d)	(m^3/yr)	(m^3)	(m^3/d)	(m^3/yr)	(m^3)	(m^3/d)	(m^3/yr)	(m^3)	(m^3)
Mammoth Lake										
Explosives Mixing	-	2,500*	2,500	-	2,500*	17,500	-	2,500*	40,000	**60,000**
Lake A53										
Dewatering (dewatering Lake A53 to Whale Tail Lake [South Basin])	-	-	-	-	153,735	153,735	-	-	-	**153,735**
Other - Small Lakes/Ponds proximal to drilling sites										
Operational Geological Drilling(b)	-	-	-	299	109,135	-	-	-	-	-
Total for Project										
Total for Project	-	-	3,277,573	-	-	914,508	-	-	48,371,738	**52,563,819**

* Licence maximum value approved prevails over value provided in NWB decision (NWB 2018)

a) max volume for first year of closure at 10, 655,000 m^3 and 4,500,000 m^3annually thereafter (NWB Decision 2018)

b) water volume is cover under Licence 2BB-MEA1828 Part C Item 1

1.2.5 Freshwater Requirements

Currently, the Whale Tail Camp operations, has a water treatment plant for potable (domestic) water. The design flow rate for the potable water for the main camp and accommodations (i.e., kitchen, laundry) is 84 cubic metres per day (m^3/day), based on a 350 people camp capacity, using both the existing exploration camp and additional 210 units and a nominal consumption of 240 litres (L)/day/person from Nemo Lake. Agnico Eagle suggests with a projected increase in on-site staff in 2022 to 390 people for the Expansion Project, the existing authorized volumes from Nemo Lake should be adequate, to be confirmed in the pending Type A amendment application. Detailed plant operation specifications were provided in the Approved Project (FEIS Volume 1, Section 1. 2.4.1).

Freshwater and potable water use will extend for operations until 2025 and additional freshwater will be required from Whale Tail Lake at closure.

1.2.5.1 Freshwater Source and Capacity

The freshwater intake locations approved under 2AM-WTP1826 are shown in Figure 1.2-1

Nemo Lake

The Nemo Lake catchment has a total area of 17.6 km^2 (including 14.4 km^2 of land surface area and 3.24 km^2 lake catchment surface area). The average outflow rates for baseline at the outlet of Nemo Lake are 0.05 cubic metres per second (m^3/s) for June, 0.02 m^3/s for August, and 0.01 m^3/s for September (Volume 6, Appendix 6-C).

Whale Tail Lake (South Basin)

The Whale Tail Lake catchment has a total area of 28.1 km^2, of which 3.9 km^2 (i.e., north of the Whale Tail Dike) will be diverted as part of operations. The average outflow rates for baseline at the outlet of Whale Tail Lake are 4.23 m^3/s for June, 0.19 m^3/s for August, and 0.01 m^3/s for September (Volume 6, Appendix 6-C).

1.2.5.2 Freshwater Infrastructure

Intakes, Pump Houses, Pipeline, Storage Tanks and Potable Water Treatment

Agnico Eagle proposes installation of an additional intake in Mammoth Lake to support emulsion plant operations. The use of water for explosives mixing is already authorized under the current water licence with source to be amended to Mammoth Lake. Location as shown on Figure 1.2-1. Intake will be constructed consistent with the intake installed at Nemo Lake. Final design and construction drawings will be provided to the NWB for review 60 days prior to construction.

1.2.6 Water Management

In support of the Expansion Project, Agnico Eagle has prepared a fully revised addendum to the Whale Tail Pit Water Management Plan (Volume 8, Appendix 8-B.2).

The main objectives pertaining to water management are to minimize the flow of surface water runoff in the pit and to limit the impact on the receiving environment. In developing the water management plan, the following principles were followed:

- keep the different water types separated as much as possible;
- control and minimize contact water through diversion and containment;
- minimize freshwater consumption by recycling and reusing the contact and process water wherever feasible; and

- meet discharge criteria before any site contact water is released to the downstream environment.

Consistent with the Approved Project, the preferred site water management options were selected based on four aspects: society, environment, economy, and engineering and viability. Refer to Section 1.10.6 of the FEIS Addendum. The selected option consists of isolating the pit area located in Whale Tail Lake with two dikes (Whale Tail Dike and Mammoth Dike) and diverting Whale Tail Lake (South Basin) to Mammoth Lake.

1.2.6.1 Water Management Infrastructure

The Expansion Project will include construction and operations of water management infrastructure, either consistent with, or in addition to Type A approved infrastructure and water management as described in Table 1.1-1.

Design criteria with required design drawings for any expansion related water management control structures will be provided with the Water Licence Amendment. In addition, for further information refer to the addendum to the Water Management Plan found in Volume 8, Appendix 8-B.2. Prior to construction detailed design drawings will be submitted to the NWB in accordance with the current Type A Water Licence 2AM-WTP1826. Any refinements to the Water Management Plan will be submitted to the NWB annually as required by the current water licence. The discharge diffuser at Whale Tail Lake (South Basin) will be similar to the diffuser designed and authorized for Mammoth Lake discharge and authorized under the current Type A Water Licence.

The water management infrastructure required for the haul road (i.e., bridges and culverts) have already been assessed and construction is underway under existing authorization. If necessary, to support access road development additional authorizations may be required for the proposed expansion.

1.2.6.2 Effluent Treatment

Any water requiring treatment will be pumped to the water treatment plant(s) prior to discharge through the diffuser in Mammoth Lake or through a diffuser in Whale Tail Lake (South Basin) or other alternatives.

Agnico Eagle may require an additional discharge point(s). Agnico Eagle is committed to maintaining discharge criteria according to the Type A Water Licence 2AM-WTP1826. Conceptual design and modelling results for the Expansion Project for alternative discharge locations will be provided to the NWB during the regulatory review process for the amendment to the Type A Water Licence. Preliminary baseline data collection was completed in 2018 on two alternative locations for effluent discharge identified by Agnico Eagle. Both lakes have been assessed qualitatively and included in the FEIS Addendum. Additional alternatives under consideration by Agnico Eagle are outlined in Section 1.10.6 of the FEIS Addendum.

1.2.6.3 Dewatering

As per Type A Water Licence 2AM-WTP1826, Agnico Eagle will complete the dewatering of Whale Tail Lake (North Basin) in 2019 following the construction of the dike and the fish out. The proposed expansion of the Whale Tail Pit Project has not changed the dewatering of the Whale Tail Lake (North Basin); however, small waterbodies and ponds within the footprint of the IVR Pit and Lake A53 (IVR Attenuation Pond) will require Fisheries and Oceans (DFO) approved fishouts and dewatering during the open water season of 2020 to 2022. Dewatering for the Expansion Project where applicable is planned for release entirely through Whale Tail Lake (South Basin).

1.2.6.4 Re-Filling

Following completion of mining, the underground mine, Whale Tail Pit, and IVR Pit, will be filled with a combination of natural runoff and contact water from the site (e.g., Groundwater ponds), and water pumped from Whale Tail Lake (South Basin). During the spring of the 2026, the water accumulated in Whale Tail Lake (South Basin) during operations will be pumped into the underground mine until it is filled and into the IVR Pit thereafter. Refilling of Whale Tail Lake (North Basin) will occur from 2026 to 2041. As part of the Whale Tail Project Fisheries Offsetting, for the Approved Project, a sill will be constructed to increase the final flooded water level from the baseline elevation of 152.5 by 1 m to 153.5 masl. The Whale Tail Dike and Mammoth Dike will then be decommissioned when the water quality monitoring results meet discharge criteria to allow water to passively flow to the natural environment.

1.2.7 Marine Area

The Approved Project relies on marine transportation for most of its supplies including fuel, construction and operation equipment, materials and consumables, including dangerous goods, food, household goods, and other non-perishable supplies. Consistent with approved operations, materials will be transported to Baker Lake via barge and will either be directly transported to Meadowbank Mine and/or the Whale Tail Pit site or temporarily held in the Baker Lake marshalling area.

Fuel is supplied to Baker Lake by marine fuel tankers at an annual volume of 96.8 million L (95 million L of ULSD and 1.8 million L of Jet A). The fuel is transported by ocean-going tankers to a fuel transfer (lightering) site located near Helicopter Island, Nunavut. Once the fuel tankers are securely anchored, fuel is transferred to either tug-assisted fuel barges or smaller shuttle tankers. The fuel barges / shuttle tankers then transport the fuel shipment through Chesterfield Narrows to Baker Lake. Fuel shipping is provided by Petro-Nav a subsidiary of Groupe Desgagnes.

Agnico Eagle does not forecast changes to the existing transportation requirements related to the marine environment; in other words, no additional ship trips are expected to be added by the Expansion Project as compared to the level of shipping currently required to re-supply the Meadowbank Mine and Whale Tail Pit Approved Project on an annual basis. The proposed marine activity will simply be extended to 2025 for mining operations.

1.2.8 Haul Roads, All-Weather Roads, and Winter Roads

No changes are proposed for the Meadowbank AWAR to Baker Lake.

To support the Expansion Project, Agnico Eagle proposes to update the haul road from 9.5 m width to 15 m width to ensure safe passage of haul trucks. Efficiency of traffic movement on the haul road is dictated by safety. In 2018, Agnico Eagle conducted an assessment which included field trials with the long haul trucks to determine optimal safety, efficiency, and production of hauling from Whale Tail Pit site. It has been determined that a 15 m road width would allow long haul trucks to pass each other safely, which a 9.5 m road width does not allow. Furthermore, during wintertime, snow tends to pile up on one side of the road and, as such, the proposed expansion will improve driving conditions.

The design parameters to allow for caribou crossing of 4:1 slope will be adhered to. No additional changes from FEIS (Agnico Eagle 2016c) are proposed related to site access. The expanded road will be constructed using waste rock or aggregates from quarry and esker sites, and top-dressed with esker material. Materials will be obtained from already permitted and leased quarry and esker sites, as well as four new quarry/esker sites. Refer to Quarry Site Location Plan Volume 1, Appendix 1-B, Figure 1-B-1. Table 1.2-3 provides a summary of quarries/eskers to be used for the expansion of the haul road. Typical cross-sections of the upgraded road based on underlying ground conditions are provided in Volume 1, Appendix 1-B.

Table 1.2-3: Quarries/Eskers for the Expansion of the Haul Road

Quarry / Esker	Status	Quarry / Esker	Status
Vault	Approved	Km 34.9	Expansion proposed
Km 2.5	New location	Esker 3	Approved
Km 8	New location	Km 40.4	New location
Km 10.5	Approved	Km 50.6	Approved
Esker 1 / Quarry 17	Approved	Km 52	Approved
Esker 2 (ABC)	Approved	Km 53	New location
Km 26.5	Expansion proposed	Eskers 4 to 7	Approved
Km 30.5	Approved		

The haul road traffic volumes for the Expansion Project are consistent with those applied to the Approved Project FEIS Volume 4, Appendix 4-B, Table 4-B-15 (Agnico Eagle 2016c). Daily vehicle traffic on the haul road is shown in Volume 4, Appendix B, Table 4-B-20. Agnico Eagle assumed that long haul trucks "daily vehicle passages" on the haul road would be 154 trips per day on average and up to 173 trips per day. The upper limit number has not changed for the Expansion Project, as it is based on a maximum throughput at the mill.

Refer to the Whale Tail Pit Haul Road Management Plan provided in Volume 8, Appendix 8-C.1.

1.2.9 Maintenance, Warehouse, and Laydown

Primary maintenance will occur using existing infrastructure at Meadowbank Mine. For light maintenance the industrial site adjacent to the Whale Tail Pit will include one maintenance shop for mine equipment and one for haul trucks. Agnico Eagle may also include a wash bay, a machine shop, and a welding shop. The concrete foundation will be designed according to the type of bay (e.g., for a wash bay, drains in the foundation will be designed for used water with a sump for an oil separator).

1.2.10 Airport Facilities

In the Approved Project FEIS, Agnico Eagle initially proposed to progressively reclaim the small airstrip at the exploration site with surface material to be reused as construction material for the proposed infrastructure at the Whale Tail site. Upon further project optimization, Agnico Eagle decided to use the existing airstrip as a construction access road for Whale Tail Dike. A section of the expanded haul road near the Whale Tail Pit site will be used as an airstrip during the operation of the expansion.

1.2.11 Explosives Production and Storage Sites

Consistent with the Approved Project, the existing emulsion plant located near the Meadowbank Mine will be maintained with deliveries on an as needed basis during operations. The haul road will be used to truck explosives between the Meadowbank Mine and the Whale Tail site, with a minimum amount of explosives to be stored at the Whale Tail site. An emulsion storage facility and plant will continue to be used at the Whale Tail Pit project. The location of general infrastructure for the management of explosives at the Whale Tail site are shown on Figure 1.2-1. Agnico Eagle will confirm compliance with legislative requirements for siting explosive storage facilities should a decision be made to relocate the facility. Any potential storage site will be located within the local study areas assessed in the FEIS Addendum.

Consistent with the Approved Project, the explosives storage facilities will be safely located away from vulnerable facilities, as stipulated by the federal and territorial *Explosives Use Act* and *Regulations*. The minimum setback distances between the proposed explosives storage facilities and the other mine site facilities will be governed by the *Quantity-Distance Principles User's Manual,* as published by the Explosives Branch of Natural Resources Canada. Use of these setback distances will ensure that the location of these proposed facilities meet all federal and territorial regulations regarding safe siting of such facilities.

For additional information on the supply, storage, and handling of explosives refer to the Ammonia Management Plan (Volume 8, Appendix 8-D.1).

1.2.12 Fuel Storage Sites

Consistent with the existing Type A Water Licence 2AM-WTP1826 and the Approved Project FEIS, the Expansion Project will require the use of fuel (P-50 Fuel Diesel ULSD-43). Fuel usage between the Meadowbank Mill and operations at the Whale Tail site is projected to be approximately 96.8 million L/year. The Whale Tail Bulk Fuel Storage Facility will be located east of the Whale Tail Camp adjacent to the mine operations haul road (Figure 1.2-1).

Agnico Eagle has approval to store 500,000 L of diesel fuel under Type A Water Licence 2AM-WTP1826 to support open pit activities under the Approved Project and 1,900,000 L of diesel fuel under Water Licence 2BB-MEA1828 to support underground development and exploration activities. Under Type A Licence 2AM-WTP1826, Agnico Eagle adjusted the size of the fuel tank to one 1,500,000 L tank under the existing water licence to support open pit activities for the Approved Project. To support underground mining activities, as part of the Expansion Project, Agnico Eagle is proposing to add:

- one above ground storage tank with approximately 500,000 L capacity within the vicinity of the current Whale Tail Pit Fuel Farm; and
- 700,000 L storage capacity between five key storage locations illustrated in Figure 1.2-1.

In total, the proposed fuel storage capacity required for the Approved Project and the Expansion Project is a total of 2.7 ML. The bulk fuel tank will be re-filled by a fuel truck on a regular basis throughout the year.

The approved fuel storage facilities at Whale Tail Pit, Meadowbank Mine, and following upgrades currently under consideration of Type A Water Licence (2AM-MEA1826, to support current operational needs associated with the Approved Project), the Baker Lake marshalling area will not change as a result of the Expansion Project.

For additional information refer to the Meadowbank and Whale Tail Bulk Fuel Storage Facilities: Environmental Performance Monitoring Plan (Volume 8, Appendix 8-D.2).

1.2.13 Waste (Domestic and Hazardous) Management

Agnico Eagle proposes to add an incinerator, a composter and a landfarm on site, to reduce traffic on the Whale Tail Pit Haul Road and to improve waste and contaminated soil management. Reduced traffic will result in less interactions with caribou and safer road conditions.

Hazardous Waste

Agnico Eagle does not propose changes to the approved handling and disposal of hazardous waste. Hazardous material management will be implemented in accordance with the approved Hazardous Material Management Plan: Meadowbank Mine Site, Whale Tail Pit Site, Baker Lake Facilities (Volume 8, Appendix 8-D.4).

Domestic Landfill Waste

Construction debris and domestic waste generated on-site will be disposed of in an on-site landfill to be located in the Whale Tail WRSF. The total capacity of this landfill is to be 59,000 m^3 approved under Type A Water Licence 2AM-WTP1826. Agnico Eagle will implement landfill management in accordance with the Landfill and Waste Management Plan (Volume 8, Appendix 8-B.1).

Incineration

Agnico Eagle is proposing an incinerator on-site for the Expansion Project.

The objective of the incinerator will be to divert organic material from the incinerator to composter. This diverted material will go to the composter instead of incinerator (except if problem with composter/maintenance).

Organic matter includes the following:

- food (e.g., coffee grounds and tea bags, eggs and egg shells, fruit and vegetable peelings, meat, solid dairy products, table scraps and plate scraping etc.)
- leaf and yard organic material including brush and tree trimmings);
- paper and cardboard; and
- dead animals (small size only).

Further details are provided in the Incinerator and Composter Management Plan (Volume 8, Appendix 8.B-5).

Composting

Agnico Eagle is proposing a composter on-site for the Expansion Project. The composter will be at the same location as the incinerator. The objective of the composter is to reduce the amount of waste incinerated (i.e., reduce fuel consumption – reduce greenhouse gases [GHG] emissions).

Weekly organic matter quantities will consist of the following:

- 7,000 kg: food materials (e.g., coffee grounds and tea bags, eggs and egg shells, fruit and vegetable peelings, meat, solid dairy products, table scraps and plate scraping etc. as well as leaf and yard organic material including brush and tree trimmings);
- 357.2 kg: cardboard quantity; and
- ~400 kg per day of compost coming out and will be put in the landfill.

Further details are provided in the Incinerator and Composter Management Plan (Volume 8, Appendix 8.B-5).

Sewage

Agnico Eagle does not propose any changes to the sewage treatment facilities to accommodate the Expansion Project activities. Sewage treatment facilities will continue to be managed in accordance with the approved Amaruq

Gold Wastewater Treatment System Operation and Maintenance Plan dated December 2015 approved by the the NWB as provided in Part B, Item 14 of Type A Water Licence 2AM-WTP1826. As stipulated in Part B, Item 17, Agnico Eagle will review the Plans as required by changes in operation and/or technology and modify the Plans accordingly in the form of an addendum to be included in the Annual Report.

Hydrocarbon Contaminated Waste

As the Project advances, Agnico Eagle foresees the need to optimize project operations with construction and operation of an on-site landfarm facility to treat and manage potential hydrocarbon contaminated soils. The proposed location of the facility is provided in Figure 1.2-1.

A Landfarm Design and Management plan in support of Project operations has been included in the addendum applications. Refer to Volume 8, Appendix 8-B.4 for specific details.

1.2.14 Power

Power requirements to support the project were assessed as part of the Approved Project. Agnico Eagle does not propose any changes to power requirements to support the Expansion Project. For additional information refer to the Approved Project (FEIS Volume 1, Section 1.2.13).

1.2.15 Borrow Pits and Quarry Sites

For the Approved Project, construction of the haul road utilized a series of quarry/esker sites from which road construction material is sourced. These quarries/eskers will be expanded (first by depth, and if needed in width) to obtain material for haul road expansion construction. Specifically, quarries/eskers to be used to expand the road further from 9 m to 15 m are provided in Table 1.2-3.

Four new (unpermitted) esker/quarry sites will be needed for the expansion of the haul road (Km 2.5, Km 8, Km 40.4, and Km 53). For additional details on approved eskers/quarries refer to the Approved Project (FEIS Volume 1, Section 1.2.14).

Management, mitigation, and monitoring of borrow pits and quarry material will be implemented in accordance with the Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1).

1.3 Project Design

Agnico Eagle continues to conduct feasibility and design studies with both the cold northern climate and remote location as the principal engineering considerations for successful design, construction, and operations. Consistent with Approved Project FEIS, the Expansion Project was designed to minimize the areas of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use for traditional pursuits and wildlife habitat. This will mainly be achieved by rapidly dewatering during the open water season, mining the pits as efficiently as possible, and then refilling as early as possible during closure.

1.4 Pace, Scale, and Timing of Project

As stated in Section 1.2.1 of the FEIS Addendum, Meadowbank Mine was scheduled to exhaust its mineable reserves by Q1 of 2019. With the recent NIRB approval and Type A Water Licence approval for development of the Whale Tail Project, mineable reserves to supplement Meadowbank Mine have been extended to 2022, with the expansion further extended mineable reserves until 2025. Agnico Eagle will continue exploration activities with the objective to extend Mine life beyond 2025.

As described in the FEIS, by extending the LOM at Meadowbank, Agnico Eagle will progressively close portions of the Meadowbank Mine while operating. Refer to Approved Project FEIS Volume 1, Section 1.4 for additional information.

The development sequence for the mine infrastructure and water management infrastructure is summarized in Table 1.4-1.

Table 1.4-1: Mine Development Sequence and Key Activities

		Construction[1]	Operations[2]							Closure[3]									Post-closure[4]
		-1	1	2	3	4	5	6	7	8	9	10	11-18	19	20	21	32	33	33
		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029-2036	2037	2038	2039	2050	Q1-Q3 2051	Q4 2051
Water Management Infrastructure	**Status[5]**																		
Groundwater Storage Pond 1 (GSP-1)	Approved																		
Groundwater Storage Pond 2 (GSP-2)	New																		
Groundwater Storage Pond 3 (GSP-3)	New																		
Water Intake in Nemo Lake and Freshwater Pump Station	Approved																		
Whale Tail Attenuation Pond Pump Station	Approved			8															
IVR Attenuation Pond Pump Station	New																		
Whale Tail WRSF Dike	Approved*																		
WRSF Pond	Approved																		
Whale Tail Dike	Approved																		
Mammoth Dike	Approved																		
Northeast Dike	Approved			7															
Whale Tail Dike Seepage Pump Station	New																		
South Whale Tail Diversion Channel	Approved																		
Whale Tail WRSF Contact Water Collection System	Approved																		
IVR WRSF Contact Water Collection System	New																		
Ore Stockpile 3 Contact Water Collection System	New																		
East Channel	Approved																		
IVR Diversion	New																		
IVR Attenuation Pond	New																		
Underground Water Management System	New																		
Water/Effluent Treatment																			
Freshwater Treatment Plant (Potable)	Approved																		
Sewage Treatment Plant	Approved																		
Construction Water Treatment Plant	Approved																		
Operation Water Treatment Plant	Approved																		
Mammoth Lake Diffuser	Approved																		
Whale Tail South Basin Diffuser	New																		
Unnamed Alternate Diffuser	New																		
TDS Treatment	New																		
Mining																			
Underground Mining[6]	New																		
Whale Tail Pit	Approved																		
Whale Tail Pit Expansion	New																		
IVR Pit	New																		
Waste Rock																			
Whale Tail Waste Rock Storage Facility	Approved*																		
Overburden Storage Pad	Approved																		
NPAG WRSF	Approved																		
Whale Tail Ore Stockpiles	Approved																		
Underground Ore Stockpiles	New																		
Underground WRSF	Approved																		
Ore Stockpile (No.4)	New																		
IVR Waste Rock Storage Facility	New																		
Dewatering																			
Fish Out - Whale Tail North Basin	Approved																		
Dewatering of Whale Tail Lake North Basin	Approved																		
Dewatering of A47 and A49 Lakes	New																		
Fish Out – A53 Lake	New																		
Dewatering of A53 Lake	New																		
Re-Filling/Flooding																			
Re-Filling/Flooding Whale Tail Pit	Approved																		
Flooding of Whale Tail (South Basin)	Approved																		
Re-Filling/Flooding Underground	New																		
Re-Filling/Flooding IVR	New																		
Re-Filling/Flooding Whale Tail (North Basin)	Approved																		
Reconnection North Basin and South Basin of Whale Tail Lake	Approved																		

		Construction[1]	Operations[2]							Closure[3]									Post-closure[4]
		-1	1	2	3	4	5	6	7	8	9	10	11-18	19	20	21	32	33	33
		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029-2036	2037	2038	2039	2050	Q1-Q3 2051	Q4 2051
Associated Infrastructure																			
Industrial Pad Development and associated buildings (camp, maintenance shop, communication towers, etc.)	Approved									9									
Widening Haul Road (9.5 m)	Approved																		
Widening Haul Road (15 m)	New																		
Additional Haul Road Quarries and Eskers	New									9									
Site access roads	Approved									9									
Explosives Magazines	Approved									9									
Landfill	Approved									9									
Landfarm	New									9									
Incinerator	New									9									
Composter	New									9									

1. Construction: Approved Project - 2018 to 2019
2. Operations: Approved Project - 2019 to 2022; Expansion 2020 to 2025
3. Closure: Approved Project - 2023 to 2029; Expansion - 2026 to 2051; pits fully flooded in 2041
4. Post-closure: Approved Project - 2030 to 2034 ; Expansion – 2051
5. Status reflects "Approved" infrastructure already assessed and permitted under Project Certificate (No. 008) and Type A Water licence 2AM-WTP1826 or other permit or authorization, and "New" infrastructure associated with proposed Expansion Project
6. Underground Mining - initial ramp development authorized under 2BB-MEA1828
7. Northeast Dike required for development of Whale Tail Dike. However dismantling of facility to support expansion will occur sooner than originally projected.
8. The approved project considered treated discharge to Mammoth Lake during open water season only; The expansion proposed addition of winter discharge to Mammoth Lake
 * Infrastructure approved, however, needs to remain in place longer than originally proposed due to the expansion and delaying of the closure of the facility
9. Final active closure timelines to be determined in Final Closure and Reclamation Planning process.

Green line = start of Expansion Project; Red dashed line = end of Approved Project operations phase

1.5 Environmental Assessment Summary

The Expansion Project Addendum applies an ecosystem-based approach by describing the ecological function of each ecosystem component or valued component (VC), indicating the ecological and cultural pathways of the potential impacts that are predicted, and updating mitigation and monitoring plans to deal with those impacts consistent with the approach applied for development of the FEIS, while taking into account recent direction provided by NIRB for amendment/reconsideration applications (NIRB 2018a). An updated summary of methods is provided in Volume 3.

1.6 Adaptive Management and Precautionary Principle

As with all Meadowbank operations (i.e., Meadowbank Mine, Whale Tail Pit, ongoing exploration, and the proposed expansion), making good use of adaptive management requires the recognition that it is a structured, iterative approach to environmental management decision making (CPR 2011). Many VCs applicable to the Project are part of dynamic natural and socio-economic systems where uncertainty can be a significant factor. The goal is to reduce uncertainty over time by incorporating learnings from design, monitoring, mitigation, and changes in operations into environmental management at the proposed mine site. Where applicable, an adaptive management strategy or approach will be used for those VCs that will be monitored by Agnico Eagle.

Agnico Eagle has taken steps to integrate its sustainable development program into all aspects of its business through the development and implementation of an internal Health, Safety, Environment and Community Relations Management System, that is structured within the RMMS. Trends are compiled, followed, and analyzed in the RMMS and compared to the pre-established goals/thresholds. Any action plan and corrective actions to be taken are documented through the RMMS. For additional information related to Agnico Eagles adaptive management system and precautionary approach, refer to Approved Project FEIS Volume 1, Section 1.6 (Agnico Eagle 2016c).

1.7 Performance Measurement and Monitoring

The Expansion Project is an extension of mining operations for the Approved Project (i.e., mining of the Whale Tail Pit orebody) that has existing waste and water management facilities and associated management plans that are approved by the NWB under Type A Water Licence 2AM-WTP1826. The existing management, monitoring, and mitigation will focus on ensuring impacts to waste and water, are consistent with those predicted for the Approved Project. The accuracy of the environmental impact predictions and the effectiveness of the mitigation measures will be verified through monitoring and annual reporting.

As indicated in the Approved Project FEIS Volume 1, Section 1.7 (Agnico Eagle 2016c), as part of the Mining Association of Canada, Agnico Eagle reports its global performance through its annual Corporate Social Responsibility report.

Regulatory requirements and targets are identified in each of the management plans required under the Project Certificate, Water Licence or any other permit, licence or authorization, as appropriate. Corrective actions will be triggered when those thresholds are reached. The RMMS will link the thresholds to appropriate corrective actions and establish accountability.

The performance of the management plans will be monitored periodically and the results communicated. Independent researchers or consultants may be engaged to review performance where necessary. The accuracy of the environmental impact predictions and the effectiveness of the mitigation measures will be verified through that process. If unusual or unforeseen adverse environmental impacts are noticed, corrective action will be put in place. Through the adaptive management process, the existing mitigation measures will be adjusted, or new mitigation measures implemented if necessary. External reporting will be completed, as required in accordance with Annual reporting requirements under the Project Certificate and/or Type A Water Licence.

For the purposes of the Expansion Project NIRB reconsideration and review process, Agnico Eagle has provided new or updated plans as summarized in Volume 8, Table 8.2-1.

As previously stated, the Expansion Project is an extension of mining operations for the Approved Project; therefore, many of the monitoring and mitigation plans are "operational" plans in place for the Whale Tail Pit Project. By title, Agnico Eagle has indicated that these plans are intended for the NIRB assessment (NIRB). These plans are living documents which will evolve as the approved and expanded project proceeds and will be updated to reflect changes in operation, technology, and direction or requests made by the NIRB and/or NWB and subsequent approvals for the project.

The _NIRB plans have been submitted for the purposes of the NIRB reconsideration process. Final plans that are in accordance with amended or approved authorizations and licenses will be provided to the regulators as directed and will incorporate operational changes, review comments, intervener recommendations, and commitments made by Agnico Eagle for the Expansion Project.

For a complete list of plans currently in place to mitigate and monitor impacts for ongoing operations of the Approved Project refer to Volume 8.

1.8 Potential Future Developments

Agnico Eagle will continue exploration activities with the objective to extend Whale Tail Project mine life beyond 2025.

The development of Whale Tail Pit as currently approved and the Expansion Project represents a portion of the mineralization identified for the Whale Tail zone. The 408 km^2 Amaruq property has potential for future development (Figure 1.8-1 and Figure 1.8-2) as:

- underground mining of the Whale Tail ore body;
- Mammoth intersect potential underground and/or open pit;
- Buffalo Pit;
- IVR Push Back (towards IVR WRSF) and underground.

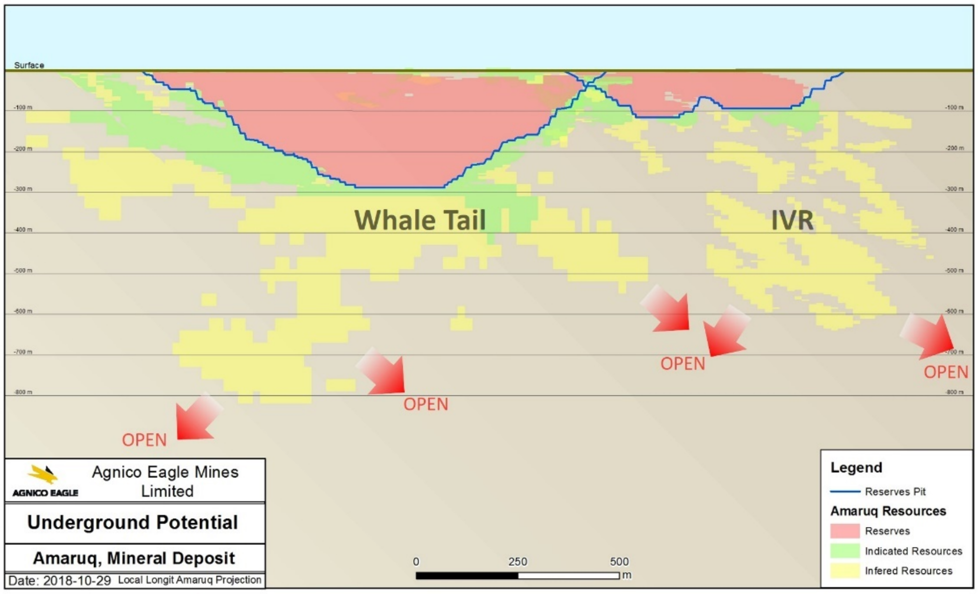


Figure 1.8-1: Underground Potential of the IVR Ore Body

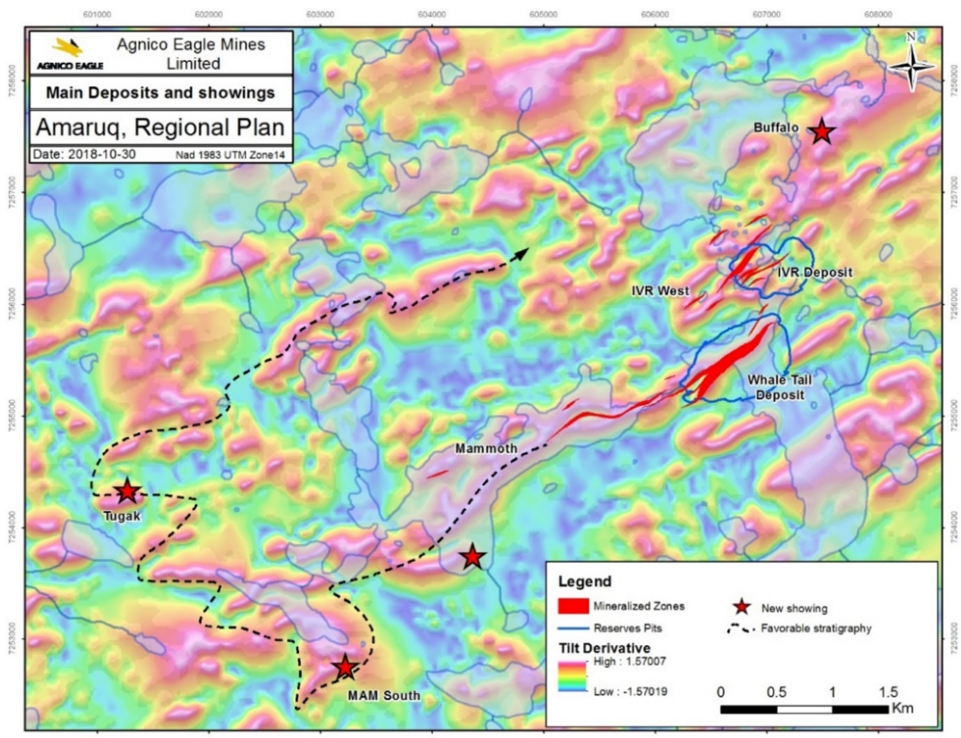


Figure 1.8-2: Geophysics Survey of the Amaruq Exploration Site and Future Development Opportunities

Agnico Eagle proposes to continue delineation drilling of the Mammoth and Buffalo intersect zones in the future.

The areas of potential future development are within the study area for the current Project. If proven economically viable the exploitation of the additional deposits would extend the LOM for Meadowbank Mine operations. Agnico Eagle would seek the appropriate modifications and/or amendments, if applicable.

1.9 Technology

The most current concepts have been selected for Project design (i.e., mining, processing, and effluent treatment). Although the technologies are considered state-of-the-art, the Meadowbank project team have adapted to difficult climatic conditions and have designed infrastructure accordingly and used up-to-date technology to solve problems.

The mining and processing techniques proposed for Expansion Project are an extension of current mining practices as described in the Approved Project (FEIS Volume 1, Section 1.10), thus Agnico Eagle intends to use familiar, proven approaches seen at many mining operations in production today; however, the Agnico Eagle is continually addressing problems using proven newest technologies to improve mining efficiency, production efficiency, reduce fuel consumption, and ultimately reduce emissions.

For example, Agnico Eagle is currently researching alternative energy sources (i.e., wind turbine and solar power) in conjunction with the Meliadine Gold Project and depending on viability may in the future extend to Meadowbank operations at Meadowbank and Whale Tail Pit.

1.10 Alternatives to the Expansion Project

Alternatives were considered during all stages of Project design. Consultation and regulatory engagement discussions have been considered as part of the alternatives assessment. In general, consistent with the Approved Project, Project alternatives were evaluated for the Expansion Project according to the following criteria:

- Environmental – potential impacts to the environment, project footprint, reclamation;
- Engineering and Viability – best engineering practices, technology, permitting, risk, and flexibility;
- Economy – cost implications, construction capital, operating costs, maintenance cost for reclamation; and
- Society – community acceptance or preference, traditional knowledge (TK), health and safety, quality of life, employment, and socio-economic effects.

The alternatives that shaped the overall Project include the following:

- Project Go/No-Go decision;
- Infrastructure, Transportation, Access, and Quarry Development
- Deposit, Mining Method, and Production;
- Processed Ore Containment and Tailing Storage;
- Overburden and Waste Rock Disposal; and
- Water Management.

For additional information refer to the Approved Project (FEIS Volume 1, Section 1.10 and subsections).

1.10.1 Project Go/No-Go Decision

The proposed expansion of Whale Tail Pit is an opportunity made real by existing mining and milling facilities at Meadowbank Mine and the recent approval by NIRB and NWB for the Whale Tail Pit Project. Without the Expansion Project, the Meadowbank Mine will close in 2023.

From the economic and societal view, the no-go alternative would result in a substantial lost opportunity. Tax and royalty revenues to government and employment and business contracting opportunities to individuals and companies would be lost.

From an environmental perspective, the no-go alternative would mean no additional impacts from mining. Existing site facilities would be decommissioned and the area disturbed would be restored within the terms of the existing licenses.

Delays in the Expansion Project associated with permitting may affect the long-term economic viability of the Meadowbank Mine. Agnico Eagle has an obligation and commitment to reclaim infrastructure through progressive reclamation as facilities are no longer needed. To reduce economic and environmental liability for the Expansion Project and existing Meadowbank Mine, Agnico Eagle's key objective is to minimize the "gap" in time between exhaustion of the Approved Project minable reserves and mining of the expansion. Mining is market driven, as such Agnico Eagle is continually aware that market conditions may yield no go scenarios.

1.10.2 Infrastructure, Transportation, Access, and Quarry Development

As stated in the Approved Project FEIS, to improve economics for the Expansion Project, Agnico Eagle has minimized Expansion Project footprint, reduced potential impacts to the environment, and reduced infrastructure requiring reclamation by using as much as possible, the established Amaruq and/or Meadowbank Mine infrastructure. All Expansion Project infrastructure is located within the local study area for the Approved Project originally assessed in the FEIS (Agnico Eagle 2016c).

The Expansion Project proposes expansion of the approved 9.5 m wide haul road to a proposed 15 m wide haul road for safety. Refer to Section 1.2.8 of the FEIS Addendum. The road allows Agnico Eagle to use Meadowbank infrastructure to the fullest extent possible and optimize operations. Operational optimization limits the need for additional on-site support infrastructure. The existence of the road allows Agnico Eagle to minimize Expansion Project footprint.

Consultation was undertaken in development of the road and road selection alternatives were discussed with community representatives (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Agnico Eagle modified the road route to take into account community preference and TK, are working with the Department of Culture and Heritage to respectfully mitigate existing cultural heritage sites, and have avoided all burial sites.

Quarry selection and use options were evaluated in the application filed for the exploration access road in 2015 and 2016. Agnico Eagle, where possible, has prioritized use based on feedback from the community and KivIA. Refer to Table 1.2-3.

1.10.3 Deposit, Mining Method, and Production

Agnico Eagle outlined the potential for future development of the Amaruq property (FEIS Addendum Section 1.8) these options were considered as Expansion Project alternatives.

Additional deposits within the Amaruq property require further exploration or advanced exploration (i.e., bulk sampling) to assess economic viability.

1.10.4 Processed Ore Containment and Tailing Storage

The processing of ore and disposal of tailings will remain consistent with the Approved Project and undertaken in accordance with Project Certificate No.004 and Type A Water Licence 2AM-MEA1526.

1.10.5 Overburden and Waste Rock Disposal

As stated in the Approved Project, Agnico Eagle is continuing to explore within the Amaruq property and it was important that proposed infrastructure site locations were not sited over potential mineralization, which might prove economical in the future. Understanding the location of existing and potential future mineralization on the Amaruq property was key in the proposed siting of the overburden and waste rock disposal areas; site water management also played a key role in siting the Whale Tail WRSF. Based on the review of interveners alternative WRSFs proposed in the Approved Project FEIS are now being considered for implementation in this expansion. Whale Tail WRSF and overburden pile placements were determined by taking into account the potential for environmental impacts in consort with facilities engineered to minimize the amount of contact water generated, requiring treatment, or requiring containment during operations and especially post-closure.

Consistent with the Approved Project, Agnico Eagle considered various locations for the WRSF, while simultaneously looking at water management. Ultimately, the location was determined based on the reasons listed above, but the primary decision criteria used to select the WRSF options were:

- to evaluate options considered in the Approved Project FEIS;
- to reduce the risks to the downstream waterbodies;
- to reduce the direct impacts on waterbodies; and
- to reduce interaction of surface water with the WRSFs.

Based on operation feedback from Meadowbank Mine operations, Agnico Eagle is also considering alternatives for waste rock and/or tailings to include potentially in-pit disposal to mined out open pits (currently under review).

1.10.6 Water Management and Schedule II Listing

To support the Approved Project, a detailed water management multiple account analysis (MAA) was completed on various options for Project water management. Refer to the Approved Project FEIS Volume 1, Appendix 1-E (Agnico Eagle 2016c) for additional information.

Current approved water management for mine water effluent includes contact water effluent diffuser in Mammoth Lake and channelling and rerouting of non-contact water towards Mammoth Lake. The later consists of blocking the water flow with the construction of the Whale Tail Dike, raising the water level of the Whale Tail Lake (South Basin) and rerouting the water flow towards the Northwest to Mammoth watershed through a channel.

To support of the Expansion Project and an Environment and Climate Change Canada (ECCC) Schedule II listing, Agnico Eagle has completed an additional MAA as one part of a larger alternatives assessment for the Whale Tail Pit Project Amendment for which a brief summary is provided below.

The Expansion Project requires an attenuation pond to annually store water between October and May, so that water can be treated and discharged mostly during ice-free conditions between June and September. The stored water would include deleterious substances (i.e., mine contact water containing suspended solids and arsenic). It is challenging to find feasible sites that are non-fish bearing, and that would meet Agnico Eagle's objective to locate the attenuation pond within sub-watersheds that contain approved, and proposed, mine infrastructure for the Whale Tail Pit Project.

The *Fisheries Act* prohibits the deposit of deleterious substances in waters frequented by fish, unless it is authorized by regulations. Under the Metal and Diamond Mining Effluent Regulations (MDMER), an amendment to Schedule II of the Regulation is required to list the natural waterbody and authorize the disposition. A Schedule II amendment is considered by ECCC after a project has conducted an assessment of alternatives to use a natural water body to store mine waste, completed EA, considered the prepared a fish habitat compensation plan that will offset the loss of fish habitat for consideration as part of the EA, and participated in public and Inuit Qaujimajatuqangit consultations on the EA, including on possible amendments to the MDMER.

Agnico Eagle has prepared an alternatives assessment to demonstrate that the use of a waterbody as an attenuation pond is the most appropriate option from an environmental, technical, and socio-economic perspectives. This assessment has followed the transparent and standardized process described in ECCC's *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (ECCC 2016).

The initial step in the assessment process identified eight potential alternatives that met four threshold criteria: must align with existing water management strategy; must be confined within the area already proposed to be affected by the Expansion Project; must provide sufficient storage capacity; and must not contradict the mine development plan. Following a critical flaw assessment, that included screening against criteria such as engineering and safety risks, and avoiding areas of high environmental, cultural and/or archeological value, five alternatives (Figure 1.10-1) were left that were carried through to the characterization stage and a MAA. The five alternatives were:

I. New attenuation pond at Lake A53 (fish-bearing);

II. New attenuation pond at Lake A53 and expand existing Whale Tail Attenuation Pond;

III. New attenuation pond at Lake 54 (non-fish-bearing);

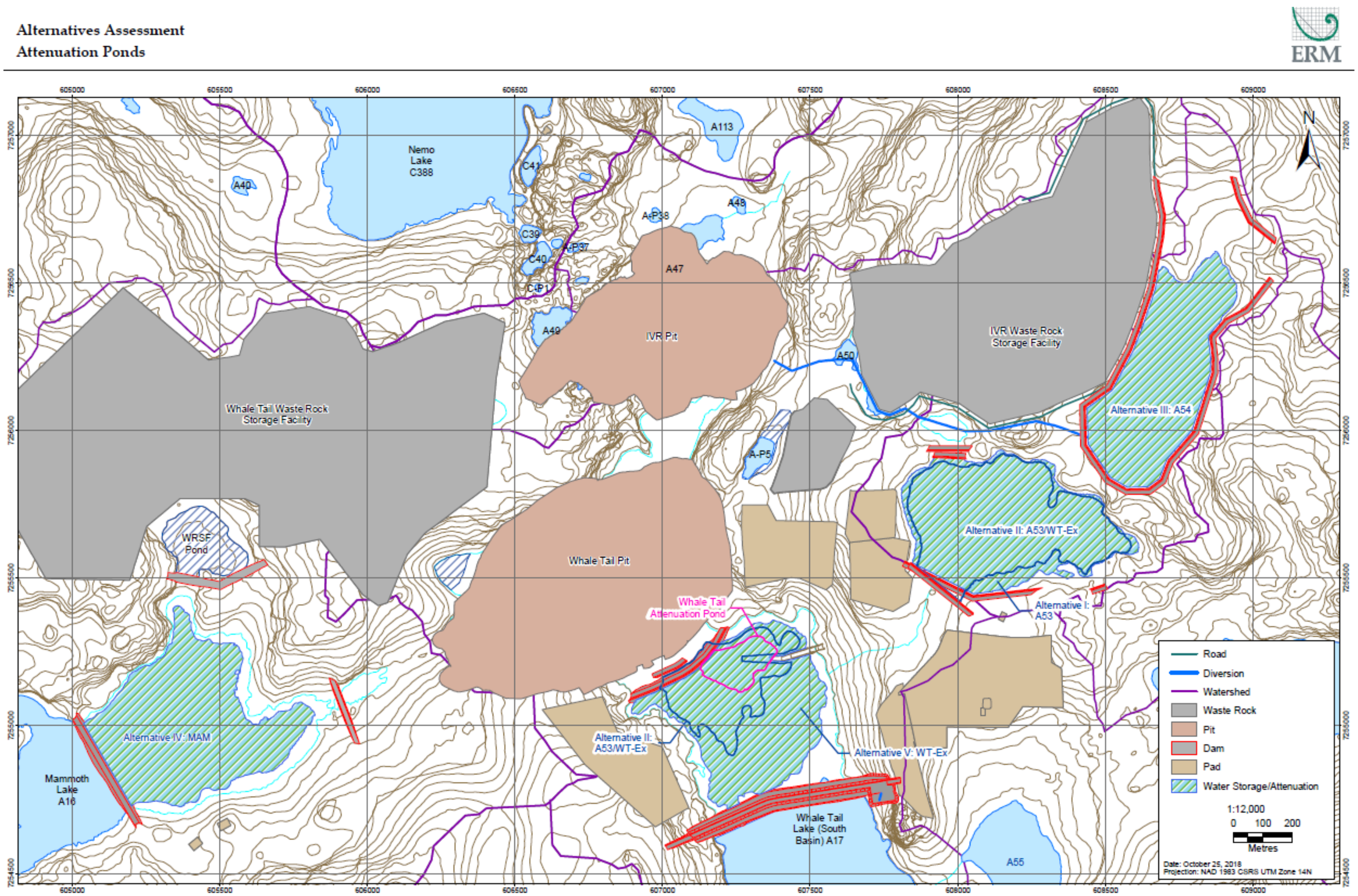
IV. New attenuation pond at Mammoth Lake (fish-bearing); and

V. Expansion of existing Whale Tail Attenuation Pond (land-based).

Inuit Qaujimajatuqangit (IQ) was incorporated throughout the alternatives assessment, including in the baseline setting description, critical flaw assessment, characterization of alternatives, in the development of meaningful indicators for the MAA, and in the determination of value-based weightings. Consultation with elders and community members in Baker Lake and Chesterfield Inlet also highlighted traditional values, areas of use, and concerns related to the water attenuation alternative, that were incorporated in the assessment of alternatives.

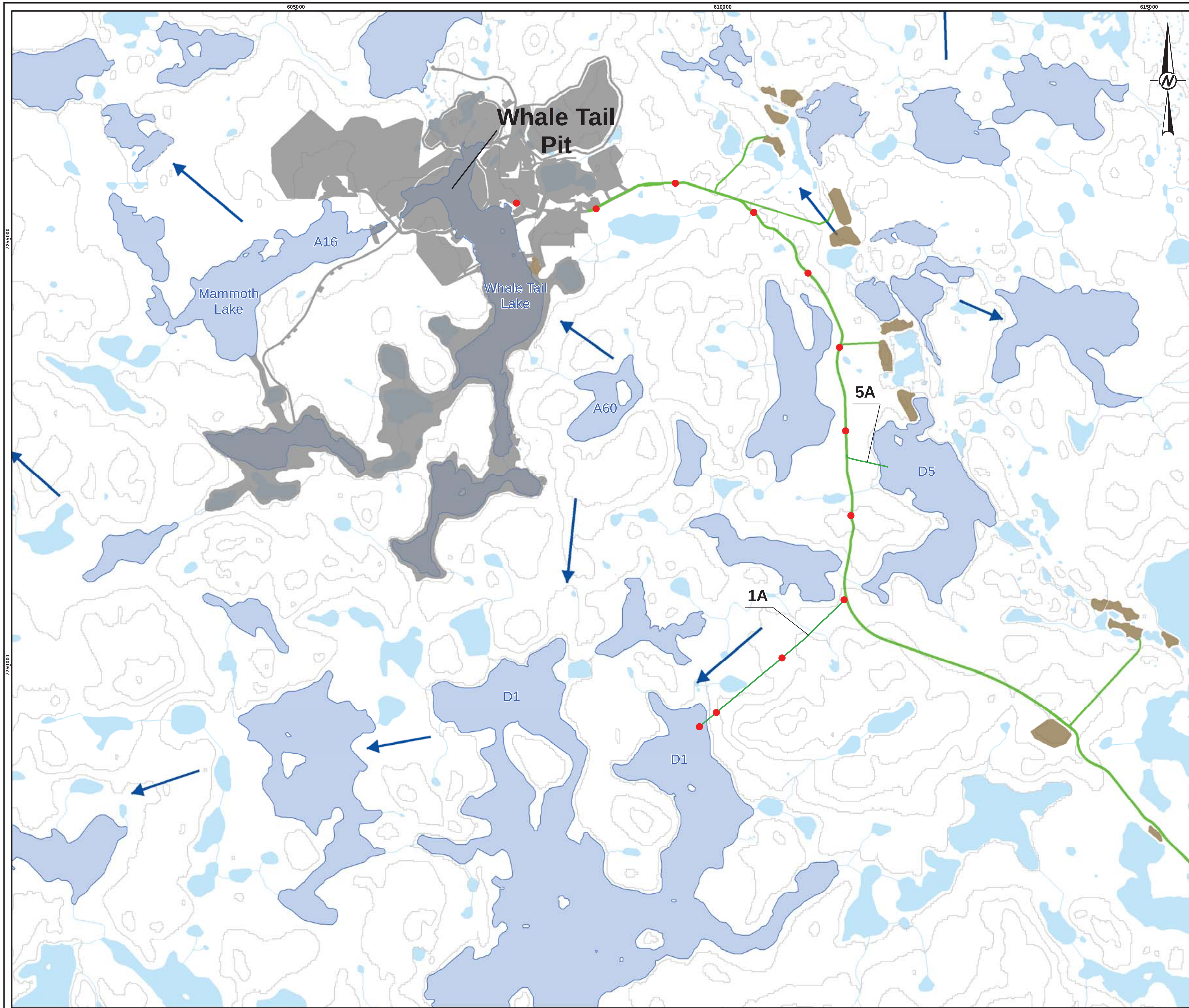
The results of the MAA indicate that Alternative I: A53 has the highest merit rating, followed by Alternative V: Expansion of the existing Whale Tail Attenuation Pond. Alternative IV: Mammoth Lake is the lowest rated alternative. Based on the outcomes of the MAA, the preferred alternative is Lake A53. This alternative proposes to store contact water for the Expansion Project in a new IVR Attenuation Pond, with adequate storage capacity, supplemented by the existing Whale Tail Attenuation Pond with a storage capacity. The public and Indigenous consultations throughout the EA process will continue to be used to seek feedback on the assessment of alternatives and water management at the site, in addition to the community consultations previously held in Baker Lake and Chesterfield Inlet in July 2018.

Figure 1.10-1: Alternative Assessment of Attenuation Ponds



In addition to the MAA, Agnico Eagle continues to evaluate water management alternatives including:

- Mine water effluent to the mined out open pits for flooding.
- Mine water effluent to the IVR Attenuation Pond and subsequently discharged into Wale Tail basin.
- Mine effluent discharge to another lake. Alternative discharge locations currently being considered are presented in Figure 1.10-2.
- Alternative underground groundwater and contact water management which may include increasing the storage capacity of the Groundwater Storage Pond 1.
- Potentially increasing the storage capacity of the Whale Tail Attenuation Pond.
- Possibility of placing waste rock that is either ML/PAG or non ML/NPAG into IVR Pit.
- Potentially modifying the performance of the Water Treatment Plant to modify discharge quality, discharge rate and/or schedule of discharge.
- Postponing the start of the TDS Treatment and potentially modifying the performance of these treatment plants to increase or decrease the discharge rate and/or discharge schedule.



LEGEND

- GROUNDWATER FLOW DIRECTION
- CONTOUR (10 m)
- HAUL ROAD
- PROPOSED ROAD ROUTE
- BORROW SOURCE
- INFRASTRUCTURE
- LAKE OF INTEREST
- WATERBODY
- WATERCOURSE

0 900 1,800

1:45,000 METRES

REFERENCE(S)

1. HAUL ROAD AND PROPOSED ROAD ROUTE OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.DWG
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
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CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

ALTERNATIVE DISCHARGE LOCATIONS AND ROAD ROUTING

CONSULTANT

GOLDER

YYYY-MM-DD	2018-10-30
DESIGNED	JR
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	1300/1340	0	1.10-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

2.0 FEIS ADDENDUM OVERVIEW

As an expansion to the existing operations at Whale Tail Pit, the proposal is subject to an Environmental Review established by the *Nunavut Planning and Project Assessment Act* and the Water Licence authorities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*. Agnico Eagle requests the NIRB reconsider Project Certificate No. 008, where appropriate to account for the Expansion Project and has provided this stand-alone FEIS Addendum to guide the process.

The FEIS Addendum includes a series of complementary documents to provide a full understanding of the consultation, TK/IQ, technical and scientific aspects of the Project (Volumes 3 through 8).

Consistent with the Approved Project, Agnico Eagle considers any documents submitted and held on respective ftp site/public registries as part of the Nunavut Planning Commission conformity determination and NIRB process, to be part of the application.

The Approved Project FEIS conformed to the *Guidelines for the Preparation of and Environmental Impact Statement* (NIRB 2004). Refer to Approved Project FEIS Volume 2, Appendix 2-A (Agnico Eagle 2016c).

This FEIS Addendum has been developed to conform to guidance provided specific to Whale Tail Pit Project (NIRB 2016), and where applicable, recent *NIRB Guidance for Seeking Approval for Modification to Previously Approved Projects* (NIRB 2018a) (i.e., Meliadine FEIS Addendum of Treated Groundwater Effluent Discharge into Marine Environment [Agnico Eagle 2018k]; and In-Pit Tailings Disposal Modification). Refer to Volume 2, Appendix 2-A for concordance against the NIRB Guidance for Seeking Approval for Modification to Previously Approved Projects.

Volume 2 summarizes the integration of TK/IQ and public consultation into the FEIS Addendum, the Project Certificate No. 008 conditions for reconsideration, a flow chart to illustrate and provide guidance for steps to integrate NIRB technical review comments into the NWB approvable management plans, the Schedule II consultation, and the EA requirements applicable to the Expansion Project. To support the NIRB, Volume 2 includes:

- Appendix 2-A: NIRB FEIS Addendum concordance;
- Appendix 2-B: Addendum regulatory history;
- Appendix 2-C: Addendum baseline data collection reports;
- Appendix 2-D: Addendum public consultation, government engagement, IQ, and community concerns
- Appendix 2-E: Multiple Accounts Analysis.

Refer to the Approved Project (FEIS Volume 2, Section 2.3) for an overview of public consultation, government engagement, and IQ. An updated summary of public consultation, government engagement, and Project concerns raised by community members is provided in Volume 2, Appendix 2-D.

Consistent with the Approved Project, Agnico Eagle has taken a holistic approach to collecting IQ for the Expansion Project through the LOM and is illustrated in Figure 2-1.

Additional IQ and Project-related concerns and issues have been provided by community members and representatives (i.e., Hunters and Trappers Organization [HTO] and KivIA) since the FEIS submission was made in 2016 for the Approved Project. This information was identified through a review of the consultation record for the Approved Project and community consultation notes for the Expansion Project (Agnico Eagle 2018a). The IQ and

Expansion Project concerns have been categorised by topic (e.g., wildlife, fish, water quality) and are included in each respective discipline sections, and integrated into the assessment, where appropriate. The Expansion Project concerns and mitigation measures are also listed in Volume 2, Appendix 2-D, Table 2-D-2.

Figure 2-1: Model Used for Integrating Inuit Qaujimajatuqangit into the Baseline Studies

This FEIS Addendum applies the same ecosystem-based approach as the Approved Project FEIS by describing the ecological function of each ecosystem component or VC, indicating the ecological and cultural pathways of the potential impacts that are predicted, and designing mitigation and monitoring plans to deal with those impacts.

A summary of baseline studies completed for the Approved and Expansion Project is provided in Volume 2, Appendix 2-C.

Volume 3 provides an overview of the approach Agnico Eagle has taken for the Expansion Project, presents the methods used in the assessment for the Expansion Project and includes:

- figures presenting the spatial and temporal boundaries of the Expansion Project as compared to the Approved Project;
- cumulative effects assessment;

- a summary of potential effects to marine and consideration of potential effects related to human health and ecological risk are provided as Appendices to Volume 3; and
- a summary of mitigations for impacts from the development of the Project are provided in Volume 3, Appendix 3-C.

A summary of the physical, biological, and cultural environments assessment of the Expansion Project in comparison to the Approved Project are provided in Volume 3 of the FEIS Addendum, while the detailed impact assessments are provided in Volumes 4 through 7 of the FEIS Addendum.

- Volume 4 (Atmospheric Environment) considers:
  - potential effects related to air quality is provided in Volume 4, Section 4.3.3; and
  - potential effects related to noise and vibration is provided in Volume 4, Section 4.4.3.
- Volume 5 (Terrestrial Environment) considers:
  - potential effects related to vegetation (wildlife habitat) is provided in Volume 5, Section 5.4.3; and
  - potential effects related to terrestrial wildlife and wildlife habitat is provided in Volume 5, Section 5.5.3.
- Volume 6 (Freshwater Environment) considers:
  - potential effects related to surface water quality is provided in Volume 6, Section 6.2.3;
  - potential effects related to surface water quantity is provided in Volume 6, Section 6.3.3; and
  - potential effects related to fish and fish habitat is provided in Volume 6, Section 6.5.4.
- Volume 7 (Human Environment) considers:
  - potential effects related to heritage resources is provided in Volume 7, Section 7.2.3;
  - potential effects related to traditional land and resource use / IQ is provided in Volume 7, Section 7.3.2; and
  - potential effects related to socio-economics is provided in Volume 7, Section 7.4 and subsections, and Appendix 7-B.

Agnico Eagle will continue to implement an environmental management system consistent with operations for the Approved Project. Agnico Eagle has either amended existing management, mitigation, and monitoring plans for the Approved Project or revised in the form of addendum based on the activities for the Expansion Project (refer to Table 8.2-1 of the FEIS Addendum).

In keeping with Agnico Eagles' commitment to an integrated environmental management plan, a formal environmental awareness program, and an on-going adaptive environmental monitoring program for operations, Agnico Eagle has continued to collect and incorporate IQ throughout the various regulatory phases to date and through the start of construction of the Whale Tail Pit Project.

2.1 NIRB Reconsideration

In October 2018, NIRB acknowledged *Receipt of Conformity Determination and Information Request for Agnico Eagle Mines Limited's Request for Reconsideration of the Whale Tail Pit Project Certificate for the "Whale Tail Expansion" Project Proposal* received from the NPC on October 16, 2018 (NIRB File No. 18MN047). To assist the NIRB in completing the reconsideration assessment, Agnico Eagle has reviewed and provided rationale with respect to Project Certificate No. 008 and determined, subject to NIRB confirmation, the Terms and Conditions (T&C) applicable to the Expansion Project that may warrant reconsideration as shown in Table 2.1-1.

Table 2.1-1: Whale Tail Pit Project Certificate No. 008 Reconsideration Rationale

No.	Discipline	Category	Term and Condition	Reporting Requirements	NIRB Commentary	Agnico Eagle Rationale
16	Hydrogeology and Groundwater Quantity and Quality	Groundwater Monitoring Plan – Hydrogeological Characterization and Mine Closure	Within two years of commencing operations, the Proponent shall: a) Conduct additional analyses to determine the approximate fill time for the Whale Tail Pit at closure; b) Undertake a hydrogeological characterization study to assess the potential for arsenic and phosphorous diffusion from submerged Whale Tail pit walls; c) If the results of the characterization study indicate a moderate to high potential for arsenic and/or phosphorous diffusion, perform detailed hydrodynamic modelling of the flooded pit lake prior to closure to evaluate meromictic conditions and flooded pit water quality; and d) Add these required activities to the site Groundwater Monitoring Plan.	An updated Groundwater Monitoring Plan that outlines the Proponent's plans to fulfill this term and condition should be submitted to the Nunavut Impact Review Board at least 30 days prior to the start of construction, with subsequent plan revisions or updates submitted annually thereafter.		In general, Expansion Project activities are captured in the existing Term and Condition. Annual reporting to NIRB/NWB. As well as NWB Type A Water Licence Part B, Item 2, 13(g), 5 (c), 17 and Part I, Item 1, 8.
23	Freshwater Aquatic Environment	Trophic Status	The Proponent shall, reflecting any direction from Environment and Climate Change Canada and Fisheries and Oceans Canada: a) Conduct additional analysis to support the conclusions that a change in trophic status in Mammoth Lake would not impact fish productivity; b) Undertake additional site-specific studies to assess the predicted trophic change on lake ecosystem productivity to monitor potential changes to downstream environments; and c) Monitor actual loadings/concentrations in the receiving environment, identify trends in downstream chemistry and productivity, and track trophic status of Mammoth Lake.	The Plan for undertaking these additional studies and associated monitoring should be submitted to the Nunavut Impact Review Board (NIRB) at least 30 days prior to operations, with updates submitted annually thereafter or as may otherwise be required by the NIRB. A report on the results of these studies and associated monitoring should be provided at least 30 days prior to closure.	For clarity, the Proponent's obligations to conduct additional analysis under 23(a) is expected to objectively test the Proponent's conclusions in the Environmental Impact Statement that a change in trophic status in Mammoth Lake would not impact fish productivity.	Receiving environment consideration for discharge to Whale Tail (South Basin) or other bodies subject to mitigation options pending operation decisions may require reconsideration of part a) and c) In general, Expansion Project activities are captured in the existing Term and Condition. Annual reporting to NIRB/NWB. As well as NWB Type A Water Licence Part B, Item 2, 13(a), 14(h), and 17, and Part I.

2.2 Technical Review and Type A Water Licence

For the Approved Project, the FEIS and the Type A Water Licence Application for mine development proceeded through a fully coordinated review process with the NIRB and NWB.

Agnico Eagle believes, for the purpose of the Expansion Project, a modified (i.e., slightly staggered) approach to the process may provide for a more effective review of the NIRB Addendum to Project Certificate No. 008 and NWB Type A Water Licence 2AM-WTP1826 Amendment Application (pending 2019). Similar to a coordinated process, Agnico Eagle will submit an application to the NWB to support the boards participation in the NIRB Technical Review, hearings, and community round table for an expeditious and thorough review of the Project. Figure 2.2-1 provides an illustration of the proposed staggered approach.

At key touch points during the process, the modified approach will allow Agnico Eagle to clearly identify, integrate, and align:

- knowledge gained through additional works being undertaken by Agnico Eagle during the operation of the approved Whale Tail Pit; and
- information requests and technical comments received by interested parties throughout the process; wherein specific technical comments related to detailed engineering would be incorporated at the appropriate time (i.e., when the requirements more appropriately align with the regulatory review at the Type A Water Licence stage they would be addressed at this stage not during the EA process).

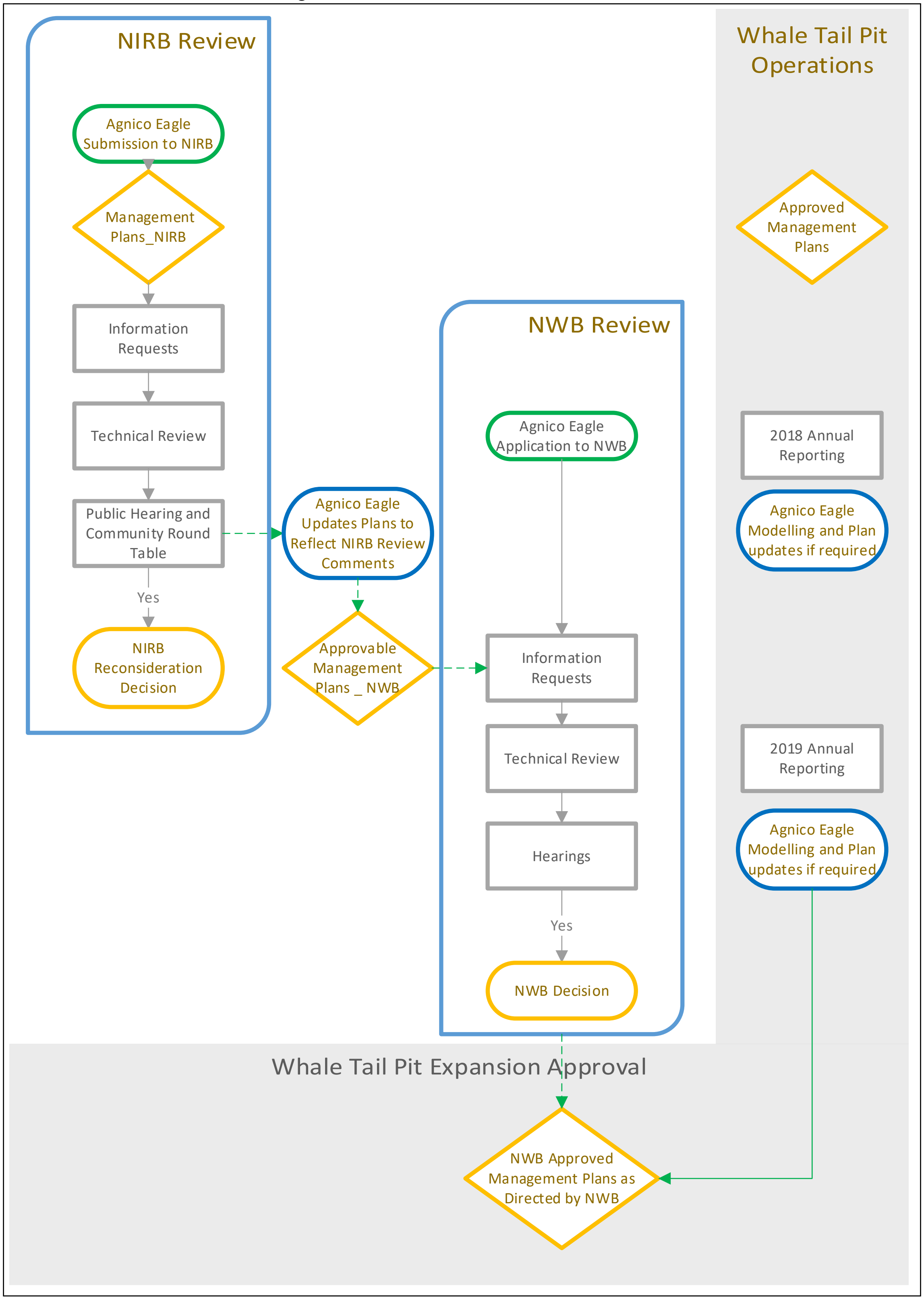
Agnico Eagle believes this approach reduces the level of uncertainty, provides increased clarity/transparency for interested parties, and confirms expectations of Agnico Eagle and interested parties that will better define the operational practices related to delivery of updated management, monitoring, and mitigation plans to manage water and waste that will continue to evolve throughout the regulatory review process.

Figure 2.2-1 provides an overview of the key touch points for review of mitigation, monitoring, and management plans, including the following:

1) Conceptual Management Plans submission to NIRB: _NIRB addendums have been included in this submission to support EA;
2) Approvable Management Plans to NWB: To be provided in response to NWB Information Requests and NIRB review comments/ recommendations. Plans will integrate where possible, additional works and updated modelling results completed by Agnico Eagle, responses, commitments and directions resulting from the NIRB process. In addition, plans will be developed as addenda, in concordance with NWB guidelines and existing terms and conditions where applicable; and
3) Final Approved Plans: To be provided following NWB issuance of Type A Water Licence. Plans will integrate where possible, additional works completed by Agnico Eagle, responses, commitments, and directions resulting from the NWB process.

Once approved, Agnico Eagle will implement the plans as directed by the NWB in accordance with the amended Type A Water Licence. For additional information related to mitigation, monitoring, and management plans refer to Volume 8.

Figure 2.2-1: Technical Review and Management Plan Process



2.3 Schedule II Listing

The *Fisheries Act* prohibits the deposit of deleterious substances in waters frequented by fish, unless it is authorized by regulations. Under the MDMER, an amendment to Schedule II of the Regulation is required to list the natural waterbody and authorize the disposition. A Schedule II amendment is considered by ECCC after a project has conducted an assessment of alternatives to use a natural waterbody to store mine waste, completed EA, considered the prepared a fish habitat compensation plan that will offset the loss of fish habitat for consideration as part of the EA, and participated in public and IQ consultations on the EA, including on possible amendments to the MDMER. For additional information refer to the Project Description (FEIS Addendum Volume 1, Section 1.10.6).

Agnico Eagle has prepared an alternatives assessment to demonstrate that the use of a waterbody as an attenuation pond is the most appropriate option from an environmental, technical, and socio-economic perspectives. This assessment has followed the transparent and standardized process described in ECCC's *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (ECCC 2016).

To support of the Expansion Project and an ECCC Schedule II listing, Agnico Eagle has completed an additional MAA as one part of a larger alternative's assessment for the Whale Tail Pit Project Amendment (Volume 2, Appendix 2-E). Pursuant to ECCC's Streamline Schedule II Process, Agnico Eagle has taken the following steps to support a request for a Part 1 exemption to stream-line the approval and go directly to *Canada Gazette*, Part 2 publication:

- Conducted an assessment of attenuation pond alternatives, including the cost and benefits of the alternatives, as part of the Expansion Project FEIS submitted to NIRB;
- Proposed fish habitat compensation plan associated with the loss of fish habitat in A53;
- Conducted consultation on the attenuation pond alternatives; and
- Considers the NIRB process, for which ECCC, DFO, Inuit, and the public participate, further consultation and will provide an opportunity for the public to comment on the alternatives assessment.

3.0 METHODS

3.1 Introduction

3.1.1 Context

Pathway analysis identifies and assesses the linkages between the proposed components or activities described in this FEIS Addendum, and the correspondent potential residual effects to VCs. A detailed description of the methods for the pathway analysis is provided in the Approved Project (FEIS Volume 3, Section 3.4).

3.1.2 Purpose and Scope

The purpose of this section is to provide a general overview of the approach and methods for analyzing, assessing, and determining the significance of potential environmental impacts. The assessment approach presented herein is based on ecological, cultural, and socio-economic principles, and EA best practice. There is general consistency in the approach for identifying pathways that link the Expansion Project to potential effects on VCs and to determining the spatial and temporal boundaries for the effects analysis across the biophysical and socio-economic environment. The approach is in line with the assessment approach described in Volume 3 of the Approved Project.

3.2 Spatial Boundaries

This FEIS Addendum evaluates effects using the same spatial boundaries as those defined in the Approved Project, which are described in each discipline section (FEIS Addendum Volumes 4 through 7). The proposed activities under the Expansion Project fall within these previously assessed areas, however additional studies completed for the Project in 2016 to 2017 supplemented the baseline data where deficiencies were identified during the review of the Approved Project, in the previous studies, or needed as a result of the expansion. A summary is described in Table 3.2-1 and local study areas (LSAs) are depicted in Figures 3.2-1 to 3.2-5. Selection of the boundary for effects study areas was based on the physical and biological properties of VCs. In addition, effects assessment areas were designed to capture the maximum spatial extent of potential effects from the Project and other previous, existing, and reasonably foreseeable future developments.

Table 3.2-1: Expansion Project Study Areas[a]

<table>
<tr><th>Disciplines / Valued Components</th><th>Local Study Area (LSA)</th><th>Regional Study Area (RSA)</th></tr>
<tr><td>Climate</td><td colspan="2">Kivalliq region of Nunavut</td></tr>
<tr><td>Air Quality</td><td colspan="2">60 km x 60 km area centered on the Whale Tail Pit
plus a 1 km length of the haul road with a distance of 2 km from the road was modelled for assessment purposes</td></tr>
<tr><td>Noise & Vibration</td><td>5 km buffer around the Project footprint (i.e., Whale Tail Pit operations and the haul road)</td><td>7 km buffer around the Project footprint</td></tr>
<tr><td>Permafrost</td><td rowspan="2">Total LSA of approximately 11,099 ha:
• 1.5 km buffer around the Whale Tail Pit operations, and
• 500 m corridor centred on the haul road footprint (travels approximately 64 km from the Vault Pit to the Whale Tail Pit)</td><td rowspan="2">No RSA was defined for terrain and permafrost as these are discussed considering regional conditions

Total soil RSA of 501,700 ha:
• 25 km radius around the Whale Tail Pit operations, and
• 25 km on either side of the haul road as well as the esker borrow sites and associated access roads</td></tr>
<tr><td>Terrain and Soil[b]</td></tr>
<tr><td>Vegetation</td><td rowspan="2">3 km buffer circle around Project facilities (i.e., 1.5 km from infrastructure), totalling approximately 28,215 ha</td><td rowspan="2">Same as soil RSA (see above)</td></tr>
<tr><td>Terrestrial Wildlife and Birds</td></tr>
<tr><td>Groundwater Quality and Quantity[b]</td><td colspan="2">Irregular polygon approximately 24,000 ha, centered around the Whale Tail Lake (Lake A17) and the Whale Tail Pit site</td></tr>
<tr><td>Surface Water Quality</td><td rowspan="3">A, C, and D watersheds (watersheds A and C were included in the Approved Project)

Hydrology LSA also includes the watersheds of each watercourse crossed by the haul road

Water Quality and Fish Habitat includes the haul road (100 m buffer on either side of the road alignment)</td><td rowspan="3">Hydrology RSA was limited to the drainage areas of Lake 2.1, Lake 23.9, Lake DS2, and Lake DS1.

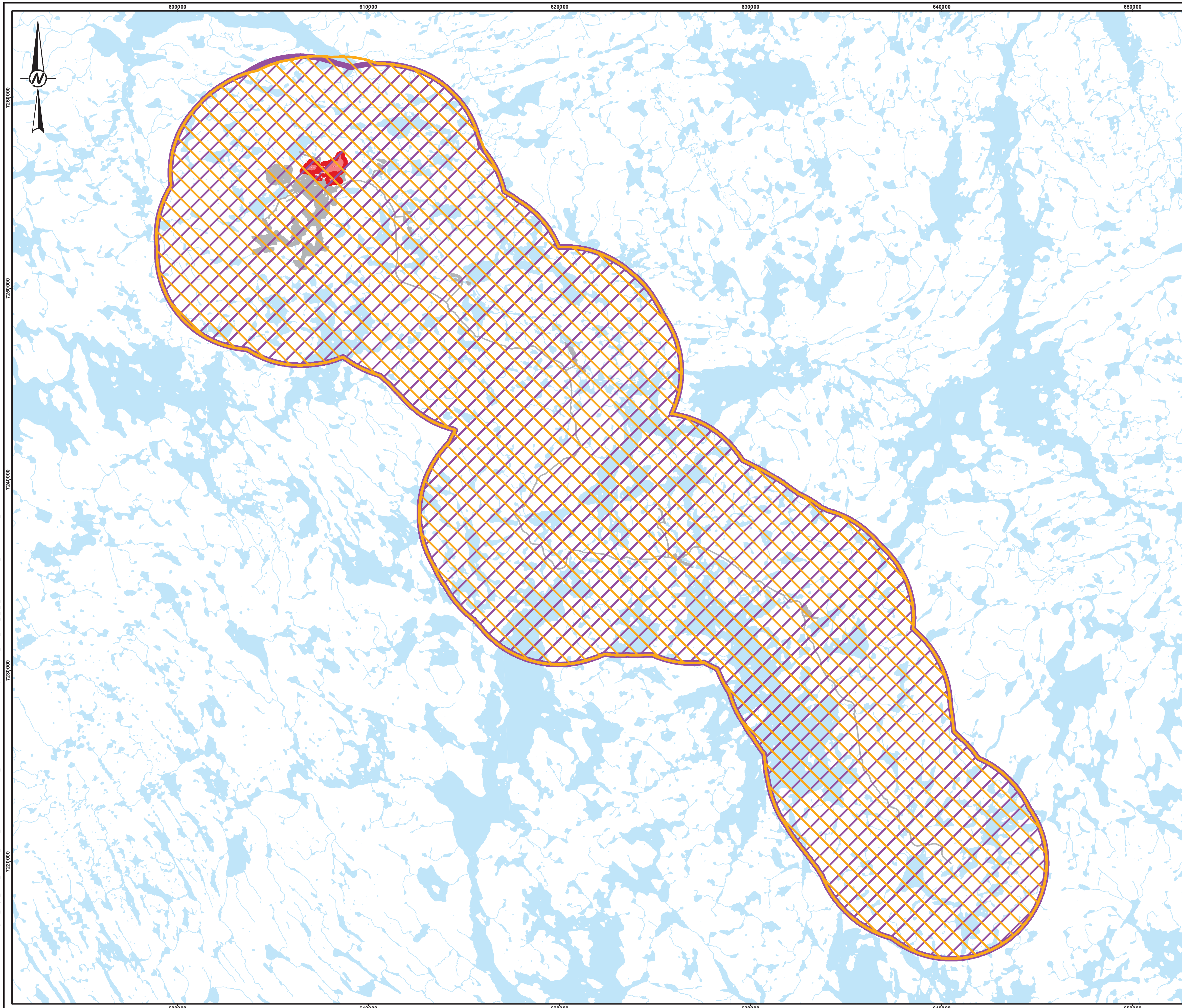
Water quality is within the RSA for hydrology and extends north to Lake DS1 and areas downstream of the Project along the flow path of water.

Fisheries RSA is divided into assessment areas to reduce uncertainty in the assessment and reflect the potential number of fishery units that may be affected by the Project – this includes waterbodies and watercourses within subsections of:
• A, C and D watersheds of the Meadowbank River Watershed, and
• Within DS2 watershed of the Thelon River Watershed</td></tr>
<tr><td>Surface Water Quantity</td></tr>
<tr><td>Fish and Fish Habitat</td></tr>
</table>

Disciplines / Valued Components	Local Study Area (LSA)	Regional Study Area (RSA)
Marine Environment[b]	Shipping corridor (eastern Hudson Strait to mouth of Chesterfield Inlet to Baker Lake via Chesterfield Narrows, and from mouth of Chesterfield Inlet to the Port of Churchill)	
Archaeology	Area that encloses the Whale Tail Pit operations, and the haul road plus 25 m on either side, including the esker borrow sites and associated access roads	No RSA was defined for heritage resources and traditional land use given the site-specific and stationary nature of these components
Traditional Land Use	The terrestrial study areas is used to evaluate potential effects of the Project on land-based activities and the freshwater study areas to discuss effects of the Project on water-based activities The heritage resources and noise and vibration study areas are considered to evaluate potential effects on the use of culturally important sites The study areas used for the marine environment, which encompass the Approved Project shipping corridor in the channel of Chesterfield Inlet, Hudson Bay, and Hudson Strait	
Socio-Economics	Kivalliq region of Nunavut	Territory of Nunavut

a) table does not compare against Approved Project Study Areas

b) Not defined as a VC in the Approved Project FEIS, but Project interactions with this component considered in this FEIS Addendum to address additional issues that have been brought to Agnico Eagle through public meetings, other forms of consultation and are consistent with recent NIRB Guidelines at other projects in Nunavut.



LEGEND

- AIR/NOISE LOCAL STUDY AREA (EXPANDED)
- AIR/NOISE LOCAL STUDY AREA (APPROVED)
- EXPANSION INFRASTRUCTURE
- APPROVED INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

0 4,000 8,000

1:200,000 METRES

REFERENCE(S)

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM NATURAL RESOURCES CANADA.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

ATMOSPHERIC ENVIRONMENT LOCAL STUDY AREAS

CONSULTANT

GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	DF
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
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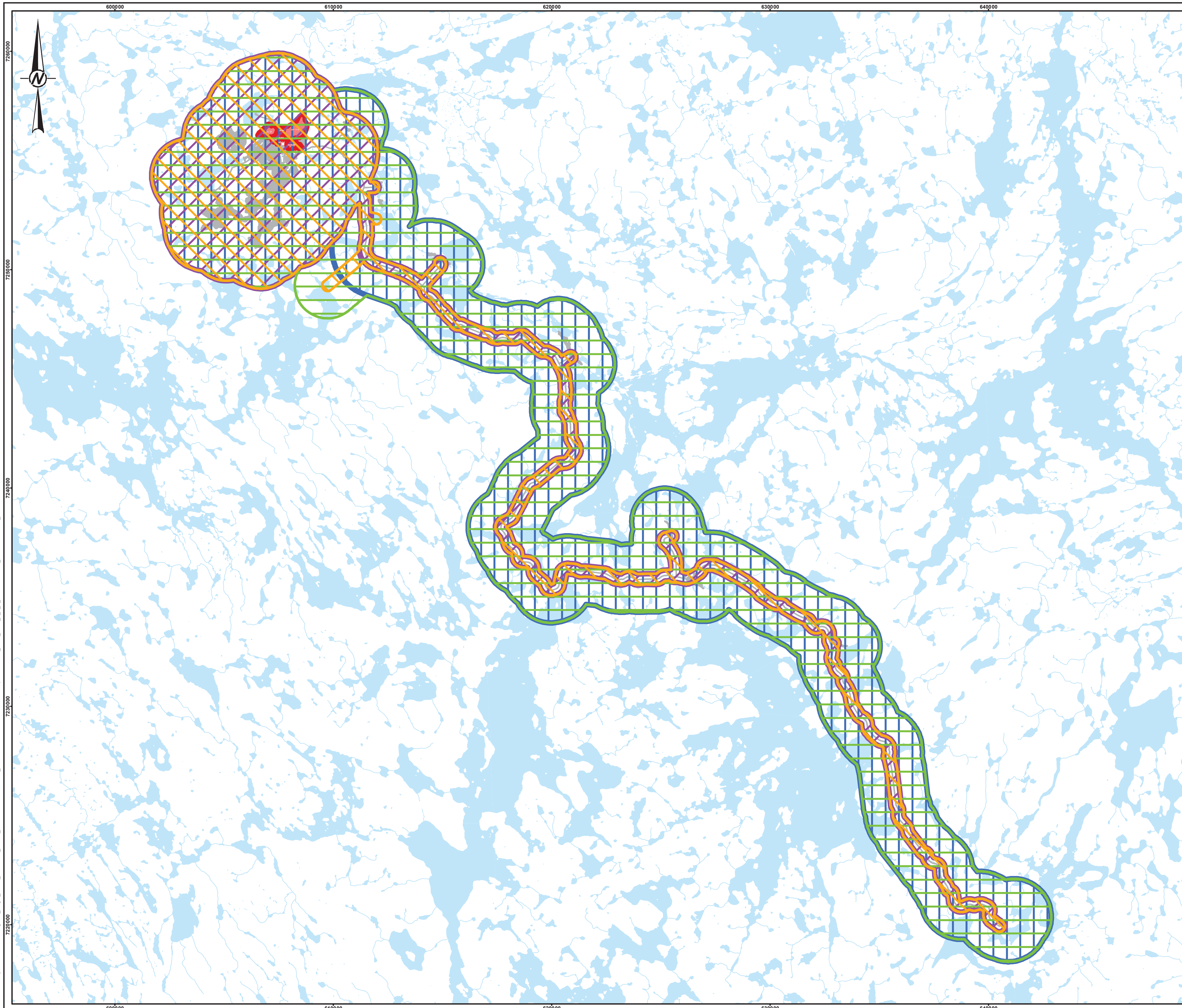

LEGEND

- TERRAIN/SOIL LOCAL STUDY AREA (EXPANDED)
- TERRAIN/SOIL LOCAL STUDY AREA (APPROVED)
- TERRESTRIAL/VEGETATION/WILDLIFE LOCAL STUDY AREA (EXPANDED)
- TERRESTRIAL/VEGETATION/WILDLIFE LOCAL STUDY AREA (APPROVED)
- EXPANSION INFRASTRUCTURE
- APPROVED INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

0 3,500 7,000

1:175,000 METRES

REFERENCE(S)

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM NATURAL RESOURCES CANADA.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

TERRESTRIAL ENVIRONMENT LOCAL STUDY AREAS

CONSULTANT

GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	DF
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
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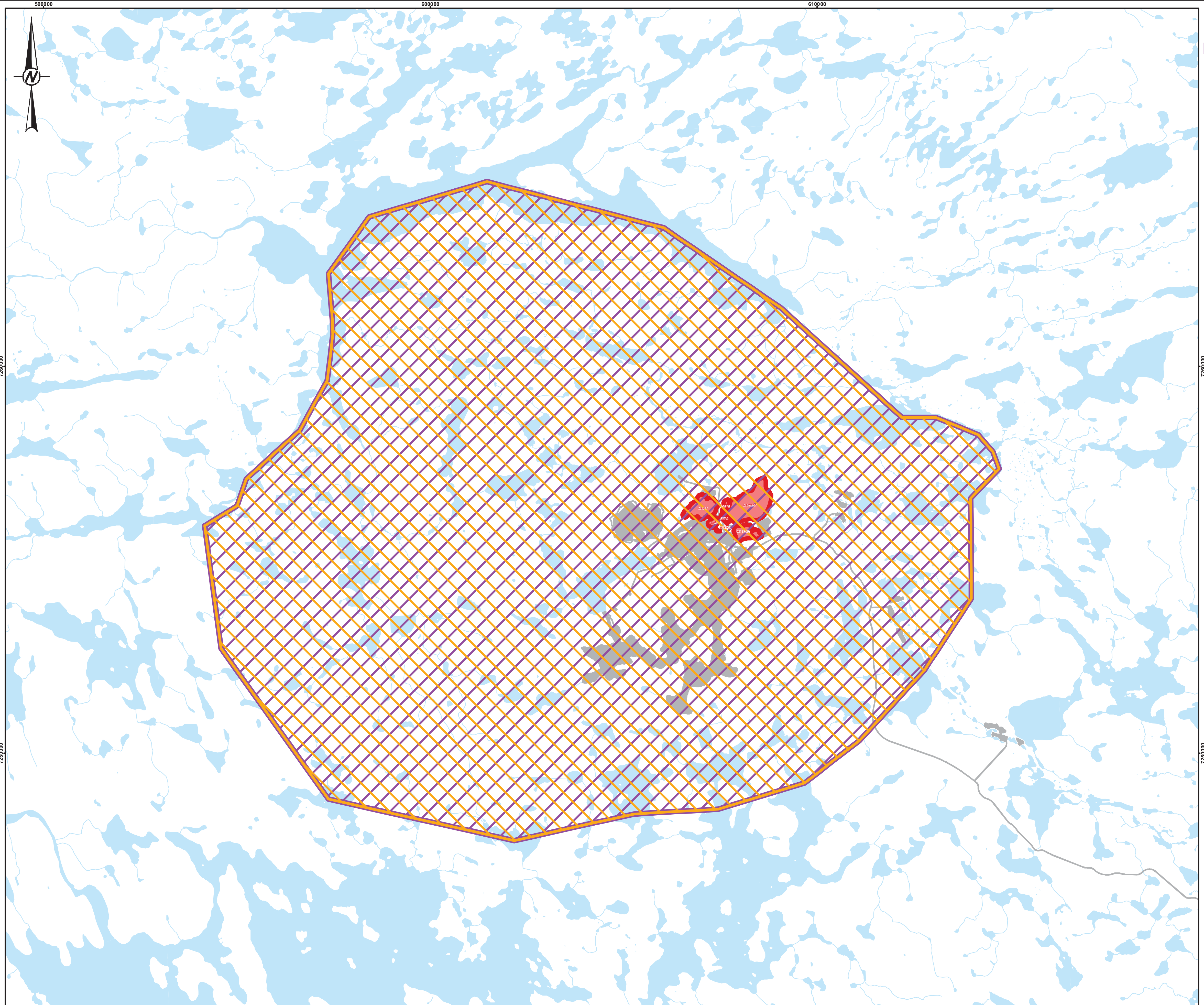

LEGEND

- HYDROGEOLOGY BASELINE STUDY AREA (EXPANDED)
- HYDROGEOLOGY BASELINE STUDY AREA (APPROVED)
- EXPANSION INFRASTRUCTURE
- APPROVED INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

0 2,000 4,000

1:100,000 METRES

REFERENCE(S)

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM NATURAL RESOURCES CANADA.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

HYDROGEOLOGY BASELINE STUDY AREA

CONSULTANT

GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	DF
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
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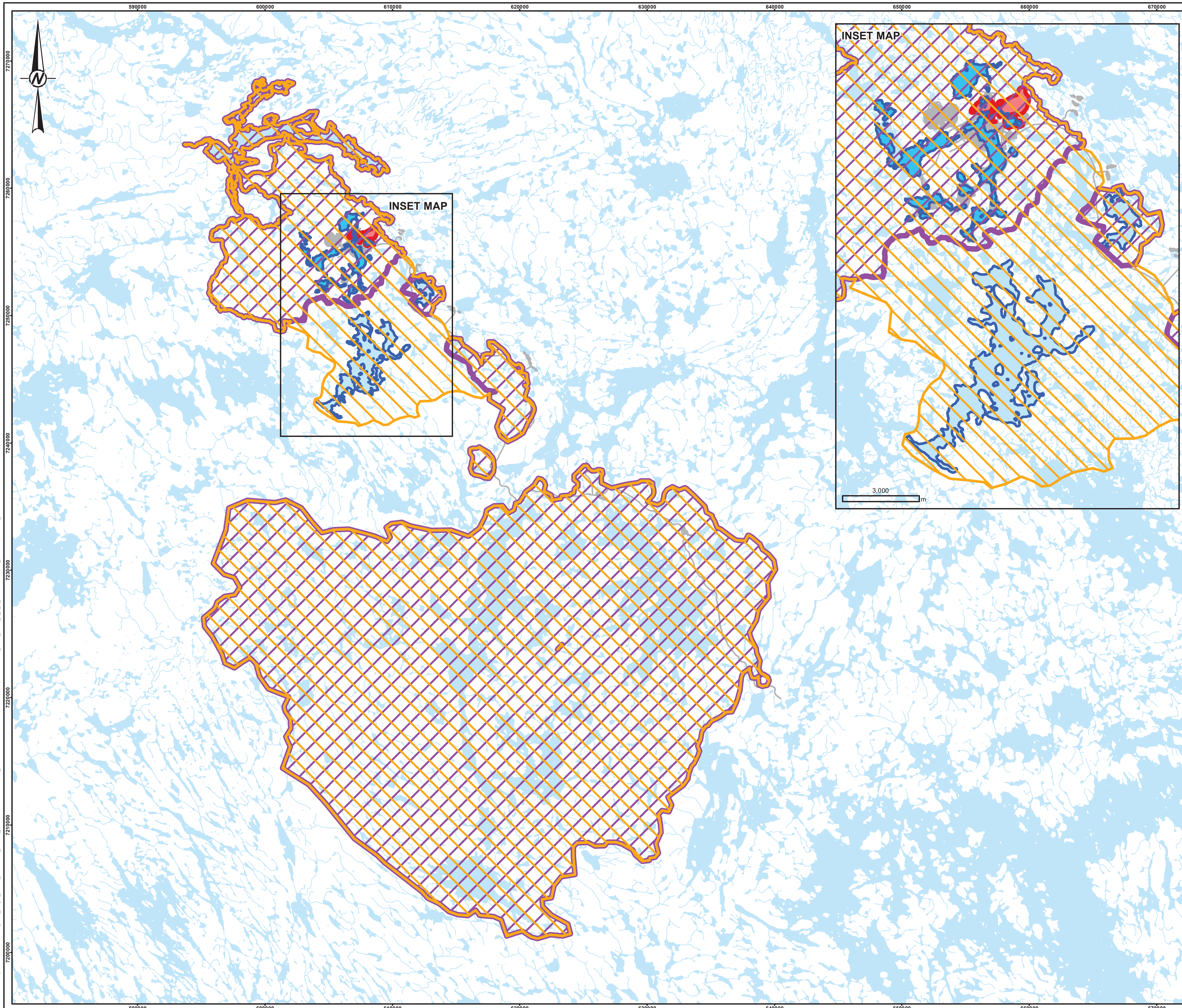

LEGEND

- SURFACE WATER/FISH HABITAT LOCAL STUDY AREA (EXPANDED)
- SURFACE WATER/FISH HABITAT LOCAL STUDY AREA (APPROVED)
- WATER QUALITY LOCAL STUDY AREA (EXPANDED)
- WATER QUALITY LOCAL STUDY AREA (APPROVED)
- EXPANSION INFRASTRUCTURE
- APPROVED INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

0 6,000 12,000

1:300,000 METRES

REFERENCE(S)

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM NATURAL RESOURCES CANADA.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

FRESHWATER ENVIRONMENT LOCAL STUDY AREAS

CONSULTANT

GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	DF
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
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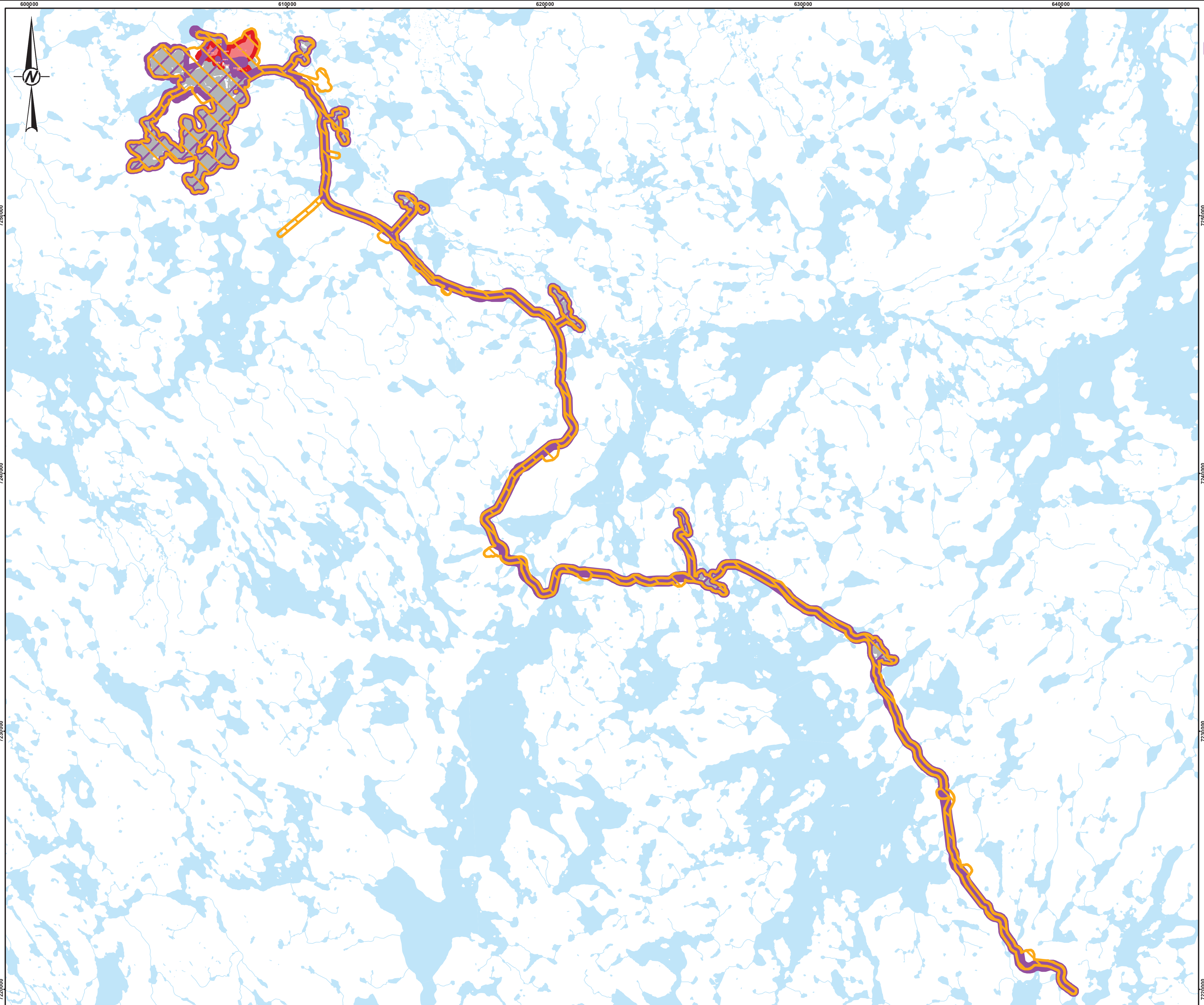

LEGEND

- HERITAGE RESOURCES STUDY AREA (EXPANDED)
- HERITAGE RESOURCES STUDY AREA (APPROVED)
- EXPANSION INFRASTRUCTURE
- APPROVED INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

0 3,000 6,000
1:150,000 METRES

REFERENCE(S)
1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM NATURAL RESOURCES CANADA.
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION

PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
HERITAGE RESOURCES LOCAL STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	DF
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
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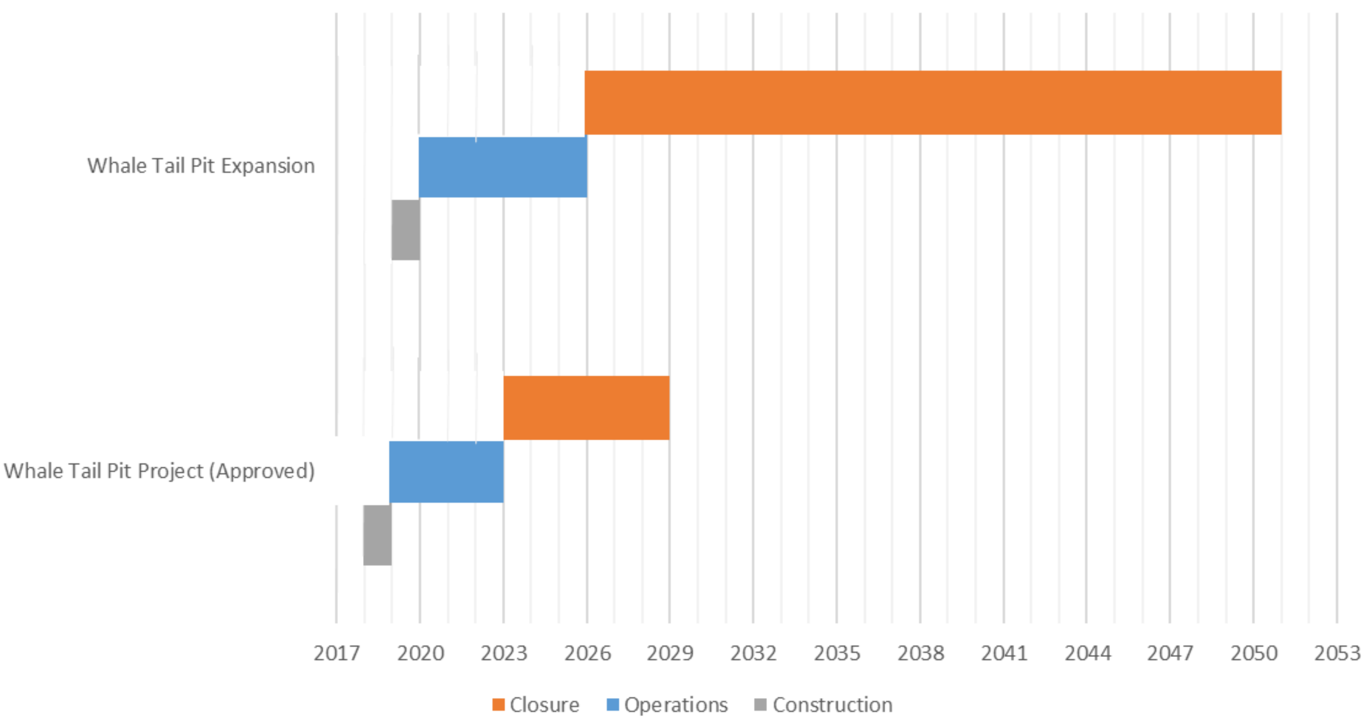
3.3 Temporal Boundaries

The approach to determine the temporal boundaries for potential effects is similar to that used to define spatial boundaries and are linked to two concepts:

- The development phases of the Project (i.e., construction, operations, and closure), focused on the proposed activities under the Expansion Project.
- The predicted duration of effects from the proposed activities on a VC, which may extend beyond closure (i.e., post-closure).

The Approved Project considered the LOM extension for the Meadowbank Mine due to the addition of the Whale Tail Pit, with operations running through to 2022 and closure culminating in 2029. This Expansion Project further expands the LOM for the Meadowbank Mine and operations at the Whale Tail Pit site, as described in the Project Description (FEIS Addendum Volume 1, Table 1.1-1 and Section 1.2.2), with mining running through 2025 and closure culminating in 2051. Progressive closure will occur, including filling of existing open pits, and both active and passive closure are considered in the assessment.

Figure 3.3-1: Temporal Boundaries – Whale Tail Pit Approved and Expansion



3.4 Valued Components, Assessment Endpoints, and Measurement Indicators

3.4.1 Identification of Valued Components

Valued components represent physical, biological, cultural, social, and economic properties of the environment that are either legally, politically, publicly, or professionally recognized as ecologically and socially important to a particular region, community, or by society as a whole. Several VCs, per the Approved Project, were selected to assess Project-related effects of the proposed activities under the Expansion Project, based on their role in the ecosystem, and value placed on them by humans for traditional use and cultural purposes, where appropriate.

Factors considered when selecting VCs included the following:

- Volumes 4 through 7 of the Approved Project;
- Biophysical and cultural components identified by NIRB during Project scoping and Agnico Eagle community and stakeholder consultation including regulatory review hearings related to the Approved Project;
- components that play roles in important ecosystem processes;
- territorial (CESCC 2016) listed species and federally listed species under Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2017) and SARA (2017);
- biological communities or species that reflect the interests of regulatory agencies, Inuit groups, and communities;
- components that can be measured or described with measurement indicators;
- components that allow cumulative effects to be considered; and
- experience with EAs and effects monitoring programs in Nunavut and the Northwest Territories.

The predicted residual effects presented for the biophysical and socio-economic environment in the Approved Project considered Project activities for the Whale Tail Pit. The geographic areas for the proposed activities under the Expansion Project are within those previously assessed for the Approved Project FEIS, and essentially include an expansion of existing and incorporation of new components and infrastructure within this same area. Baseline data and modelling completed for the Approved Project are being used to describe the existing environment for the Expansion Project, supplemented by additional field investigations conducted in 2016 and 2017. Mitigation measures described in the Approved Project will continue to be applied, including for the new proposed activities, as appropriate. A matrix table of proposed activities under the Expansion Project and VCs listed in the Approved Project is provided, and for each VC, all reasonable interactions between the proposed activities from construction through closure are identified (Table 3.4-1).

Table 3.4-2 presents the potential changes to VCs in relation to the proposed activities for the Expansion Project, including new potential effects that require assessment. VCs assessed in the Approved Project that are not relevant to the proposed activities have not been included. VCs with no interactions with the proposed amendment activities, as identified in Table 3.4-1, will have no change per the assessment completed in the Approved Project and are not carried forward.

Table 3.4-1: Linkage Matrix between Proposed Activities for the Expansion Project and Biophysical and Socio-Economic Valued Components for the Approved Project

Approved Project Valued Component	Proposed Activities – Expansion Project				
	Construction activities for project components and infrastructure (ongoing through operations); widening of haul road	Dewatering of IVR area	Dewatering of Lake A53	Operations (staggered approach as construction progresses)	Closure (staggered approach per previous Project approvals and delays as appropriate for extended operations and activities)
Climate[a]					
Air Quality	X			X	X
Noise	X			X	X
Permafrost	X			X	
Terrain and Soil[a]	X			X	
Vegetation	X				X
Terrestrial Wildlife and Birds	X			X	X
Groundwater quality and quantity[b]	X	X	X		
Surface water quality	X			X	X
Surface water quantity		X	X		X
Fish and fish habitat		X	X		X
Marine environment[b]				X	
Archaeology	X				
Traditional Land Use	X				X
Employment	X			X	
Training	X				

Approved Project Valued Component	Proposed Activities – Expansion Project				
	Construction activities for project components and infrastructure (ongoing through operations); widening of haul road	Dewatering of IVR area	Dewatering of Lake A53	Operations (staggered approach as construction progresses)	Closure (staggered approach per previous Project approvals and delays as appropriate for extended operations and activities)
Business Opportunities					
Community Wellness					X
Infrastructure and social services					X

a) there are no measurable or actual interactions with the VC and the proposed activities

b) Not defined as a VC in the Approved Project FEIS, but Project interactions with this component considered in this FEIS Addendum to address additional issues that have been brought to Agnico Eagle through public meetings, other forms of consultation and are consistent with recent NIRB Guidelines at other projects in Nunavut.

X = VC interaction with the Proposed Activities in this FEIS Addendum; Blank = No VC interaction with the Proposed Activities in this FEIS Addendum.

While not defined as VCs, Project interactions with the following components will also be included in the FEIS Addendum for the Expansion Project:

- vibration;
- sediment quality;
- non-traditional land use;
- human and ecosystem health;
- population demographics;
- economics;
- governance and leadership; and
- worker and public health.

3.4.2 Assessment Endpoints and Measurement Indicators

Effects statements are used to focus the analysis of changes to VCs that are associated with one or more primary pathways. Assessment endpoints and measurement indicators as defined in Volume 3, Section 3.2.2, Table 3.2-1 of the Approved Project (Agnico Eagle 2016c) are unchanged for the Expansion Project, as applicable.

Valued components with no explicit assessment endpoint are still analyzed for project-specific and cumulative changes in measurement indicators. The changes are characterized in terms of magnitude, duration, and geographic extent, but are not classified using typical definitions of impact criteria (e.g., low magnitude and long-term duration). These VCs may also be included in follow-up and monitoring programs. The pathway assessment approach and effects analysis are applied to VCs with and without assessment endpoints, except that effects on VCs without explicit assessment endpoints are not classified using impact criteria or evaluated for significance.

Table 3.4-2: Approved Project Valued Components and Proposed Activities Interactions Matrix and Potential Changes in the Assessment

Approved Project Valued Component	Approved Project / Expansion Project Predicted Effect Primary Pathways	Residual Impacts Approved Project (Agnico Eagle 2016c)	Residual Impacts Expansion Project	Approved Project Assessed Significance	Summary of Key Changes due to Proposed Activities	Consequence of Proposed Change: Determining Significance
Biophysical Environment						
Climate	Additional 3 years of processing and use of supporting infrastructure at the Meadowbank mine site and the existing AWAR for delivery of materials and contributions for the Whale Tail Project itself can produce greenhouse gas emissions that contribute to climate change.	Refer to Approved Project FEIS Volume 4, Section 4.2.3	No change from Approved Project	Not applicable due to no assessment end points	GHG emissions from the Project can contribute to climate change, though this cannot be measured. As described by the federal government *"…the contribution of an individual project to climate change cannot be measured"* (FTPCCCEA 2003). Emission estimates were compared to Canada's Greenhouse Gas Emissions Reporting Program reporting thresholds, total emissions in Nunavut and Canada's national GHG emission estimates. When compared to Canada's national emissions, the Expansion Project contributes to an approximately 0.05% increase in national GHG emissions.	No change - Project GHG emission calculations were updated to reflect predictions as a result of the development of the Expansion Project
Air Quality – Haul Road Traffic	Traffic along the upgraded haul road from the Whale Tail mining site to the existing Meadowbank Mine has the potential to generate combustion emissions and road dust that can affect air quality	Refer to Approved Project FEIS Volume 4, Section 4.3.4	No change from Approved Project	Not applicable due to no assessment end points	Results of the assessment (considering the operations phase as a conservative estimate of the maximum potential Project-related effects to air quality) indicate rates of atmospheric deposition are below relevant dustfall standards within 500 m from the haul road. Analysis of the geochemistry of the locally-sourced haul road material does not indicate that the dust being deposited has the potential to affect soil and water quality	No change – potential effects are captured in the assessment for other VCs
Air Quality – Mining Operations	Mining operations at the Whale Tail mining site have the potential to produce combustion emissions and dust that can affect air quality	Refer to Approved Project FEIS Volume 4, Section 4.3.4	No change from Approved Project	Not applicable due to no assessment end points	Air quality modelling results indicate that the effects of mining activities on regional air quality are limited in spatial extent and occur primarily on dry, windy days in the summer. Predicted concentrations of criteria air contaminants were below relevant ambient air quality standards, though particulate matter (PM_{10}) and total suspended particles were above Nunavut air quality guidelines during operations. The effects are reversible once the Expansion Project is decommissioned and the haul road becomes inactive	No change – potential effects are captured in the assessment for other VCs
Noise – Haul Road Widening	Noise emissions from construction equipment can increase ambient noise levels	Refer to Approved Project FEIS Volume 4, Section 4.4.4	No change from Approved Project	Not significant	Haul road widening activities are planned ahead of operations within the RSA; there are no occupied dwellings or active cultural sites within the RSA. Results from modelling completed for the Expansion Project indicate that construction effects are predicted to be less than AER Directive 038 and ISO 9613-2 technical standard, and less than existing ambient noise levels within the RSA	No change – continued implementation of the Meadowbank Mine Noise Monitoring and Abatement Plan
	If required, blasting can result in ground vibration and increase ambient noise levels		No change from Approved Project	Not significant	Haul road widening activities are not currently expected to include blasting. Should blasting be required, results from modelling completed for the Expansion Project indicate that noise and vibration will be well below the Ontario Noise Pollution Control Publication (NPC) 119 limits and DFO Guidance for Use of Explosives In or Near Canadian Fisheries Waters at the LSA boundary, and blasting should not occur within 101 m of areas used for fish spawning or within 22 m of fish habitat	No change – should blasting be required, the setbacks indicated per modelling will be adhered to and captured under the Meadowbank Mine Noise Monitoring and Abatement Plan
Noise – Pit Operations	Noise emissions from mining equipment can increase ambient noise levels	Refer to Approved Project FEIS Volume 4, Section 4.4.4	No change from Approved Project	Not significant	Results for modelling completed for the Expansion Project are, similarly to the Approved Project, predicted to be less than AER Directive 038 and ISO 9613-2 technical standard at the RSA boundary. In addition, noise levels from both the Approved and the Expansion Project pit operations are predicted to be less than the directive and technical standard at the LSA boundary	No change
	Blasting can result in ground vibration and increase ambient noise levels		No change from Approved Project	Not significant	Results for modelling completed for the Expansion Project are, similarly to the Approved Project, predicted to be less than the NPC-119 limits and DFO Guidance for Use of Explosives In or Near Canadian Fisheries Waters at the LSA boundary, and blasting should not occur within 700 m of areas used for fish spawning or within 148 m of fish habitat	No change – should blasting be required, the setbacks indicated per modelling will be adhered to and captured under the Meadowbank Mine Noise Monitoring and Abatement Plan

Approved Project Valued Component	Approved Project / Expansion Project Predicted Effect Primary Pathways	Residual Impacts Approved Project (Agnico Eagle 2016c)	Residual Impacts Expansion Project	Approved Project Assessed Significance	Summary of Key Changes due to Proposed Activities	Consequence of Proposed Change: Determining Significance
Noise – Haul Road Operations	Noise emissions from vehicles on the haul road can increase ambient noise levels		No change from Approved Project	Not significant	The composition and volume of haul road traffic is not expected to change as a result of the Expansion Project. Results from modelling completed for the Expansion Project indicate that operations are predicted to be less than AER Directive 038 and ISO 9613-2 technical standard, and less than existing ambient noise levels within the RSA	No change
Permafrost	Physical loss or permanent alteration of existing permafrost conditions within the mined out area. Permafrost degradation may result from the excavation of the open pit, potential groundwater inflows to the open pit during operations (if depth extends below the base of permafrost). In addition, the flooding of the pit at closure may result in the creation of a larger talik beneath the pit lake	Refer to Approved Project FEIS Volume 5, Section 5.3.4	Not applicable due to no measurable endpoints	Not applicable due to no measurable endpoints	Changes expected include accelerated thawings through the underground mine shafts, though integrity of the permafrost may be preserved through project design during operations. Per modelling, the active layer should revert to pre-development thickness over time, with only minor changes to permafrost in flooded areas during the lifetime of the Project	No change – potential effects are captured in the assessment for other VCs
	(NEW) Underground mining resulting in physical loss or permanent alteration of permafrost within the mined out areas. Permafrost degradation and retreat due to excavation of the mined out areas coupled with the inflow of groundwater to the underground operations, as the proposed underground operation will extend below the permafrost	Not applicable – underground mining was not considered for the Approved Project	Not applicable due to no measurable endpoints	Not applicable – not assessed	Changes expected include accelerated thawings through the underground mine shafts, though integrity of the permafrost may be preserved through project design during operations. Per modelling, the active layer should revert to pre-development thickness over time, with only minor changes to permafrost in flooded areas during the lifetime of the Project	
Terrain and Soil[a]	Physical loss or permanent alteration of terrain and soil features within the Project footprint, including the mined out area, haul road and eskers (borrow sources), roads to Lake D1 and D5, and quarries along the haul road. Re-sloping, site preparation and other land disturbance activities are expected to result in changes to the distribution of terrain and soils	Refer to Approved Project FEIS Volume 5, Section 5.3.4	Not applicable due to no measurable endpoints	Not applicable due to no measurable end points	Changes to the existing terrain and soil conditions will continue to be confined to the Project footprint which is 1,188.1 ha (Expansion Project) and this equates to 10.7% of the terrain, permafrost, and soils LSA (11,099.2 ha)	No change – potential effects are captured in the assessment for other VCs
	Changes to soil properties - soil disturbance may change physical, chemical, and biological properties of soil and contouring and excavation can cause compaction, and erosion to soils, and changes to soil quality		Not applicable due to no measurable endpoints		Change to physical, chemical and biological soil properties remain unchanged from what was assessed in the Approved Project, and most soils are not expected to be susceptible to compaction with applicable mitigation. Water and wind erosion potential remains unchanged (moderate) for the Expansion Project footprint	
Vegetation	Direct loss and fragmentation of vegetation habitat from the Project footprint as described in Terrain and Soil	Refer to Approved Project FEIS Volume 5, Section 5.4.4	Low to negligible impacts due to the size of the geographic area, duration and reversibility of the effect	Not significant	Overall vegetation and consequential wildlife habitat loss as a result of the Expansion Project footprint is small, 3.7% of the LSA and 0.2% of the RSA	No change – Project design and construction phases aim to minimize impacts by minimizing the width of the road and associated borrow areas
	Loss or alteration of local flows, drainage patterns (distribution), and drainage areas from the Project footprint and haul road that can cause changes to vegetation (wildlife habitat)		Low to negligible impacts due to the size of the geographic area, magnitude, duration and reversibility of the effect	Not significant	The change in water regime variations could influence vegetation communities, but are unlikely to be permanent over the life of the Project. Effects on vegetation habitat communities due to changes in hydrology would be localized and limited to the Project LSA	No change
	Dust deposition on vegetation (wildlife habitat) from haul road and mining activities		No change from Approved Project	Not significant	Per air quality, the assessment indicates rates of atmospheric deposition are below relevant dustfall standards and reclamation will be progressive to stabilize disturbed surfaces	No change
Terrestrial Wildlife and Birds	Changes to wildlife habitat quantity through direct loss and fragmentation of wildlife habitat from the Project footprint (caribou and upland birds) as described in Terrain and Soil	Refer to Approved Project FEIS Volume 5, Section 5.5.4	Low to negligible impacts due to the size of the geographic area, magnitude and duration of the effect	Not significant	The Expansion Project will increase the amount of habitat loss and duration of this loss by 4 years as compared to the Approved Project, but the loss is low and largely confined to the LSA (4.2% of LSA, 0.2% of RSA)	No change – revegetation of disturbed areas during closure starting in 2026 will progressively offset lost habitat and reduce residual effects

Approved Project Valued Component	Approved Project / Expansion Project Predicted Effect Primary Pathways	Residual Impacts Approved Project (Agnico Eagle 2016c)	Residual Impacts Expansion Project	Approved Project Assessed Significance	Summary of Key Changes due to Proposed Activities	Consequence of Proposed Change: Determining Significance
Terrestrial Wildlife and Birds	Changes to wildlife habitat quality through sensory disturbance from vehicles, on-site equipment, human presence, and vibrations, can change the amount of different quality habitats, and alter wildlife movement and behaviour (caribou and upland birds), as well as barriers to migration, which may affect population connectivity and distribution (caribou)	Refer to Approved Project FEIS Volume 5, Section 5.5.4	No change from Approved Project	Not significant	The Expansion Project will extend operations by four years and sensory disturbance will be largely confined within the RSA, but are not predicted to exceed the effectiveness of ongoing mitigation per the Approved Project (which will continue for the Expansion Project). The mitigation employed for the Approved Project for design of components that may disrupt movement of caribou will be equally effective for the Expansion Project	No change
	Changes to wildlife survival and reproduction through destruction of nests and flooding from construction activities including increased flows or water levels can increase risk of mortality to individual birds, which can affect population sizes (upland and water birds)		Reduced residual effects from the Approved Project due to the size of the geographic area	Not significant	The design of the Expansion Project will mitigate 15.6% of the area predicted to be flooded under the Approved Project, and analysis through higher resolution LiDAR data resulted in a more accurate prediction of a maximum of 148.5 ha of terrestrial habitat that will be flooded – resulting in a reduced affected area and reduced residual effects	No change
Surface Water Quality	Air emissions and the deposition of dust and metals for air emissions to waterbodies	Refer to Approved Project FEIS Volume 6, Section 6.4.4	No change from Approved Project	Not significant	Per air quality, the assessment indicates rates of atmospheric deposition are below relevant dustfall standards and reclamation will be progressive to stabilize disturbed surfaces	No change
	Water management and flooding		Low to negligible impacts due to the size of the geographic area, magnitude and duration of the effect	Not significant	Potential effects of dewatering activities are expected to augment water levels of Whale Tail Lake (South Basin), and the period of flooding has been increased from 2 to 6 years (e.g., an additional four years), but remains brief relative to literature information of similar settings and effects will be largely confined to the RSA	No change
	Development of the Project footprint, water management and effluent discharge		Low to negligible impacts due to the size of the geographic area, magnitude and duration of the effect	Not significant	Potential effects from operations were increased in magnitude and duration due to current mining schedule, including consideration of potential effects from the alternate discharge locations. Assessment of the alternate discharge location will reduce potential impacts to the downstream receiving environment	No change
Surface Water Quantity	Approved and Expansion Project footprint, which will physically alter watershed areas and drainage patterns, may change downstream discharge, water levels, and channel/bank stability in streams, and affect water quality, fish habitat, and fish	Refer to Approved Project FEIS Volume 6, Section 6.3.4	Low to negligible impacts due to the size of the geographic area, magnitude and duration of the effect	Not significant	Water levels regimes, flood discharges and discharges will change from baseline levels during operations into closure with no to negligible effects on channel and bank stability for the various lakes and downstream lakes affected (Lake A16, Whale Tail Lake (South Basin) and Lake C38). The effects are reversible at post-closure.	No change
	Dewatering of lakes may change discharges, water levels, and channel/bank stability in receiving and downstream waterbodies, and affect water quality, fish and fish habitat		Low to negligible impacts due to the size of the geographic area, magnitude and duration of the effect	Not significant	Pumped discharge will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. Where practical, natural drainage patterns will be used or re-established. The Water Management Plan will continue to be implemented.	No change
	Alteration of watershed flow paths may change flows, water levels, and channel/bank stability in diverted and receiving waterbodies, and affect water quantity, water quality, fish and fish habitat		No change from Approved Project	Not significant		No change
Fish and Fish Habitat	Construction of the IVR Pit and WRSF, and use of Lake A53 as the IVR Attenuation Pond, will result in the direct loss of fish habitat	Refer to Approved Project FEIS Volume 6, Section 6.5.4	Low to negligible impacts due to the size of the geographic area, magnitude and duration as well as the reversibility of the effect	Not significant	Project-related effects on fish and fish habitat will primarily result from direct habitat losses from Project footprint changes due to construction and lake dewatering activities, as well as planned fish-outs and flooding of Whale Tail Lake, but applicable Project-design and mitigation measures per the Approved Project will allow for fish populations and habitat to be maintained or retained during operations for a longer period of time in the Whale Tail Lake (South Basin), and reclaimed at closure	No change
	Dewatering of the smaller waterbodies and watercourses associated with the IVR Pit, WRSF, and attenuation pond will result in the direct loss or alteration of fish habitat			Not significant		No change
	Dewatering of the smaller waterbodies associated with the IVR Pit and attenuation pond will result in the removal and subsequent mortality of fish			Not significant		No change

Approved Project Valued Component	Approved Project / Expansion Project Predicted Effect Primary Pathways	Residual Impacts Approved Project (Agnico Eagle 2016c)	Residual Impacts Expansion Project	Approved Project Assessed Significance	Summary of Key Changes due to Proposed Activities	Consequence of Proposed Change: Determining Significance
	Water diversions during construction and operations will result in a reduction of water levels and flows at downstream locations		Low to negligible impacts due to the size of the geographic area	Not significant	There may be shifts in community structure and nutrient levels in the receiving environment, and lakes in the northeast area that were within the Mine footprint will either become part of Whale Tail Lake, connected by the flooded IVR Pit, or remain as lost habitat. Assessment of alternate discharge location will reduce potential impacts to downstream receiving environment. Pumped discharge will be directed to the lake environment, and not directly to outlets, to attenuate flow changes. Effects to flows and water levels diminish at downstream locations where effects to fish and fish habitat are expected to be negligible. The Water Management Plan will continue to be implemented	No change
	Refilling of the diked area at closure will affect water levels and flows at downstream locations			Not significant		No change
	Operational activities and discharge may change trophic status in receiving and downstream waterbodies			Not significant		No change
	Reconnection of the refilled area of Mammoth Lake, Whale Tail Lake to the remaining watershed and releases of water may change long-term trophic status in the lakes and downstream locations		Low to negligible impacts due to the size of the geographic area	Not significant		No change
Marine Environment[a]	Accidents and malfunctions could result in fuel spills with direct adverse effects on marine water quality and associated adverse effects on marine wildlife VCs and their habitats.	Refer to Approved Project FEIS Volume 3, Appendix 3-A	Moderate to high impacts due to the nature, magnitude and complexity of the impacts, the probability of the impacts occurring as well as the frequency, duration and reversibility of the impacts	Not significant	No change to the shipping volumes or quantity of fuel being shipping from the Approved Project.	No change – this effect is considered previously assessed - mitigation measures outlined in the Approved Project will be carried forward through the Expansion Project
	Alteration in marine wildlife (mammals) behavior due to underwater noise from vessel activities		Low to moderate impacts due to the size of the animal populations likely to be affected by the impacts, as well as the frequency and duration of the impacts	Not significant	Underwater noise generated by Project vessels during shipping will likely exceed the acoustic behavioral thresholds for marine mammals. Behavioral changes may include evasive maneuvers such as diving or changes in swimming direction and/or speed	No change – this effect is considered previously assessed - shipping activities and associated mitigation measures per the Approved Project will be continued for the Expansion Project.
	Vessel movements in the shipping corridor may result in collisions with marine mammals		Low to moderate impacts due to the size of the geographic area and animal populations likely to be affected by the impacts, as well as the probability, frequency and duration of the impacts occurring	Not significant	Potential effects from operations were increased in duration due to current mining schedule. No change to shipping volume from the Approved Project	No change – this effect is considered previously assessed - shipping activities and associated mitigation measures per the Approved Project will be continued for the Expansion Project. No vessel strikes recorded with marine mammals or marine birds since the start of the Meadowbank Mine
	Vessel lighting at night may result in marine bird mortality or injury due to collisions with vessels (sensory disturbance)			Not significant		
	Alteration of marine bird behavior due to vessel lighting at night and in-air noise during ship-to-ship loading (lightering)		Low to moderate impacts due to the size of the animal populations likely to be affected by the impacts, as well as the frequency and duration of the impacts	Not significant	The potential for behavioral changes (sensory disturbance) in marine birds due to in-air noise from lightering activities (e.g., vessel operations) is considered low for the incremental effect, since the lightering operations area is located away from important bird nesting and breeding areas. No change to shipping volume from the Approved Project	No change – this effect is considered previously assessed - shipping activities and associated mitigation measures per the Approved Project will be continued for the Expansion Project
Human Environment						
Archaeology	No primary pathways identified for archaeology (heritage sites) as heritage sites identified through baseline studies for the Project will be avoided/not developed and mitigation as outlined in the Archaeological Management Plan implemented	Refer to Approved Project FEIS Volume 7, Section 7.2.4	Low to negligible impacts due to the size of the geographic area, the historical, cultural and archaeological significance of the area and the probability of the impacts occurring	Not significant	No change as the same approach as in the Approved Project will be followed for the Expansion Project, as outlined in the updated Archaeological Management Plan – Agnico Eagle commits to conducting additional archaeological assessments for any previously unassessed Project footprint locations in archaeologically sensitive areas. Should any heritage sites be identified in proposed quarries, they will not be developed	No change

Approved Project Valued Component	Approved Project / Expansion Project Predicted Effect Primary Pathways	Residual Impacts Approved Project (Agnico Eagle 2016c)	Residual Impacts Expansion Project	Approved Project Assessed Significance	Summary of Key Changes due to Proposed Activities	Consequence of Proposed Change: Determining Significance
Traditional Land Use	Project activities may affect continued opportunities for traditional wildlife harvesting	Refer to Approved Project FEIS Volume 7, Section 7.3.3	Low to negligible impacts due to the size of the geographic area, the historical, cultural and archaeological significance of the area and size of the human and animal populations likely to be affected by the impacts	Not significant	No change – though changes in caribou movements and distribution within the RSA are anticipated due to the Expansion Project, caribou will still be available in preferred harvesting locations. Continued opportunities for traditional harvesting of wildlife may decrease for some traditional land users	No change
	Project activities may affect continued opportunities for traditional fishing			Not significant	Measurable changes in the availability of fish for harvesting in certain areas is anticipated at the regional level due to direct and indirect effects of the Expansion Project, though the Expansion Project does not overlap with identified community-preferred fishing sites, and species are expected to remain locally and regionally abundant and available (e.g., Arctic Char, Lake Trout, Burbot, and Round Whitefish)	No change
	Project activities may affect continued opportunities for traditional plant harvesting			Not significant	Per the vegetation assessment, overall vegetation and consequential wildlife habitat loss as a result of the Expansion Project footprint is small and TLU of the Expansion Project area is limited for plant harvesting	No change
	Project activities may affect continued opportunities for the use of culturally important sites			Not significant	No new cultural sites were identified in the literature review for the Expansion Project and two additional heritage resource sites recorded in the LSA will be avoided	No change
	(NEW) Project activities may affect continued opportunities for traditional marine resource harvesting		Low to negligible impacts due to the size of the geographic area, size of the human and animal populations likely to be affected by the impacts and the probability of impacts occurring	Not applicable – not assessed	Mitigation measures outlined in the Approved Project related to the marine environment will be carried forward through the Expansion Project, and no detectable environmental changes or residuals effects to marine resources are anticipated because of the Expansion Project. Marine resources will continue to be available for harvesting locally and regionally	Not significant – mitigation will include continuing implementation of the Shipping Management Plan, Oil Pollution Emergency Plan, Spill Contingency Plan and Emergency Response Plan
Employment	Continued direct, indirect and induced employment	Refer to Approved Project FEIS Volume 7, Section 7.4.4	Moderate to high positive impacts due to the size of the human population likely to benefit from the impacts and the frequency and duration of the impacts	Significant (positive)	The Expansion Project represents both and extension of employment opportunities (i.e., workforce transitions from the Approved to the Expansion Project as appropriate) and a source of new employment for Nunavummiut (25% increase relative to the Approved Project operations workforce requirements). Projection of induced employment and incomes is uncertain as it is not within the control of Agnico Eagle (determined externally based on spending by direct and indirect workers)	No change
	Continued direct, indirect and induced incomes			Significant (positive)		No change
Training	Provision of workforce training and support for community education			Significant (positive)	Training programs per the Approved Project will be continued at the Meadowbank Mine for the Expansion Project, as described in the SMP for the Approved Project. This includes support for educational attainment in communities through the initiatives outlined in the SMP	No change
Business Opportunities	Continued territorial economic activity		High positive impacts due to the size of the geographic area, size of the human populations likely to benefit from the impacts and the duration of the impacts	Significant (positive)	The Expansion Project will continue to serve territorial economic growth and expansion of Nunavut's Gross Domestic Product beyond the scheduled closure of the Meadowbank Mine and the Approved Project, particularly during operations	No change
	Continued contributions to government revenue			Significant (positive)	The Expansion Project's contribution to the territorial budget will add to the Approved Project estimate via taxes and royalty payments at the territorial level	No change
	Continued local economic activity			Significant (positive)	It is expected that the Expansion Project will continue to source goods and services from Nunavut- and Baker Lake-registered companies and that existing contracts will be extended based on Project need	No change

Approved Project Valued Component	Approved Project / Expansion Project Predicted Effect Primary Pathways	Residual Impacts Approved Project (Agnico Eagle 2016c)	Residual Impacts Expansion Project	Approved Project Assessed Significance	Summary of Key Changes due to Proposed Activities	Consequence of Proposed Change: Determining Significance
Community Wellness	Continued community investment	Refer to Approved Project FEIS Volume 7, Section 7.4.4	Moderate to high positive impacts due to the size of the human populations likely to benefit from the impacts and the duration of the impacts	Significant (positive)	The Expansion Project represents a continuation of the beneficial effects of regular incomes to employees and through support of community programs and continuation of the Meadowbank IIBA	No change
	Improved worker and public health and safety			Significant (positive)	Continued positive effects through the provision of training, on-site health services and public education programs on safe and healthy lifestyles, as described in the SMP	No change
	Potential for Project-related accidents and emergencies		No applicable	Significant	Per the Approved Project, Agnico Eagle will operate the Expansion Project to the highest standard of health, safety and risk management. Planning traffic and shipment schedules and communication with hamlets, in addition to driver safety training, will help to minimize the risk of traffic accidents. Project risk management and emergency response planning pre-emptively establishes procedures to minimize risk of injury to workers, communities, and the environment associated with Project-related accidents. Project facilities with the potential to pose public health risks will be secured to prevent access and potential resultant injury	No change
	Changes in family and community cohesion		High negative impacts due to the size of the human population likely to be affected and the probability of the impact occurring	Significant	There is uncertainty regarding individual responses to increased incomes, the ability or willingness of those affected to take up related programming, and the way in which families and communities will respond to changes in income distribution. Agnico Eagle will continue to employ the practices developed at Meadowbank Mine. The Expansion Project will continue to offer an Employee and Family Assistance Program that, among other counselling services, provides employees with guidance on money management and coping with work routines and strategies to maintain employment. Further details on the Work Readiness Program and the Employee and Family Assistance Program are provided in the SMP	No change
Population, Infrastructure and Social Services	(NEW) Population growth and demographic change	Refer to Approved Project FEIS Volume 7, Section 7.4.4	Low to negligible impacts due to the size of the human populations likely to be affected by the impacts and the probability of impacts occurring	Not applicable – not assessed	The direct labour requirement of the Expansion Project is not expected to induce a meaningful scale of intra-regional migration within Kivalliq. In advance of construction and operations, Agnico Eagle will clearly communicate labour force requirements to community liaisons, and will work with communities and local governments to provide clear information regarding the recruitment process for Project employment opportunities. The SMP outlines monitoring which includes monitoring of migration, community population, housing stock and condition and use of physical infrastructure and services. This will continue to be employed for the Expansion Project and Agnico Eagle will continue to collaborate with the Government of Nunavut and communities to develop issue-specific mitigation or to identify areas of priority for community investment	Not applicable - dependant on scale of speculative migration
	(NEW) Change in demand for and availability of housing		Moderate impacts due to the size of the geographic area, size of the human populations likely to be affected by the impacts and the duration of the impacts	Not applicable – not assessed		Potentially significant - dependant on scale of speculative migration
	(NEW) Change in demand for and capacity of services and infrastructure			Not applicable – not assessed		Potentially significant - dependant on scale of speculative migration

a) Not defined as a VC in the Approved Project FEIS, but Project interactions with this component considered in this FEIS Addendum to address additional issues that have been brought to Agnico Eagle through public meetings, other forms of consultation and are consistent with recent NIRB Guidelines at other projects in Nunavut.

3.5 Pathway Analysis

Pathway analysis identifies and assesses the linkages between the Expansion Project components or activities, and the correspondent potential residual effects to VCs. A detailed description of the methods for the pathway analysis are provided in Volume 3, Section 3.4 of the Approved Project FEIS.

The predicted residual effects presented for the physical, biological, and socio-economic environment in the Approved Project considered Project activities for the Whale Tail Pit from construction to closure, including the haul road and associated activities at the Meadowbank Mine. The geographic area for the proposed activities in the Expansion Project falls within the areas previously assessed for the Approved Project, though the footprint is expanding to accommodate for the expansion of the haul road and additional on-site facilities. Expansion Project components as described in the Project Description (Volume 1). In addition to previously collected baseline data for the Approved Project, data from supplemental studies conducted by Agnico Eagle since 2016 has been incorporated into the current Expansion Project design and this assessment.

Given that the Expansion Project remains within previously assessed areas, many of the FEIS predicted effects will remain unchanged,, which will be primarily focused at the Whale Tail Pit site. Mitigation measures described in the Approved Project will continue to be applied, as appropriate.

For each of the VCs all reasonable interactions between the proposed activities under the Expansion Project from construction through closure were identified (Volume 3, Appendix 3-C), consistent with the approach followed for the recent Meliadine Gold Mine FEIS Addendum (Agnico Eagle 2018k). From these interactions, a list was made of all potential effects pathways for the Project. Potential pathways through which the proposed activities under the Expansion Project could affect VCs are presented in Volume 3, Appendix 3-C. Each potential pathway is assessed and described as follows:

- No linkage – pathway is non-existent or is removed as it was previously assessed and the proposed activities under the Expansion Project represent a negligible change, or is removed by environmental design features and mitigation so that the proposed activities result in no detectable environmental change and residual effects to VCs or the associated habitat relative to baseline or guideline values. Not carried through the effects assessment.
- Secondary – pathway could result in a minor environmental change but would have a negligible residual effect on VCs or the associated habitat relative to baseline or guideline values. Not carried through the effects assessment.
- Primary – pathway is likely to result in a measurable environmental change that could contribute to residual effects on VCs or the associated habitat relative to baseline or guideline values. Require further effects analysis to determine the environmental significance from the proposed activities under the Expansion Project on VCs or the associated habitat.

In summary, for the Expansion Project:

- Pathways with no linkage to VCs are included in Volume 3, Appendix 3-C, and will not be carried through the effects assessment.
- Pathways that are anticipated to be secondary are included in Volume 3, Appendix 3-C, and will not be carried through the effects assessment.

- Primary pathways were determined linking the proposed activities under the Expansion Project to effects on the environment and will be carried through the effects analysis. The Primary pathways are presented in Volume 3, Appendix 3-C, including rationale for the identified pathways.

The effects analysis considers all primary pathways that result in expected changes to existing habitat and the abundance and distribution of wildlife VCs after implementing environmental design features and mitigation. Thus, the analysis is based on the residual effects from the proposed activities.

3.6 Residual Effects Analysis

An effects analysis follows the general approach to analyzing potential project-specific and cumulative (where applicable) effects on the environment. The effects analysis for the VCs followed the assessment methodology described in Volume 3 and in discipline sections in Volumes 4 through 7 of the Approved Project FEIS. Where possible and appropriate, the analyses are quantitative, and include data from field studies, modelling results, scientific literature, government publications, effects monitoring reports, and personal communications. Available IQ and community information is incorporated into the analysis and results, where information is available. Due to the amount and type of data available, some analyses are qualitative and include professional judgement or experienced opinion.

Effects statements are used to focus the analysis of changes to VCs that are associated with one or more primary pathways. Pathways associated with each effects statement are classified using scales (categorical values such as negligible, low, or high) for each impact criterion (e.g., magnitude). Assessment endpoints and measurement indicators defined in Volume 3, Section 3.2.2, Table 3.2-1 of the Approved Project FEIS are unchanged for the Expansion Project FEIS Addendum, as applicable.

3.7 Residual Impact Classification and Determination of Significance

3.7.1 Residual Impact Classification

The purpose of the residual impact classification is to describe the residual incremental and cumulative adverse effects from the previous and existing developments including the Approved Project, the Expansion Project (i.e., the Application Case), and future developments (i.e., the Future Case, if applicable) on VC measurement indicators using a scale of common words rather than numbers and units. The use of common words or criteria is accepted practice in EA. It is difficult (and not appropriate) to provide definitions for all residual adverse effects criteria and significance that are universally applicable to all of the VCs. Consequently, specific definitions are provided for each VC in Volume 3, Appendix 3-E, and are unchanged from the Approved Project criteria. Further information on the approach for describing effects per these criteria are per the Approved Project criteria in Volume 3, Section 3.7.1 of the Approved Project FEIS (Agnico Eagle 2016c).

The classification of residual impacts from associated primary pathways and the determination of environmental significance are only completed for those VCs that have assessment endpoints. Results from the residual impact classification are then used to determine the environmental significance of the Project (and other developments) on assessment endpoints.

For criteria such as frequency and likelihood, the scales can be applied consistently across all biophysical VCs. Socio-economic criteria do not include frequency and likelihood as it is assumed that the impacts have a high likelihood to occur continuously during the assessment period. The scale of classifications for direction, magnitude, geographic extent, and duration are dependent on each biophysical and socio-economic VC. The definitions for these scales are ecologically, socially, or logically based on the VC. The scales for these criteria are specifically defined for each VC in the Approved Project (FEIS Volume 3, Appendix 3-E; Agnico Eagle 2016c).

3.7.1.1 Summary of Residual Impact Classification on Primary Pathways

Primary pathways and their applicable mitigation measures are discussed under the individual discipline sections in Volumes 4 through 7, and as presented in Volume 3, Appendix 3-C. The effects assessment is also further described in the individual discipline sections as summarized in Table 3.4-2. Residual impact classifications are presented in Volume 3, Appendix 3-E. To provide transparency, the definitions for these scales were ecologically or logically based on the identified VCs. Although professional judgement is inevitable in some cases, an effort was made to classify impacts using scientific principles and supporting evidence where possible. The scale for the residual impact criteria for classifying effects from the proposed activities are specifically defined for each VC, and definitions for each criterion are provided in Volume 3, Appendix 3-E.

3.7.2 Determination of Significance

The evaluation of significance for VCs also follows the general approach described in Volume 3, Section 3.7.2 of the Approved Project. The significance evaluation considers the entire set of pathways that influence an assessment endpoint, as well as qualitative key factors.

As much as possible, effects are classified and significance determined using established guidelines, thresholds or screening values, and scientific principles. Environmental significance is used to identify predicted impacts that have sufficient magnitude, duration and geographic extent to cause fundamental changes to VCs. The following definitions are used for assessing the significance of impacts on VCs, and the associated continued opportunity for traditional use of VCs:

- Not significant – impacts are measurable at the individual level, and strong enough to be detectable at the population level, but are not likely to decrease resilience or increase the risk to population maintenance and opportunities for traditional and non-traditional use.
- Significant – impacts are measurable at the population level and likely to decrease resilience and increase the risk to population maintenance and impact opportunities for traditional and non-traditional use. A number of high magnitude and irreversible impacts at the population level (regional scale) would likely be significant.

Classification of residual effects and determination of significance for the socio-economic environment generally follow the methods used for biophysical VCs; however, there are some differences in the selection and definition of effects criteria (refer to Volume 3, Appendix 3-D). For socio-economic VCs, direction, magnitude, geographic extent, and duration are the criteria used to classify effects and evaluate the significance of changes to assessment endpoints. The assessment of significance considers the scale of these criteria and professional opinion, which is based on the context of the communities involved, and the informed value and judgement of interested and affected organizations and specialists. The level of significance also assesses the efficacy of the proposed mitigation (i.e., policies, practices, and investments) and benefit enhancement programs to limit negative effects and foster positive effects on the continued persistence of long-term sustainable social, cultural, and economic features of the environment.

3.7.2.1 Summary of Significance Classification on Primary Pathways

As shown in Table 3.4-2, the proposed activity pathways influencing VCs were generally determined to be low to moderate in magnitude, local to regional in geographic extent and short- to medium-term in duration. Most of the potential impacts are deemed reversible through the application of appropriate mitigation measures and reclamation activities through closure and post-closure. The changes to the environment and the various VCs should not have a significant impact on the structure and function of populations and communities in the biophysical or socio-economic environment in the vicinity of the Project (including both Approved and Expansion Project activities), relative to natural factors occurring over the same period of time and space.

3.8 Approach to Cumulative Effects

Cumulative effects were considered as part of the overall assessment in the Approved Project. The assessment developed in the Approved Project does not change for the Expansion Project FEIS Addendum, as the proposed activities are within the previously assessed areas.

3.8.1 Definition and Application

The magnitude, spatial extent, and duration of potential effects on the measurement endpoints resulting from cumulative effects are expected to be similar to or greater than those related to non-cumulative effects. The cumulative effects assessment follows the same approach as outlined in the Approved Project (FEIS Volume 3, Section 3.5.2). As indicated in the Approved Project, not every VC requires an analysis of cumulative effects. The key is to determine if there are overlapping effects between the proposed activities for the Expansion Project and Approved Project, and other developments/activities for each environmental component. While some updates were required to account for new developments, the conclusions for cumulative effects as assessed through the Approved Project remain largely unchanged as the Expansion Project is an extension of the Meadowbank Mine, largely within the boundaries previously assessed for the Approved Project and that continues to focus on the Kivalliq region. Cumulative effects identified, analyzed, and assessed in each discipline section in consideration of the proposed activities for the Expansion Project, relative to the Approved Project, are summarized in Volume 3, Appendix 3-D.

3.9 Prediction Confidence and Uncertainty

Most assessments of impacts embody some degree of uncertainty. The purpose of the uncertainty section is to identify the key sources of uncertainty and discuss how uncertainty is addressed to increase the level of confidence that effects will not be worse than predicted.

Confidence in effects analyses can be related to many elements, including the following:

- adequacy of baseline data for understanding existing conditions and future changes unrelated to the Project (e.g., extent of future developments, climate change, catastrophic events);
- model inputs (e.g., estimates of the spatial distribution of dust deposition);
- understanding of project-related impacts on complex ecosystems that contain interactions across different scales of time and space (e.g., how and why a project will influence wildlife); and
- knowledge of the effectiveness of the environmental design features for reducing or removing impacts (e.g., environmental performance of a project).

Uncertainty in these elements can decrease confidence in the prediction of environmental significance. Like all scientific results and inferences, residual impact predictions must be tempered with uncertainty associated with the data and the current knowledge of the system. It is anticipated that the baseline data are moderately sufficient for understanding current conditions, and that there is a moderate level of understanding of project-related impacts on the ecosystem.

Where appropriate, uncertainty may also be addressed by additional mitigation and in follow-up and monitoring programs. Each discipline includes a discussion of sources of uncertainty and how uncertainty is addressed.

Prediction confidence for impacts as a result of the proposed activities under the Expansion Project on the biophysical and socio-economic environment is high as the extent of potential impacts is well known and within previously assessed areas. Uncertainties identified for the Approved Project for the various VCs remain consistent (refer to Volumes 4 to 7 of the Approved Project).

3.10 Monitoring and Follow-Up

Monitoring programs are proposed to deal with the uncertainties associated with the impact predictions and environmental design features. In general, monitoring is used to test (verify) impact predictions and determine the effectiveness of environmental design features (mitigation). Monitoring is also used to identify unanticipated effects and implement adaptive management where required. Typically, monitoring includes one or more of the following categories, which may be applied during the development of the Project:

Compliance monitoring and inspection: monitoring activities, procedures, and programs undertaken to confirm the implementation of approved design standards, mitigation, and conditions of approval, and of Company commitments (e.g., inspecting the installation of a silt fence; monitoring mine water discharge quality and volumes).

Follow-up: programs designed to test the accuracy of impact predictions, reduce uncertainty, determine the effectiveness of environmental design features, and provide appropriate feedback to operations for modifying or adopting new mitigation designs, policies, and practices. Results from follow-up programs can be used to increase the certainty of impact predictions in future EAs. Where applicable, the results from follow-up programs completed at the Meadowbank Mine and Approved Project, where applicable were considered in the assessment of the Expansion Project.

These programs form part of the environmental management system for the Whale Tail Project. If monitoring or follow-up detects effects that are different from predicted effects, or the need for improved or modified design features, then adaptive management will be implemented by Agnico Eagle. This may include increased or decreased monitoring, changes in monitoring plans, or additional mitigation. Proposed monitoring programs are provided for the various disciplines in Volumes 4 through 7 of the Approved Project, and monitoring, mitigation and management plans are listed in Table 8.2-1, Volume 8 of this FEIS Addendum.

4.0 ATMOSPHERIC ENVIRONMENT

4.1 Introduction

Volume 4 focuses on climate, air quality, noise, and vibration. To support the review of the FEIS Addendum, Agnico Eagle has provided all appendices in the FEIS Addendum Application. It should be noted that historical baseline reports (Appendix 4-A and Appendix 4-D) were reviewed and received conformity approval as part of the Approved Project FEIS submission (Agnico Eagle 2016c), and then final approval under Project Certificate No. 008. These baseline reports remain unchanged. Appendices 4-B, 4-C, and 4-E have been updated to address the Expansion Project.

4.1.1 Valued Components

The identification of VCs and factors considered in their selection are described in Section 3.4.1 of the FEIS Addendum. A summary of the atmospheric environment VCs and rationale for inclusion in the Expansion Project are provided in Table 4.1-1.

Table 4.1-1: Valued Components of the Atmospheric Environment

Valued Component	Rational
Climate	■ Greenhouse gas emissions from the Project can contribute to climate change ■ Climate change will affect weather in the Kivalliq region ■ Community elders are concerned about climate change and recent unpredictability in weather (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c)
Air Quality	■ Combustion emissions from mobile and stationary equipment have the potential to affect air quality ■ Fugitive dust emissions from mining activities in the mining area have the potential to affect air quality ■ Fugitive road dust emitted from the haul road has the potential to affect air quality ■ Community elders are concerned about the effects aerial deposition of fugitive dust may have on other VCs; for example, soil quality, water quality, flora and fauna (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c)
Noise and Vibration	■ Noise and vibration were included as a VC in the Approved Project FEIS ■ Community elders are concerned about Project noise effects on birds (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c) ■ Hunters and trappers are concerned about Project noise effects on wildlife, especially caribou (Cumberland 2005a) ■ Increased ambient noise levels resulting from Project noise emissions can result in effects to humans and wildlife ■ Ground vibration and airborne noise resulting from Project blasting can result in effects to humans and wildlife

4.1.2 Spatial and Temporal Boundaries

4.1.2.1 Climate

Consistent with the Approved Project, the spatial boundary associated with the climate VC is considered to be the Kivalliq region of Nunavut. The temporal boundary is the Environment Canada 30-year climate normal data from 1981 to 2010 for the Baker Lake meteorological station. Temporal boundaries for the assessment of potential effects related to climate change are considered up to year 2100.

4.1.2.2 Air Quality

Consistent with those defined in the Approved Project (FEIS Volume 4, Section 4.1.3.2), the spatial boundary for the assessment of potential effects of the Expansion Project on regional air quality is a 60 km by 60 km domain centered on the Whale Tail Pit. For conservatism, Expansion Project-related air emissions in the assessment are calculated based on the peak emissions year for the Expansion Project (2022) and is inclusive of emissions from the Approved Project.

4.1.2.3 Noise and Vibration

For the Approved Project, the temporal boundary for assessment of potential effects on the atmospheric environment, for construction, operations, and closure was about a three to four-year LOM, with operations running from 2019 through 2022 and closure culminating in 2029 (FEIS Addendum Volume 3, Section 3.3). The Expansion Project construction activities are proposed from 2019 to 2020, operations from 2020 to 2025, and closure from 2026 to 2051, followed by post-closure from 2051.

The regional study area (RSA) for the Expansion Project is consistent with the Approved Project (FEIS Volume 4, Section 4.1.3.3). The RSA was established as a buffer surrounding the Expansion Project footprint at a distance of 7 km (Approved Project FEIS Volume 4, Figure 4.1-1). In accordance with research suggesting that noise sources farther than 5 km from the Expansion Project will not meaningfully influence cumulative noise levels in the area (Drew and South 2009), the LSA for the Expansion Project noise and vibration assessment was established as a buffer surrounding the Expansion Project footprint at a distance of 5 km (FEIS Addendum Figure 3.2-1).

There are no occupied dwellings located in the LSA or RSA, and baseline studies did not identify any traditional land and resource or cultural sites that are currently used in the LSA or RSA. In the absence of occupied dwellings and active traditional land and resource or cultural sites in the LSA and RSA, noise and vibration levels were predicted for discrete receptors corresponding to cultural and spiritual sites that were used in the past, for a grid of receptors covering the LSA and RSA, and for a discrete receptor corresponding to the most impacted location on the LSA boundary (Rmax).

4.2 Climate and Meteorology

A summary of the key changes to the assessment of the climate and meteorology component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 4.2-0.

Table 4.2-0: Climate and Meteorology: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
4.2.1 Incorporation of IQ	Review of • Arctic Climate Impact Assessment, Chapter 3: The Changing Arctic: Indigenous Perspectives (ACIA 2005). • Unikkaaqatigiit: Putting the Human Face on Climate Change, Perspectives from Nunavut Communities (Communities of Arctic Bay, Kugaaruk and Repulse Bay 2005). • Public Information Meeting Summary Report September 4, 2014 for the NIRB's monitoring of Agnico Eagle Mines Ltd.'s Meadowbank Gold Project (NIRB 2014). • Public Information Meetings Summary Report, September 9 – September 11, 2015. Created for the	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016

Section of FEIS	Approved Project	Expansion Project
	NIRB's Monitoring of Agnico Eagle Mines Ltd.'s Meadowbank Gold Mine Site (NIRB 2015a). • Back River Project Final Environmental Impact Statement: Volume 4: Atmospheric Environment and references therein (Sabina 2015). • Whale Tail Inuit Qaujimajatuqangit Baseline Report and references therein (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c).	• Whale Tail Pit Open House-Coral Harbor, October 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type "A" Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board's Hearing Regarding the Review of Agnico Eagle Mines Limited's Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
4.2.2 Existing Environment and Baseline Information	• Meteorological data from 2005 to 2009 for the Baker Lake meteorological station were used as input to the air quality dispersion model used to assess potential Project-related effects to air quality	Unchanged
4.2.3 Climate and Project Interactions	• Greenhouse gas emissions from the Project are calculated as a measurement endpoint and compared to emissions from Nunavut to put the Project-related emissions into better context. • The short duration of the proposed Project indicates that climate change related effects to the Project are likely negligible.	No new primary pathways identified Section 4.2.3.1 Updated to reflect greenhouse gas emissions predicted as a result of the Expansion Project
4.2.4 Monitoring and Follow-up	ECCC conducts long-term monitoring of weather and climate in the Kivalliq region of Nunavut. There are currently no plans to conduct supplementary meteorological monitoring at the Project.	Unchanged

4.2.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to climate and meteorology were provided by community members since the FEIS submission was made in 2016 for the Approved Project. This assessment considers the review of community consultation notes from Agnico Eagle (2018c) and NIRB (2017), as well as consultation notes for the Expansion Project (Agnico Eagle 2018a).

The concerns as they pertain to the Expansion Project have been incorporated into Section 4.2.1.1 and Section 4.2.1.2 of the FEIS Addendum. For additional information refer to the Approved Project FEIS Volume 4, Section 4.2.1 (Agnico Eagle 2016c).

4.2.1.1 Existing Environment and Baseline Information

Additional IQ and concerns regarding climate and meteorology since the Approved Project FEIS submission include the following:

- The snow and main northwest wind is relied on by hunters for navigating during the winter by snowmobile (Agnico Eagle 2018a).
- The Project area (i.e., Whale Tail area) is considered warmer than the Meadowbank area because it's farther inland (NIRB 2017).
- Char from the coast will travel up rivers up to 80 miles to the same site every year, but their migration patterns are changing because of low river levels due to climate change (Agnico Eagle 2018a).
- Concerns regarding potential effects of the Project on climate change (Agnico Eagle 2018b).

4.2.1.2 Valued Component Selection

For the Expansion Project, the selection of VCs remains the same as the Approved Project (FEIS Volume 4, Section 4.2.1.2).

4.2.1.3 Impact Assessment

The Expansion Project considers the same potential effects as the Approved Project.

The impacts of climate change have the potential to affect a wide range of environmental, social and economic systems of value to Inuit, as indicated by the observations and changes experienced by Baker Lake traditional land users.

Climate change is a global issue caused in part by emissions of GHG. It is not possible to measure the effects of the Expansion Project on climate (FTPCCCEA 2003), as compared to observing the effects of global climate change on the Kivalliq region. Consequently, this assessment quantifies Expansion Project-related greenhouse gas emissions and puts them into regional context by comparing them to GHG emissions from all of Nunavut.

4.2.1.4 Mitigation and Monitoring

Traditional harvesters have stated that they have had to adapt their land use patterns based on climate change. Warmer temperatures during the late summer have resulted in land users delaying the caching period by a month due to meat rotting, and a shorter caching period for hunters. Shifts in caribou migration patterns and caribou availability have caused harvesters to shift their harvesting patterns (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Monitoring of weather is conducted regionally by ECCC and is predicted to continue indefinitely as a means of monitoring long-term trends in regional climate. Refer to the Greenhouse Gas Reduction Plan (Volume 8, Appendix 8-E.2)

4.2.2 Existing Environment and Baseline Information

A detailed description of the existing regional weather and climate near the Expansion Project are included in Volume 4, Appendix 4-A.

4.2.3 Climate and Expansion Project Interactions

Pathway analysis is provided in Section 3.5 of the FEIS Addendum. Primary pathways that require further effects analysis to determine the environmental significance from the Expansion Project are provided below. Pathways determined to have no linkage or those that are considered secondary are not predicted to result in environmentally significant effects are provided in Volume 3, Appendix 3-C, Table 3-C-1.

Consistent with the Approved Project, there is no assessment endpoint for climate. Greenhouse gas emissions from the Expansion Project are calculated as a measurement endpoint and compared to emissions from Nunavut to put the Expansion Project-related emissions into better context (Section 4.2.3.1 of the FEIS Addendum).

4.2.3.1 Effects of the Expansion Project on Climate

Greenhouse gas emissions from the Expansion Project can contribute to climate change, even though the contribution of any one project to global climate change cannot be measured (FTPCCCEA 2003).

As part of this assessment, Expansion Project-related emissions of GHGs were calculated using methods consistent with the GHGRP. These emissions estimates were then compared to the GHGRP reporting threshold (10,000 tonnes), to total emissions from Nunavut, and to Canada's national GHG emissions estimates. The total emissions for Nunavut and Canada are calculated from the 5-year average of emissions from 2012 to 2016 (ECCC 2018).

Emissions are expected to exceed 10,000 tonnes per year for the peak year of production (Table 4.2-1). Total average emissions from Nunavut from 2012 to 2016 were 649 kilotonnes CO_2e/yr (kt CO_{2e}/yr; Table 4.2-1). When compared to Canada's national emissions (711,400 kt CO_2e/yr), the Expansion Project contributes to an approximately 0.05% increase in national GHG emissions.

Table 4.2-1: Greenhouse Gas Emissions Summary for the Expansion Project in 2022

Emissions Source	Approved Project		Expansion Project		Change
	Greenhouse Gas Emissions (kt CO_{2e})	Project Emission as a Proportion of Nunavut and Canadian Emissions (%)	Greenhouse Gas Emissions (kt CO_{2e})	Project Emission as a Proportion of Nunavut and Canadian Emissions (%)	Expansion Less Approved Project (kt CO_{2e})
Non-road Exhaust	62.5	—	142.0	—	+79.5
Generators	8.4	—	18.0	—	+9.6
Heaters	3.1	—	1.9	—	-1.2
Incinerator	-	—	2.3	—	+2.3
Project Total[a]	**74.0**	**—**	**164.2**	**—**	**+90.2**
Nunavut Total[b]	**649**	**11.4**	**649**	**25.3**	
Canadian Total[b]	**711,400**	**0.01**	**711,400**	**0.02**	

a) Project Total includes annual emissions from the Approved Project and the Expansion Project for the peak production year of 2022.
b) 2012 to 2016 average (ECCC 2018).
ktCO_{2e} = kilotonnes of carbon dioxide equivalents

4.2.3.2 Effects of Climate Change on the Expansion Project

Climate change predictions suggest that for the Arctic air temperatures are expected to increase by 3-4°C by 2050 (CCDS 2009). The impact of climate change was considered as part of the assessment for various VCs in the Approved Project (Agnico Eagle 2016), and is considered unchanged under the Expansion Project. Climate conditions and projected climate change are discussed in the Meadowbank Gold Project Baseline Physical Ecosystem Report (Cumberland 2005h) and O'Kane Consultants (2015); the Meadowbank Mine is some 64 km south of the Expansion Project. The Intergovernmental Panel on Climate Change's (IPCC) climate change mitigation scenario RCP4.5 results in a year 2100 multi-model Arctic wide prediction of +7°C in late fall and +3°C in late spring (Overland et al. 2013). The effects of changes of this magnitude to terrestrial, aquatic and marine ecosystems, social and economic systems of the Arctic are an active area of research (e.g., NASA ABoVE). However, the short duration of the Expansion Project means that climate change related effects to the Expansion Project are likely negligible. Within the Whale Tail area, permafrost is regionally predicted to be moderately thermally sensitive to climate change, with a low to moderate physical response resulting from thaw (Smith and Burgess 2004). The gradual increase in the active layer due to climate change could impact Expansion Project infrastructure remaining after closure and decommissioning (e.g., the WRSF).

The foundations of the WRSF are expected to remain frozen under a long-term warming trend; however, the potential deepening of the active layer will be considered in the design of the WRSF and mine infrastructure. A thermal assessment of the WRSF at Whale Tail Pit has been completed by Golder (2018b) in response to a recommendation identified in the Final Hearing Report (NIRB 2017). The 1D thermal modelling study suggests that increasing air temperatures associated with climate change will result in an increase of the core temperature of the WRSF, but the pile should remain frozen after 100 years. In addition, although the pile would warm up progressively at depth, the depth of the active layer is not predicted to change significantly with an average predicted depth of 4 m and maximum depth of 4.2 m after 100 years post-closure (Golder 2018b). These parameters will continue to be monitored and evaluated to ensure closure objectives consistent with the approved project are achieved for the expansions. The decommissioned haul road will not be significantly impacted by the long-term warming trend as it will no longer be in use.

4.2.4 Monitoring and Follow-up

ECCC currently conducts long-term monitoring of weather and climate in the Kivalliq region of Nunavut. There are currently no plans to conduct supplementary meteorological monitoring for the Expansion Project.

4.3 Air Quality

A summary of the key changes to the assessment of the air quality VC for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 4.3-0.

Table 4.3-0: Air Quality: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
4.3.1 Incorporation of IQ	Review of: • Unikkaaqatigiit: Putting the Human Face on Climate Change, Perspectives from Nunavut Communities (Communities of Arctic Bay, Kugaaruk and Repulse Bay 2005). • Public Information Meeting Summary Report September 4, 2014 for the NIRB's monitoring of Agnico Eagle Mines Ltd.'s Meadowbank Gold Project (NIRB 2014). • Public Information Meetings Summary Report, September 9 – September 11, 2015. Created for the NIRB's Monitoring of Agnico Eagle Mines Ltd.'s Meadowbank Gold Mine Site (NIRB 2015a). • Back River Project Final Environmental Impact Statement: Volume 4: Atmospheric Environment and references therein (Sabina 2015). • Whale Tail Inuit Qaujimajatuqangit Baseline Report and references therein (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c).	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type "A" Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board's Hearing Regarding the Review of Agnico Eagle Mines Limited's Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
4.3.2 Existing Environment and Baseline Information	• Air Quality Baseline	No new studies completed
4.3.3 Potential Project-related Effects Assessment	Three primary pathways were identified	No new primary pathways identified. Assessment updated to include emissions predicted from the Expansion Project activities in year 2022.
4.3.4 Residual Impact Classification	Primary pathways have been identified for air quality. However, no residual impact classification is made because air quality does not have an assessment endpoint, only measurement endpoints (i.e., comparison to relevant ambient air quality guidelines or standards). Any potential effects associated with the primary pathways are captured in the assessment of potential	Unchanged

Section of FEIS	Approved Project	Expansion Project
	effects to, and residual impact classifications for, other VCs (e.g., soil quality, water quality, and human health).	
4.3.5 Cumulative Effects Assessment	No cumulative effects for air quality are anticipated for this Project	Unchanged
4.3.6 Uncertainty	Sources of uncertainty include differences in actual versus predicted emissions, differences in actual versus predicted natural mitigation of windblown dust, differences in actual versus predicted road-bed silt content and/or the effectiveness of proposed dust mitigation measures, etc.	Unchanged
4.3.7 Monitoring and Follow-up	Air Quality and Dustfall Monitoring Plan	Refer to Volume 8, Appendix 8-E.1 for an updated Air Quality and Dustfall Monitoring Plan

4.3.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to air quality were provided by community members since the FEIS submission was made in 2016 for the Approved Project. This assessment considers review of community consultation notes from Agnico Eagle 2018c,e), NIRB and NWB (2017), and NIRB (2017), as well as consultation for the Expansion Project (Agnico Eagle 2018a).

The following comments and concerns have been raised by community members related to the effects of the Expansion Project:

- It was noted that caribou don't like pollution, smells or dust (Agnico Eagle 2018a).
- Concerns regarding changes to air quality in the mine area (Agnico Eagle 2018c).
- Baker Lake community members have observed a lot of dust along the AWAR and reported that dust in general is affecting several communities in Nunavut (NIRB and NWB 2017). Concerns were expressed about the potential human health effects associated with road dust (NIRB and NWB 2017).
- Concerns regarding the managing and monitoring of dust and dust suppression chemicals to prevent or minimize harm to fish and wildlife in the area (NIRB and NWB 2017). Baker Lake community members emphasized the need for community participation in dust-monitoring and mitigation (NIRB 2017; NIRB and NWB 2017).

The concerns as they pertain to the Expansion Project have been incorporated into Section 4.3.1.2 of the FEIS Addendum.

4.3.1.1 Existing Environment and Baseline Information

The Expansion Project does not change IQ integration from the Approved Project. Inuit have documented recent changes to air quality, and are concerned about the potential effects of these changes on their traditional land use activities and resources and are provided in the Approved Project FEIS Volume 7, Appendix 7-A (Agnico Eagle 2016c).

4.3.1.2 Valued Component Selection

For the Expansion Project, the selection of VCs remain the same as the Approved Project FEIS Volume 4, Section 4.3.1.2 (Agnico Eagle 2016c).

4.3.1.3 Impact Assessment

The Expansion Project considers the same potential effects as the Approved Project.

Inuit Qaujimajatuqangit highlighted concerns about the sensitivity of caribou and muskox to losses of vegetation habitat (habitat quantity) and changes in vegetation habitat quality (habitat quality) because of dust deposition. Concerns were also raised related to the effects of dust on other traditional resources and activities that Inuit depend on. Potential effects of the Expansion Project on air quality and atmospheric deposition were predicted and compared to national and territorial air quality guidelines as there are no standards that can be drawn explicitly from IQ.

4.3.1.4 Mitigation and Monitoring

Community members requested that emissions of road dust be mitigated through road watering and the application of chemical dust suppressants, and that the accumulation of dust be monitored over time (NIRB 2015a; Agnico Eagle 2016b, 2016c, 2016d). In response to these concerns, and as a NIRB requirement (Project Certificate No. 008; T&C #2), Agnico Eagle conducts local meteorology, air quality, and dustfall monitoring at their existing Meadowbank Mine (e.g., Agnico Eagle 2013a, 2015, 2016a,b, 2017a,b, 2018f,g) and is also applying dust suppressant in key areas that were identified by community members.

Mitigation and monitoring opportunities for the Expansion Project are similar to those at the existing Meadowbank Mine and Approved Project. Public consultation with community members indicates that they expect mitigation and monitoring strategies employed at the proposed Expansion Project to be similar to those employed at the Meadowbank Mill and for the Approved Project.

4.3.2 Existing Environment and Baseline Information

To quantify existing air quality in the Kivalliq region, the Approved Project assessment undertook a comprehensive analysis of available air quality measurements in Arctic Canada, including results of the 2008 NASA ARCTAS[1] airborne field campaign and are summarized in Volume 4, Appendix 4-A.

Background concentrations of CACs used in this assessment are the same as those used in the Approved Project (Table 4.3-1).

[1] https://espo.nasa.gov/arctas

Table 4.3-1: Summary Statistics for Background Concentrations of Criteria Air Contaminants

Compound (units)	Averaging Period	Percentile	Background Concentrations used in the FEIS Addendum	Air Quality Standard
CO (ppmv)	1-hr	90th	**0.3**	13
	8-hr	90th	**0.3**	5
NO_2 (ppbv)	1-hr	90th	**5.0**	159
	24-hr	90th	**4.5**	106
	Annual	50th	**1.9**	24
O_3 (ppbv)	1-hr	90th	**17.3 – 30.6**[a]	82
	8-hr	90th		63
SO_2 (ppbv)	1-hr	90th	**1.0**	172
	24-hr	90th	**1.0**	48
	Annual	50th	**0.1**	8
$PM_{2.5}$ (µg/m^3)	24-hr	90th	**6.6**	28
	Annual	50th	**3.6**[b]	8.8

a Indicated values are the range in monthly average concentrations used as input for the conversion of NO_2 to NO in the air quality model.

b Geometric average (median or 50th percentile) of 5-years of 24-hr average concentrations after removing zeros and hourly concentrations above the 97.6th percentile.

CO = carbon monoxide; NO_2 = nitrogen dioxide; NO = nitrogen monoxide; SO_2 = sulfur dioxide; $PM_{2.5}$ = particulate matter smaller than 2.5 micrometres in aerodynamic diameter; O_3 = ozone; ppbv = parts per billion, volumetric; ppmv = parts per million, volumetric; µg/m^3 = micrograms per cubic metre

Additional information as it relates to the existing environment are provided in the Approved Project (FEIS Volume 4, Section 4.3.2).

4.3.3 Potential Expansion Project-related Effects Assessment

Inuit Qaujimajatuqangit and professional scientific opinion were used to identify potential Project related effects to air quality. These pathways are summarized in Volume 3, Appendix 3-C, Table 3-C-1. Primary pathways include the following:

1) Traffic along the upgraded haul road from the Whale Tail mining site to the existing Meadowbank Mine has the potential to generate combustion emissions and road dust that can affect air quality.

2) Mining operations at the Whale Tail mining site have the potential to produce combustion emissions and dust that can affect air quality.

Traffic on the haul road during expansion and decommissioning of the Expansion Project have the potential to affect air quality. However, the emissions intensity from construction and decommissioning activities is much lower than the intensity of air emissions, including dust, during the operations phase. This assessment considers emissions during the Expansion Project's operations phase (specifically year 2022, the peak year of mining activity) to be a conservative estimate of the maximum potential Expansion Project related to effects to air quality.

Consistent with the Approved Project, this air quality assessment includes quantification of these air emissions and predictions of the spatial patterns of their regional atmospheric deposition to support in the effects assessment for other valued ecosystem components (e.g., water quality, soils, human health).

4.3.3.1 Effects of Haul Road on Air Quality

To evaluate potential effects of the haul road on air quality, this assessment undertook the following:

1) Quantification of baseline concentrations of CACs in the Kivalliq region of Nunavut (Volume 4, Appendix 4-A).
2) Calculation of CAC emissions from the following haul road sources (Volume 4, Appendix 4-B):
    a. exhaust from vehicles operating on the haul road; and
    b. un-paved road dust from the haul road.
3) Air quality dispersion modelling of a representative 1 km section of the haul road oriented northeast to southwest was used to predict the following (Volume 4, Appendix 4-C):
    a. maximum plus background concentrations of CAC as a function of distance from the haul road; and
    b. maximum dust deposition as a function of distance from the haul road.

The model predicted ground level concentrations of CO, NO_2, and SO_2 due to haul road vehicle emissions represent a very small increase as compared to background concentrations, and are well below their relevant ambient air quality standards (Volume 4, Appendix 4-C). Predictions of $PM_{2.5}$ adjacent to the haul road were below Nunavut ambient air quality guidelines within 100 to 300 m from the haul road. Thus, the focus of the assessment is the potential effects of total suspended particulate matter (i.e., dust) on air quality adjacent to the haul road.

In the near field, maximum total suspended particulate matter (TSP) concentrations adjacent to the road are predicted to exceed the 24-hour average ambient air quality standard (FEIS Addendum Table 4.3-2; Figure 4.3-1; red line = 120 $\mu g/m^3$) at distances of up to 1,000 m from the haul road. Maximum annual TSP concentrations are predicted to exceed the ambient air quality standard (60 $\mu g/m^3$) only within the first 100 to 300 m from the haul road.

Table 4.3-2: Maximum Total Suspended Particulate Concentrations Function of Distance from the Haul Road

Distance (m)	24-hr (µg/m³)	Annual (µg/m³)
25	1236.1	94.5
50	1160.5	102.2
75	979.7	77.0
100	848.7	61.5
300	375.7	21.2
500	212.8	12.4
750	130.7	8.5
1,000	93.2	6.7
1,500	51.1	5.2
2,000	32.3	4.5
Ambient Air Quality Standard	120	60

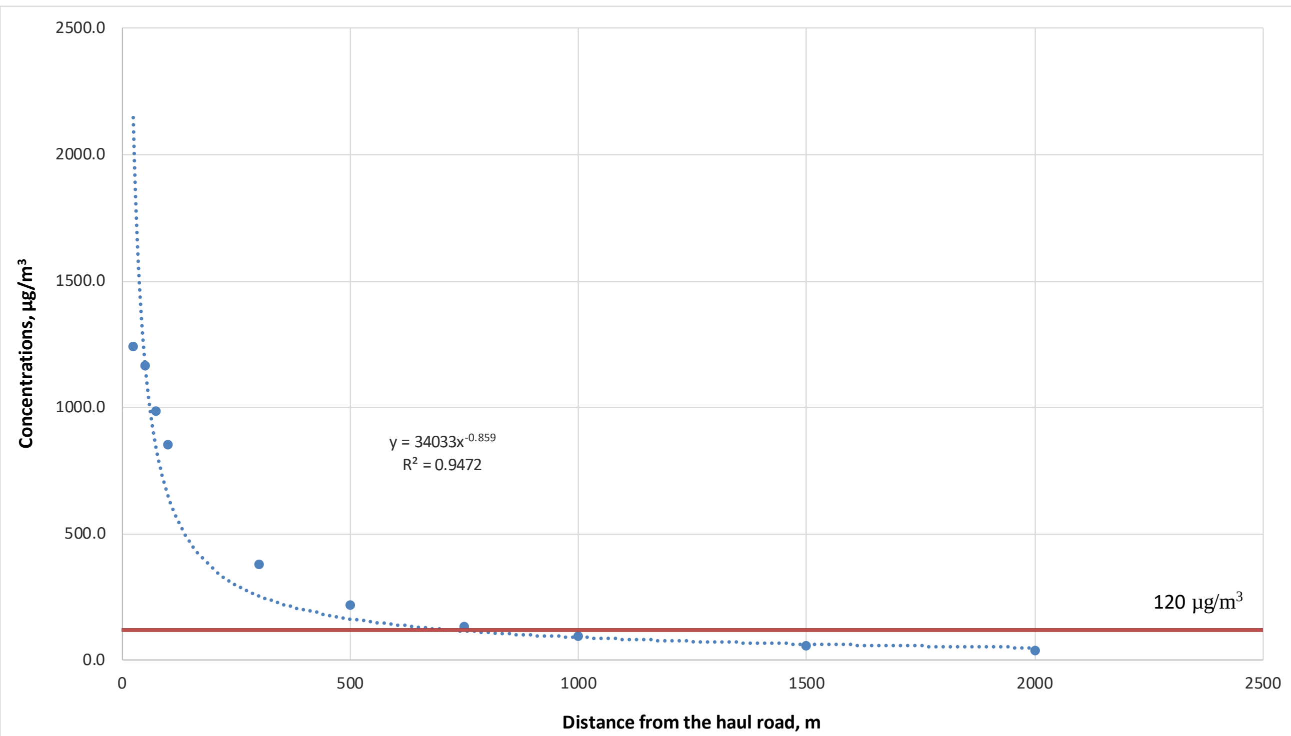


Figure 4.3-1: Maximum 24-hr Total Suspended Particulate Concentrations as a Function of Distance from the Haul Road

Predicted dust deposition rates are compared to Alberta and Ontario guidelines/standards (Volume 4, Appendix 4-C). The Alberta monthly dust fall guidelines for residential and recreation area is 0.53 milligram per square centimetre per 30 days ($mg/cm^2/30days$). The Ontario annual dust fall standard is 0.46 $mg/cm^2/30days$. Maximum predicted monthly dustfall is predicted to be below the Alberta guideline for residential and recreation area within 500 m of the haul road (Table 4.3-3 and Figure 4.3-2). Annual dust deposition is predicted to be below the Ontario dustfall standard within 75 m from the haul road.

The effects of dust emissions on air quality adjacent to the haul road are limited in spatial extent and occur primarily on dry windy days in the summer. Snow cover and frozen ground during winter months provides natural mitigation of windblown dust and road dust from un-paved roads. These effects are reversible in that dust will no longer affect air quality once the Expansion Project is decommissioned and the haul road becomes inactive. Results of this assessment indicate rates of atmospheric deposition are below relevant dustfall standards within 500 m from the haul road. Analysis of the geochemistry of the locally-sourced haul road material does not indicate that the dust being deposited has the potential to affect soil and water quality (Golder 2014).

Table 4.3-3: Model Predicted Maximum Dust Deposition as a Function of Distance from the Haul Road

Distance (m)	Monthly ($mg/cm^2/30days$)	Annual ($mg/cm^2/30days$)
25	3.42	0.53
50	3.40	0.61
75	2.47	0.43
100	1.90	0.32
300	0.59	0.09
500	0.31	0.04
750	0.17	0.02
1000	0.11	0.02
1500	0.06	0.01
2000	0.03	0.01
Dust fall criteria	**0.53**	**0.46**

$mg/cm^2/30days$ = milligram per square centimetre per 30 days

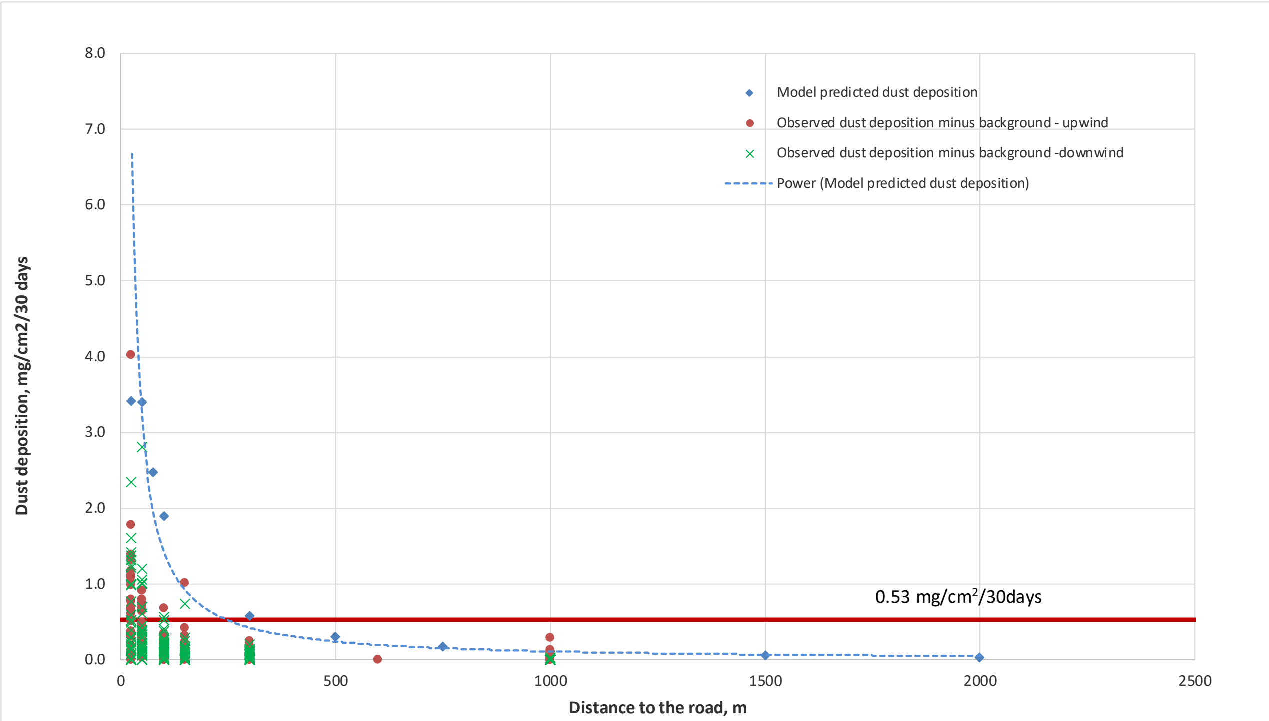


Figure 4.3-2: Predicted (this assessment) and Observed (Meadowbank Mine) Dust Deposition as a Function of Distance from Mine Haul Roads

4.3.3.2 Effects of the Expansion Project Operation on Air Quality

To evaluate potential effects of the Expansion Project mining operations on air quality, this assessment undertook the following:

1) Quantification of baseline concentrations of CAC in the Kivalliq region of Nunavut (Volume 4, Appendix 4-A).

2) Calculation of CAC emissions from the following sources (Volume 4, Appendix 4-B):

    a. Expansion Project activities, including:

        i. in pits and underground drilling and blasting;
        ii. in pits and underground material handling;
        iii. un-paved road dust from mining operations; and
        iv. exhaust from off-road equipment operating within Whale Tail Mining area;

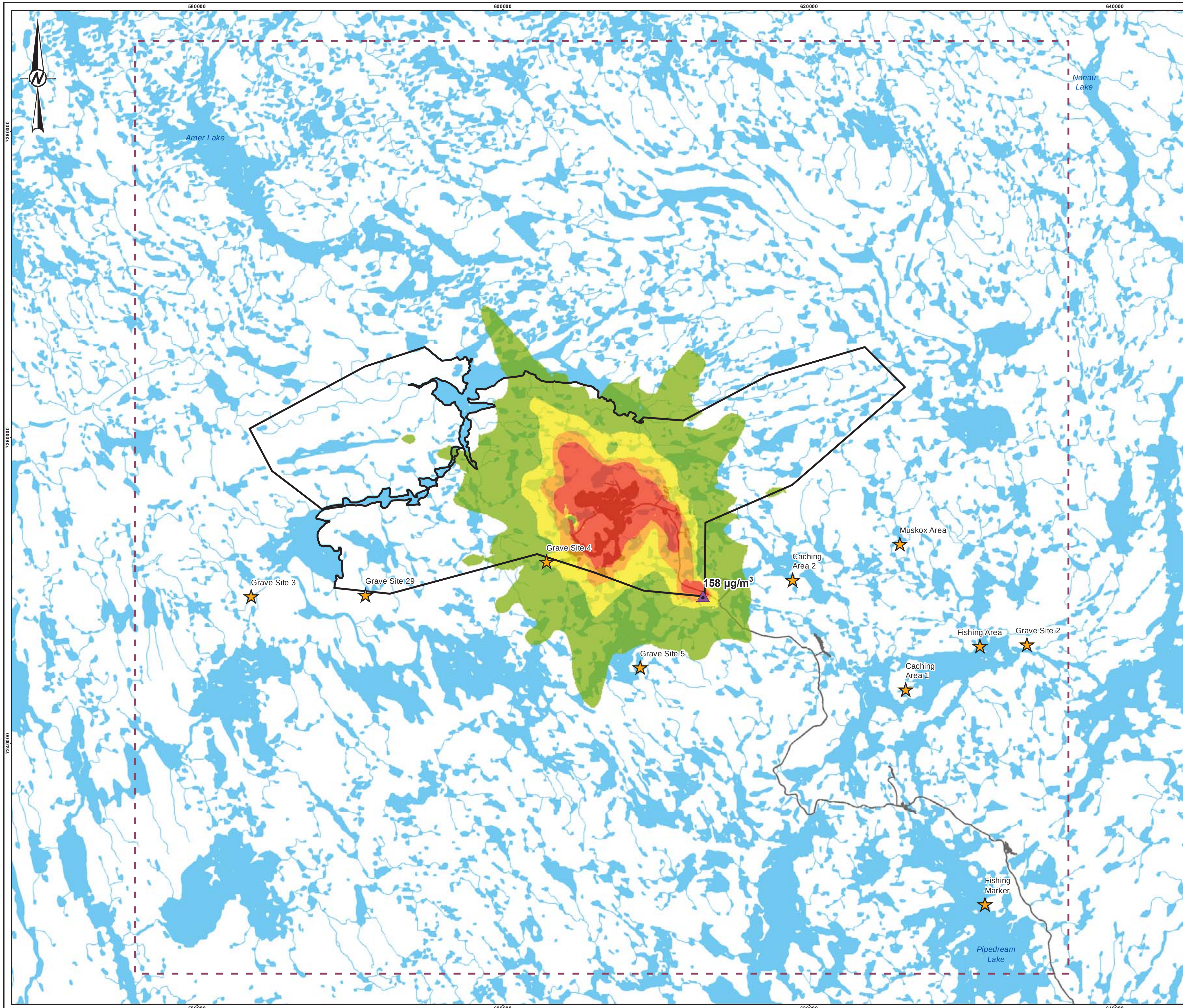
    b. wind erosion from ore pad and waste storage piles;
    c. stationary combustion emissions from the camp heating and camp power;
    d. un-paved road dust and vehicle exhaust from the section of haul road within the Property boundary; and
    e. emissions from an incinerator.

3) Air quality dispersion modelling to predict maximum plus background concentrations of CAC at the Property boundary (Volume 4, Appendix 4-C).

The model predicted maximum gas (SO_2, NO_2, and CO) concentrations of the Expansion Project are inclusive of Approved Project emissions and higher than those of the Approved Project because the worst case 1-hour emission rate from blasting activity was used in the Expansion Project modelling (Table 4.3-4). Air quality modelling results predict the occurrence of maximum plus background concentrations of PM_{10} and TSP above the Nunavut air quality guidelines outside the Property boundary. For PM_{10}, the worst year of the 5-year simulation includes four PM_{10} exceedances. For TSP, the worst year of the 5-year simulation includes one 24-hour TSP exceedance. Figure 4.3-3 illustrates the predicted spatial distribution of maximum plus background 24-hour average TSP concentrations. As indicated, the region where the maximum plus background TSP concentrations are predicted to exceed the air quality criteria over a 24-hour period is small.

Air quality modelling also included an evaluation of maximum plus background concentrations of CACs at important local cultural or human health receptors. Predicted concentrations of all CACs were below their relevant ambient air quality standards at all of these local receptors.

The effects of mining activities at the Expansion Project on regional air quality are limited in spatial extent and occur primarily on dry windy days in summer. These effects are reversible in that emissions will no longer affect air quality once the Expansion Project is decommissioned and the haul road becomes inactive.



LEGEND

- WATERCOURSE
- WATERBODY
- DISCRETE RECEPTOR
- MAXIMUM POINT OF IMPINGEMENT
- MODEL BOUNDARY
- PROJECT FOOTPRINT - EXPANSION PROJECT
- PROPERTY BOUNDARY

CONCENTRATION (µg/m³)

- < 30
- 30 - 60
- 60 - 90
- 90 - 120
- > 120

0 5,000 10,000

1:250,000 METRES

REFERENCE(S)

1. NATIONAL TOPOGRAPHIC DATA BASE (NTDB) DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 14 DATUM: NAD 83

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

MODEL PREDICTED MAXIMUM 24-HOUR TSP CONCENTRATIONS

CONSULTANT

GOLDER

YYYY-MM-DD	2018-10-25
DESIGNED	ZY
PREPARED	LMS
REVIEWED	CMc
APPROVED	CM

PROJECT NO.	PHASE	REV.	FIGURE
1896037	4100	0	4.3-3

Table 4.3-4: Summary Statistics for Criteria Air Contaminants

Compound (units)	Averaging Period	Background Concentrations	Approved Project - Maximum plus Background Concentrations Outside of Project Boundary	Expansion Project- Maximum plus Background Concentrations Outside of Project Boundary	Change: Expansion Less Approved Project	Air Quality Standard
CO (ppmv)	1-hr	0.3	5.7	10	**+4.3**	**13**
	8-hr	0.3	1.6	2.7	**+1.1**	**5**
NO_2 (ppbv)	1-hr	5.0	148	204	**+56**	**213**
	24-hr	4.5	31	65	**+34**	**106**
	Annual	1.9	4.5	7.2	**+2.7**	**32**
SO_2 (ppbv)	1-hr	1.0	66	116	**+50**	**172**
	24-hr	1.0	2.2	34	**+32**	**57**
	Annual	0.1	0.2	0.9	**+0.7**	**11**
$PM_{2.5}$ (µg/m^3)	24-hr	6.6	20 (14[b])	28 (17[b])	**+8 (3)**	**28[b]**
	Annual	3.6[(a)]	4.3	4.9	**+0.6**	**8.8**
PM_{10} (µg/m^3)	24-hr	3.6[(a)]	52	107	**+55**	**50**
TSP (µg/m^3)	24-hr	3.6[(a)]	174	158	**-16**	**120**
	Annual	3.6[(a)]	17	19	**+2**	**60**

a) Geometric average (median or 50th percentile) of 5-years of 24-hr average concentrations after removing zeros and hourly concentrations above the 97.6th percentile.

b) 3-year, 98th percentile.

CO = carbon monoxide; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; $PM_{2.5}$ = particulate matter smaller than 2.5 micrometres in aerodynamic diameter; PM_{10} = particulate matter smaller than 10.0 micrometres in aerodynamic diameter; TSP = total suspended particulate matter; ppbv = parts per billion, volumetric; ppmv = parts per million, volumetric; µg/m^3 = micrograms per cubic metre; hr = hour.

4.3.3.3 Potential for Acid Deposition

Table 4.3-5 summarizes Expansion Project and haul road emissions of SO_2, NO_x (as NO_2) and NH_3, and emissions from other reported sources in Nunavut (ECCC 2018). Expansion Project emissions are conservative because annual totals are based on maximum daily output and because it is assumed that the Expansion Project emits enough ammonia to completely neutralize all emissions of sulfur and nitrogen oxides. This is a conservative assumption because the Expansion Project is a negligible source of these emissions.

Acid deposition modelling was not undertaken because there are few sources in Nunavut and they are distributed over a large area; emissions reported for Nunavut are likely underestimated. Further justification is provided in the discussion that follows.

Table 4.3-5: Acidic Gas Emissions Summary

Parameter	SO_2	NO_2	NH_3
Expansion Project and Haul Road Emission (t/d)	0.08	6.0	3.24[a]
Total Nunavut Emissions (t/d)	0.05[b]	9.2[b]	-[c]
Expansion Project H^+ equivalents (t/d)	0.32		
Acid Deposition Modelling Threshold	0.175		

a) assuming complete conversion of SO_2 to sulfate (SO_4^{2-}) and NO_x to nitrate (NO_3^-), and their complete neutralization by ammonium (NH_4^+).
b) 2012 to 2016 NPRI average (ECCC 2018).
c) no NH_3 air emissions reported to NPRI (2012 to 2016).
SO_2 = sulfur dioxide; NO_2 = nitrogen dioxide; NH_3 = ammonia; t/d = tonnes per day; % = percent; NPRI = National Pollutant Release Inventory.

The Canada-wide requirement for the use of ultra-low sulfur diesel in on- and off-road equipment results in a low rates of SO_2 emissions from the Expansion Project plus the Meadowbank Mill (0.08 t/d). Maximum predicted SO_2 deposition near the Expansion Project is 0.106 grams per square metre per year (g/m^2/yr). This is equivalent to 0.032 gram sulphur per square meters per year (g -S/m^2/yr) and occurs within the Expansion Project boundary.

The maximum predicted NO_2 deposition rate is within the Amaruq property boundary (0.24 g/m^2/yr). There are no rates of nitrogen deposition greater than 0.04 g/m^2/yr outside the property boundary. A deposition rate of 0.04 g/m^2/yr is equivalent to an increase in nitrogen deposition rates in the region of 0.12 kg-N/ha/yr.

Background levels of Arctic nitrogen deposition are approximately less than 1 kg-N/ha/yr. Changes to Arctic heath composition appear at ~10 kg-N/ha/yr, and the critical load of nitrogen is predicted to be on the low end of 5 to 15 kg-N/ha/yr (Gordon et al. 2001). The nitrogen deposition results presented in this assessment indicate that even within the property boundary, no changes to tundra vegetation due to N deposition is expected. Results from the monitoring program in place at the Meadowbank Mine appear to confirm this, as there have been no effects to water quality detected due to acid deposition. As a result, these rates of nitrogen [a nutrient] deposition are not predicted to have adverse effects on the Arctic terrestrial or aquatic ecosystems.

NH_3 emissions have not been directly estimated for this assessment. There is some potential for NH_3 emissions from the use of ammonium nitrate and fuel oil explosives, and from ammonia generated by camp waste water systems. For this assessment, NH_3 emissions are estimated by assuming that each equivalent of sulfate (2) and each equivalent of nitrate (1) is neutralized by one equivalent of ammonium (i.e., 2 + 1 = 3 equivalents). For this location, with a presumed absence of major NH_3 emissions (dominant sources = sewage, livestock, and agriculture), the complete neutralization of acidic sulfate and nitrate emissions by ammonium is a very conservative assumption.

4.3.4 Residual Impact Classification

Consistent with the Approved Project, although primary pathways have been identified for air quality, no residual impact classification are made because air quality does not have an assessment endpoint. Any potential effects associated with the primary pathways are captured in the assessment of potential effects to, and residual impact classifications for, other VCs (e.g., soil quality, water quality, and human health).

4.3.5 Cumulative Effects Assessment

Consistent with the Approved Project, no cumulative effects for air quality (from sources other than the Expansion Project) are anticipated for the Expansion Project because of the following:

- emissions of gases and $PM_{2.5}$ from the Expansion Project are relatively low;

- concentrations of gases and $PM_{2.5}$ are all well below their relevant air quality guidelines or standards outside the Expansion Project boundary; and
- there are no existing or proposed additional sources of TSP emissions within the 60 km x 60 km study domain (existing Meadowbank Mine is outside this area), a region that can reasonably be expected to bind the area over which TSP concentrations above background values can be measured/monitored.

4.3.6 Uncertainty

Consistent with the Approved Project, the following sources of uncertainty could affect the predictions of air emissions and/or the predicted concentrations and deposition rates of CACs within the study domain:

- Differences in actual versus predicted emissions from the uses of explosives or the consumption of fossil fuels at the Expansion Project.
- Differences in actual versus predicted natural mitigation of windblown dust from un-paved road surfaces, drilling and blasting activities, materials handling, or wind erosion of the ore pad or the WRSF.
- Differences in actual versus predicted road-bed silt content and/or the effectiveness of proposed dust mitigation measures at the Expansion Project.
- Extension of the life of the Whale Tail Pit, and/or development of new mines or mining areas in the region could affect the amount of dust generated at the site and along the haul road.
- Actual emissions are predicted to be below those presented in this assessment because they are conservatively estimated assuming equipment (e.g., power generators) are operated at 100% of their capacity at all times.

4.3.7 Monitoring and Follow-up

4.3.7.1 Dust Mitigation

Both IQ and scientific monitoring suggest that road watering and the application of chemical suppressants can reduce dust emissions. Road watering is a simple cost effective dust mitigation option provided that adequate water resources are available. Proposed dust mitigation efforts include the following:

1) daily road watering or application of dust suppressants at the Approved Project, Expansion Project, and Meadowbank Mill during the frost free summer season;
2) enforcement of haul truck speed limits along the haul road; and
3) strategic road watering or dust suppressants along the haul road at hot-spots, near sensitive habitat, and/or during dry windy conditions in summer.

The use chemical dust suppressants was considered (see Volume 4, Appendix 4-C). Chemical suppressants include organic hydrocarbon-based products and mineral salts (e.g., EK-35 or calcium chloride). It should be noted, while the human health and ecological effects of these dust suppressants are predicted to be low, they are not native to the Kivalliq region and their long-term effects on Arctic ecosystems has not been evaluated. Chemical suppressants can run off mine and road surfaces during spring melt and during precipitation events with the potential to affect soil or water quality.

4.3.7.2 Particulate Matter and Dustfall Monitoring

In accordance with Project Certificate No. 004 and No. 008 Terms and Conditions, the objective of this program is to monitor ambient air quality and dustfall at the Meadowbank and Whale Tail Pit mine site perimeters and roads, with the goals of verifying compliance with applicable standards, and mitigating potential environmental effects. The parameters to be measured are suspended particulates (TSP, PM_{10}, $PM_{2.5}$), NO_2 and dustfall (settleable particulate matter).

The Air Quality and Dustfall Monitoring Plan (Volume 8, Appendix 8-A.1) will be followed for the Expansion Project.

4.4 Noise and Vibration

A summary of the key changes to the assessment of the noise and vibration component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 4.4-0.

Table 4.4-0: Noise and Vibration: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
4.4.1 Incorporation of IQ	Review of: • Inuit Qaujimajatuqangit Baseline Report (Approved Project Volume 7, Appendix 7-A; Agnico Eagle 2016c); • Guidelines for the Integration of IQ into the Environmental Assessment (Golder 2016c); • Public Information Meeting 2014 Summary Report (NIRB 2014); • Public Information Meeting 2015 Summary Report (NIRB 2015); • Meadowbank Gold Project – Baseline Traditional Knowledge Report (Cumberland 2005a); • Proposed All-weather Exploration Road from the Meadowbank Mine to the Amaruq Site – Baseline Traditional Knowledge Report Version 2 (Agnico Eagle 2014a); and • Community Consultations/Public Information Meeting Summary Reports for 2014 and 2015 (NIRB 2014, 2015).	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type “A” Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board’s Hearing Regarding the Review of Agnico Eagle Mines Limited’s Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
4.4.2 Existing Environment and Baseline Information	• 2015 Noise Baseline	No new studies completed
4.4.3 Potential Project-related	Three primary pathways were identified	No new primary pathways identified. Additional modelling snapshots: • haul road widening (i.e., widening of haul road as a result of the Expansion Project)

Section of FEIS	Approved Project	Expansion Project
Effects Assessment		• mine operations (i.e., surface and underground mining in new areas as a result of the Expansion Project) • haul road operation (i.e., modelling the full length of the haul road in response to information requests arising from the Approved Project FEIS)
4.4.4 Residual Impact Classification	No residual impact predictions are made because noise does not have measurable assessment endpoints. Any potential effects associated with the primary pathways are captured in the assessment of potential effects to, and residual impact classifications for, other VCs, specifically in wildlife, birds and fisheries.	Unchanged
4.4.5 Cumulative Effects Assessment	The potential Project-related noise effects assessment presented, includes cumulative effects assessment. Because blasting is an extremely short-duration activity, the likelihood of cumulative effects from blasting activities (i.e., the temporal overlap of multiple blasting events occurring simultaneously) is small. As such, a cumulative effects assessment for blasting activities is not appropriate and was not conducted.	Unchanged
4.4.6 Uncertainty	Modelling is conservative (i.e., tending to overestimate Project impacts on noise and vibration)	Unchanged
4.4.7 Monitoring and Follow-up	Follow-up noise monitoring for the Project will be conducted in general accordance with the regular noise monitoring currently being conducted as part of the Meadowbank Mine Noise Monitoring and Abatement Plan	Refer to Volume 8, Appendix 8-E.7 for an updated Noise Monitoring and Abatement Plan

4.4.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to noise and vibration were provided by community members and incorporated into the Expansion Project noise and vibration assessment, which takes into account review of community consultation notes, NIRB and NWB (2017), NIRB (2017), and consultation notes for the Expansion Project (Agnico Eagle 2018b).

Although the area near the Expansion Project is not commonly used for traditional activities, the following comments and concerns have been raised by community members related to effects of Expansion Project noise:

- Consideration should be made for evaluating noise levels along the road where traditional land use travel north and south is predominant.
- Caribou don't like noise or vibration and concerns were expressed about potential effects of Project noise on caribou herds that overlap the Project, and on their migration patterns (Agnico Eagle 2018b).
- The effects of blasting on fish, birds and other wildlife, and whether this would be monitored (NIRB and NWB 2017).

The concerns as they pertain to the Expansion Project have been incorporated into Sections 4.4.3 and 4.4.7 of the FEIS Addendum. For additional information refer to the Approved Project (FEIS Volume 4, Section 4.4.1).

4.4.1.1 Existing Environment and Baseline Information

The Expansion Project is consistent with IQ integration from the Approved Project. Historical IQ and the concerns expressed by Baker Lake community members that are either directly or indirectly related to Expansion Project noise effects on wildlife are summarized in the Approved Project FEIS Volume 7, Appendix 7-A (Agnico Eagle 2016c).

4.4.1.2 Valued Component Selection

There is no change to the selection of VCs for the Expansion Project. Refer to Section 4.1.1 of the FEIS Addendum.

4.4.1.3 Impact Assessment

This FEIS Addendum considers the potential effects assessed under the Approved Project FEIS Volume 4, Section 4.4.1.3 (Agnico Eagle 2016c) and takes into account the concerns raised by community members related to effects of industrial noise on wildlife and Information Requests (IRs) (i.e., GN 36 to 39) received during the regulatory processes for the Approved Project, particularly concerns related to caribou and the methods outlined below describe how the approach taken considers impacts to caribou.

The response of caribou to one mechanism (such as noise from a passing vehicle) cannot be separated out from the other associated sensory disturbances (such as the movement and smell of the vehicle) and based on Environment Canada (2012), should be considered and mitigated holistically.

The Alberta Energy Regulator (AER) and Ontario Ministry of Environment, Conservation, and Parks (MECP) guidance documents were considered in the assessment in the absence of regulatory guidance or scientific consensus on wildlife-specific noise and vibration assessment methods or impact thresholds. The AER guidance document acknowledges as much when it states:

> *"Landowners and residents often express concern about the impact of industrial noise on domestic animals and wildlife. While not the basis for these requirements, the EUB* [former name of the AER] *continues to examine peer-reviewed scientific literature and has concluded to date that typical industrial noise regulated under its jurisdiction does not significantly impact the physiology and habituation patterns of animals over the long term. The literature does suggest that animals might temporarily avoid an area until they become familiar or acclimatized to industrial noise."* (AER 2007)

Because atmospheric absorption attenuates high frequency noise more substantially than low frequency noise, noise levels from industrial sources and blasting are heavily weighted towards the low frequency end of the spectrum when observed at large propagation distances (e.g., locations more than 1 km from the noise sources, where caribou may be present). Research into the range of caribou hearing has found that they are less sensitive to low frequency noise than humans (Flydal et al. 2001). For example, the caribou hearing threshold at 63 Hz is approximately 30 decibels (dB) higher than the human hearing threshold at 63 Hz. Put another way, a human could be expected to detect low frequency noise approximately 30 dB quieter than could be detected by a caribou. This suggests that assessing Expansion Project noise and vibration impacts on caribou using limits sets out in the AER and MECP guidance is protective of caribou as it is highly conservative (i.e., likely to overestimate potential impacts).

4.4.1.4 Mitigation and Monitoring

Based on public concerns related to the effect of noise on wildlife, the mitigation and monitoring plan (Volume 8, Appendix 8-E.7) outlines Agnico Eagle's strategies for reducing noise disturbance with regard to wildlife.

4.4.2 Existing Environment and Baseline Information

Results of the 2015 baseline field survey are described in detail in Volume 4, Appendix 4-D. Refer to Table 4.4-1 in Section 4.4.2 of the Approved Project FEIS (Agnico Eagle 2016c) for detailed description of baseline field survey results. Existing noise levels measured at R7 (unoccupied location adjacent to the haul road) are representative of ambient noise in the pristine (undisturbed) environment. In other words, existing noise levels reported for R7 do not include the influence of anthropogenic noise sources. Noise from sporadic helicopter flyovers was observed at R7, but data samples contaminated by helicopter flyovers were removed from the analysis and not included when calculating daytime and nighttime existing noise levels at R7. Vehicular traffic on the haul road was inaudible at R7 for the duration of the field survey and had no material influence on the measured noise levels.

Ambient noise levels measured at R7, R8, and R9 are representative of existing conditions in the LSA/RSA. As such, the noise levels measured at these monitoring locations were averaged and used to represent existing ambient noise levels for the Expansion Project noise and vibration assessment. Table 4.4-1 presents the average of noise levels measured at R7, R8, and R9, which were used to represent existing ambient noise levels in the Expansion Project noise and vibration assessment.

Table 4.4-1: Representative Existing Ambient Noise Levels

Area of Applicability	Existing Ambient Noise Levels [dBA]		Existing Ambient Noise Levels [dBC]	
	Daytime	Nighttime	Daytime	Nighttime
LSA and RSA	30	30	45	46

dBA = A-weighted decibel; dBC = C-weighted decibel

4.4.3 Potential Expansion Project-related Effects Assessment

Pathway analysis is provided in Section 3.5 of the FEIS Addendum. Primary pathways that require further effects analysis to determine the environmental significance from the Expansion Project are provided below. Pathways determined to have no linkage or those that are considered secondary are not predicted to result in environmentally significant effects. No linkage and secondary pathways and are provided in Volume 3, Appendix 3-C, Table 3-C-1.

The following primary pathways were identified for the Expansion Project noise and vibration assessment:

- Surface and Underground Operations:
  - noise emissions from mining equipment can increase ambient noise levels;
  - blasting can result in ground vibration and increase ambient noise levels;
- Haul Road Operations:
  - noise emissions from vehicles on the haul road can increase ambient noise levels;
- Haul Road Widening:
  - noise emissions from construction equipment can increase ambient noise levels;
  - blasting can result in ground vibration and increase ambient noise levels.

These are the same three noise and vibration pathways identified in the Approved Project (FEIS Volume 4, Section 4.4.3).

The assessment methodologies and limits set out in AER Directive 038 are based on cumulative noise levels (i.e., Approved Project and Expansion Project noise levels combined with existing ambient noise levels). As such, the potential Expansion Project noise effects assessment presented in Section 4.4.3 includes the cumulative effects assessment. To be clear, the noise assessment for the FEIS Addendum modelled the Approved Project and the Expansion Project in combination. In the noise assessment, there is no distinction made between equipment/activities associated with Approved Project mining operations and Expansion Project mining operations.

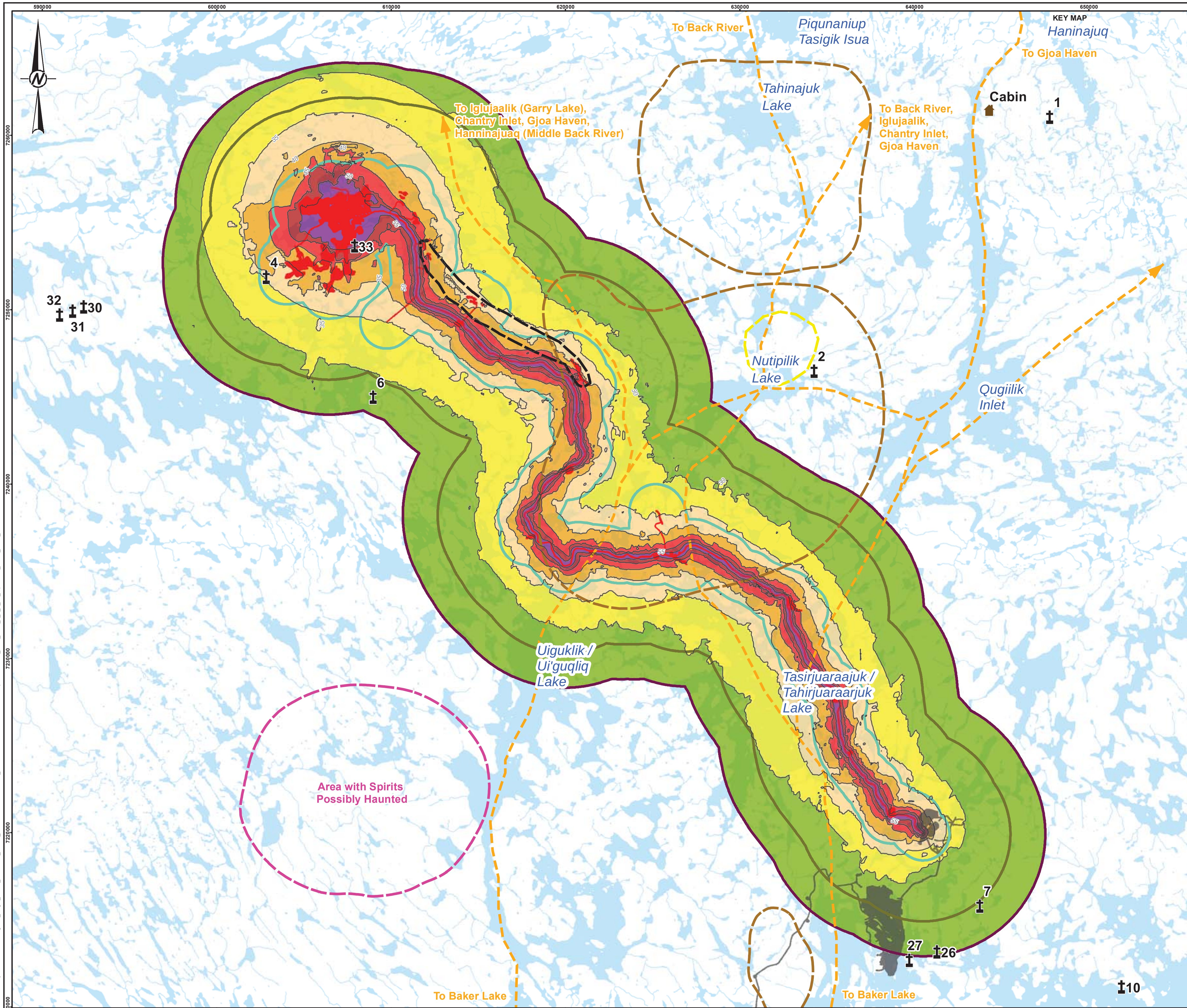
4.4.3.1 Whale Tail Pit Expansion and Underground Operations

4.4.3.1.1 Conventional Noise Sources

Potential noise impacts from Approved and Expansion Project pit and underground operations were assessed in effectively the same way as Approved Project pit operations. Noise levels from Approved and Expansion Project pit and underground operations were predicted using the ISO 9613-2 technical standard (ISO 1996) and compared to Permissible Sound Level (PSL) limits and Low Frequency Noise (LFN) criteria from AER Directive 038. The noise model for Approved and Expansion Project pit and underground operations reflects mining activities during the year 2022, which is planned to be the year of highest production for the Approved and Expansion Project (Volume 4, Appendix 4-E). Noise sources modelled for Approved and Expansion Project pit and underground operations include surface mining equipment in the Whale Tail and IVR pits, ventilation fans for underground mining activities, dewatering pumps, power plants at the worker camp and ramp portal, ore crushing equipment, water treatment plant, building heaters, incinerator, and the haul road.

To address concerns raised during the NIRB process for the Approved Project, the model of Approved and Expansion Project pit and Underground operations incorporated terrain elevation data into the prediction algorithm and the model predicted noise levels for a grid of receptors that covered the entire RSA, including cultural and spiritual sites that were used in the past.

As shown in Figure 4.4-1 and Figure 4.4-2, noise levels from Approved and Expansion Project pit and underground operations are predicted to be less than 30 dBA at the RSA boundary for both summertime and wintertime propagation conditions, which is less than the existing ambient noise level (Table 4.4-1) at the boundary of the RSA. Similarly, for all periods, Approved and Expansion Project pit and underground operations noise levels are predicted to be less than 35 dBA for all locations on the LSA boundary.



KEY MAP

LEGEND

- CABIN
- GRAVE SITE
- WHALE TAIL EXPANSION PROJECT FOOTPRINT
- INFRASTRUCTURE/ALL WEATHER ROAD
- NOISE LSA
- NOISE RSA
- 1.5KM BUFFER ON WHALE TAIL EXPANSION PROJECT FOOTPRINT
- POTENTIAL ARCHAEOLOGICAL SITE
- CAMPING AREA
- CACHING AREA
- SPIRITS AND HAUNTED AREA
- WINTER TRAVEL ROUTE
- WATERCOURSE
- WATERBODY

ENERGY EQUIVALENT SOUND LEVEL (L_{eq}) (dBA)

- <30
- 30-35
- 35-40
- 40-45
- 45-50
- 50-55
- >55

0 5 10
KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 14N

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

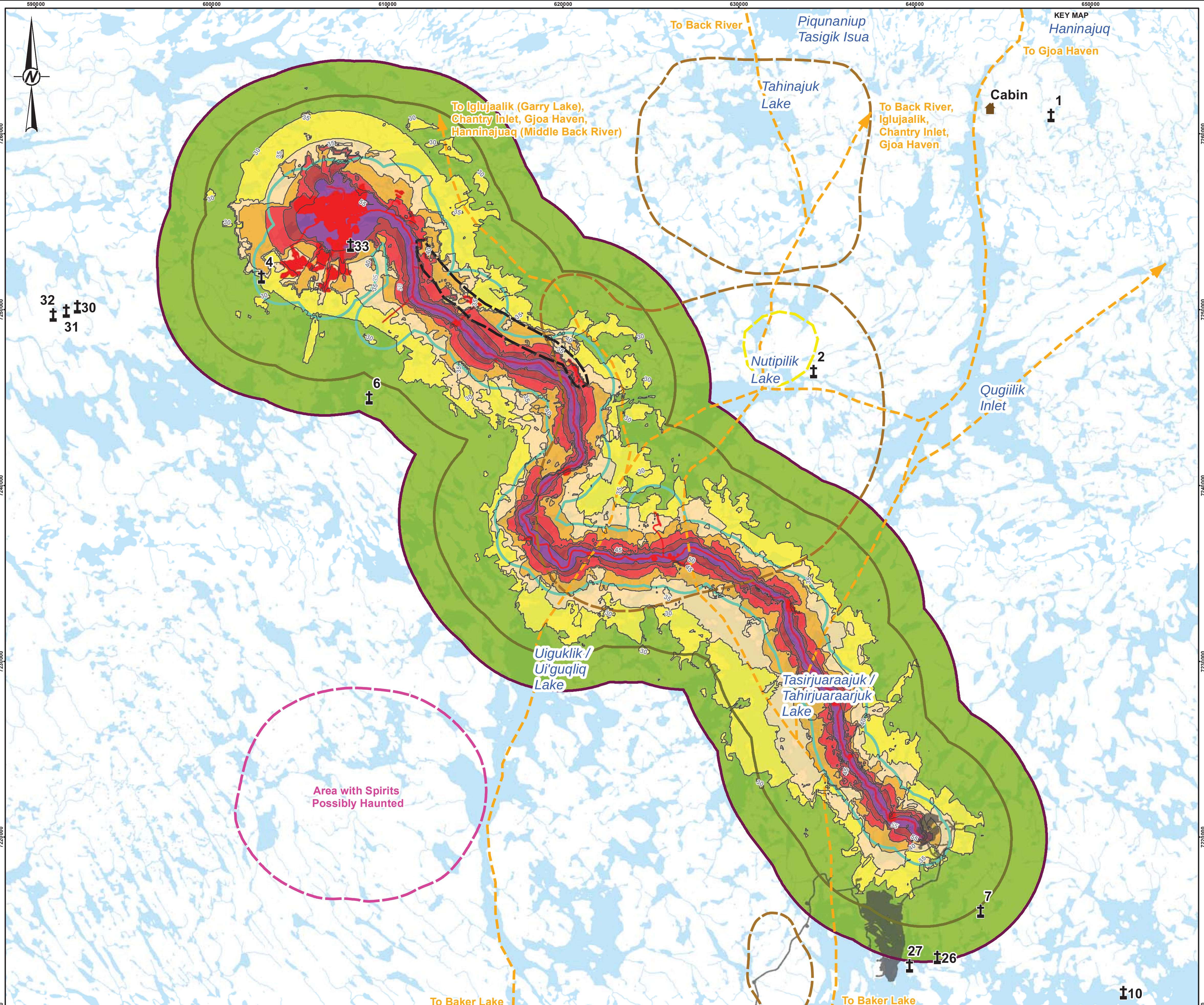
PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
SURFACE AND UNDERGROUND OPERATIONS NOISE LEVEL PREDICTIONS: SUMMER

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-09
DESIGNED	VY
PREPARED	MH
REVIEWED	VY
APPROVED	AF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	4200/4205	0	4.4-1



LEGEND

- CABIN
- GRAVE SITE
- WHALE TAIL EXPANSION PROJECT FOOTPRINT
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- CACHING AREA
- SPIRITS AND HAUNTED AREA AREA
- WINTER TRAVEL ROUTE
- WATERCOURSE
- WATERBODY

ENERGY EQUIVALENT SOUND LEVEL (L_{eq}) (dBA)

- <30
- 30-35
- 35-40
- 40-45
- 45-50
- 50-55
- >55

0 5 10
KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
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COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 14N

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
SURFACE AND UNDERGROUND OPERATIONS NOISE LEVEL PREDICTIONS: WINTER

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-09
DESIGNED	VY
PREPARED	MH
REVIEWED	VY
APPROVED	AF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	4200/4205	0	4.4-2

To assess potential Approved and Expansion Project noise effects using PSL values, cumulative noise levels associated with pit and underground operations were calculated by summing predicted Approved and Expansion Project noise levels with existing ambient noise levels (Volume 4, Appendix 4-E).

For conservatism, the PSL assessment was focused on that point on the LSA boundary with maximum predicted Approved and Expansion Project noise level (i.e., Rmax) and is presented in Table 4.4-2. At Rmax, cumulative noise levels for Approved and Expansion Project pit and underground operations are predicted to be the same as cumulative noise levels for Approved Project pit operations, and the Expansion Project will not increase cumulative noise beyond levels associated with Approved Project pit operations. The Approved and Expansion Project is predicted to comply with the AER Directive 038 PSL limit everywhere along the LSA boundary.

Table 4.4-2: Pit and Underground Operations - Permissible Sound Level Assessment

Assessment Location	Project Phase / Period	Existing Ambient Noise Level [dBA]	Pit Operations Project Noise Level [dBA]	Pit Operations Cumulative Noise Level[a] [dBA]	Permissible Sound Level [dBA]
Rmax – point on LSA boundary with maximum predicted Project noise level	Approved Project / Summertime / Daytime	30	33	35	50
	Approved Project / Summertime / Nighttime	30	33	35	40
	Approved Project / Wintertime / Daytime	30	34	35	55
	Approved Project / Wintertime / Nighttime	30	34	35	45
	Approved and Expansion Project / Summertime / Daytime	30	34	35	50
	Approved and Expansion Project / Summertime / Nighttime	30	34	35	40
	Approved and Expansion Project / Wintertime / Daytime	30	33	35	55
	Approved and Expansion Project / Wintertime / Nighttime	30	33	35	45

a Calculated as the logarithmic sum of the existing ambient noise level and the Pit Operations Project noise level.
Rmax = maximum predicted Project noise level; dBA = A-weighted decibel.

The LFN test from AER Directive 038 consists of two conditions that must both be satisfied for an LFN effect to exist. The first condition is that the difference between dBC and dBA noise levels is greater than or equal to 20. The second condition is the presence of a clear tonal component at a frequency below 250 Hz.

The difference between dBC and dBA cumulative noise levels at Rmax is predicted to be less than 20 for Approved Project pit operations and equal to 20 for the Approved and Expansion Project (Table 4.4-3). Based on the first LFN condition set out in AER Directive 038, this result suggests there will be a potential LFN effect for Approved and Expansion Project pit and underground operations.

Table 4.4-3: Pit and Underground Operations – Low Frequency Noise Assessment

Assessment Location	Project Phase / Period	Existing Ambient Noise Level [dBC]	Whale Tail Pit Operations Project Noise Level [dBC]	Whale Tail Pit Operations Cumulative Noise Level [dBC]	Whale Tail Pit Operations Cumulative Noise Level [dBA]	Difference: dBC minus dBA
Rmax – point on LSA boundary with maximum predicted Project noise level	Approved Project / Summertime / Daytime	45	53	54	35	19
	Approved Project / Summertime / Nighttime	46	53	54	35	19
	Approved Project / Wintertime / Daytime	45	53	54	35	19
	Approved Project / Wintertime / Nighttime	46	53	54	35	19
	Approved and Expansion Project / Summertime / Daytime	45	54	55	35	20
	Approved and Expansion Project / Summertime / Nighttime	46	54	55	35	20
	Approved and Expansion Project / Wintertime / Daytime	45	54	55	35	20
	Approved and Expansion Project / Wintertime / Nighttime	46	54	55	35	20

Rmax = maximum predicted Project noise level; dBC = C-weighted decibel; dBA = A-weighted decibel.

Tonal components are sometimes observed in noise emissions from equipment that operates in a highly periodic manner (e.g., cooling fans) but it is very unusual to observe tonal components in noise emissions from mining equipment, and even more unusual to observe tonal components in cumulative noise levels resulting from the combined contribution of multiple pieces of mining equipment. As such, it is very unlikely that noise levels from Approved and Expansion Project pit and underground operations will satisfy the second LFN condition from AER Directive 038, and equally unlikely that an LFN effect will exist for Approved and Expansion Project pit and underground operations, notwithstanding noise levels are predicted to satisfy the first LFN condition.

While it is not appropriate to compare directly measured Meadowbank Mine noise levels and the model-predicted Approved and Expansion Project noise levels, due to the day to day variability in measured noise levels from changes in local meteorological conditions (i.e., wind speed and direction), and differences in mining equipment and activities at the two sites, a high-level general comparison is instructive. In general, the noise levels that have been measured at Meadowbank in the last three years (i.e., 2015, 2016, and 2017 annual reports) are consistent with the model-predicted Approved and Expansion Project noise levels, taking into account the conservatism inherent in computer modelling (i.e., using downwind receptors 100% of the time). The Approved and Expansion Project model predictions are, generally-speaking, close to but slightly higher than the measured Meadowbank noise levels.

4.4.3.1.2 Blasting Noise and Vibration Sources

In the absence of Nunavut-specific regulatory guidance, noise and vibration from blasting activities associated with Approved and Expansion Project pit and underground operations were assessed in accordance with methods and limits described in the MECP *Noise Pollution Control Publication 119* (MECP 1978) – hereafter referred to as NPC-119 – and in the DFO *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (DFO 1998). Ground vibration levels and airborne noise levels associated with blasting were predicted using empirical formulae (ISEE 1998; DFO 1998) and were compared to limits set out in NPC-119 and the DFO guidance document.

Peak Particle Velocity and PPL were predicted for locations up to 15 km from the blasting activity consistent with the methods used for the Approved Project (Table 4.4-4). Both PPV and PPL values were calculated using empirical formulae discussed in detail in Volume 4, Appendix 4-E (ISEE 1998).

Table 4.4-4: Approved and Expansion Project Pit Operations – Blasting Noise and Vibration Predictions

Distance from Blast [m]	Peak Particle Velocity – Ground Vibration [mm/s]	Peak Pressure Level – Airborne Noise [dBZ]
100	504	142
200	166	136
500	38	127
1000	13	120 – NPC-119 limit[a,c]
1150	10 – NPC-119 limit[a,b]	119
1500	7	117
2000	4	114
4000	1	107
5000 – LSA boundary	1	105
6000	1	103
8000	0	101
10000	0	98
15000	0	95

[a] MECP (1978)

[b] The NPC-119 PPV limit is the maximum ground vibration level considered acceptable by the guideline. The results in this table show that PPV values are predicted to decay to below the NPC-119 limit for distances greater than 1150 m from pit operations blasting activities.

[c] The NPC-119 PPL limit is the maximum airborne noise level considered acceptable by the guideline. The results in this table show that PPL values are predicted to decay to below the NPC-119 limit for distances greater than 1000 m from pit operations blasting activities.

LSA = local study area; m = metre; mm/s = millimetres per second; dBZ = unweighted or linear decibels; PPL = Peak Pressure Level; PPV = Peak Particle Velocity.

The PPV results indicate that ground vibration associated with blasting as will decay to the 10 mm/s limit established in NPC-119 (MECP 1978) within 1,150 m of the blasting source and that PPV ground vibration will decay to 1 mm/s at the LSA boundary (Table 4.4-4), and therefore well below the NPC-119 limit.

Recent blast monitoring at the Vault Pit suggests that the empirical formula used to predict PPV ground vibration levels is highly conservative (Agnico Eagle 2014b) as it tends to overestimate PPV levels. Refer to Section 4.4.3.2.2 of the Approved Project FEIS.

Airborne noise associated with blasting will decay to the 120 dBZ limit established in NCP-119 (MECP 1978) within 1,000 m of the blasting source and that PPL airborne noise will decay to 105 dBZ at the LSA boundary (Table 4.4-4), and therefore well below the NPC-119 limit.

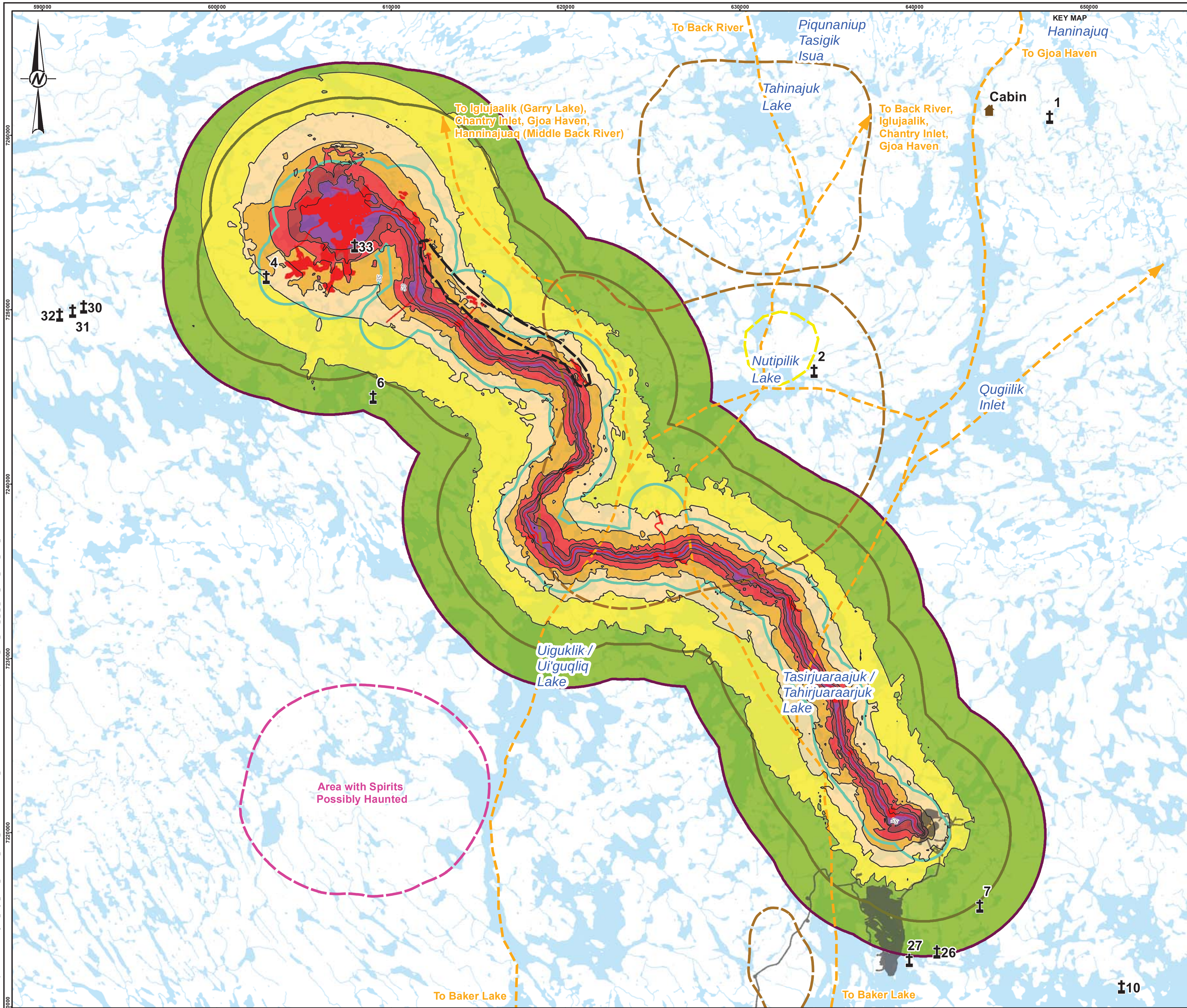
The setback distance from Approved and Expansion Project pit and underground operations blasting activities required to achieve compliance with DFO PPL limits for the protection of fish habitat is predicted to be 148 m. The setback distance from Approved and Expansion Project pit and underground operations blasting activities required to achieve compliance with DFO PPV limits for the protection of spawning beds during the period of egg incubation is predicted to be 700 m. Both setback distances were calculated using empirical formulae from the DFO guidance document (DFO 1998), (Volume 4, Appendix 4-E). Consistent with the Approved Project, blasting will be carefully managed and monitored in the context of DFO limits and appropriate setbacks will be established.

4.4.3.2 Haul Road Operations

The composition and volume of haul road traffic is not expected to change as a result of the Expansion Project. Notwithstanding, noise levels from haul road operations were remodelled based on concerns raised related to modelling within a spatial context (see IR *"HC_4"*). Haul traffic for the Approved and Expansion Project was modelled along the full length of the haul road, local terrain data was incorporated into the modelling prediction algorithm, and both noise from the open pit and underground operations were cumulatively modelled.

Approved and Expansion Project noise levels from haul road operations are predicted to be less than 30 dBA at the RSA boundary for both summertime and wintertime propagation conditions (Figures 4.4-3 and 4.4-4, respectively). Approved and Expansion Project noise levels from haul road operations are predicted to be less than the existing ambient noise level (see Table 4.4-5) at the boundary of the RSA and less than 35 dBA at the boundary of the LSA.

For conservatism, the PSL assessment was focused on the Rmax (Table 4.4-5). The difference in predicted haul road noise levels for the Approved Project and the combined Approved and Expansion Project results entirely from changes to the noise modelling approach as there is no difference in haul road traffic.



KEY MAP

LEGEND

- CABIN
- GRAVE SITE
- WHALE TAIL EXPANSION PROJECT FOOTPRINT
- INFRASTRUCTURE/ALL WEATHER ROAD
- NOISE LSA
- NOISE RSA
- 1.5KM BUFFER ON WHALE TAIL EXPANSION PROJECT FOOTPRINT
- POTENTIAL ARCHAEOLOGICAL SITE
- CAMPING AREA
- CACHING AREA
- SPIRITS AND HAUNTED AREA
- WINTER TRAVEL ROUTE
- WATERCOURSE
- WATERBODY

ENERGY EQUIVALENT SOUND LEVEL (L_{eq})
(dBA)

- <30
- 30-35
- 35-40
- 40-45
- 45-50
- 50-55
- >55

0 5 10
KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 14N

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

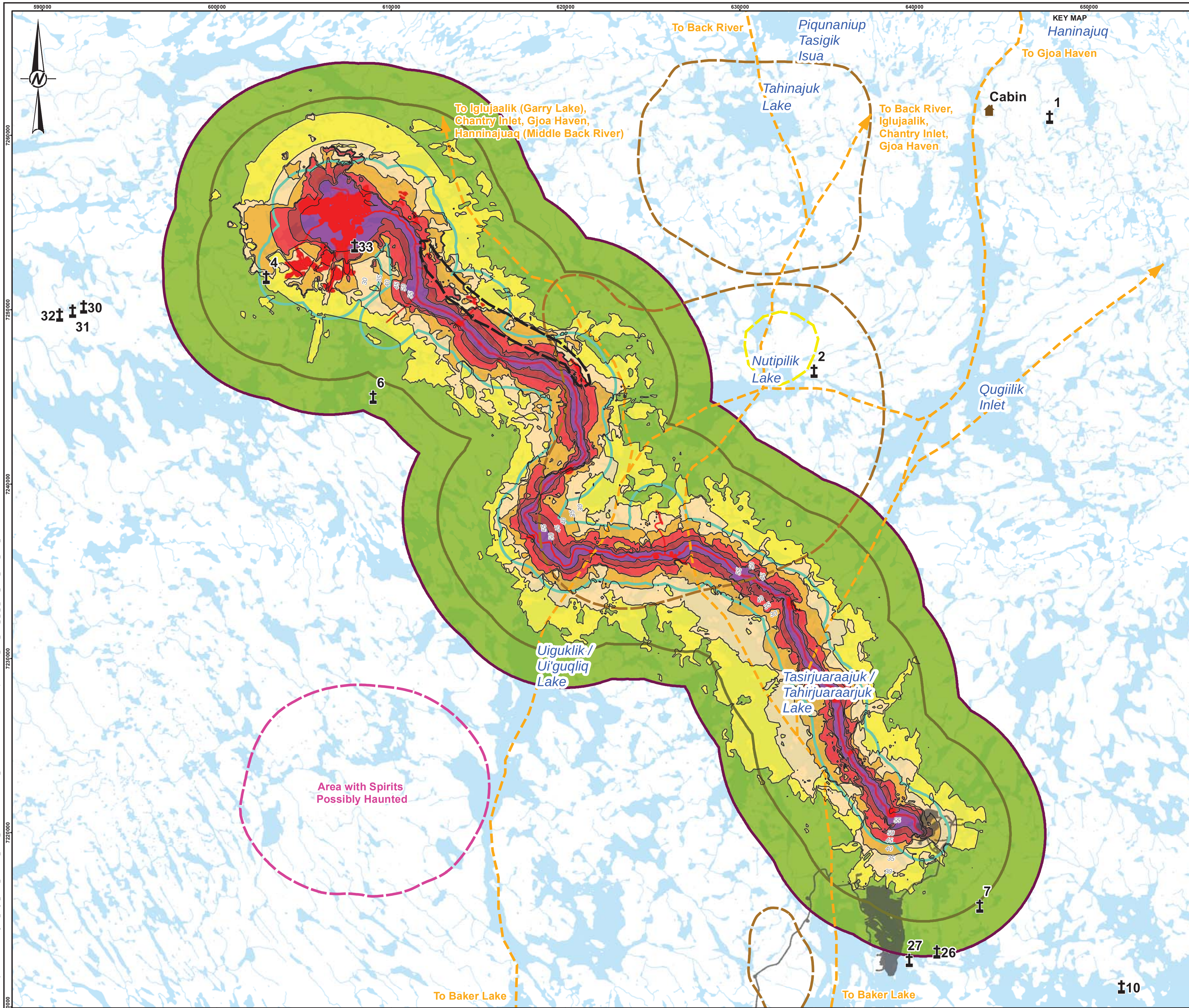
PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
HAUL ROAD WIDENING PLUS
SURFACE AND UNDERGROUND OPERATIONS
NOISE LEVEL PREDICTIONS: SUMMER

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-09
DESIGNED	VY
PREPARED	MH
REVIEWED	VY
APPROVED	AF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	4200/4205	0	4.4-3



KEY MAP

LEGEND

- CABIN
- GRAVE SITE
- WHALE TAIL EXPANSION PROJECT FOOTPRINT
- INFRASTRUCTURE/ALL WEATHER ROAD
- NOISE LSA
- NOISE RSA
- 1.5KM BUFFER ON WHALE TAIL EXPANSION PROJECT FOOTPRINT
- POTENTIAL ARCHAEOLOGICAL SITE
- CAMPING AREA
- CACHING AREA
- SPIRITS AND HAUNTED AREA
- WINTER TRAVEL ROUTE
- WATERCOURSE
- WATERBODY

ENERGY EQUIVALENT SOUND LEVEL (L_{eq}) (dBA)

- <30
- 30-35
- 35-40
- 40-45
- 45-50
- 50-55
- >55

0 5 10
KILOMETRES

REFERENCE(S)
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COORDINATE SYSTEM: NAD 1983 CSRS UTM ZONE 14N

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
HAUL ROAD WIDENING PLUS SURFACE AND UNDERGROUND OPERATIONS NOISE LEVEL PREDICTION: WINTER

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-09
DESIGNED	VY
PREPARED	MH
REVIEWED	VY
APPROVED	AF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	4200/4205	0	4.4-4

Table 4.4-5: Haul Road Operations - Permissible Sound Level Assessment

Assessment Location	Project Phase / Period	Existing Ambient Noise Level [dBA]	Haul Road Operations Project Noise Level [dBA]	Haul Road Operations Cumulative Noise Level[a] [dBA]	Permissible Sound Level [dBA]
Rmax – point on LSA boundary with maximum predicted Project noise level	Approved Project / Summertime / Daytime	30	28	32	50
	Approved Project / Summertime / Nighttime	30	28	32	40
	Approved Project / Wintertime / Daytime	30	31	34	55
	Approved Project / Wintertime / Nighttime	30	31	34	45
	Approved and Expansion Project / Summertime / Daytime	30	30	33	50
	Approved and Expansion Project / Summertime / Nighttime	30	30	33	40
	Approved and Expansion Project / Wintertime / Daytime	30	32	34	55
	Approved and Expansion Project / Wintertime / Daytime	30	32	34	45

Note: Cumulative noise levels for the Approved Project were taken directly from the Approved Project (FEIS Volume 4, Table 4.4-11).
[a] Calculated as the logarithmic sum of the existing ambient noise level and the haul road operations noise level.
Rmax = maximum predicted Project noise level; LSA = local study area; dBA = A-weighted decibel.

For both summertime and wintertime haul road operations, Approved and Expansion Project cumulative noise levels on the LSA boundary are predicted to be less than the applicable PSL values (Table 4.4-5) and the Approved and Expansion Project haul road operations are predicted to comply with the AER Directive 038 PSL limit everywhere along the LSA boundary.

The potential for LFN effects was assessed by comparing predicted noise levels expressed in dBC and dBA. The LFN assessment was focused on Rmax (Volume 4, Appendix 4-E).

The difference between dBC and dBA cumulative noise levels is predicted to be less than 20 at Rmax (Table 4.4-6). Based on the first LFN condition set out in AER Directive 038, this result suggests that there will be no LFN effect along the LSA boundary for the Approved and Expansion Project haul road operations.

Table 4.4-6: Haul Road Operations – Low Frequency Noise Assessment

Assessment Location	Project Phase Period	Existing Ambient Noise Level [dBC]	Haul Road Operations Project Noise Level [dBC]	Haul Road Operations Cumulative Noise Level [dBC]	Haul Road Operations Cumulative Noise Level [dBA]	Difference: dBC minus dBA
Rmax – point on LSA boundary with maximum predicted Project noise level	Approved Project / Summertime / Daytime	45	49	50	32	18
	Approved Project / Summertime / Nighttime	46	49	51	32	19
	Approved Project / Wintertime / Daytime	45	50	51	34	17
	Approved Project / Wintertime / Nighttime	46	50	51	34	17
	Approved and Expansion Project / Summertime / Daytime	45	51	52	33	19
	Approved and Expansion Project / Summertime / Nighttime	46	51	52	33	19
	Approved and Expansion Project / Wintertime / Daytime	45	52	53	34	19
	Approved and Expansion Project / Wintertime / Daytime	46	52	53	34	19

Rmax = maximum predicted Project noise level; LSA = local study area; dBA = A-weighted decibel; dBC = C-weighted decibel.

4.4.3.3 Haul Road Widening

4.4.3.3.1 Conventional Noise Sources

As part of the Expansion Project, the width of the haul road will be increased from 9.5 to 15 m. Noise levels from haul road widening were predicted using the ISO 9613-2 technical standard (ISO 1996). Because activities associated with haul road widening will take place at the same time as haul road operations, noise predictions for haul road widening were summed with noise predictions for Approved and Expansion Project haul road operations, and the resulting cumulative noise levels were compared to PSL limits and LFN criteria from AER Directive 038.

Haul road widening activities were modelled at four representative locations along the haul road (see IR HC_4). The four modelling locations were selected to show representative cumulative noise levels (i.e., widening plus haul road operations) along the full length of the haul road, from Whale Tail in the north to Meadowbank in the south. Noise levels from haul road widening were predicted for a grid of receptors that covered the entire RSA, including cultural and spiritual sites that were used in the past.

At the RSA boundary, noise levels from haul road widening (in combination with Approved and Expansion Project haul road operations) are predicted to be less than 30 dBA, the existing ambient noise level (Table 4.4-1 and Figures 4.4-3 and 4.4-4). This is the case for both summertime and wintertime propagation conditions. Similarly, for all periods, noise levels from haul road widening (in combination with Approved and Expansion Project haul road operations) are predicted to be less than 35 dBA at the LSA boundary. For conservatism, the PSL assessment was focused on the Rmax (Table 4.4-7).

Table 4.4-7: Haul Road Widening – Permissible Sound Level Assessment

Assessment Location	Activity / Period	Existing Ambient Noise Level [dBA]	Approved and Expansion Project Noise Level[a] [dBA]	Approved and Expansion Project Cumulative Noise Level[b] [dBA]	Permissible Sound Level [dBA]
Rmax – point on LSA boundary with maximum predicted Project noise level	Haul Road Widening / Summertime / Daytime	30	30	33	50
	Haul Road Widening / Summertime / Nighttime	30	30	33	40
	Haul Road Widening / Wintertime / Daytime	30	32	34	55
	Haul Road Widening / Wintertime / Nighttime	30	32	34	45

[a] Calculated as the logarithmic sum of predicted noise levels for haul road widening activities and Approved and Expansion Project haul road operations.

[b] Calculated as the logarithmic sum of the existing ambient noise level and the Approved and Expansion Project combined noise level.

dBA = A-weighted decibel; LSA = local study area; Rmax = point with maximum predicted Project noise level.

For both summertime and wintertime haul road widening activities, Approved and Expansion Project cumulative noise levels are predicted to comply with the AER Directive 038 PSL limit everywhere along the LSA boundary (Table 4.4-8).

The potential for LFN effects was assessed by comparing predicted noise levels expressed in dBC and dBA (Volume 4, Appendix 4-E). The LFN assessment was focused on that point on the Rmax (Table 4.4-8).

Table 4.4-8: Haul Road Widening – Low Frequency Noise Assessment

Assessment Location	Activity / Period	Existing Ambient Noise Level [dBC]	Approved and Expansion Project Noise Level[a] [dBC]	Approved and Expansion Project Cumulative Noise Level [dBC]	Approved and Expansion Project Cumulative Noise Level [dBA]	Difference: dBC minus dBA
Rmax – point on LSA boundary with maximum predicted Project noise level	Haul Road Widening / Summertime / Daytime	45	51	52	33	19
	Haul Road Widening / Summertime / Nighttime	46	51	52	33	19
	Haul Road Widening / Wintertime / Daytime	45	52	53	34	19
	Haul Road Widening / Wintertime / Nighttime	46	52	53	34	19

[a] Calculated as the logarithmic sum of predicted noise levels for haul road widening activities and Approved and Expansion Project haul road operations.
Rmax = maximum predicted Project noise level; dBA = A-weighted decibel; dBC = C-weighted decibel; LSA = local study area.

The difference between dBC and dBA cumulative noise levels is predicted to be less than 20 at Rmax for haul road widening activities (Table 4.4-8). Based on the first LFN condition set out in AER Directive 038, this result suggests that there will be no LFN effect along the LSA boundary.

4.4.3.3.2 Blasting Noise and Vibration Sources

Haul road widening for the Expansion Project will require blasting in a number of quarries. In the absence of Nunavut-specific regulatory guidance, noise and vibration from blasting activities associated with haul road widening were assessed in accordance with methods and limits described in NPC-119 (MECP 1978) and in the DFO guidance document (DFO 1998). In particular, ground vibration levels and airborne noise levels associated with blasting for haul road widening were predicted using empirical formulae (ISEE 1998; DFO 1998) and were compared to limits set out in NPC-119 and the DFO guidance document.

Both PPV and PPL values were calculated using empirical formulae discussed in detail in Volume 4, Appendix 4-E (ISEE 1998). The haul road widening blasting assessment was based on the assumption that up to 45 kg of explosives will be detonated simultaneously.

Ground vibration associated with blasting as part of haul road widening will decay to the 10 mm/s limit established in NPC-119 (MECP 1978) within 165 m of the blasting source and that PPV ground vibration will decay to below quantifiable levels at the LSA boundary (Table 4.4-9) and are therefore are predicted to be well below the NPC-119 limit.

Airborne noise associated with blasting as part of haul road widening will decay to the 120 dBZ limit established in NCP-119 (MECP 1978) within 300 m of the blasting source and that PPL airborne noise will decay to 93 dBZ at the LSA boundary (Table 4.4-9) and are therefore well below the NPC-119 limit.

Table 4.4-9: Haul Road Widening – Blasting Noise and Vibration Predictions

Distance from Blast [m]	Peak Particle Velocity – Ground Vibration [mm/s]	Peak Pressure Level – Airborne Noise [dBZ]
100	23	130
165	10 – NPC-119 limit[a,b]	125
200	8	123
300	4	120 – NPC-119 limit[a,c]
1000	1	108
5000 – LSA boundary	0	93
6000	0	91
8000	0	88
10000	0	86
15000	0	82

Note: table presents PPV and PPL predictions for locations up to 15 km from the blasting activity to address IRs from the Approved Project review.

[a] MECP (1978)

[b] The NPC-119 PPV limit is the maximum ground vibration level considered acceptable by the guideline. The results in this table show that PPV values are predicted to decay to below the NPC-119 limit for distances greater than 165 m from haul road construction and widening blasting activities.

[c] The NPC-119 PPL limit is the maximum airborne noise level considered acceptable by the guideline. The results in this table show that PPL values are predicted to decay to below the NPC-119 limit for distances greater than 300 m from haul road construction and widening blasting activities.

LSA = local study area; m = metre; mm/s = millimetres per second; dBZ = unweighted or linear decibels; PPL = Peak Pressure Level; PPV = Peak Particle Velocity.

The setback distance from haul road widening blasting activities required to achieve compliance with DFO PPL limits for the protection of fish habitat is predicted to be 22 m. The setback distance from haul road widening blasting activities required to achieve compliance with DFO PPV limits for the protection of spawning beds during the period of egg incubation is predicted to be 101 m. Both of these setback distances were calculated using empirical formulae from the DFO guidance document (DFO 1998) (Volume 4, Appendix 4-E). Consistent with the Approved Project, blasting will be carefully managed and monitored in the context of DFO limits and appropriate setbacks will be established.

4.4.4 Residual Impact Classification

Consistent with the Approved Project, although primary pathways have been identified for noise and vibration, no residual impact classification are made because noise and vibration does not have an assessment endpoint. Any potential effects associated with the primary pathways are captured in the assessment of potential effects to, and residual impact classifications for, other VCs (e.g., wildlife).

4.4.5 Cumulative Effects Assessment

The assessment methodologies and limits set out in AER Directive 038 are based on cumulative noise levels (i.e., Approved Project and Expansion Project noise levels combined with existing ambient noise levels). As such, the potential Expansion Project noise effects assessment presented in Section 4.4.3 includes the cumulative effects assessment. The noise level predictions and analysis presented in Table 4.4-2, Table 4.4-3, Table 4.4-5, Table 4.4-6, Table 4.4-7, and Table 4.4-8 include the contribution of existing ambient noise levels.

Because blasting is an extremely short-duration activity, the likelihood of cumulative effects from blasting activities (i.e., the temporal overlap of multiple blasting events occurring simultaneously) is small. As such, a cumulative effects assessment for blasting activities is not appropriate and was not conducted.

4.4.6 Uncertainty

According to the ISO 9613-2 standard, the overall accuracy of the propagation algorithm used in the Approved and Expansion Project models of conventional noise sources is plus or minus (±) 3 decibels (dB) for distances between source and receptor up to 1 km. The accuracy for propagation distances greater than 1 km is not stated in the ISO 9613-2 standard. Model accuracy also depends on the accuracy of the noise emissions inputs, which is often ±2 dB for measured sources and larger for emissions values calculated from acoustics handbooks or technical standards. Accounting for both these sources of uncertainty, the overall accuracy of the conventional noise level predictions presented in the Expansion Project noise and vibration assessment is expected to be ±3.6 dB, which is consistent with the uncertainty identified in the Approved Project noise and vibration assessment.

Conservative assumptions regarding the Expansion Project were made to account for the level of uncertainty inherent in the noise level predictions. Most importantly, all receptor points were assumed to be downwind from all sources 100% of the time. Because downwind conditions enhance noise propagation, this assumption tends to overestimate the noise effects of the Expansion Project. Furthermore, the noise sources associated with surface mining in the Whale Tail and IVR pits were all modelled at grade level to match their position at the beginning of mining operations. As mining progresses the depth of the open pit will increase, and the sides of the pit will provide screening for the noise sources inside. As such, modelling surface mining sources at grade level is conservative and will tend to overestimate noise effects for later years of Approved and Expansion Project operations.

The empirical formulae used to assess Approved and Expansion Project blasting have only one input, charge mass, and they do not account for specific ground conditions or atmospheric conditions in the LSA/RSA; therefore, there is substantial uncertainty associated with the specific predictions obtained using these formulae. Comparison with recent blast monitoring results from the Vault Pit suggest the empirical formulae used in the Expansion Project FEIS Addendum are highly conservative (Agnico Eagle 2014b) and, consequently, tend to overestimate noise and vibration levels associated with blasting. However, the empirical formulae are useful for conservatively gauging the likely magnitude of noise and vibration effects associated with Approved and Expansion Project blasting activities (i.e., they provide useful information about approximate setbacks required to achieve compliance with regulatory limits). As such, use of empirical formulae to assess blasting is appropriate in the context of a FEIS - particularly, in the case of this Expansion Project since there are no dwellings or other sensitive receptors at which specific values must be predicted.

4.4.7 Monitoring and Follow-up

Follow-up noise monitoring for the Approved Project and Expansion Project will be conducted in general accordance with the regular noise monitoring currently being conducted as part of the Noise Monitoring and Abatement Plan (Volume 8, Appendix 8-E.7).

The Noise Monitoring and Abatement Plan (Volume 8, Appendix 8-E.7) includes noise monitoring at receptors selected to characterize potential noise impacts from the Approved Project. In compliance with the Project

Certificate, Agnico Eagle's mitigation and monitoring plan undertakes measures to protect, mitigate, and monitor noise and vibration, including:

- Ensuring Worker health and safety (T&C #4);
- Minimizing sensory disturbance to humans and wildlife (T&C #5); and
- Development in consultation with Elders, GN, Health Canada (HC) and ECCC of a Noise Monitoring and Abatement Plan to protect people and wildlife from mine activity noise (Project Certificate No. 004, T&C #62).

Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NIRB. Agnico Eagle considers that existing terms and conditions of the Project Certificate issued for the Approved Project (No. 008) and the amended Project Certificate (No. 004) are sufficient to protect, mitigate and monitor noise impacts associated with the Expansion Project.

Any new required mitigation measures related to primary effects for the Expansion Project are described in relation to the predicted effects and summarized in pathway tables provided in Volume 3, Appendix 3-C.

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan.

5.0 TERRESTRIAL ENVIRONMENT

5.1 Introduction

Volume 5 focuses on geology and geochemistry, terrain, permafrost, and soils, vegetation, and terrestrial wildlife and birds. To support the review of the FEIS Addendum, Agnico Eagle has provided all appendices in the FEIS Addendum Application. It should be noted that historical baseline reports (Appendices 5-A, 5-B, 5-C, and 5-D) were reviewed and received conformity approval as part of the Approved Project FEIS submission (Agnico Eagle 2016c), and then final approval under Project Certificate No. 008. These baseline reports remain unchanged. Appendices 5-E and 5-F have been updated to address the Expansion Project.

5.1.1 Valued Components

The identification of VCs and factors considered in their selection are described in Section 3.4.1 of the FEIS Addendum. A summary of the terrestrial environment VCs and rationale for inclusion in the Expansion Project are provided in Table 5.1-1 and Table 5.1-2. While not defined as a VC, Expansion Project interactions with terrain and soil are included in this FEIS Addendum.

Table 5.1-1: Summary of Terrestrial Environment Valued Components

Valued Component	Rationale for Inclusion
Permafrost	• Permafrost is a VC. The Project is expected to affect existing permafrost conditions where excavations or landfilling will lead to changes in thermal ground conditions.
Vegetation (wildlife habitat)	• The Project is expected to affect existing vegetation (i.e., plant populations and communities, including communities with the potential for rare and traditional plants) through direct and indirect effects that may lead to changes in vegetation cover and species composition, which in turn can affect wildlife habitat quality and quantity. • Inuit Qaujimajatuqangit highlighted concerns about the sensitivity of wildlife species, specifically caribou and muskox, losses of vegetation habitat (habitat quantity) and changes in vegetation habitat quality (habitat quality) because of Project activities and dust deposition

Several wildlife VCs were selected to assess Project-related effects on the terrestrial wildlife and wildlife habitat (Cumberland 2005f; Table 5.1-2). Valued components were selected for the Approved Project based on discussions with stakeholders, public meetings, IQ, and experience with other mines in the north. These VCs were then confirmed to be appropriate for the Approved Project through an additional IQ study carried out in 2014 (Agnico Eagle 2014a). Factors considered when selecting wildlife VCs included the following criteria:

- biophysical components identified by NIRB during Approved Project scoping, Agnico Eagle community and stakeholder consultation;
- represent important ecosystem processes;
- territorially and federally listed species (COSEWIC 2016; GC 2018);
- communities or species that reflect the interests of regulatory agencies, traditional use, and communities;
- wildlife that can be measured or described with measurement endpoints and allow cumulative effects to be considered; and

- experience with EAs and effects monitoring programs in Nunavut.

Existing environment information for each VC is provided in the FEIS Addendum Section 5.5.2.

Table 5.1-2: Terrestrial Wildlife Valued Components and Rationale

Wildlife VC	Species Included	Rationale for Inclusion
Ungulates	Barren-ground caribou	Important subsistence, cultural, and economic species; migratory species with extensive range requirements; may be affected by disturbance during seasonal movements; primary prey species for large carnivores in northern environments
Ungulates	Muskox	Important subsistence, cultural, and economic species; prey species for large carnivores in northern environments
Predatory Mammals	Grizzly bear Wolverine Arctic wolf	Large home range size linked to caribou migrations; top predator in ecosystem; can be attracted to human disturbance; long generation time means one individual may be affected by disturbance over multiple years resulting in potential regional population effects; important subsistence and cultural species.
Raptors	Peregrine falcon Gyrfalcon Rough-legged hawk Short-eared owl Snowy owl	Sensitive to noise disturbance and human activity during nesting; includes peregrine falcon and short-eared owl (federal species at risk)
Water Birds	Common loon Red-throated loon Pacific loon Yellow-billed loon Canada goose Snow goose Long-tailed duck	Includes water birds, loons, and swans; water birds may be affected by loss of shoreline habitat for breeding; important staging habitat may also be lost; sensitive to noise disturbance and human activity; some species are important for subsistence; a number of species are listed as sensitive in Nunavut
Upland Birds	Lapland longspur Horned lark Savannah sparrow Rock ptarmigan Red-necked phalarope Semipalmated sandpiper	Includes a range of species that are abundant and sensitive to disturbance
Small Mammals	Arctic hare Arctic ground squirrel (sik sik) Collared lemming Northern red-backed vole	Small mammals are important prey species for raptors and predatory mammals

5.1.2 Spatial and Temporal Boundaries

5.1.2.1 Spatial Boundaries

5.1.2.1.1 Terrain, Permafrost, and Soils

This FEIS Addendum considers the same spatial boundaries as those defined for the Approved Project with an additional 132.3 ha mapped that covers the road corridors to Lake D1 and Lake D5. Most proposed activities associated with the Expansion Project fall within the previously assessed areas.

The terrain, permafrost, and soils LSA and RSA boundaries are consistent with those defined in the Approved Project (FEIS Volume 5, Section 5.1.3.1.1). The LSA is based on a 1.5 km buffer around the approved Whale Tail Pit operations, and a 500 m wide corridor centered on the haul road footprint (Volume 5, Appendix 5-A). The Approved Project footprint was 820.1 ha and with the additional 368.0 ha for the Expansion Project this results in a total project footprint of 1,188.1 ha. The additional 368.0 ha for the Expansion Project includes the additional areas mapped for the road corridors to Lake D1 and Lake D5.

A RSA was not identified for the assessment of potential effects to terrain and permafrost. The RSA for soil was defined as a 50 km buffer centred on the study area (i.e., 25 km radius around Whale Tail Pit site, and 25 km on either side of the road, esker borrow sites and esker borrow site access roads) and encompasses an area of 501,700 ha (5,017 km^2).

5.1.2.1.2 Vegetation and Wildlife

This FEIS Addendum considers the same spatial boundaries as those defined for the Approved Project. The proposed activities associated with the Expansion Project fall within the previously assessed areas.

The vegetation (wildlife habitat) LSA and RSA boundaries are consistent with those defined in the Approved Project (FEIS Volume 5, Section 5.1.3.1.2).

The terrestrial vegetation and wildlife LSA (FEIS Addendum Figure 3.2-2) was defined as a 3 km buffer circle around the Project facilities (i.e., 1.5 km from infrastructure) and covers an area of approximately 28,215 ha (282 km^2) (Volume 5, Appendix 5-C, Figure 2). The primary sources of impacts (e.g., direct effects) are expected to occur within the LSA.

The RSA was defined as a 50 km buffer centred on the study area (i.e., 25 km on either side of the road, esker borrow sites and esker borrow site access roads) and encompasses an area of 501,700 ha (5,017 km^2). This RSA is a similar size to those established along other mine roads (e.g., Meadowbank AWAR), and is intended to encompass all Project effects. The RSA includes both the haul road and part of the existing Meadowbank AWAR.

5.1.2.2 Temporal Boundaries

For the Approved Project, the temporal boundary for assessment of potential effects on the terrestrial environment, for construction, operations, and closure of the Project was a three to four-year LOM, with operations running from 2019 through 2022 and closure culminating in 2029 (FEIS Addendum Section 3.3).

The Expansion Project activities are to be initiated upon receipt of Project approvals. Construction activities are proposed from 2019 to 2020, operations from 2020 to 2025, and closure from 2026 to 2051, followed by post-closure from 2051.

5.2 Geology and Geochemistry

A summary of the key changes to the assessment of the geology and geochemistry component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 5.2-0.

Table 5.2-0: Geology and Geochemistry: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
5.2.1 Geology Baseline Environment	Review of • Cumberland (2003) • Agnico Eagle lithology summary provided by Agnico Eagle staff	Updated geochemistry baseline program (Volume 5, Appendix 5-E)
5.2.2 Geochemistry	Approved Project FEIS Volume 5, Appendix 5-E (Agnico Eagle 2016c)	Updated geochemistry baseline program (Volume 5, Appendix 5-E)

5.2.1 Geology Baseline Environment

The Amaruq property are underlain by Archean supra crustal rocks of the metamorphosed Woodburn Lake Group. These rocks are believed to have been deposited in a continental rift setting and include mafic to ultramafic and volcaniclastic rocks interlayered with clastic sedimentary units that include greywacke, siltstone, mudstone, banded iron formation, and chert. This rock sequence has been intruded by granitoid rocks and lamprophyres, and underwent multiple deformation events and metamorphism.

The geology of the Whale Tail deposit is described in more detail in the Geochemistry report (Volume 5, Appendix 5-E). There is some consistency between the main lithological units found at Meadowbank Mine (intermediate volcanic, iron formation, ultramafic, and quartzite) and those at the Whale Tail deposit, which include ultramafic komatiites, clastic sedimentary rocks, mafic volcanic rocks and felsic to intermediate intrusive rocks.

Three different mineralization styles are present at the Whale Tail deposit, with gold associated with pyrrhotite or arsenopyrite. Mineralization is hosted in the iron formation (as layers, lenses or disseminations), chert (as silica flooding), and throughout the entire rock sequence (as veins).

Overburden at the Amaruq property consists of shallow till overlying undulating bedrock with scattered outcrops and eskers as described in Volume 5, Appendix 5-A. Till is characterized as a massive matrix supported diamicton composed of pebbly silty sand with locally derived boulders. Glaciofluvial sediments are composed of coarsely stratified to finely laminated medium to coarse sand and gravel, and lacustrine sediments are composed of poorly stratified silty sand. The Expansion Project is located within the continuous permafrost zone.

5.2.2 Geochemistry

Waste Rock, Ore, Overburden, and Lake Sediments

A chemical characterization program investigated the geo-environmental properties of mine wastes that will be disturbed by mining, namely, waste rock and ore from Whale Tail Pit (Approved and Expansion Project), Underground (under Whale Tail Pit), and IVR Pit, tailings (Whale Tail Pit only), overburden (Whale Tail Pit only), and Whale Tail Lake sediments. Static geochemistry tests, mineralogy, and kinetic leaching tests were carried out to investigate the reactivity of these materials with respect to their potential to generate ARD and to release constituents (metal leaching) to the receiving environment.

Similar to the Approved Project, mineralization in the Whale Tail Pit expansion, IVR Pit, and Underground is low sulphur but the sulphur carries arsenic, which is enriched in all waste rock types. The geochemical properties of these units in the proposed Expansion areas are also similar, with IVR Pit intersecting a smaller number of lithologies; mostly basalts and komatiite while underground development rock is mostly diorite. The majority of the waste rock is NPAG with the exception of a few formations as discussed below. Arsenic, sulphur, and carbonate-buffering capacity are the parameters of environmental interest present in mining wastes.

The surficial overburden and lake sediment are NPAG. Overburden has low leachability (NML) but the fines portion of the material could be amenable to erosion and transport as suspended solids in contact water, which will be collected in contact water collection systems. Lake sediments are arsenic leaching (ML). All overburden and lake sediment will be managed permanently in a WRSF.

As for the Approved Project, but with slightly different lithological proportions, most of the waste rock lithologies to be disturbed by mining of the Whale Tail Pit, Underground, and IVR Pit are NPAG (79%) and include komatiite, iron formation, basalt, south greywacke and diorite. These units will not require means to control ARD.

PAG waste rock includes some komatiite and iron formation samples, as well as the chert and central greywacke units, while the north greywacke unit has a variable ARD potential. This unit occurs in all three mining zones evaluated to date. Testing is on-going to determine if this material is likely to go acid in the long-term. To date, longer-running and additional kinetic test results are consistent with findings for the Approved Project, suggesting that the PAG rock is not likely to generate ARD at site for decades if no ARD control mechanisms were put in place (Volume 5, Appendix 5-E, Section 4.7). This period of time is longer than the anticipated duration of mine construction and operations. ARD control mechanisms (a thermal cover of NPAG/NML waste rock) will nonetheless be implemented during mining operations. No PAG waste rock was encountered at IVR Pit; any rock having an uncertain or PAG designation will be managed as PAG rock. All PAG waste rock from Whale Tail Pit will be permanently managed in the Whale Tail WRSF.

Of the NPAG samples, the komatiite, basalt and iron formation units and some of the lake sediments leach arsenic at elevated concentrations in static and kinetic leaching tests relative to other NPAG and PAG lithologies (diorite and south greywacke). These elevated concentrations do not mean that water contacting this rock at site will necessarily exceed the effluent limits (Type A Water Licence 2AM-WTP1826) because conditions at site differ substantially from the aggressive leaching conditions of the laboratory tests. The arsenic is anticipated to be sourced from sulphide minerals including arsenical pyrite, arsenopyrite and trace amounts of arsenides (gersdorffite, nickeline) observed in komatiite and iron formation but with varying degree of exposure (i.e., some sulphides are locked in). As such, preventing oxidation is expected to minimize arsenic leaching. The amount or degree to which this could affect receiving water quality has been evaluated through water quality modelling for the Expansion Project and presented in Volume 6, Appendix 6-H.

During operation, Agnico Eagle will progressively cap the WRSFs with NML and NPAG material until closure. During operation, contact water will be collected, monitored, and treated as necessary before discharge to the receiving environment.

Based on results to date, a sulphur content of 0.1 wt% (percent by weight) is proposed as a preliminary cut-off criteria below which waste rock can be considered NPAG and an arsenic content of 75 ppm is proposed to evaluate potential arsenic leachability (Volume 6, Appendix 6-H). These will be verified during construction and operations in accordance with the updated Operational ARD-ML Sampling and Testing Plan (Volume 8; Appendix 8-E.5). This plan is submitted as required by Project Certificate No. 008 and Type A Water Licence 2AM-WTP1826.

The NPAG and NML waste rock will be identified during operations per the Operational ARD-ML Sampling and Testing Plan (Volume 8, Appendix 8-E.5) using rock composition-based segregation criteria (sulfur, sulfur to carbonate ratio and arsenic content), not lithological criteria, to avoid the risk of compositional variability in lithologies and lithological mixing in the mining block model which will be used for rock excavation.

NPAG/NML rock will either be used immediately for construction material or will be stockpiled in the NPAG pile temporarily and used as cover material for the Whale Tail WRSF or IVR WRSF. A sufficient tonnage of NPAG and low arsenic waste rock is identified to be available to cover these facilities based on tonnages of material available from NPAG and NML units, specifically the diorite and south greywacke (Volume 8, Appendix 8-A.1) which occur on the south side of the Whale Tail Pit, easily segregated from PAG and/or ML rock.

The approximate proportion of each geochemical category of rock is provided in the Table 5.2-1 by lithology, for comparison purposes. For Whale Tail Pit, there is no significant change in the proportion of each rock type based on tonnage compared to the Approved Project, though the total tonnage of waste rock has increased (Volume 8, Appendix 8-A.1 and Appendix 8-E.5).

Some of the ore samples leach elevated arsenic concentrations that are short-lived in the first cycles of kinetic leaching tests. No other parameter from ore samples is leached at elevated concentrations in kinetic testing. This material will be placed in temporary stockpiles at Whale Tail for transport to the Meadowbank Mill for processing.

For more information regarding evaluation of geochemical properties of waste rock, ore, tailings, overburden and sediment refer to Volume 5, Appendix 5-E.

Tailings

A chemical characterization program investigated the geo-environmental properties of five metallurgical samples (i.e., tailings). Samples included individual samples from three major ore zones to be targeted at the Whale Tail Pit, as well as two samples of composite material from these zones that were a representative blend of the ore to be produced over the LOM for Whale Tail Pit at the time of sampling. Tailings samples were analyzed by static (all five samples) and kinetic (two composite samples only) geochemical test methods. The process water was also analyzed.

The Whale Tail mineralization is low sulphur but the sulphur carries arsenic, which is enriched in tailings. Although arsenic is of interest in waste rock, it is not mobilized from the tailings solid phase at elevated concentrations.

Whole tailings are PAG. Based on kinetic weathering tests there is available buffering capacity from both carbonate minerals in tailings and from lime added in metallurgical processing to delay the onset of acidic conditions for up to approximately 15 years (under laboratory conditions) if continually exposed, although it is expected that the lime will be flushed more quickly than carbonate minerals. Prolonged exposure of tailings should be avoided because once the available buffering capacity is consumed, the tailings can start to oxidize and develop acidic conditions. Therefore, the tailings require oxidation control in the long-term, which is consistent with the current data and long-term closure strategy for the approved Meadowbank Mine TSF.

Table 5.2-1: Waste Materials and their Anticipated Reactivity, Proportion of Total Tonnage, and Waste Management

Material Type	Rock Name (Code)	Anticipated Reactivity		Whale Tail Pit		IVR Pit		Underground	
		ARD Potential	ML Potential	%Total Tonnage	Waste Management	% Total Tonnage	Waste Management	% Total Tonnage	Waste Management
Waste Rock by Lithology	North Basalt (V3-1a)[a]	No	Moderate	0%	PAG and/or ML: to Whale Tail WRSF NPAG/low leaching: construction use / NPAG stockpile	32%	PAG and/or ML: to IVR WRSF NPAG/low leaching: construction use / NPAG stockpile	0%	All waste rock will be stored temporarily in the Waste Rock Exploration Pad prior to backfill underground
	South Basalt (V3-1b)[b]	No	Moderate	11%		3%		5%	
	Iron Formation (S9E-S9D)	No	High	12%		0%		2%	
	North Komatiite (V4A-0a)	No	High	9%		12%		9%	
	South Komatiite (V4A-0b)	No	Moderate	17%		46%		3%	
	Chert (S10)[d]	Yes	Variable	11%		1%		13%	
	Central Greywacke (S3C)	Yes	Variable	5%		3%		1%	
	North Greywacke (S3N)[c]	Variable	Variable	9%		3%		0%	
	South Greywacke (S3S)	No	Low	15%	Construction use or NPAG stockpile	0%		2%	
	South Diorite (I2S)	No	Low	12%		0%		65%	
	Total Waste Rock			**100% (138 Mt)**		**100% (27.6 Mt)**		**100% (2.2 Mt)**	
Other Material	Overburden and Lake Sediments[e]	No	Variable	5% (7.6Mt)	To Whale Tail WRSF	11% (3.7 Mt)	To IVR WRSF	0%	-
	Ore	Yes	High	10% (16.8Mt)	Temporary Stockpile / Meadowbank Mill	8% (2.9 Mt)	Temporary Stockpile / Meadowbank Mill	63% (3.8 Mt)	Temporary Stockpile / Meadowbank Mill
	Tailings[f]	Yes		10%	Meadowbank TSF	8%	Meadowbank TSF	63%	Meadowbank TSF

Note: Individual tonnages may not sum to the total due to rounding.
[a] includes gabbro (I3A).
[b] includes lamprophyres (I4O).
[c] Includes S3Nb (near contact).
[d] Includes S10E, S10_mSi and S10_sSi.
[e] Tonnage of Lake Sediment is not available; it is grouped with the overburden in terms of tonnage and sample count.
[f] Tonnage of tailings material is not available and assumed to be the same as ore tonnage.

5.3 Terrain, Permafrost, and Soils

A summary of the key changes to the assessment of the terrain, permafrost, and soils component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 5.3-0.

Table 5.3-0: Terrain, Permafrost, and Soils: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
5.3.1 Incorporation of IQ	Review of: • Whale Tail IQ Baseline Report (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c); • Meadowbank Gold Project Baseline Traditional Knowledge Report (Cumberland 2005a); • Environmental Impact Statement (EIS) Guidelines for the Meadowbank Project (NIRB 2004); • Proposed All-weather Exploration Road from the Meadowbank Mine to the Project site-Baseline Traditional Knowledge Report (Agnico Eagle 2014a); and • Community Consultations/Public Information Meeting Summary Reports for 2014 and 2015 (NIRB 2014, 2015)	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type “A” Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board’s Hearing Regarding the Review of Agnico Eagle Mines Limited’s Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
5.3.2 Existing Environment and Baseline Information	• 2015 Terrain, Soils, and Permafrost baseline report • 2015 Permafrost and Hydrogeological Characterization	• 2017 Whale Tail Thermal Assessment (Golder 2017c) • 2018 Whale Tail Post-Closure Pit Lake Thermal Assessment (Golder 2018a) • 2018 Whale Tail Project Waste Rock Storage Facility Cover Thermal Assessment (Golder 2018b)
5.3.3 Potential Project-related Effects Assessment	Three primary pathways were identified	No new primary pathways identified; assessment completed to address new Project activities
5.3.4 Residual Impact Classification	No residual impact predictions are made because permafrost, terrain and soil do not have measurable endpoints.	Unchanged
5.3.5 Cumulative Effects Assessment	Localized to the Project, and will not interact with other disturbances regionally	Unchanged

Section of FEIS	Approved Project	Expansion Project
5.3.6 Uncertainty	Uncertainty was addressed in the assessment by being conservative in defining impacts, incorporating information from available and applicable literature, and using past experience in similar areas including the experience gained from the Meadowbank Mine.	Unchanged
5.3.7 Monitoring and Follow-up	Permafrost conditions will be continuously monitored and inspected during all phases of the Project to verify impact predictions and ensure the effectiveness of the design criteria through a variety of monitoring plans: • Mine Waste Rock Management Plan • Tailings Management Plan • Whale Tail Pit Haul Road Management Plan	Plan have been updated for the Expansion Project, refer to Volume 8, Table 8.2-1

5.3.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to terrain, permafrost, and soils were provided by community members and incorporated into the assessment which takes into account review of community consultation notes, NIRB and NWB (2017), NIRB (2017), and consultation notes for the Expansion Project (Agnico Eagle 2018a).

The following Project concerns have been raised by community members related to effects of the Project on terrain, permafrost, and soils:

- The area near the Whale Tail Pit Expansion Project is not commonly used for traditional land use activities.
- The depth of the pit, and concerns regarding the creation of a large hole in the ground which was considered unnatural (Agnico Eagle 2016g; 2016h).
- The depth of the Whale Tail Pit and potential impacts on the land if the pit is deeper than the permafrost (NIRB 2017).
- Preference to reduce the operational footprint as much as possible.

The concerns as they pertain to Expansion Project have been incorporated into Section 5.3.3.1 of the FEIS Addendum. For additional information refer to the Approved Project (FEIS Volume 5, Section 5.3.1).

5.3.1.1 Existing Environment and Baseline Information

This Expansion Project does not change IQ integration from the Approved Project. Historical IQ and the importance of landforms and terrain within the Project area were considered for the Approved Project FEIS Volume 7, Appendix 7-A and summarized in the Approved Project FEIS Volume 5, Section 5.3.1.1 (Agnico Eagle 2016c).

5.3.1.2 Valued Component Selection

There is no change to the selection of VCs for the Expansion Project. Refer to Section 5.1.1 of the FEIS Addendum.

5.3.1.3 Impact Assessment

This FEIS Addendum considers the potential effects assessed under the Approved Project. This assessment takes into account the concern raised by community members related to the depth of Whale Tail Pit and any potential impacts on the land if the pit is deeper than the permafrost (NIRB 2017).

5.3.1.4 Mitigation and Monitoring

During the consultation meetings in 2014 and 2015, Elders expressed concern for wolf dens located in eskers to be used as borrow sources. The Elders have requested that the esker areas be surveyed for den sites and signs of wolf prior to their being designated as borrow pits (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Elders also suggested that a local hunter who is familiar with the area should assist with the survey; therefore, the eskers were surveyed for dens in 2015 and a local hunter was involved with the survey. Results are provided in Volume 5, Appendix 5-C. Mitigation measures applicable to the direct loss of terrestrial habitat due to the excavation of open pits, construction of infrastructure, roads, etc. is discussed in the Terrestrial Ecosystem Management Plan (TEMP; Volume 8, Appendix 8-E.9). As outlined in the TEMP, Agnico Eagle has fulfilled its commitment to hiring local wildlife monitors and conduct surveys to address Elder’s requests. The mitigations for the Expansion Project included in this FEIS Addendum will be the same as those for the Approved Project.

5.3.2 Existing Environment and Baseline Information

The Terrain, Permafrost, and Soils Baseline Report (Volume 5, Appendix 5-A) describes the existing terrain, permafrost, and soils conditions in the Expansion Project area, including methods used to collect baseline data and to generate terrain and soil data and maps required to support the assessment of effects. Subsequent work completed by Golder (2017c, 2018a) is summarized below; otherwise no new information has been collected since the Approved Project was submitted in 2016. Given the expansion is within the same geographic area of the Approved Project, a brief summary of baseline conditions relevant is provided herein (FEIS Addendum Sections 5.3.2.2 through 5.3.2.4) that highlights the key information relevant to the Expansion Project.

5.3.2.1 Baseline Study Methods

The terrain, permafrost, and soil baseline study methods are described in detail in Volume 5, Appendix 5-A, Section 2.0.

5.3.2.2 Baseline Terrain

Table 5.3-1 provides a summary of surficial materials found within the LSA. This FEIS Addendum considers the same spatial boundaries as those defined for the Approved Project, with an additional 195.0 ha mapped to incorporate the road corridors to Lake D1 and Lake D5, and the quarries along the haul road. As such Table 5.3-1 now includes the surficial materials in the expanded LSA.

The properties of each surficial material crossed by the haul road are described in detail in Volume 5, Appendix 5-A.

Table 5.3-1: Summary of Surficial Materials in the Local Study Area

Surficial Material	Whale Tail Pit		Haul Road		Local Study Area		Expanded Local Study Area	
	Area (ha)	Percent (%)	Area (ha)	Percent (%)	Area (ha)	Percent (%)	Area (ha)	Percent (%)
Anthropogenic	0.0	0.0	25.0	0.8	25.0	0.2	0.0	0.0
Bedrock	232.2	3.0	115.1	3.6	347.3	3.2	0.0	0.0
Colluvium	13.5	0.2	1.8	0.1	15.2	0.1	0.0	0.0
Fluvial	2.9	<0.1	0.0	0.0	2.9	<0.1	42.9	22.0
Glaciofluvial	486.7	6.3	112.7	3.5	599.3	5.5	0.0	0.0
Lacustrine	0.0	0.0	4.7	0.1	4.7	<0.1	0.0	0.0
Organic	0.4	<0.1	4.7	0.2	5.1	<0.1	0.0	0.0
Till	5,457.3	70.7	2,703.9	85.0	8,161.2	74.8	115.8	59.4
Waterbody	1,529.5	19.8	214.0	6.7	1,743.5	16.0	36.3	18.6
Total	**7,722.4**	**100.0**	**3,181.8**	**100.0**	**10,904.2**	**100.0**	**195.0**	**100.0**

Note: Numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. Expanded LSA refers to the additional area mapped to incorporate road corridors to Lake D1 and Lake D5, and the quarries along the haul road.

ha = hectare; % = percent; < = less than.

5.3.2.3 Baseline Permafrost

As described in the Approved Project (FEIS Volume 5, Section 5.3.2.3), the Expansion Project is found within the zone of continuous permafrost as defined by Heginbottom et al. (1995), meaning that permafrost is found underlying 90 to 100% of the landscape. Heginbottom et al. (1995) suggest that the permafrost in the Canadian Shield extends to depths of more than 500 m in the northern Ungava Peninsula, Somerset Island and Bathurst Inlet, and decreases in thickness to about 60 m in the Churchill, Manitoba area, which lies south of the southern limit of continuous permafrost.

The depth of permafrost in the Expansion Project LSA is estimated to be 450 to 550 m depending on proximity to lakes, similar to that estimated for the Meadowbank Mine (Cumberland 2005c). Permafrost and hydrogeological characterization work by Knight Piésold (Approved Project FEIS Volume 6, Appendix 6-A, Attachment A; Agnico Eagle 2016c) around Whale Tail Lake suggests permafrost is estimated to be approximately 425 m deep. A talik is expected in the central section of Whale Tail Lake and the talik is likely underlain by permafrost in the shallower and narrower parts the lake (Approved Project FEIS Volume 6, Appendix 6-A, Attachment A; Agnico Eagle 2016c). Detailed descriptions of periglacial processes are provided in Volume 5, Appendix 5-A.

Subsequent thermal analysis of Whale Tail Lake completed by Golder (2018a) in support of the Approved Project and the Expansion Project, suggests the permafrost may be up to 495 m deep in areas away from deep lakes. Analytical calculation and numerical modelling by Golder (2017c) suggest that open talik conditions are possible in the southern portion of the lake where the lake becomes wider and deeper and there is likely a closed talik formation (talik underlain by permafrost) under the lakes to the north of Whale Tail Pit and shallower portion of the Whale Tail Lake.

5.3.2.3.1 Baseline Climate Conditions and Projected Climate Change

Baseline climate conditions and projected climate change was fully assessed for the Approved Project. Refer to Approved Project FEIS Volume 5, Section 5.3.2.3.1.

5.3.2.4 Baseline Soils

Baseline soils was fully assessed for the Approved Project (refer to Approved Project FEIS Volume 5, Section 5.3.2.4; Agnico Eagle 2016c). Table 5.3-2 provides a summary of soil types identified within the LSA. This FEIS Addendum considers the same spatial boundaries as those defined for the Approved Project, with an additional 195.0 ha mapped to incorporate the road corridors to Lake D1 and Lake D5, and the quarries along the haul road. As such Table 5.3-2 now includes the dominant soil groups in the expanded LSA. For additional information refer to Volume 5, Appendix 5-A.

Table 5.3-2: Dominant Soil Subgroups within the Local Study Area

Soil Order	Dominant Soil Subgroup	Whale Tail Pit		Haul Road		Local Study Area		Expanded Local Study Area	
		Area [ha]	Proportion [%]	Area [ha]	Proportion [%]	Area [ha]	Proportion [%]	Area [ha]	Proportion [%]
Cryosolic	Orthic Dystric Turbic Cryosol	5,336.5	69.1	2,394.1	75.2	7,730.6	70.9	107.5	55.1
	Regosolic Turbic Cryosol	176.3	2.3	360.9	11.3	537.2	4.9	8.3	4.3
	Terric Fibric Organic Cryosol	0.4	<1	4.7	0.1	5.1	<1	0.0	0
Brunisolic	Orthic Dystric Brunisol	431.2	5.6	91.3	2.9	522.5	4.8	42.8	21.9
Gleysolic	Rego Gleysol	2.9	<1	n/a	n/a	2.9	<1	0.0	0
Bedrock/ Colluvium	n/a	245.7	3.2	116.9	3.7	362.5	3.3	0.0	0
Water	n/a	1,529.5	19.8	214.0	6.7	1,743.5	16.0	36.3	18.6
Total		**7,722.4**	**100**	**3,181.8**	**100**	**10,904.2**	**100**	**195.0**	**100**

Note: Numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.
Expanded LSA refers to the additional area mapped to incorporate road corridors to Lake D1 and Lake D5, and the quarries along the haul road.
ha = hectare; % = percent; n/a = not applicable; < = less than.

Soil Baseline Metal Chemistry

Baseline soils metal chemistry was fully assessed for the Approved Project and no additional soil chemistry has been collected. In summary, sampling for baseline metal chemistry of soils was completed in 2015, and the results can be found in Artinian and Gagnon (2016). The ninety samples collected within the Expansion Project footprint are summarized in Volume 5, Appendix 5-B.

5.3.3 Potential Expansion Project-related Effects Assessment

Pathway analysis is provided in the Expansion Project (FEIS Addendum Volume 3, Section 3.5). Primary pathways that require further effects analysis are provided below. Pathways determined to have no linkage or those that are considered secondary are not predicted to result in environmentally significant effects are provided for the Expansion Project in Volume 3, Appendix 3-C, Table 3-C-2.

Expansion Project impacts on terrain, permafrost, and soils will result from construction, operations, and closure activities during the LOM. Some of these activities will result in maintaining existing permafrost conditions or the physical gain of permafrost through permafrost growth into structural fills as well as to the long-term growth of permafrost beneath the Whale Tail WRSF and IVR WRSF. Other activities will result in physical loss of terrain, permafrost and soil due to extraction of rock and soil material for use in construction, and due to the physical mining of the open pit. Flooding of the open pits at closure will result in the retreat of permafrost away from the flooded pit area. The following provides a list of the primary pathways that require further effects analysis in this assessment to determine the environmental significance from the Project on terrain, permafrost, and soils:

- Physical loss or permanent alteration of existing permafrost conditions within the mined out area. Permafrost degradation may result from the excavation of the open pit, potential groundwater inflows to the open pit during operations (if depth extends below the base of permafrost). In addition, the flooding of the pit at closure may result in the creation of a larger talik beneath the pit lake.
- Underground mining resulting in physical loss or permanent alteration of permafrost within the mined out areas. Permafrost degradation and retreat due to excavation of the mined out areas coupled with the inflow of groundwater to the underground operations, as the proposed underground operation will extend below the permafrost.
- Physical loss or permanent alteration of terrain and soil features within the Expansion Project footprint, including the mined out area, haul road, eskers (borrow sources), roads to Lake D1 and Lake D5, and quarries identified along the haul road. Re-sloping, site preparation and other land disturbance activities are expected to result in changes to the distribution of terrain and soils.
- Changes to soil properties - soil disturbance may change physical, chemical, and biological properties of soil and contouring and excavation can cause compaction, and erosion to soils, and changes to soil quality.

5.3.3.1 Effects of the Project on Terrain, Permafrost and Soils

- **Physical loss or permanent alteration of permafrost within the mined out area including (1) permafrost degradation and retreat due to excavation of the open pit, (2) potential groundwater inflows to the open pit during operations if depth extends below the base of permafrost, and (3) flooding of pit may result in the creation of a larger talik zone beneath the pit lake.**
- **Physical loss or permanent alteration of permafrost within the mined out area including (1) permafrost degradation and retreat due to excavation of the underground mine, (2) groundwater inflows to the underground mine during operations.**

Concerns were raised by community members with regards to the depth of Whale Tail Pit and potential impacts on the land if the pit is deeper than the permafrost (NIRB 2017). The base of the open pit design is expected to be within the permafrost regime, with the upper portion in the current talik zone beneath the lake (Golder 2017c).

As described and assessed for the Approved Project, the permafrost and talik conditions below the northern part of Whale Tail Lake have been characterised by Knight Piésold (Approved Project FEIS Volume 6, Appendix 6-A, Attachment A; Agnico Eagle 2016c). Permafrost is expected below the land and in the shallowest areas of Whale Tail Lake, but a talik is thought to exist below the central portions of the lake. Knight Piésold (Approved Project FEIS Volume 6, Appendix 6-A, Attachment A; Agnico Eagle 2016c) suggests that the talik in the immediate vicinity of the proposed open pit is most likely underlain by permafrost. Where the pit is land based, excavation of the open pit will result in the retreat of permafrost into the walls and floor of the pit. The open pit will expose deeper bedrock to ambient air temperatures, likely resulting in the development of an active layer with an annual freeze/thaw cycle. A talik zone approximately 100 to 200 m in depth currently exists below the proposed open pit that is currently under water (Approved Project FEIS Volume 6, Appendix 6-A, Attachment A; Agnico Eagle 2016c). As material is removed from the pit, the talik may reduce in size due to the loss of the thermal heat source maintaining the talik open. This had been observed at the Meadowbank site Second Portage Lake where monitoring has shown an increase in permafrost aggradation (Agnico Eagle 2014c). Subsequent flooding of the pit at the completion of mining may result in an increase in the size of the talik from baseline conditions through increased water depths in areas of the lake that were previously shallow and thereby subject to freezing and permafrost growth.

Subsequent work by Golder (2017c) supported these results and found that the talik in the immediate vicinity of the open pit is most likely underlain by permafrost. This is based on available thermistor data and also the results of analyses of talik conditions under Whale Tail Lake built on numerical modelling and analytical solutions. The thermistor AMQ17-1265A installed within the lake in 2017 suggests that the talik depth is approximately 112 m from the lake water level and permafrost is present between 112 m and 343 m below lake surface (i.e., between 40 m above sea level and 191 m below sea level) (Golder 2018a).

Modelling of the thermal conditions of Whale Tail Pit post-closure by Golder (2018a) suggests that during pit flooding the warm pit lake temperature will impact the upper portion of the permafrost under the pit, and talik zones will start to occur around the pit wall and floor. With time the permafrost under the lake will continue to thaw and the open talik that exists currently in the south part of Whale Tail Lake will expand to the north and include the area under Whale Tail Pit Lake. The modelling suggests that 300 years after closure the majority of the permafrost under the pit lake is thawed and is an open talik (Golder 2018a); although it is likely to be a larger open talik, water quality predictions are expected to be suitable post-closure. The affects to the receiving water quality have been evaluated through water quality modelling for the Expansion Project and presented in Volume 6, Appendix 6-H.

Underground operations are also planned beneath the Whale Tail and IVR pits. It is proposed that the underground operation below Whale Tail Pit will extend to 505 m below sea level and to 83 m below sea level for the underground operation below IVR Pit (Volume 6, Appendix 6-B). Based on the thermistor and modelling results the underground operation will extend through the permafrost into non-frozen ground.

There are potential engineering challenges due to permafrost in underground mining operations. Accelerated thawing may occur and cause damage to the mine infrastructure (Mine Design Queen’s University 2016). Pronovost (2001) reported a one-year cycle of thaw, on 1.5 m of rock around excavations due to ventilation, freeze back at Raglan Mine, Nunavik. Although not heated, Raglan Mine observed such influence on the rock during summer, offset by the cold underground environment during winter. During the underground operations warm air will circulate through underground infrastructure during the summer leading to summer thawing of permafrost zones immediately adjacent to the ramps, tunnels, and shafts (Volume 8, Appendix 8-A.3). However, as observed at Raglan Mine (Pronovost 2001) these zones are expected to freeze-back during winter with the circulation of colder air. Similarly, according to Ghoreishi-Madiseh et al. (2011), underground backfilling operations would temporarily thaw immediately adjacent rock over approximately six months in active zones of the mine. Upon closure the underground infrastructure will be actively and naturally flooded and the flooding will accelerate thawing of permafrost zones immediately adjacent to the area. However, due to the limited footprint flooding of the underground infrastructure is not expected to have a significant impact on the overall permafrost thawing process under the pit lake (Volume 8, Appendix 8-A.3).

Water diversions are required for the operations of the open pits and are described in the updated Water Management Plan (Volume 8, Appendix 8-B.2). The diversion plans associated with Whale Tail Pit were assessed under the Approved Project. The Expansion Project includes diversion plans associated with IVR Pit, including construction of the IVR Diversion to limit the flow of water into the IVR Pit by diverting the upstream watershed to Nemo Lake.

Approved construction of the Whale Tail Dike will result in the flooding of a number of upstream tributary lakes; it is anticipated that an additional 148.5 ha of land will be flooded (Volume 6, Appendix 6-F). The duration of the flooding of Whale Tail Lake (South Basin) will be extended. Furthermore, the Expansion Project will result in flooding of IVR Pit; it is anticipated that an additional 37 ha of land will be flooded.

The active layer in the newly flooded areas may increase in thickness due to the insulating effect of water. However, these areas will be re-exposed at closure when Whale Tail Pit is progressively refilled from Whale Tail Lake (South Basin) and the active layer should revert to the pre-development thickness over time. It is anticipated that there will only be minor changes to permafrost in the flooded areas during the lifetime of the Expansion Project.

Whale Tail Dike will be monitored with piezometers and thermistor strings to understand the hydraulic and thermal behavior during reservoir filling. A Thermal Monitoring Plan for the Whale Tail Project, including thermistors in Whale Tail Dike and Mammoth Dike areas, has been updated (Volume 8, Appendix 8-A.3) to comply with the Project Certificate No. 008 (T&C #14).

- **Physical loss or permanent alteration of terrain and soils within the Expansion Project footprint, including the mined out area, haul road and eskers (borrow sources). Re-sloping, site preparation and other land disturbance activities can result in changes to the distribution of terrain and soils.**

Consistent with the Approved Project any additional site clearing and construction for the Expansion Project, particularly through the processes of soil stripping and storage, will result in changes to soil quantity and distribution, and changes to terrain. Soil removal will occur mainly during the construction phase, and to a much lesser extent during operations. For the purposes of the Expansion Project assessment, it is assumed that the total Approved and Expansion Project footprint will be disturbed. Changes to the existing terrain and soil conditions will continue to be confined to the total area of the Approved and Expansion Project footprint which is 1,188.1 ha and this equates to 10.7% of the terrain, permafrost, and soils LSA (11,099.2 ha).

Construction of the Expansion Project will aim to minimize impact to existing terrain, permafrost and soil conditions, and will limit potential thaw-settlement of infrastructure due to permafrost degradation. The construction and road fills will be placed directly over existing terrain, including soils and vegetation, without stripping or grubbing to avoid disturbance of the subgrade soils. Construction and road fill thickness will be designed to promote the aggradation of permafrost into thaw-stable fill materials to enhance the stability of the foundations and overlying structural fill materials.

A summary of the surficial materials (terrain types) and soils that are anticipated to be lost or permanently altered within the Approved and Expansion Project footprint during construction, operations, and closure are presented in Table 5.3-3 and Table 5.3-4, respectively.

Table 5.3-3: Summary of Physical Loss or Permanent Alteration to Terrain Types due to the Construction, Operations, and Closure of the Project

Terrain Type	Terrain Symbol	Approved Project Footprint		Expansion Project Footprint		Total (Approved and Expansion Project) Footprint	
		Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
Fluvial	F	0.1	<1	2.4	0.6	2.5	0.2
Glaciofluvial	FG	85.9	10.5	12.9	3.5	98.8	8.3
Morainal (Till)	M	370.1	45.1	307.7	83.6	677.8	57.0
Anthropogenic	A	0.1	<1	0.1	<1	0.2	<1
Rock	R	10.6	1.3	18.7	5.1	29.3	2.5
Water	N	353.3	43.1	26.1	7.1	379.4	31.9
Total		**820.1**	**100**	**368.0**	**100.0**	**1,188.1**	**100.0**

Note: Numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.
ha = hectare; % = percent; n/a = not applicable; < = less than.

Table 5.3-4: Summary of Physical Loss or Permanent Alteration to Soil Types due to the Construction, Operations, and Closure of the Project

Soil Order	Dominant Soil Subgroup	Approved Project Footprint		Expansion Project Footprint		Total (Approved and Expansion Project) Footprint	
		Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
Cryosolic	Orthic Dystric Turbic Cryosol	365.1	44.5	270.8	73.6	635.9	53.5
	Regosolic Turbic Cryosol	12.9	1.6	55.7	15.1	68.6	5.8
Brunisolic	Orthic Dystric Brunisol	83.2	10.1	12.9	3.5	96.1	8.1
Gleysolic	Rego Gleysol	0.1	<1	2.4	0.7	2.5	0.2
Bedrock/ Colluvium	n/a	5.4	0.7	-	-	5.4	0.5
Anthropogenic	n/a	0.1	<1	0.1	<1	0.2	<1
Water	n/a	353.3	43.1	26.1	7.1	379.4	31.9
Total		**820.1**	**100**	**368.0**	**100.0**	**1,188.1**	**100.0**

Note: Numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.
ha = hectare; % = percent; n/a = not applicable; < = less than.

Based on the Total (Approved and Expansion) Project disturbance area, till is still the dominant surficial material that will experience the greatest change representing 677.8 ha (57.0%) of the Approved and Expansion Project footprint. The soil map unit that will likely experience the greatest change is still the Orthic Dystric Turbic Cryosol which represents 635.9 ha (53.5%) of this footprint.

Concern was raised by community members with regards to the creation of a large hole in the ground which is considered unnatural. The Whale Tail Pit is an open pit that extends across the northern edge of Whale Tail Lake. The lake will be dammed to isolate the pit area and allow the mining operations to commence. Upon closure the pit will be progressively refilled to a level of 153.5 masl (i.e., 1 m higher than the baseline conditions). It is anticipated that post-closure Whale Tail Lake will have a surface area of 2.34 km^2 or a 41% increase in size from baseline (FEIS Addendum Section 6.3.3.1.6.1). Further details are provided in in the updated Water Management Plan (Volume 8, Appendix 8-B.2).

- **Soil disturbance can change physical, biological, and chemical properties of soils, and increase erosion potential due to contouring, and excavation can cause compaction and increase erosion potential of soils**

Consistent with the Approved Project, site clearing and construction for the Expansion Project may result in changes to soil quality. Changes to soil quality may influence the ability of soil to support natural plant communities following closure. Soil removal will occur mainly during the construction phase, and to a lesser extent during operations (i.e., as pit blasting activities are occurring). During decommissioning and reclamation, the soil (i.e., growth media) will be not re-constructed as outlined in the Whale Tail Interim Closure and Reclamation Plan (Volume 8, Appendix 8-F.1). The footprint of the open pits will primarily be a lake at closure landscape and surface that could be reclaimed with topsoil is limited therefore the limited topsoil will not be salvaged. However, as required by the Project Certificate No. 008 (T&C #13), Agnico Eagle will explore the feasibility of topsoil/organic matter salvage as part of project development and provide updates to the Closure and Reclamation Plan based on this investigation with summaries as needed in the annual report to regulators.

Soil quality can be altered during construction operations through the following processes:

- physical, biological, and/or chemical changes in the absence of soil stockpiling and replacement on the reclaimed landscape; and
- compaction of soil through site clearing, contouring, excavation, and decommissioning and reclamation

The potential effect on soil quality as a result of the Expansion Project is discussed qualitatively and semi-quantitatively by evaluating the potential for soil compaction, erosion, and reclamation suitability rating changes. The effect of Expansion Project activities on soil quality was determined through evaluation of changes expected to occur to soil quality indicators through the disturbance of soil materials. These evaluations are based on studies reported in the literature and baseline data collected in the LSA for the Approved Project (Volume 5, Appendix 5-A).

Changes to Physical, Chemical, and Biological Soil Properties

Changes to physical, chemical and biological soil properties were fully assessed in the Approved Project, and remain unchanged for the Expansion Project. As described in the Approved Project, soil disturbance during construction is expected to cause physical changes to soil such as loss of soil structure. Loss of soil structure resulting from physical changes to the soil, and a reduction in the amount of soil organic matter and soil organic carbon present within the soil, influences the bulk density, pore size distribution, microbial community structure, and resistance to erosion (Wick et al. 2009). The direct loss of soil organic matter and soil organic carbon is expected to decrease the ability of soil to support vegetation. The adverse effects on soil ecological characteristics are expected to result in decreased rates of nutrient cycling and reduced availability of macro and micro nutrients in the substrates of the closure landscape for several years or decades after reclamation (Abdul-Kareem and McRae 1984; Stark and Redente 1987; Wick et al. 2009).

Soil Compaction

Potential soil compaction effects were fully assessed for the Approved Project and remain unchanged by the Expansion Project. Most soils in the closure landscape are not expected to be susceptible to compaction. By employing the mitigation actions outlined in Volume 3, Appendix 3-C, Table 3-C-2, soil quality degradation due to compaction is expected to be mitigated.

As described in the Approved Project, soil compaction decreases soil quality and occurs primarily from heavy equipment or repeated passes of equipment across the soil surface during site clearing, contouring and excavation. Soil changes due to compaction causes shifts in the microbial community; impedes root growth and seedling establishment; decreases water, air and nutrient movement; and reduces plant productivity (Blouin et al. 2008; Busse et al. 2006; Corns 1988; Tuttle et al. 1988).

Soil compaction affects the success of reclamation by decreasing plant establishment and plant growth. Compaction of coversoil and subsoil has the potential to lead to a decrease in long-term productivity (Blouin et al. 2008; Heuer et al. 2008). The decrease in long-term productivity is a result of increases in soil bulk density and soil strength, reductions in soil aeration (i.e., less soil oxygen), reduced water infiltration and available soil water, restricted root growth, reductions in soil microbiological activity, and influences on nutrient uptake.

Soils in the Approved and Expansion Project footprint are predominantly coarse to moderately coarse-textured glacial till and colluvium with high coarse fragment content commonly overlying bedrock at shallow depths (less than 1 m) and generally are not susceptible to compaction. Soils prone to compaction in the LSA are limited to low-lying, imperfectly and poorly drained areas where the clay content of soils is slightly higher.

Soil Erosion

Soil erosion was fully assessed for the Approved Project and conclusions remain unchanged.

Erosion is a concern within the Approved and Expansion Project footprint during construction due to removal of the vegetation cover. Most soils in the LSA are rated as having moderate erosion potential, with the exception of areas with morainal blankets or colluvial deposits on slopes greater than 60%, and areas containing glaciofluvial soils. In areas of gullied or dissected terrain, the erosion potential would increase. The soil erosion ratings represent the maximum erosion that would occur in exposed mineral soils with no mitigation in place. Accelerated erosion related to Expansion Project activities would be confined mainly to the Expansion Project footprint.

Water and wind erosion potential remains as a moderate rating for the majority of the Expansion Project footprint (Table 5.3-5 and Table 5.3-6).

As required by the Project Certificate No. 008 (T&C #11), Agnico Eagle has developed an Erosion Management Plan (Volume 8, Appendix 8-E.6) to prevent or minimize erosion and its resulting effects from project-related land disturbance and update the plan as required by the NIRB.

Table 5.3-5: Predicted Water Erosion Potential within Project Footprint

Water Erosion Risk	Approved Project Disturbance Footprint		Expansion Project Disturbance Footprint		Total (Approved and Expansion Project) Footprint	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
High	0.0	0.0	0.0	0.0	0.0	0.0
Moderate to High	0.0	0.0	0.0	0.0	0.0	0.0
Moderate	378.1	46.1	326.3	88.7	704.4	59.3
Low	83.3	10.2	15.4	4.2	98.7	8.3
Not rated – Water, Anthropogenic and Bedrock/ Colluvium	358.7	43.7	26.3	7.1	385.0	32.4
Total	**820.1**	**100**	**368.0**	**100.0**	**1,188.1**	**100.0**

ha = hectare; % = percent.

Table 5.3-6: Predicted Wind Erosion Potential within Project Footprint

Wind Erosion Risk	Approved Project Disturbance Footprint		Expansion Project Disturbance Footprint		Total (Approved and Expansion Project) Footprint	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
High	83.2	10.1	12.9	3.5	96.1	8.1
Moderate to High	12.9	1.6	55.7	15.1	68.6	5.8
Moderate	365.1	44.5	270.8	73.6	635.9	53.5
Low	0.1	<1	2.4	0.7	2.5	0.2
Not rated – Water, Anthropogenic and Bedrock/ Colluvium	358.7	43.7	26.3	7.1	385.0	32.4
Total	**820.1**	**100**	**368.0**	**100.0**	**1,188.1**	**100.0**

Note: Numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.
ha = hectare; % = percent; < = less than.

5.3.3.2 Effects of Terrain, Permafrost, and Soils on the Expansion Project

While the assessment deals with the effects of the Project on the environment there is also a need to provide discussion on the effects of the Environment on the Project. Changes in climate, including moisture have the potential to effect a Project in either a positive or negative direction. The Project site consist of relatively subdued bedrock-controlled terrain with thin till veneers. The permafrost is characterized as extensive continuous permafrost with low to mid to nil ground ice conditions; the latter reflecting the shallow materials and bedrock controlled topography. Climate models suggest that Arctic air temperatures are to increase by 3 to 4^{o}C by 2050. While this anticipated warming may effect thick sediments on steeper slopes, it is unlikely that given the subdued topography, any thaw slides will occur within the area. The potential degradation of permafrost from warming temperatures is likely to result in a more active layer and higher ground moisture conditions but given the shallow nature of the soil materials, it will not likely effect the overall Project.

The existing terrain conditions found within the Expansion Project footprint will to some extent dictate the Approved and Expansion Project footprint. For example, the routing of the haul road has been selected to minimize the number of water crossings and the availability of borrow material along the route. Where possible, the haul road has been located in areas of higher elevation which tend to have better drainage, minimize the potential for snow drifting and avoid low lying areas with poorer ground conditions.

The potential for permafrost degradation associated with proposed infrastructure will have an effect on Expansion Project design. For example, thaw-stable fill materials (with a minimum fill thickness) will be placed overlying the existing terrain to maintain existing permafrost conditions along the haul road route and minimize the creation of thaw instabilities.

Climate change predictions suggest that for the Arctic air temperatures are expected to increase by 3 to 4ºC by 2050, rising to 5 to 7ºC across the mainland by 2100 (CCDS 2009). This is similar to the climate change modelling completed by O'Kane (2015) who suggest that scenarios, temperatures at the Meadowbank Mine will increase by 0.05ºC per year for the next 60 years; a rise of 3ºC. Permafrost is sensitive to climate change and an increase in air temperature will likely cause natural permafrost degradation. The long-term increase in surface temperature and subsequent increase in thickness of the active layer will not occur during the operational lifespan of the Expansion Project. However, the gradual increase in the active layer due to climate change could impact infrastructure remaining after closure and decommissioning (e.g., the WRSFs). The foundations of the WRFs are expected to remain frozen under a long-term warming trend however the potential deepening of the active layer will be considered in the design of the WRSFs and mine infrastructure. The decommissioned haul road will not be significantly impacted by the long-term warming trend as it will no longer be in use.

A thermal assessment of the WRSF at Whale Tail Pit has been completed by Golder (2018b) in response to a recommendation identified in the Final Hearing Report (NIRB 2017). The 1D thermal modelling study suggests that increasing air temperatures associated with climate change will result in an increase of the core temperature of the WRSF, but the facility should still remain frozen after 100 years. In addition, although the facility would warm up progressively at depth, the depth of the active layer is not predicted to change significantly with an average predicted depth of 4 m and maximum depth of 4.2 m after 100 years post-closure (Golder 2018b).

Although earthquakes occur in all regions of Canada, certain areas have a higher probability of experiencing damaging ground motions caused by earthquakes. The Expansion Project is located in an area with low probability of expected ground motion (NRCan 2015). This probability is used in the National Building Code to help design and construct buildings that are as earthquake proof as possible. The potential effects of seismicity are considered in the final design of infrastructure for the Project. For example, in earthwork dam designs and building infrastructure, the design will be constructed in accordance with National Building Code requirements and Dam Safety Guidelines, where applicable.

5.3.4 Residual Impact Classification

Although primary pathways have been identified for permafrost, terrain and soil, no residual impact predictions are made because permafrost, terrain and soil do not have measurable endpoints. Any potential effects associated with the primary pathways for terrain, permafrost and soils are captured in the assessment of the potential effects to, and residual impact classifications for, other VCs. Mitigation measures designed to reduce impacts are provided in Volume 3, Appendix 3-C, Table 3-C-2.

5.3.5 Cumulative Effects Assessment

A cumulative effects assessment was not completed for terrain, permafrost, and soil as effects to these components are localized to the Project and will not interact with other disturbances regionally.

5.3.6 Uncertainty

Consistent with the uncertainty identified for the Approved Project, the following uncertainties apply to the Expansion Project and the assessment:

- There is a level of uncertainty with regard to the thickness of the active layer and soil water content (ice content). The active layer at Meadowbank Mine ranges from 1.3 m in areas of shallow overburden and away from the influence of lakes, up to 4 m adjacent to lakes and up to 6.5 m beneath the stream connecting Third Portage and Second Portage Lakes (Cumberland 2005c). It can be expected that the thickness of the active layer within the Whale Tail deposit is likely similar to that at Meadowbank Mine.
- Soil storage effects are not well known for soils in northern climates. Therefore, conservatism was applied in assessing the effect and the effect was defined as primary. It is likely that the changes to soil quality will be minor based on the use of best management practices for soil handling during site preparations, and stockpile design, as presented in Volume 3, Appendix 3-C.
- Baseline terrain and soil field surveys and mapping provide an estimation of the distribution of surficial materials and soil resources. Consequently, an amount of uncertainty is always present as maps cannot provide detailed, site-specific information to all areas. However, sufficient terrain and soil field surveys were completed for the purposes of the assessment.
- The baseline mapping provides an estimation of the distribution of soil resources at a given map scale resolution.

Uncertainty was addressed in the assessment by being conservative in defining impacts, incorporating information from available and applicable literature, and using past experience in similar areas including the experience gained from the Meadowbank Mine. In addition, the application of environmental design features and mitigation, progressive closure, and the continued implementation of the Waste Rock Management Plan, the Interim Closure and Reclamation Plan, and the Water Management Plan (FEIS Addendum Volume 8) will mitigate effects to terrain, permafrost, and soils.

5.3.7 Monitoring and Follow-up

Monitoring programs may be a combination of environmental monitoring to track conditions and follow up monitoring to verify the accuracy of effect predictions and adaptively manage and implement further mitigation as required.

Permafrost conditions will be continuously monitored and inspected during all phases of the Expansion Project to verify impact predictions and ensure the effectiveness of the design criteria. Where required adaptive management strategies will be implemented. Full details on management plans and monitoring for the WRSF, dewatering of the dikes, and haul road are provided in Waste Rock Management Plan (Volume 8, Appendix 8-A.1), Water Management Plan (Volume 8, Appendix 8-B.2), and Whale Tail Pit Haul Road Management Plan (Volume 8,

Appendix 8-C.1). A Thermal Monitoring Plan has been updated (Volume 8, Appendix 8-A.3) to comply with Project Certificate No. 008 (T&C #14).

Soil conditions will be monitored according to the Project Certificate No. 008 to estimate reclamation success.

In addition, upon issuance the Project Certificate No. 008, Agnico Eagle is implementing measures to protect, mitigate and monitor geological features, soils and permafrost, including:

- Prevention potential impacts to sensitive land features (T&C #9);
- Prevent or limit project impacts to pre-existing permafrost and seasonal ground ice conditions and to ensure integrity of site infrastructure is maintained (T&C #10);
- Ensure management of erosion from land disturbance (T&C #11);
- Ensure that disturbed land parcels no longer required for operations are progressively reclaimed with the natural aesthetics restored to the extent practicable, and in a manner that considers community aesthetic values (T&C #12); and
- Ensure that disturbed land can support revegetation on closure (T&C #13).

Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NIRB. Agnico Eagle considers, the existing terms and conditions of the Project Certificate issued for the Approved Project are sufficient to protect, mitigate and monitor geological features, soils and permafrost impacts associated with the Expansion Project.

Any new required mitigation measures related to primary effects for the Expansion Project are described in relation to the predicted effects and summarized in pathway tables provided in (Volume 3, Appendix 3-C).

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan.

5.4 Vegetation

A summary of the key changes to the assessment of the vegetation component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 5.4-0.

Table 5.4-0: Vegetation: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
5.4.1 Incorporation of IQ	Review of: • Project IQ Baseline Report (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c); • Meadowbank Gold Project Baseline Traditional Knowledge Report (Cumberland 2005a); • Environmental Impact Statement (EIS) Guidelines for the Meadowbank Project (NIRB 2004); • Proposed All-weather Exploration Road from the Meadowbank Mine to the Project Site - Baseline Traditional Knowledge Report (Agnico Eagle 2014a); • Community Consultations/Public Information Meeting Summary Reports for 2014 and 2015 (NIRB 2014, 2015a).	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017

Section of FEIS	Approved Project	Expansion Project
		• Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type "A" Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board's Hearing Regarding the Review of Agnico Eagle Mines Limited's Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
5.4.2 Existing Environment and Baseline Information	• 2015 Terrestrial Baseline Characterization Report	• 2016 Terrestrial Baseline Supplemental Report • 2017 Comprehensive Terrestrial Baseline Characterization
5.4.3 Potential Project-related Effects Assessment	Three primary pathways were identified	No new primary pathways identified
5.4.4 Residual Impact Classification	Residual impact classification definitions and the effects criteria and level for determining significance were assessed and mitigations recommended	Unchanged
5.4.5 Cumulative Effects Assessment	Localized and will not interact with other disturbances regionally	Unchanged
5.4.6 Uncertainty	Uncertainty was addressed in the assessment by incorporating information from available and applicable literature, and using past experience in similar areas including the experiences at nearby Meadowbank Mine.	Unchanged
5.4.7 Monitoring and Follow-up	Vegetation monitoring objectives and methods will follow the Terrestrial Ecosystem Management Plan	Refer to Volume 8, Appendix 8-E.9 for an updated Terrestrial Ecosystem Management Plan

5.4.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to vegetation was provided by community members since the FEIS submission was made in 2016 for the Approved Project. This assessment takes into account review of community consultation notes from Agnico Eagle (2018e), NIRB and NWB (2017), and NIRB (2017), and consultation notes for the Expansion Project (Agnico Eagle 2018a). The following concerns have been raised by community members related to effects on vegetation:

- The effects of mine operations, dust and dust suppressants on caribou habitat and their food sources, and potential harm to caribou health and meat quality; specifically gastrointestinal issues experienced by community members every year in the spring which may be linked to caribou ingesting chemicals used in dust suppressants (NIRB and NWB 2017; NIRB 2017; Agnico Eagle 2018e)

The concerns as they pertain to the Expansion Project have been incorporated into Section 5.4.7 of this FEIS Addendum. For additional information refer to the Approved Project FEIS Volume 5, Section 5.4.1 (Agnico Eagle 2016c).

5.4.1.1 Existing Environment and Baseline Information

The Expansion Project does not change IQ integration from the Approved Project. Inuit Qaujimajatuqangit, including the importance of certain plants used by wildlife, particularly lichen, which are an important part of the caribou's diet (Cumberland 2005a) were considered for the Approved Project.

5.4.1.2 Valued Component Selection

For the Expansion Project, the selection of VCs remains the same as the Approved Project FEIS Volume 5, Section 5.4.1.2 (Agnico Eagle 2016c) and includes IQ integration from the Approved Project. Inuit Qaujimajatuqangit has been integrated in the selection of vegetation as a VC because it provides habitat for wildlife including species that are culturally important (e.g., caribou and muskox) and is also used directly for traditional use (e.g., berry picking).

5.4.1.3 Impact Assessment

The Expansion Project considers the same potential effects as the Approved Project, and takes into account the concerns raised by community members related to effects of dust on vegetation.

5.4.1.4 Mitigation and Monitoring

Mitigation measures for the Expansion Project included in this FEIS Addendum will be the same as those for the Approved Project. Mitigation measures and monitoring programs have been proposed to address these IQ concerns around vegetation (wildlife habitat) loss, habitat denigration by contamination (i.e., dust), and reclamation rate and are detailed in the TEMP (Volume 8, Appendix 8-E.9) and Section 5.4.7 of the FEIS Addendum.

5.4.2 Existing Environment and Baseline Information

Existing conditions were described to provide context for the vegetation assessment in the Terrestrial Baseline Characterization Report (Volume 5, Appendix 5-C). This report describes the methods used to collect baseline data, summarize field data and to generate vegetation maps required to support the vegetation EIS. Subsequent work completed by Dougan and Associates (2017) is summarized below. A brief summary of baseline conditions is provided in Section 5.4.2.2 which highlights the key information relevant to the Expansion Project.

5.4.2.1 Baseline Study Methods

Vegetation field programs were completed to classify vegetation communities within the LSA. Field programs were completed from August 28 to September 3, 2014, July 3 to 13, 2015, and July 14 to 21, 2016. Surveys included plot-based and transect-based vegetation inventories to characterize plant species (including traditional and listed plant species) within the LSA. Ecological Land Classification (ELC) surveys were also completed to verify land cover classification and important wildlife habitat (e.g., graminoid and lichen-dominated vegetation communities) within the LSA.

Baseline phenology studies were completed to record data on vascular plant development during the 2003, 2004, and 2005 growing seasons. These results were used to guide the timing of the 2014, 2015, and 2016 vegetation field surveys and are presented in Volume 5, Appendix 5-C, Section 3.3.5.

5.4.2.2 Baseline Vegetation

The 2014, 2015, and 2016 vegetation surveys identified 181 vascular plants in the Approved and Expansion Project area, of which 150 were identified to species level and 31 were identified to genus level. A total of 99 non-vascular plants (33 bryophytes and 66 lichens) were identified from field surveys. Of these, 10 specimens were identified to genus level. Appendices D and E of Dougan and Associates (2017) shows the full list of vascular and non-vascular species recorded within the Approved and Expansion Project area, including graminoid and lichen species important for wildlife forage. The most common and widespread vascular species found were northern Labrador-tea (*Rhododendron tomentosum*) and mountain cranberry (*Vaccinium vitis-idea*) which were both observed in 99 of the 126 plots surveyed and present in all ELC types. The overall findings indicate that the majority of the areas surveyed consist of low-diversity vascular plant communities dominated by fewer than 10 species. The most common and widespread non-vascular species found were arctic butterfingers lichen (*Dactylina arctica* ssp. *arctica*) and green witch's hair lichen (*Alectoria ochlroleuca*) which were observed respectively in 69 and 60 of the 126 plots surveyed and present in all ELC types.

Only two federally listed plant species (i.e., the moss species Porsild's bryum [*Haplodontium macrocarpum*] and felt-leaf willow [*Salix silicicola*]) have been identified within Nunavut; these species and suitable habitat were not observed within the LSA during field programs (Dougan and Associates 2017, Appendix D). Of the 181 confirmed vascular species recorded during field programs, six are territorially listed as *Sensitive* (CESCC 2011). A full list of the vascular and non-vascular species recorded during field surveys and their CESCC status is presented in Dougan and Associates (2017).

A total of 15 ELC units were mapped within the RSA and 13 ELC units in LSA. Table 5.4-1 shows the area (ha) and proportion (%) of each ELC community within the RSA and LSA for the Expansion Project. A detailed description and analysis of the ELC distribution within the study area is provided in Volume 5, Appendix 5-C, Section 3.3.3.

Elders expressed concerns about the loss of caribou habitat, particularly lichen (Cumberland 2005a). Caribou generally feed on lichen during winter, and forbs, shrubs (i.e., leaves and stems) and graminoid species during the growing season (Adamczewski et al. 1988). Lichen-dominated communities were considered to be high quality winter habitat for caribou, and graminoid-dominated communities were considered to be high-quality habitat for caribou in the growing season, and year-round for muskox (Volume 5, Appendix 5-C, Table 4-17a).

There is little disturbance in the RSA with the exception of the Meadowbank Mine. Lakes are the most common ELC Unit; overall lakes contribute one quarter (25%) of the RSA and more than one fifth (21%) of the LSA. High-quality caribou habitat includes the Lichen/Rock complex and Heath Upland ELC units, covering 46% of the LSA and 39% of the RSA, respectively. Most of the Lichen/Rock complex patches are located in the southwestern portion of the RSA whereas the Heath Upland patches are mostly localized in the east portion of the RSA.

The Wet Graminoid vegetated ELC unit, has high year round habitat suitability for ungulates is less common in the LSA and RSA and represents <1% of each study area. Patches of these ELC units are localized in the southeast portion of the RSA intermixed with the Lichen/Rock Complex patches. The Sand ELC unit includes a non-vegetated sandy substrate and a cover of ericaceous shrubs and lichens (Volume 5, Appendix 5-C). Patches of the Sand ELC unit are scattered in the RSA and mostly localized in the southern portion of the LSA.

Existing disturbance accounts for 0.5% of the RSA and is associated with the Meadowbank Mine footprint.

Within the RSA, the proportion and distribution of vegetation (wildlife habitat) may be different than it was historically. Historical higher spring precipitation increased soil moisture, and vegetation species, which function as caribou forage. However, higher temperatures and a decline in snow and rain in recent years has created drier conditions, which promote growth of birches, willow, and grasses, resulting in a decrease in caribou habitat (Agnico Eagle 2014a; GN 2005; Cumberland 2005a; Thorpe 2000). The earlier spring-melt and later freeze-up has altered the vegetation upon which caribou foraged, thereby influencing caribou migration and foraging behaviour (Thorpe 2000). Similarly, berry producing shrubs have been negatively affected, with decreased growth rates and berry production, as well as delayed berry ripening, resulting in a reduction in feeding areas for wildlife and traditional plant harvesting areas (GN 2005).

Table 5.4-1: Total Area and Percent Cover of Ecological Land Classification Units within the Expansion Project Regional Study Area and Local Study Area

ELC Unit	RSA		Expansion Project LSA[a]	
	Area (ha)	Area (%)	Area (ha)	Area (%)
Natural				
Boulder/Gravel	46,683	9.3	2,063	7.2
Graminoid Tundra	10,549	2.1	472	1.6
Graminoid/Shrub Tundra	7,575	1.5	420	1.5
Heath Tundra	56,308	11.2	3,594	12.5
Heath Upland	79,062	15.8	5,495	19.1
Heath Upland/Rock Complex	7,725	1.5	359	1.2
Lichen Tundra	21,406	4.3	1,424	4.9
Lichen/Rock Complex	114,897	22.9	7,646	26.5
Sand	2,312	0.5	171	0.6
Shrub Tundra	4,939	1.0	213	0.7
Shrub/Heath Tundra	8,434	1.7	516	1.8
Wet Graminoid	2,617	0.5	130	0.5
subtotal vegetated ELC unit	*362,508*	*72.3*	22,504	*78.1*
Non-vegetated				
Cloud/Shadow	12,508	2.5	0	0.0
Water	125,623	25.0	6,178	21.4
subtotal non-vegetated ELC unit	*138,132*	*27.5*	*6,178*	*21.4*
Disturbed				
Existing disturbance	1,061	0.2	0	0.0
Total	**501,701**	**100.0**	**28,808**	**100.0**

Notes: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values.
The Sand ELC unit includes a non-vegetated sandy substrate and a cover of ericaceous shrubs and lichens (Volume 5, Appendix 5-C).
a Expansion Project area includes Approved Project
ELC = Ecological Land Classification; RSA = Regional Study Area; LSA = Local Study Area; ha = hectare; % = percent.

5.4.3 Potential Expansion Project-related Effects Assessment

A comprehensive analysis of the potential pathways for effects on vegetation (wildlife habitat) during construction, operations, and closure is provided for the Expansion Project in Volume 3, Appendix 3-C, Table 3-C-2.

Primary pathways are those where effects from the Expansion Project will likely result in a measurable change to measurement indicators that could contribute to residual effects on a VC relative to the Baseline Case or guideline values. Pathways determined to have no linkage or those that are considered secondary are not predicted to result in environmentally significant effects on vegetation (wildlife habitat) and are not carried through the effects assessment. Secondary effects pathways and effects pathways with no linkage are summarized in the pathway analysis table in Volume 3, Appendix 3-C. The following are the primary pathways that require further effects analysis to determine the environmental significance from the Project on vegetation:

- Direct loss and fragmentation of vegetation habitat from the Expansion Project footprint.
- Loss or alteration of local flows, drainage patterns (distribution), and drainage areas from the Expansion Project footprint and haul road that can cause changes to vegetation (wildlife habitat).
- Dust deposition on vegetation (wildlife habitat) from haul road and mining activities.

5.4.3.1 Primary Pathways Effect Analysis

The primary pathways considered for the Expansion Project are the same as those assessed for the Approved Project. The evaluation of Expansion Project effects on vegetation (wildlife habitat) considers the changes of vegetation measurement indicators: habitat quantity and habitat quality (Table 5.4-2).

Table 5.4-2: Measurement Indicators and Primary Pathways

Measurement Indicator	Associated Primary Pathway
Changes to Vegetation Habitat Quantity	Direct loss and fragmentation of vegetation habitat from the Expansion Project footprint
Changes to Vegetation Habitat Quality	Loss or alteration of local flows, drainage patterns (distribution), and drainage areas from the Project footprint and haul road that can cause changes to vegetation
	Dust deposition on vegetation from haul roads and mining activities

Vegetation habitat quantity refers to the amount of habitat present for each ELC unit. Habitat quantity is primarily affected by physical changes (e.g., vegetation clearing), and is represented as the amount of area (i.e., hectares) of each ELC unit.

Vegetation habitat quality refers to the integrity, of each ELC unit on the landscape, and their continued ability to support the community of organisms naturally associated with them and to perform ecological functions. Habitat quality is typically reduced in human-altered ecosystems due to changes in physical (e.g., quality or quantity of soil or water) and biological (e.g., vegetation and wildlife communities) properties.

5.4.3.1.1 Changes to Vegetation Habitat Quantity

Primary effects to vegetation will include the physical removal of vegetation in all construction areas (i.e., the Project). The maximum amount of vegetated and non-vegetated ELC units lost due to the Expansion Project is predicted to be approximately 1,188 ha, or 4.1% of the LSA. In the LSA, there are 22,629 ha (78.6% of the LSA) of vegetated land cover units. Of these about 565 ha (2.5%) are predicted to be lost due to the mine site and 263 ha (1.0%) would be lost due to widening of the haul road (Table 5.4-3). Predicted loss of vegetated land cover units in the Expansion Project footprint will increase by an additional 217 ha (1.0%) for the mine site, and 130 ha (0.6%) for the haul road as compared to the Approved Project. Overall losses of vegetation communities in the Expansion footprint are shown in Table 5.4-3.

Losses of graminoid ELC units, such as the Graminoid Tundra and the Graminoid/Shrub Tundra, represent a decrease in caribou habitat in the LSA and RSA. A total loss of 21 ha of the Graminoid Tundra ELC unit would occur in the LSA, of which 18 ha (3.8%) of the loss is associated with the mine site and 3 ha (0.7%) to the haul road. For the Expansion Project footprint, the loss of the Graminoid Tundra ELC unit increases by 3 ha for the mine site and 1 ha for the haul road when compared to the Approved Project footprint. In the RSA, for the Approved and Expansion Project, there will be a total loss of 21 ha (0.2%) of the Graminoid Tundra ELC unit and 7 ha (0.1%) Graminoid/Shrub ELC unit. The Wet Graminoid ELC unit also functions as high-quality caribou and muskox habitat and is relatively uncommon in the Wager Bay Plateau ecoregion (Volume 5, Appendix 5-C). Approximately 10 ha (7.4%) of the Wet Graminoid ELC unit is anticipated to be lost due to the mine footprint development, and represents the largest proportional loss of ELC units. For the Expansion Project footprint, the loss of the Wet Graminoid ELC unit increases by 2 ha (<1%). Despite losses to this vegetation unit, this vegetation habitat remains well distributed across the LSA, RSA, and the broader Wager Bay Plateau ecoregion in low proportions.

Table 5.4-3: Ecological Land Classification Units Availability in the Project Footprint

ELC Unit	Approved Project Footprint LSA				Expansion Project Footprint LSA				Difference Between Approved and Expansion Footprints (ha)		RSA		
	Mine Site		Haul Road[a]		Mine Site		Haul Road[a]				Baseline Area (ha)	Project	
	Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)	Mine Site	Haul Road		Area (ha)	Area (%)
Vegetated Units													
Boulder/Gravel	-41	2	-10	0.5	-69	3.3	-25	1.2	28	15	46,683	-93	0.2
Graminoid Tundra	-15	3.2	-2	0.5	-18	3.8	-3	0.7	3	1	10,549	-21	0.2
Graminoid/Shrub Tundra	-4	1.1	-1	0.3	-4	1.0	-2	0.5	0	1	7,575	-7	0.1
Heath Tundra	-75	2.2	-11	0.3	-119	3.3	-27	0.8	44	16	56,308	-146	0.3
Heath Upland	-74	1.4	-36	0.7	-115	2.1	-60	1.1	41	24	79,062	-175	0.2
Heath Upland/Rock Complex	-3	0.9	-2	0.6	-4	1.3	-3	1.0	1	1	7,725	-8	0.1
Lichen Tundra	-21	1.5	-9	0.6	-32	2.2	-17	1.2	11	8	21,406	-49	0.2
Lichen/Rock Complex	-91	1.2	-51	0.7	-173	2.3	-112	1.5	82	61	114,897	-285	0.2
Sand[b]	-1	0.4	-9	5.1	-2	1.3	-9	5.3	1	0	2,312	-11	0.5
Shrub Tundra	-7	3.3	-<1	0.2	-8	4.0	-1	0.4	1	1	4,939	-9	0.2
Shrub/Heath Tundra	-10	1.9	-1	0.2	-11	2.1	-2	0.5	1	<1	8,434	-13	0.2
Wet Graminoid	-8	6.1	-<1	0.1	-10	7.4	-<1	0.1	2	0	2,617	-10	0.4
Subtotal vegetated units	*-348*	*1.6*	*-133*	*0.6*	*-565*	*2.5*	*-263*	*1.2*	*217*	*130*	*362,508*	*-828*	*0.2*
Non-vegetated Units													
Cloud/Shadow	0	0	0	0	0	0	0	0			12,508	0	0.0
Water	-339	5.7	-0.2	<0.01	-360	5.9	-0.3	<0.01	21	0.1	125,623	-360	0.3
Subtotal non-vegetated units	*-339*	*5.7*	*-0.2*	*<0.01*	*-360*	*5.9*	*-0.3*	*<0.01*	*21*	*0.1*	*138,132*	*-360*	*0.3*
Disturbed													
Existing disturbance	0	0	0	0	0	0	0	0			1,061	0	0.0
Total	**-687**	**2.4**	**-133**	**0.5**	**-925**	**2.4**	**-263**	**0.9**	**238**	**130**	**501,701**	**-1188**	**0.2**

Note: Some numbers are rounded for presentation purposes. Therefore, it may appear that the totals do not equal the sum of the individual values. Percent of area is calculated as the percent of baseline area affected by the Project.

[a] Haul road area summaries include the esker borrow sites and esker borrow site access roads.

[b] The sand ELC unit includes a non-vegetated sandy substrate and a cover of ericaceous shrubs and lichens (Volume 5, Appendix 5-C).

ELC = Ecological Land Classification; RSA = Regional Study Area; LSA = Local Study Area; ha = hectare; % = percent; < = less than

The design and construction phases will aim to minimize impacts to existing vegetation habitat quantity. Mitigation measures, such as minimization of the proposed road width and associated borrow areas, will be implemented.

Lichen-dominated communities are high quality winter habitat for caribou and include the Heath Upland and Lichen/Rock Complex. For the Expansion Project footprint, these ELC units are expected to decrease by 60 ha (1.1%) and 122 ha (1.5%) respectively in the LSA due to the road footprint. Compared to the Approved Project footprint for the haul road, the Heath Upland/Rock Complex will decrease by an additional 1 ha in the Expansion Project Footprint. Heath Upland and Lichen/Rock Complex are suitable nesting habitat for upland breeding birds VC (Approved Project FEIS Volume 5, Section 5.5). It is expected that habitat availability for these ELC units are not limited as 5,320 ha and 7,361 ha will remain undisturbed in the LSA, respectively.

Expansion of the haul road is anticipated to be primarily within the Sand ELC unit, with 9 ha (5.2%) of this ELC unit affected. Although the Sand ELC unit is uncommon in the Wager Bay plateau ecoregion, RSA and LSA, this ELC unit will remain well distributed in the LSA and RSA with 171 ha and 2,312 ha, respectively.

The Project will result in a 360 ha (5.8%) loss of the Water ELC unit in the LSA as a result of the mine and haul road footprints, which translates to 0.3% of this ELC unit affected in the RSA. Compared to the Approved Project footprint, the Water ELC units affected by the Expansion Project footprint remain unchanged. The water ELC unit includes watercourses and waterbodies, which “to the Inuit people, rivers were not just rivers, they were survival” (Local Inuit Field Assistant, 2015, pers. comm. July 5, 2015). Effects of water habitat losses, such as water courses, streams and lakes are assessed in Volume 6.

Overall vegetation and consequential wildlife habitat loss as a result of the Expansion Project footprint is small, 3.7% of the LSA and 0.2% of the RSA; the Expansion Project is anticipated to decrease vegetated ELC units by 0.2% (828 ha) (Table 5.4-3). Comparing the Approved Project footprint with the Expansion Project footprint, the Lichen /Rock complex ELC unit shows greatest loss (area). The area of Lichen /Rock complex loss increases by 143 ha with the Expansion Project footprint; 82 ha for the mine site and 61 ha for the haul road

During construction and operations, Expansion Project effects are localized around the mine site and haul road within the LSA. Losses to vegetation communities are predicted to be long-term for ELC units within the mine footprint that will be naturally revegetated in the long-term post-closure.

Reclamation efforts will focus on providing conditions conducive to natural re-colonization of the site by surrounding native vegetation. Large-scale re-vegetation of the site is not considered feasible at this time as there is no readily-available seed material for native plants. In addition there is a lack of available soils in the Expansion Project area which, in conjunction with the harsh climatic conditions (short cold and dry growing season), makes it difficult to establish vegetation over large areas (Volume 8, Appendix 8-F.1). Reclamation activities and natural re-vegetation of disturbed areas during the closure phase will improve the loss of vegetation communities and reduce overall residual effects within the LSA.

Revegetation of disturbed areas during the closure phase beginning in 2026 will offset these lost habitats and reduce residual effects within the LSA and RSA. The closure vegetation communities will differ from the existing vegetation communities due to the effects of disturbance and recolonization and possibly climate change, but revegetated areas of the Expansion Project footprint are expected to be productive and upland birds are anticipated to recolonize.

5.4.3.1.2 Changes to Vegetation Habitat Quality

Potential effects to vegetation associated with non-footprint disturbances may occur during operations and include dust deposition (total suspended particulate). These effects were assessed qualitatively and are based on results from the Approved Project (FEIS Volume 4, Section 4.3).

Dust will be generated as a result of natural conditions in addition to clearing and construction activities, active hauling on the haul road, dumping waste rock, and other operational activities. Dust deposition has the potential to affect Arctic plants and vegetation communities (Auerbach et al. 1997; Myers-Smith et al. 2006, Walker and Everett 1987). The primary effects of dust are generally confined to the immediate area next to roadways (Everett 1980; Walker and Everett 1987).

An air quality modelling assessment was completed to predict the spatial extent of dust deposition and air emissions with the mine site and haul road (FEIS Addendum Volume 4, Section 4.3). Dust is anticipated to be produced by construction and operations of the haul road and mine site, but effects are anticipated to be relatively limited.

Modelling was completed for the haul road assuming no mitigation measures were applied. Rates of atmospheric deposition are below relevant dustfall standards within 500 m from the haul road (FEIS Addendum Volume 4, Section 4.3).

Dust deposition is expected to continue on the AWAR for the additional years of operation of the Meadowbank Mine. The 2015-2017 Air Quality and Dustfall Monitoring Reports for the Meadowbank Mine (Agnico Eagle 2016a, 2017a, 2018f) indicated lower dustfall than previous years with only 1 exceedance each year.

Dustfall studies have been completed for the Meadowbank AWAR from 2012 to 2017 with sampling stations deployed at 50, 100, and 150 m from both sides of the road. Data from these studies support dustfall modelling predictions for the Expansion Project; specifically that the majority of dustfall occurs within 100 m of the road, and that impacts to vegetation (wildlife habitat) because of dust will be restricted to this area (Agnico Eagle 2014e). Additionally, these studies support the efficacy of proposed dust control mitigations.

Effects of dust on vegetation will be reversible during the closure phase and will be reduced relative to effects expected during the construction and operations phases, as use of the haul road will be discontinued and surfaces and shoulders will be rehabilitated to promote natural encroachment of vegetation. Natural succession of vegetation communities, and thus habitat restoration will begin. Dust will no longer affect air quality once the Expansion Project is decommissioned and the haul road becomes inactive. Therefore, dustfall effects on vegetation are predicted to be reversible. Regular monitoring on the haul road (Volume 8, Appendix 8-E.9) will assess the rate of revegetation along the road. If residual effects are higher than expected, an adaptive management strategy will be taken to ensure that effects are reduced further (Volume 8, Appendix 8-E.9).

Changes to hydrology and drainage patterns are expected to occur during Expansion Project construction and operations, and will extend to closure (Volume 6, Appendix 6-F). Dewatering of the Whale Tail Lake will occur at the end of the construction phase, resulting in the flooding of a number of tributary lakes upstream of the Whale Tail Dike to the Mammoth Lake Watershed, thereby altering flows at Mammoth Lake and downstream lakes. Flooding of terrestrial vegetation is expected to reach a maximum of 148.5 ha in June 2020 and continue to May 2026 (Volume 6, Appendix 6-F). This change in water regime variations can strongly influence plant species composition, community structure, and biological diversity (Vale et al. 2015). These temporary changes in water levels will affect soil moisture, and may result in localized effects to vegetation habitat quality through decreased species abundance.

No measurable differences in water flows and water levels are predicted from baseline to post-closure (Approved Project FEIS Volume 6, Section 6.3). It is unlikely that there will be permanent changes in vegetation community composition over the life of the Expansion Project (seven years between construction [initial water diversion] and closure).

Mitigation measurements such as directing the pumping discharge directly to the lake environment using natural drainage patterns, when possible to reduce the use of ditches or diversion berms would limit changes in surface water flows to the local level, and therefore minimize effects on vegetation habitat condition. Changes in hydrology because of the Expansion Project are not predicted to further reduce vegetation condition in the LSA or RSA beyond the extent of the footprint.

5.4.4 Residual Impact Classification

Residual impact classification definitions and the effects criteria and level for determining significance are described in Volume 3, Appendix 3-E.

After mitigation measurements are applied (Volume 3, Appendix 3-C, Table 3.C-2), the effects of the Approved and Expansion Project footprint are limited to 1,188 ha, of which 828 ha are limited to vegetated ELC units and 360 ha to water (Table 5.4-3). This loss is predicted to occur mostly in the mine site. Consistent with the Approved Project, although high-quality caribou and muskox habitat (i.e., graminoid and lichen dominated ELC units) will be affected by the Expansion Project, these ELC units will remain well represented across the LSA and RSA.

Physical loss of vegetation populations and communities as a result of construction period will remain during the life of the mine. Arctic plant growth rates are limited by harsh growing conditions and a short growing season (Bliss and Wein 1971); therefore, it is anticipated that once vegetation is removed the loss is considered long-term and continuous until functional habitat is reclaimed during the closure phase (see Interim Closure and Reclamation Plan [Volume 8, Appendix 8-F.1] and TEMP [Volume 8, Appendix 8-E.9]). Re-vegetation of disturbed Arctic sites is variable and depends on the extent and intensity of the disturbance (i.e., removal of vegetation or removal of vegetation and soil) and the type of vegetation community. Although Arctic ecosystems can take from 20 to 75 years to recover after disturbance (Forbes et al 2001; Walker and Everett 1987), native sedges (*Carex* spp) and cotton grasses (*Eriophorum* spp.) may revegetate in Arctic tundra in as little as five to 10 years (Chapin and Chapin 1980), and viviparous species such as *Poa alpigena* sp. *colpodea*, *Polygonum viviparum*, *Saxifraga rivularis*, and *S. foliolosa* were successful in establishing within 20 years following disturbance. Research on abandoned winter roads on peatlands in the Hudson Bay Lowland also showed that lichen, bryophyte, and vascular plant cover returned to a similar state as the adjacent undisturbed peatlands within five years, though species composition was different (Campbell and Bergeron 2012).

The closure vegetation communities will differ from the existing vegetation communities due to the effects of disturbance and recolonization, but revegetated areas of the Expansion Project footprint are expected to be productive and function as wildlife habitat, thus the loss is expected to be reversible (Table 5.4-4). Within the LSA and RSA, these changes to vegetation (wildlife habitat) are small enough that there will be no measurable ecological change.

Table 5.4-4: Residual Impacts Classification and Determination of Significance on Vegetation

Pathways with Potential to Affect Vegetation (Wildlife Habitat)	Measurement Indicator	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Likelihood	Significance for Assessment Endpoint[a]	Consequence of Proposed Change: Determining Significance
Direct loss and fragmentation of vegetation habitat from the Project footprint	Changes to Vegetation Habitat Quantity	Negative	Low	Local	Long-term	Continuous	Reversible	Likely	Not Significant	No change
Loss or alteration of local flows, drainage patterns (distribution), and drainage areas from the Project footprint and haul road that can cause changes to vegetation	Changes to Vegetation Habitat Quality	Negative	Low	Local	Medium-term	Continuous	Reversible	Likely	Not Significant	No change

Note: For further information on consequence of proposed change: determining significance for the Expansion Project refer to Table 3.4-2.

[a] Assessment endpoint is defined as self-sustaining and ecologically effective plant populations and communities.

During the construction and operations stage, dust deposition may result in changes to the vegetation quality, particularly to the vegetation adjacent to the haul road. The 2015 and 2017 Air Quality and Dustfall Monitoring report (Agnico Eagle 2016a, 2017a, 2018g) prepared for the Meadowbank Mine indicates that the Alberta Environment recreational/residential area dustfall guidelines were exceeded in 1 out of 48 samples in 2015, 1 out of 47 samples in 2016, 1 out of 48 in 2017. The dust exceedances have shown a trend of decreasing from 2012 through 2017, which is likely a result of increased efforts to manage dust on site roads through use of dust suppressants (calcium chloride application) and water trucks.

Progressive reclamation will be used to reclaim areas no longer needed for road construction by stabilizing disturbed land surfaces, which will promote natural re-vegetation. Therefore, dustfall effects on vegetation are considered medium-term and reversible. Monitoring and adaptive management will be implemented to ensure dustfall deposition is controlled over the life of the Project (TEMP, Volume 8, Appendix 8-E.9).

It is unlikely that there will be permanent changes in vegetation community composition due to the Expansion Project. The effects on vegetation habitat communities due to changes in hydrology would be localized and limited to the LSA. At post-closure, it is expected that hydrology conditions would return to baseline (Approved Project FEIS Volume 6, Section 6.3). Therefore, changes in vegetation communities composition due to changes in hydrology are expected to be reversible.

5.4.4.1 Determination of Significance

Residual effects for the Expansion Project are consistent with the Approved Project. Residual effects to vegetation (wildlife habitat) were determined to be significant to vegetation if ELC units are expected to no longer be: i) self-sustaining, or ii) ecologically effective.

Incremental changes in the vegetation quantity and quality due to the Expansion Project are expected to be small. However, the incremental additions of the Expansion Project to existing effects on vegetation, including changes to quantity, are predicted to be within the resilience and adaptability limits of vegetation units for the following reasons:

- decrease of vegetation quantity due to the Expansion Project is small and confined to the footprint; and
- changes in vegetation quality are localized and are expected to be small after mitigation.

The combined evidence concerning vegetation quantity and quality in the LSA and RSA indicates that vegetation would remain self-sustaining and ecologically effective during construction and operations and would continue to function as wildlife habitat. Graminoid and lichen-dominated ELC units that function as high-quality caribou and muskox habitat will continue to be present and well distributed across the landscape. Consequently, incremental effects from the Expansion Project on vegetation are not considered to be significant on a local and regional scale (Table 5.4-4).

Reclamation activities and natural re-vegetation of disturbed areas during the closure phase (see Interim Closure and Reclamation Plan [Volume 8, Appendix 8-F.1] and TEMP [Volume 8, Appendix 8-E.9]) will improve vegetation units lost and reduce overall residual effects within the LSA even further.

5.4.5 Cumulative Effects Assessment

A cumulative effects assessment was not completed for vegetation (wildlife habitat) as effects to this component are localized and will not interact with other disturbances regionally. Cumulative effects to wildlife are considered in Section 5.5 of the FEIS Addendum.

5.4.6 Uncertainty

Consistent with the uncertainty identified for the Approved Project, the following uncertainties apply to the Expansion Project and the assessment:

- Baseline vegetation survey and mapping provide an estimate of the presence and distribution of vegetation ELC units, and vegetation species. Consequentially, an amount of uncertainty is present because maps cannot provide detailed, site-specific information to all areas.
- Dust deposition models, including: differences in actual versus predicted natural mitigation of windblown dust from unpaved surfaces, drilling and blasting activities, material handling, or wind erosion and/or the effectiveness of proposed dust mitigation measures at the Project.
- Accuracy of the hydrology modelling: differences in actual versus predicted results may vary based on climate conditions and actual filling duration.

Uncertainty was addressed in the assessment by incorporating information from available and applicable literature, and using past experience in similar areas including the experiences at nearby Meadowbank Mine. In addition, the application of environmental design features and mitigation, the Interim Closure and Reclamation Plan (Volume 8, Appendix 8-F.1) and the Water Management Plan (Volume 8, Appendix 8-B.2) will mitigate effects to vegetation.

5.4.7 Monitoring and Follow-up

During community meetings, concerns were expressed about activities resulting in losses of vegetation communities, a reduction in quality of wildlife forage through dust deposition, and the capacity of vegetation to regenerate following mine activities. The TEMP (Volume 8, Appendix 8-E.9) and Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1) address these concerns and will continue to manage the interaction between the Project and the terrestrial ecosystem so that residual effects to vegetation, wildlife, and wildlife habitats are acceptable.

The objectives of monitoring vegetation will be to ensure that measures to minimize the amount of vegetation (wildlife habitat) lost due to Expansion Project construction and operations are effective, and that concentrations of contaminants in vegetation do not exceed acceptable level for wildlife health. Monitoring will also ensure that potentially contaminated vegetation is removed (or isolated from wildlife), and that the site is restored to its natural state (Volume 8, Appendix 8-E.9).

In addition, consistent with Project Certificate No. 008, Agnico Eagle is implementing measures to protect, mitigate, and monitor vegetation, including:

- Prevention of invasive species introduction (T&C #25);
- Encouraging re-establishment of vegetation in disturbed areas as part of progressive reclamation efforts (T&C #26); and
- Exploring the feasibility of topsoil/organic matter salvage as part of project development to determine if disturbed land can support revegetation on closure (T&C #13).

Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NIRB. Agnico Eagle considers, the existing terms and conditions of the Project Certificate issued for the Approved Project are sufficient to protect, mitigate and monitor vegetation impacts associated with the Expansion Project.

Any new required mitigation measures related to primary effects for the Expansion Project are described in relation to the predicted effects and summarized in pathway tables provided in Volume 3, Appendix 3-C.

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan.

5.5 Terrestrial Wildlife and Wildlife Habitat

A summary of the key changes to the assessment of the wildlife and wildlife habitat component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 5.5-0.

Table 5.5-0: Wildlife and Wildlife Habitat: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
5.5.1 Incorporation of IQ	Review of: • Project IQ Baseline Report (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c); • Meadowbank Gold Project Baseline Traditional Knowledge Report (Cumberland 2005a); • Environmental Impact Statement (EIS) Guidelines for the Meadowbank Project (NIRB 2004); • Proposed All-weather Exploration Road from the Meadowbank Mine to the Project Site - Baseline Traditional Knowledge Report (Agnico Eagle 2014a); • Community Consultations/Public Information Meeting Summary Reports for 2014 and 2015 (NIRB 2014, 2015).	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type “A” Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board’s Hearing Regarding the Review of Agnico Eagle Mines Limited’s Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
5.5.2 Existing Environment and Baseline Information	• 2015 Terrestrial Baseline Characterization Report	• 2016 Terrestrial Baseline Supplemental Report • 2017 Comprehensive Terrestrial Baseline Characterization • 2017 Whale Tail Water Bird Report
5.5.3 Project-related Effects Analysis	Three primary pathways were identified	No new primary pathways identified. The same primary pathways are assessed.
5.5.4	Overall, the weight of evidence, and the experience from the Meadowbank Mine, indicates that incremental and cumulative effects from the Project	Unchanged

Section of FEIS	Approved Project	Expansion Project
Residual Impact Classification and Determination	will not have a significant adverse effect on the existing self-sustaining and ecologically effective wildlife populations.	
5.5.4.2 Cumulative Effects	Incremental and cumulative encounter rates with, and residency time in, development Zones of Influence (ZOI)	Updated incremental and cumulative encounter rates with, and residency time in, development ZOIs for Expansion Project (Volume 5, Appendix 5-F)
5.5.4.4 Uncertainty	Uncertainty has been addressed by applying a conservative estimate of effects in the residual impact classification and in the determination of significance. It is anticipated that the baseline data is moderately sufficient for understanding current conditions, and that there is a moderate level of understanding of Project-related impacts on the ecosystem.	The Expansion Project does not influence the uncertainty with the Approved Project FEIS.
5.5.5 Monitoring and Follow-up	• Adaptive management • Terrestrial Ecosystem Management Plan	Refer to Volume 8, Appendix 8-E.9 for an updated Terrestrial Ecosystem Management Plan

5.5.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to wildlife were provided by community members since the FEIS submission was made in 2016 for the Approved Project. This assessment takes into account review of community consultation notes (Agnico Eagle 2016c, 2017c, 2018b,c; NIRB and NWB 2017; NIRB 2017), Terrestrial Advisory Group (TAG) meetings (Agnico Eagle and Golder 2016, 2017a,b, 2018) and consultation notes with Baker Lake and Chesterfield Inlet for the Expansion Project (Agnico Eagle 2018a). IQ and concerns regarding wildlife are summarized below, as well as in Sections 4.3.1, 4.4.1, and 5.4.1 of the FEIS Addendum.

Baker Lake community members re-iterated that caribou is considered a staple food source and their protection is paramount: "…*but we must remember we are the last of the remaining Inuit people that depend on caribou* (NIRB 2017, p.657). It was noted that caribou meat will taste different depending on the caribou's diet (Agnico Eagle 2018a). Muskox are also part of the diet of Baker Lake community members, and fox and wolverine are hunted for their skins (Agnico Eagle 2018a).

Baker Lake community members stated that the caribou calving season is between April and June (Agnico Eagle 2018a, NIRB and NWB 2017). There are two caribou herds that overlap the Meadowbank area, which long-time hunters are able to distinguish based on their appearance and taste (Agnico Eagle 2018a). One herd was described as brown tan in colour with 'manes that stick out', while the other herd had some white hair (Agnico Eagle 2018a). There is also an inland herd that is typically the 'skinniest' and will run and swim away from mosquitoes (Agnico Eagle 2018a).

Caribou migrate down to Baker Lake in August, as described by a community member:

> *When it starts getting dark they come down the migration corridor…we used to see caribou all winter but not anymore. We still get them coming down in August. All the way from Saskatchewan. They walk from and to near calving grounds* (Agnico Eagle 2018a, p.46)

The value of caribou crossings to Baker Lake community members, and their protection, was described:

> *Our traditional values are about the caribou crossings. The people from Baker Lake understand caribou crossings very well because they are sacred, they are what brings caribou from there up to here so that they could end up on the floor of somebody's igloo so that they could eat, so they could survive…the crossings to us are very valuable. We are not allowed to put any kind of garbage or anything*… (NIRB 2017, p. 656)

The importance of not disturbing the first caribou herd passing through during migration was emphasized:

> *With respect to caribou, we are concerned -- when I was growing up, I remember when I was young -- a young adult, our elders would teach the youth how to hunt, and they told us not to bother the caribou. When someone is hunting, when the herd was coming through, they used to tell -- tell the youth, You have to let…the leaders go through first…and it's -- today, it's hard to bring that point across…* (NIRB 2017, p. 668-669)

Since 2008 and the construction of Meadowbank mine, Baker Lake community members have observed changes in caribou distribution patterns:

> *There used to be caribou around Baker. At the runway, I remember when we used to -- when I would fly in, there would be caribou on the runway and we'd have -- they'd have to shoo them away. There used to be caribou around town. We don't see that anymore. That's just within my lifetime of being in and out of the community* (NIRB 2017, p. 660)

Some Baker Lake community members have indicated that caribou have been affected by mining in general, and that explosives may be scaring them away (NIRB and NWB 2017). Changes in caribou movement because of the haul road, including disturbance from road traffic (i.e., speed and horns) have been observed by some community members (NIRB and NWB 2017), while others have indicated that they've observed no changes to caribou movement and migration because of the road (NIRB 2017). It was noted that muskox can also affect the movement patterns and migration routes of caribou herds (NIRB 2017).

The importance of protecting caribou for future generations was emphasized:

> *And we have to watch out for the future; our caribou, make sure we're protecting them -- 'cause, when the mine closes and there's no more jobs, then people are still going to be relying on the caribou. Are the caribou going to be there?* (NIRB 2017, p.663)

> *Our wildlife and our land has to be considered for our future and training for our youth. It is something that they were educated in. We're losing our wildlife*… (NIRB 2017, pg. 639)

It was also noted that a large RSA should be used to monitor and study the effects of all aspects of the Project on caribou, to capture the different herds and their large distribution and movement patterns (NIRB 2017).

The following concerns were expressed by Baker Lake and Chesterfield Inlet community members related to effects on wildlife and continue to be discussed at TAG meetings (Agnico Eagle and Golder 2016, 2017a,b, 2018):

- The effects of the mine, including the haul road and increased traffic between Whale Tail and Meadowbank on caribou movement and migration (Agnico Eagle 2017c, 2018a; NIRB 2017; NIRB and NWB 2017) and concerns with monitoring and enforcement of road traffic to ensure caribou are not disturbed or harmed during their migration (Agnico Eagle 2016c, 2018a; NIRB and NWB 2017).

- The impact of haul road traffic on all wildlife (Agnico Eagle 2016c).
- Potential changes to the landscape from infrastructure (i.e., berms or dams) or lake configuration affecting caribou movement patterns and obstructing their migration routes (Agnico Eagle 2018a).
- The effects of pollution, smell, and dust on caribou (Agnico Eagle 2018a).
- The managing and monitoring of dust and dust chemical suppressants to make sure there is no harm to caribou and other wildlife in the area (NIRB and NWB 2017).
- Food safety and the effects of dust, dust suppressants and mine operations on caribou health and meat quality, and whether any studies are being conducted to determine the effects of mining activities on caribou health (NIRB and NWB 2017; NIRB 2017; Agnico Eagle 2018c).
- The effects of noise and vibration on caribou, and disturbance from explosives at the mine site to wildlife and birds, including to caribou during their migration (Agnico Eagle 2018a; NIRB and NWB 2017).
- Disturbance to wildlife, particularly caribou, from helicopters, and the enforcement of helicopter regulations around wildlife (Agnico Eagle 2016c; NIRB and NWB 2017).
- The monitoring of caribou injury and mortality from Meadowbank Mine operations since they started (NIRB 2017).
- Disturbance to potential caribou calving grounds in the Whale Tail area (Agnico Eagle 2018a; NIRB and NWB 2017).
- Potential effects on muskox, wolverine, and fox, and wolf and fox dens in the Whale Tail area (Agnico Eagle 2018a,b; NIRB 2017)

The concerns as they pertain to the Expansion Project have been incorporated into Sections 5.5.2.2, 5.5.2.3, 5.5.2.4.3, 5.5.3.3, and 5.5.3.4. For additional information related to IQ refer to Volume 5, Section 5.5.1 of the Approved Project FEIS.

5.5.1.1 Existing Environment and Baseline Information

The Expansion Project does not change IQ integration from the Approved Project.

5.5.1.2 Valued Component Selection

Inuit Qaujimajatuqangit was incorporated in VC selection by reviewing documented IQ information, discussions with members of the local community, concerns raised through consultation with regulators (GNDoE and NIRB), and a review of VCs identified in other northern mine projects and past applications for support of extending LOM. The Approved Project Guidelines (NIRB 2004) required that special consideration be given to species of particular social, cultural and economic importance, including those for human consumption.

For the Expansion Project, the selection of VCs remains the same as the Approved Project (FEIS Volume 5, Section 5.5.1.2).

5.5.1.3 Impact Assessment

The Expansion Project considers the same potential pathways as the Approved Project, and takes into account the concerns raised by community members related to effects of the Expansion Project on wildlife VCs.

5.5.1.4 Mitigation and Monitoring

Mitigation measures are developed to reduce impacts and effects to wildlife and wildlife habitat. Mitigation measures to minimize effects and monitoring is provided in the TEMP (Volume 8, Appendix 8-E.9). In November of 2016, caribou were designated as threatened by COSEWIC (2016). Based on these concerns, concerns raised during the review of the Approved Project and in the TAG meetings, the TEMP was updated four times in 2017 to address Information Requests, concerns around mine related effects to caribou, and commitments raised during the regulatory process for the FEIS of the Approved Project.

5.5.2 Existing Environmental and Baseline Information

Existing environment and baseline information is provided in Volume 5, Appendix 5-C. In addition to the environmental monitoring information collected at the Meadowbank Mine (Gebauer and Boulanger 2007; Gebauer et al. 2008 to 2015); baseline field studies were completed at the Project in 2014 and 2015.

Additional baseline monitoring was completed post-Approved Project FEIS in 2016 and 2017 (Dougan and Associates (2017) and included the following:

- Arctic Program for Regional and International Shorebird Monitoring (PRISM) plot surveys for upland breeding birds and water birds within the RSA;
- shoreline surveys for water birds along waterbodies within 100 m of the proposed footprint;
- ground reconnaissance surveys for caribou, muskox, predatory mammals, nesting raptors, and other species in the vicinity of eskers;
- ground-truthed caribou track surveys around the Whale Tail study area and along the haul road alignment
- height-of-land surveys for caribou, muskox, predatory mammals, and other species incidentally observed during vegetation monitoring plots; and
- raptor nest surveys in the RSA.

5.5.2.1 Species of Concern

The intent of the federal *Species at Risk Act*, is to protect species at risk from becoming extirpated or extinct as a result of human activity. Species with ranges that overlap with the Expansion Project, may be considered to be of concern as a result of either their national, territorial or Committee on Status of Endangered Wildlife in Canada (COSEWIC) status. To date, no species have been listed under the Nunavut *Species at Risk Act*.

There are six wildlife species of concern with breeding or wintering ranges that overlap with the Expansion Project (Table 5.5-1). In November of 2016, caribou were designated as threatened by COSEWIC (2016). Although there are changes to wildlife species of concern, these are the same species assessed in the Approved Project.

Table 5.5-1: Wildlife Species of Concern for the Project

Species	COSEWIC Assessment	Federal *Species at Risk Act*	Potential Impacts	Wildlife Value Component
Caribou (Barren-ground population)	Threatened	no status	direct habitat loss; indirect habitat loss from sensory disturbance	Caribou
Grizzly bear (western population)	Special concern	no status	May be attracted to developments if food is available; direct habitat loss	Predatory mammal
Wolverine (western population)	Special concern	no status	May be attracted to developments if food or shelter are available; direct habitat loss	Predatory mammal
Peregrine falcon (*anatum-tundrius* complex)	Not at risk	Schedule 1	Direct habitat loss	Raptor
Red-necked phalarope	Special concern	no status	Direct habitat loss	Water bird
Short-eared owl	Special concern	Schedule 1	Direct habitat loss	Raptor

Source: COSEWIC (2016); GC (2016, 2018).

COSEWIC = Committee on the Status of Endangered Wildlife in Canada.

5.5.2.2 Caribou

Caribou are an important part of the Arctic ecosystem, and a key part of the culture and traditional economy of Nunavut. There are five migratory barren-ground caribou herds identified in the Kivalliq including the Beverly, Ahiak, Wager Bay, Lorillard, and Qamanirjuaq herds (Volume 5, Appendix 5-C, Figure 7.1). As a result, Inuit traditionally did not live at or near the calving grounds but rather chose to remain at a distance, and set up camps along the migration routes (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Elders have stated that there are no caribou calving grounds identified near the Whale Tail area (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c), and according to Nagy et al. (2011), the nearest calving ground is over 100 km away.

Since 1999, studies on the caribou population status, distribution, seasonal movements, traditional use, and hunting pressures were undertaken (Cumberland 2005e; Gebauer et al. 2008 to 2015; Volume 5, Appendix 5-C). These reports describe existing conditions within the LSA and RSA, and provide a regional dataset on the existing conditions for migratory caribou with large home ranges and is summarized herein. Recently spring (2018), caribou from the Lorillard and Wager Bay herds were collared and that information was collected and used to support this FEIS Addendum.

Additional targeted field surveys were also conducted along the haul road route in 2014 and 2015 (Volume 5, Appendix 5-C) and 2017 (Dougan and Associates 2017). Information regarding caribou seasonal abundance, movement patterns, water crossings, habitat use, and harvesting patterns is summarized in the following sections.

No caribou mortalities have occurred on the AWAR since 2013 (Table 5.5-2) as documented between 2007 and 2017. Mitigation implemented to reduce the road-related effects to caribou includes speed limit signs, wildlife activity notices, and road closures. This is a direct result of Elders requesting an increase in wildlife monitoring along the road, which continues to be communicated by communities (NIRB 2017), a quicker response time, and road closures during key caribou migration periods (Agnico Eagle 2015b). Details of all wildlife mortalities can be found in the annual wildlife monitoring reports (Gebauer et al. 2008 to 2015).

Table 5.5-2: Caribou Road Mortalities at Meadowbank Mine and on All-Weather Access Road, 2007 to 2017

Year	Meadowbank	AWAR
2007	0	2
2008	0	2
2009	0	0
2010	0	1
2011	0	0
2012	0	1
2013	0	5
2014	0	0
2015	0	0
2016	0	0
2017	0	0

Note: this table includes road related mortalities only and does not include mortalities at the Meadowbank Mine due to other causes.
AWAR = All-Weather Access Road.

Procedures for monitoring caribou movements across the AWAR, including regularly broadcasted wildlife warnings and closing the AWAR when large number of caribou are present, have shown to be effective (Volume 8, Appendix 8-E.9). One road closure was required in 2016, closures occurred five times in 2017 (Table 5.5-3) and during the spring migration of 2018 (Agnico Eagle 2017, 2018c). Road closures are a standard operating procedure when deemed necessary to allow for safe caribou passage. Similar mitigation has been applied to road for the Approved Project There were 33 road closures (and partial closures) for the Approved Project's Amaruq road in 2018 that occurred between April 14 to May 30.

Table 5.5-3: All-Weather Access Road Closures Due to Caribou Presence, 2009 to 2018

Baker Lake to Meadowbank AWAR Data	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Road closures for caribou migration (days)	2	0	1	5	0	4	10	1	5	14
Date (range) of closure or partial closure	mid Oct	10 to 26 Oct	5 to 30 Oct	4 to 25 Nov	28 Nov to 21 Dec	23 Oct to 26 Nov	15 Nov to 10 Dec	18 Apr	9 Aug to 4 Nov	13 Apr to 16 May

AWAR = All-Weather Access Road.

Seasonal Abundance

Population status of the herds that interact with the Whale Tail area is unclear, but many mainland Nunavut caribou herds including the Beverly, Ahiak and Qamanirjuaq are believed to be in decline (Vors and Boyce 2009, CARMA 2016).

Collared caribou from all five herds have used the RSA, although at different frequencies and seasons, depending on their herd ranges. The date ranges for the seasons follow those used in Gebauer et al. 2015.

Collared caribou from all five herds spent 0.37% of their total time in the RSA (i.e., the ratio of collar time within the RSA versus outside the RSA). The collar data indicates that the Ahiak, Lorillard, and Wager Bay herds have the greatest likelihood of interacting with the Approved and Expansion Project, as they were the most frequently recorded herds within the RSA. The Ahiak herd had 27 unique individuals recorded interacting with the RSA for a total of 317 days, the Lorillard herd had 25 unique individuals recorded interacting with the RSA for a total of 268 days, and the Wager Bay herd had 12 unique individuals recorded interacting with the RSA for a total of 329 days. This represents a total percent of time recorded of 0.7%, 0.9%, and 2.1% spent in the RSA for the Ahiak, Lorillard, and Wager Bay herds, respectively. Only one unique individual from the Qamanirjuaq herd and six unique individuals from the Beverly herd have been recorded in the RSA; therefore, percentage of collar locations is nil or very low in all seasons. Subsequent analysis of collar data from the Ahiak, Beverly, Lorillard and Wager Bay caribou herds to meet the Approved Project Commitments 9 and 10 showed that the Ahiak and Beverly spring, fall and winter ranges did not overlap with the Whale Tail Project (Golder 2017a). Therefore, effects assessment analyses for the Expansion Project were only carried out with collar data from the Lorillard and Wager Bay caribou herds because they had the greatest potential to interact with the Approved and Expansion Project. For the Expansion Project, five unique individuals from the Lorillard herd recorded locations within the RSA for a total of 33 days (1.1%) since May 2017. From the Wager Bay herd, eight unique individuals recorded locations within the RSA for a total of 62 days (4.5%). The amount of time collared caribou are spending in the RSA remains low as described in the Approved Project FEIS.

Collared caribou were most commonly recorded in the RSA during the late winter (i.e., 8.0% of the collar time) and fall rut (i.e., 5.1% of the collar time). The data do not indicate calving activity in the RSA as few collared caribou are present in the RSA during the calving period, which is consistent with Elders identifying there that there are no calving grounds near the Whale Tail area (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Some collared caribou have been recorded traveling through the RSA during the calving and post-calving season, and Elders have reported that cows with calves do frequent the area around the haul road route (Agnico Eagle 2014a). During the calving period, one individual from the Ahiak herd was recorded for a total of two days, and one individual from the Lorillard herd was recorded for approximately one day. No collared individuals from the Beverly herd were recorded in the RSA during the calving season, and no collared individuals from the Qamanirjuaq and Wager Bay herds were recorded during the calving or post-calving seasons.

Movement Patterns

Within the RSA, caribou movements appear to be diffuse and distributed across the study area, with potential movement corridors north of Tehek Lake (Volume 5, Appendix 5-C, Figure 7.8). Caribou trails identified in the RSA during IQ workshops and confirmed by field biologists during the baseline surveys support this observation (Volume 5, Appendix 5-C, Figure 7.9). Elders also noted many caribou frequent the area around Tasirjuaraajuk (Pipedream) Lake (Agnico Eagle 2014a).

The RSA appears to be located within a transit corridor during spring and fall migration, predominantly for the Ahiak and Lorillard herds moving between calving and wintering grounds. For spring migration (April to June), areas of high use by collared caribou are more contained (i.e., less spread out), and these corridors are quite clearly delineated on the way to, and in proximity of, calving grounds outside the RSA (Volume 5, Appendix 5-C, Figure 7.9). For fall migration (September to November), as animals are migrating to wintering grounds, areas of high use by collared caribou are more widely distributed (Volume 5, Appendix 5-C, Figure 7.10). Fall migration corridors are located in closer proximity to the Project RSA than spring corridors. Travel routes along Uiguklik Lake that were identified by Elders, reportedly followed caribou migration routes (Agnico Eagle 2014a). Muskox can also influence the movement and migration patterns of caribou (NIRB 2017). Further description of caribou seasonal movements is provided in Volume 5, Appendix 5-C, Section 4.3.3.9.

The collar data were queried to describe by season the number of collared individuals that entered the LSA (i.e., within 3 km of the road), how many of these individuals went on to cross the AWAR and haul road route, and if so, how many times individuals crossed. The query included both actual interactions with the AWAR and expected interactions with the haul road route (Volume 5, Appendix 5-D, Table 5-D-2). Ahiak and Lorillard herds were the most likely herds to interact with the AWAR and the haul road route. The Ahiak herd had seven unique individuals cross the AWAR and 19 unique individuals cross the haul road route. The Lorillard herd had 19 unique individuals cross the AWAR and 13 unique individuals cross the haul road route. The Wager Bay herd had three unique individuals cross the AWAR and five unique individuals cross the haul road route. The Beverly and Qamanirjuaq herds had no caribou cross the AWAR and two and one unique individuals cross the haul road route respectively. Caribou from all herds were most commonly recorded crossing the haul road route and the AWAR during the spring season. None of the herds were recorded crossing the haul road route during the calving season, and only one caribou was recorded during the post-calving season.

Habitat Use

Habitat selection and behaviour of barren-ground caribou are frequently the result of their response to environmental conditions; therefore, caribou can be found in a variety of habitat types at any one time. Selection of habitat appears to take place over several spatial scales and is related to food availability, ease of travel, relief from insects and predation (Curatolo 1975). Hunters have suggested that weather and snow conditions play a greater role in defining caribou distribution than other factors, and that a range of conditions characterize prime wintering areas (Kendrick and Manseau 2008).

At the scale of the annual range, barren-ground caribou have large ranges and make large seasonal movements across these ranges. The estimated geographic ranges of the herds that may interact with the Expansion Project, range from approximately 144,000 to 462,000 km^2 (Table 5.5-4; Nagy et al. 2011; Volume 5, Appendix 5-C, Figure 7.1). At the scale of the seasonal range, caribou select habitats dominated by lichen, heath tundra, and rock vegetation types (Johnson et al. 2005). Caribou generally feed on lichen during winter, and fresh shrubs (leaves and stems) and graminoids during the vegetation growing season (Adamczewski et al. 1988); therefore, habitat that contains these features will be of higher value to caribou in the appropriate season. Habitat suitability rankings were used to identify quality habitats for the Meadowbank Mine (Cumberland 2005e) and were updated for the Approved Project (Volume 5, Appendix 5-C, Section 4.3.4).

Table 5.5-4: Annual Range of Kivalliq Caribou Herds

Herd	Annual Home Range Area (km^2)
Ahiak	416,796
Beverly	436,671
Lorillard	144,541
Qamanirjuaq	461,856
Wager Bay	269,209

km^2 = square kilometre.

Water crossings in particular play an important role in many periods of the annual cycle for caribou and their connection with people (NIRB 2017). During migration, caribou follow natural geographic features, which cause them to concentrate at traditional water crossings (Williams and Gunn 1982). No federal or territory protected water crossings are found in the RSA; however, Elders identified narrows along Uiguklik and Nutipilik lakes as known caribou crossing areas (Agnico Eagle 2014a). Caribou were traditionally (and sometimes still are) hunted at such crossing places (Agnico Eagle 2014a).

Harvesting Patterns

Historical harvesting patterns were described for the Approved Project (FEIS Volume 5). No new harvesting information was available for 2016 or 2017 but harvest levels are anticipated to be within historical ranges.

5.5.2.3 Muskox

Recent community consultation notes (Agnico Eagle 2018a) indicate that muskox are hunted for food by communities.

Details on muskox habitat preferences, reproduction and behaviour are provided in Volume 5, Appendix 5-C, Section 4.3.4.1. No muskox mortalities at the Meadowbank Mine or on the AWAR have been documented to date.

5.5.2.4 Predatory Mammals

Predatory mammals are highly mobile animals that predominantly feed on other vertebrates and occupy the top or near-top terrestrial trophic layer. Within the RSA, this group is represented by three VC species; Arctic wolf, grizzly bear, and wolverine. Further details on predatory mammal habitat preferences, reproduction, and behaviour are provided in Volume 5, Appendix 5-C, Section 4.3.4.1.

To date, mine-related mortalities of wolf and wolverine at the Meadowbank Mine have been low (Table 5.5-5). There have been no grizzly bear mortalities to date, and only three wolverine. The AWAR presents a lesser risk to wolverine and wolf, with only one and three mortalities to date, respectively (Table 5.5-6). Details of all wildlife mortalities can be found in the annual wildlife monitoring reports (Gebauer et al. 2008 to 2015; Agnico Eagle 2017d, 2018d).

Table 5.5-5: Summary of Meadowbank Mine Site Wildlife Mortalities, 2007 to 2017

Year	Grizzly Bear	Wolverine	Wolf
2007	0	0	0
2008	0	0	2
2009	0	0	4
2010	0	0	1
2011	0	1	4
2012	0	0	1
2013	0	1	0
2014	0	0	1
2015	0	0	1[a]
2016	0	0	0
2017	0	1	0

[a] Naturally injured wolf that was euthanized.

Table 5.5-6: Summary of Meadowbank All-Weather Access Road Wildlife Mortalities, 2007 to 2017

Year	Grizzly Bear	Wolverine	Wolf
2007	0	0	0
2008	0	0	2
2009	0	0	0
2010	0	0	0
2011	0	0	1
2012	0	1	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0

5.5.2.4.1 Arctic Wolf

Details on Arctic wolf presence in the study area, reproduction, and behaviour are provided in Volume 5, Appendix 5-C, Section 4.3.4.1.

5.5.2.4.2 Grizzly Bear

Details on grizzly bear presence in the RSA, reproduction, and behaviour are provided in Volume 5, Appendix 5-C, Section 4.3.4.1.

5.5.2.4.3 Wolverine

Wolverines were noted as a species that was not specifically targeted for harvesting and only taken incidentally while hunting other species (Cumberland 2005a). Elders interviewed in 2008 noted that some people do hunt wolverines, and more recent community consultation notes (Agnico Eagle 2018a) indicate that wolverines are hunted for the fur. Details on wolverine presence in the RSA, reproduction and behaviour, are provided in Volume 5, Appendix 5-C, Section 4.3.4.1.

5.5.2.5 Raptors

Detail on raptor presence in the RSA, reproduction, and behaviour are provided in Volume 5, Appendix 5-C, Section 4.3.4.2.

At the Meadowbank Mine, peregrine falcons have initiated nests on the cliffs created in the AWAR quarries. This was first observed in 2009 and was followed by the development of a Peregrine Falcon Management and Protection Plan in 2013. Monitoring has found one to eight nests annually since 2009 in the 22 quarries, and additional nests in Portage Pit (Table 5.5-7). Monitoring of nest productivity is not undertaken, but chicks have been observed in some of these nests. Agnico Eagle continues to work with Alastair Franke and the Arctic Raptor Group (who assisted with baseline data collection for the Whale Tail Pit; Volume 5, Appendix 5-C). Adaptive management actions taken for raptors nesting in AWAR quarries is documented in Section 5.5.5.1.2. Studies at other mines in northern Canada have indicated that peregrine falcons and gyrfalcon nesting is not affected by mining activity (Coulton et al. 2013), and that nesting on mine infrastructure is not uncommon (ERM 2015).

Table 5.5-7: Presence of Peregrine Falcon Nests within the Local Study Area, 2009 to 2017

Location	2009	2010	2011	2012	2013	2014	2015	2016	2017
Quarry 1	No	No	No	No	No	No	No	No	No
Quarry 2	No	Yes	Yes	Yes	Yes	Yes	No	No	No
Quarry 3	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Quarries 4 to 6	No	No	No	No	No	No	No	No	No
Quarry 7	No	No	No	No	No	No	No	Yes	Yes
Quarry 8	No	No	No	No	No	No	No	No	Yes
Quarry 9	No	No	No	No	No	No	No	No	No
Quarries 10 to 11	No	No	No	No	No	No	No	No	No
Quarry 12	No	No	No	No	No	No	No	No	No
Quarry 13	No	No	No	No	No	No	No	No	No
Quarry 14	No	No	No	No	No	No	No	No	No
Quarry 15	No	No	No	No	No	No	No	No	No

Location	2009	2010	2011	2012	2013	2014	2015	2016	2017
Quarry 16	No	No	No	No	No	No	Yes	Yes	Yes
Quarry 17	No	No	No	No	No	No	No	No	Yes
Quarry 18	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Quarry 19	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarry 20	No	No	No	No	No	No	No	No	No
Quarry 21	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarry 22	No	No	No	No	No	No	No	No	Yes

5.5.2.6 Water Birds

Details of water bird presence, reproduction, and behaviour are provided in Volume 5, Appendix 5-C, Section 4.3.4.2).

Sporadic reports of water bird mortalities have been reported over the years, with one report of a Canada goose dying after getting stuck in the Meadowbank Mine TSF pond in 2015. As a result of this incident, more intensive monitoring of the tailings pond during the migratory period for water birds has been conducted (e.g., daily monitoring during the migratory season). In 2016, a juvenile merganser was caught in gill nets during the fish-out program for Phaser Lake (Agnico Eagle 2017d). No water bird mortalities occurred in 2017 (Agnico Eagle 2018a). Protocols for deterrents are outlined in the Wildlife Protection and Response Plan (Volume 8, Appendix 8-E.9).

5.5.2.7 Upland Breeding Birds

Various upland breeding bird species, including horned lark, American pipit, white-crowned sparrow, savannah sparrow, lapland longspur, snow bunting, willow ptarmigan, rock ptarmigan, semi-palmated sandpiper, and American golden-plover, are present within the study areas. None of the upland birds occurring within the study area are listed federally (COSEWIC 2016). The red-necked phalarope is listed federally as a species of special concern (COSEWIC 2016) but has not been observed. Elders consider upland birds to be less common than they were in the past and attribute this to changes in climate (Agnico Eagle 2014a).

Upland birds have been surveyed at the Meadowbank Mine since 2003 using PRISM protocols. The plots are grouped in areas near the Meadowbank Mine, and in a control area. Analysis of this data up to and including 2012 did not detect any differences in species abundance, richness, or diversity either with proximity to the Mine, or over time (Gebauer et al. 2013). Including all birds identified, an average density of 1.15 birds per hectare were recorded between 2003 and 2015 (SD = 0.13, Table 5.5-8). Baseline studies near the Approved and Expansion Project in 2015 found a total density of 1.41 birds per hectare representing 13 species (Volume 5, Appendix 5-C, Section 4.3.3.1), results which were comparable to the control area in 2015.

Baseline monitoring continued in 2016 with 22 species detected at 20 Whale Tail plots with a density of 1.19 birds per hectare (Dougan and Associates 2017). A total of 23 species were detected at 20 control plots with a density of 0.75 birds per hectare (Dougan and Associates 2017). Information of related to the number of males, females or unknown sex were not listed in Dougan and Associates (2017) and could not be included in Table 5.5-8.

Table 5.5-8: Density of Upland Birds Observed during PRISM Surveys, 2003 to 2015

Year	Male	Female	Unknown	Number of Plots	Male/ha	Female/ha	Unknown/ha	Total Observation/ha
2003	122	66	20	13	0.587	0.317	0.096	1.000
2004	113	53	25	12	0.589	0.276	0.130	0.995
2005	360	216	100	39	0.577	0.346	0.160	1.083
2006	522	247	118	43	0.759	0.359	0.172	1.289
2007	526	270	141	45	0.731	0.375	0.196	1.301
2008	517	214	200	45	0.718	0.297	0.278	1.293
2009	543	245	105	45	0.754	0.340	0.146	1.240
2010	484	297	98	45	0.672	0.413	0.136	1.221
2011	441	244	79	45	0.613	0.339	0.110	1.061
2012	378	190	123	45	0.525	0.264	0.171	0.960
2015	486	240	159	45	0.675	0.333	0.221	1.229

PRISM = Program for Regional and International Shorebird Monitoring; ha = hectare.

5.5.2.8 Small Mammals

The species presence, reproduction, and behaviour of small mammals are described in Volume 5, Appendix 5-C, Section 4.3.4.1.3. No new species were detected during 2016 baseline studies (Dougan and Associates 2017).

5.5.3 Expansion Project-related Effects Analysis

Analysis of the potential pathways for effects on terrestrial wildlife and birds during construction, operations, and closure is provided for the Expansion Project in Volume 3, Appendix 3-C, Table 3-C-3.

Primary pathways are those where effects from the Expansion Project will likely result in a measurable change to measurement indicators that could contribute to residual effects on a VC relative to the Baseline Case or guideline values. Pathways determined to have no linkage or those that are considered secondary are not predicted to result in environmentally significant effects on terrestrial wildlife and birds and are not carried through the effects assessment. Secondary effects pathways and effects pathways with no linkage are summarized in the pathway analysis table in Volume 3, Appendix 3-C, Table 3-C-3. The following are the primary pathways that require further effects analysis to determine the environmental significance from the Expansion Project on terrestrial wildlife and birds:

- Changes to wildlife habitat quantity.
- Changes to wildlife habitat quality.
- Changes to Wildlife Survival and Reproduction.

The Primary pathways considered for the Expansion Project are the same assessed for the Approved Project.

5.5.3.1 Primary Pathways Effects Analysis

The evaluation of Expansion Project effects on terrestrial wildlife considers the changes of measurement indicators: and associated primary pathways (Table 5.5-9).

Table 5.5-9: Measurement Indicators and Primary Pathways

Measurement Indicator	Associated Primary Pathway
Changes to Wildlife Habitat Quantity	Direct loss and fragmentation of wildlife habitat from the Expansion Project footprint (caribou and upland birds)
Changes to Wildlife Habitat Quality	Sensory disturbance from vehicles, on-site equipment, human presence, and vibrations, can change the amount of different quality habitats, and alter wildlife movement and behaviour (caribou and upland birds) Barriers to migration, which may affect population connectivity and distribution (caribou)
Changes to Wildlife Survival and Reproduction	Destruction of nests and flooding from construction activities including increased flows or water levels can increase risk of mortality to individual birds, which can affect population sizes (upland and water birds)

5.5.3.2 Primary Pathway Direct Habitat Loss

- **Direct loss and fragmentation of wildlife habitat from the Expansion Project footprint**

Developing the Expansion Project will result in the loss of vegetation communities leading to a direct loss of wildlife habitat, affecting all VCs. Mitigation to prevent direct loss from the Expansion Project footprint (including the Approved Project) is outlined in the existing TEMP (Project Certificate No. 008, T&C #28) and includes the compact arrangement of Expansion Project infrastructure to assist with minimizing the overall footprint.

The landscape has been described in terms of ELC units, and ELC loss from the Expansion Project is described in Section 5.4.3 (Vegetation) of the FEIS Addendum. Further to this, habitat suitability rankings were used as a means to quantify the relative value (high, medium and low) of the various ELC units for the VC species and measure the amount of habitat lost to each VC as a result of the Expansion Project. These habitat suitability rankings were developed for the Approved Project (Volume 5, Appendix 5-C).

Losses of preferred habitats are anticipated for all VCs but as a low percentage of the available habitat in the LSA and RSA for each VC. The maximum amount of vegetated and non-vegetated ELC units lost due to the Expansion Project is predicted to be approximately 1,188 ha, or 4.1% of the LSA (i.e., 0.2% of the RSA) (Table 5.4-3). The majority of the Expansion Project footprint is comprised of lichen/rock complex (26.5%), water (21.4%), heath upland (19.1%), and heath tundra (12.5%). Of these classes, heath upland likely has the greatest value to wildlife.

Habitat suitability rankings for caribou are provided for both the growing and winter seasons (Volume 5, Appendix 5-C, Table 4.7). Ecological land classification units were ranked as high, moderate, low or nil based on expert opinion. For example, wet graminoid is considered high quality habitat in the growing season as there is abundant forage, while lichen/rock complex is considered low quality. For the purpose of this assessment, high and moderate habitats were considered to be preferred habitat (Volume 5, Appendix 5-C, Section 4.2.3.1.1).

While caribou are most abundant in the RSA during the fall and winter, they can be present throughout the year and display different habitat preferences between summer and winter. Approximately 66% of the Expansion Project footprint is preferred caribou habitat in the growing season, and 60% during the winter season (Table 5.5-10). This is equal to approximately 2.8% and 2.5% of the preferred habitat in the growing and winter season, respectively in the LSA, and lesson more than 0.2% of the available preferred habitat in the RSA. Further, the RSA is not frequently used by caribou; collared caribou of the Wager Bay herd were most common in the RSA, but this was based on 12 GPS-collared caribou spending 2.1% of their collar time in the RSA (Volume 5, Appendix 5-D, Table 5-D-1).

To forecast the displacement of upland breeding birds by the Approved Project and Expansion Project, PRISM data from Meadowbank Mine was reviewed. The average number of upland birds observed on PRISM plots at Meadowbank Mine between 2003 and 2015 is 1.15 per ha (Table 5.5-8) and 1.41 per ha during the 2014 and 2015 Project baseline studies, respectively (Volume 5, Appendix 5-C, Section 4.3.3.1). In 2016 baseline studies, the average number of birds was 0.97 per ha (Dougan and Associates 2017). Considering the number of upland birds observed at the Meadowbank Mine, and using the higher baseline density of 1.41 birds per hectare, the Approved Project footprint is predicted to displace approximately 1,200 birds or approximately 3% and 0.2% of the likely number of birds in the LSA and RSA, respectively. The Expansion Project is predicted to displace approximately 1,675 birds or about 4.2% and 0.2% of the likely number of birds in LSA and RSA, respectively. Bird mitigation from flooding is being addressed through collaboration with ECCC to develop the Waterbird Management Plan.

In addition to direct loss of habitat, the Expansion Project may also result in fragmentation of the existing landscape. Mitigation to prevent habitat fragmentation includes designing roads as low and narrow as possible, while maintaining safe construction and operations practices, and meeting legislated requirements, as outlined in the Haul Road Management Plan. Habitat fragmentation is the progressive subdivision of habitat blocks into fragments. Although fragmentation always accompanies habitat loss, it is a different phenomenon (McGarigal and Cushman 2002; Fahrig 2003). Habitat fragmentation effects are lesser in magnitude than direct habitat loss (Andrén 1999; Fahrig 1997, 2003), and species with very specific habitat requirements and low dispersal abilities are more likely to be affected by habitat fragmentation. Reclamation activities and natural re-vegetation of disturbed areas during the closure phase will improve the loss of vegetation communities and reduce overall residual effects within the LSA. Thus, direct habitat loss and fragmentation are anticipated to have a limited effect on habitat quantity in the LSA and RSA.

The conclusion for Expansion Project is the same as for the Approved Project.

Table 5.5-10: Habitat Suitability Areas for Caribou in the Local Study Area and Regional Study Area

Habitat Suitability (ha)	LSA		RSA		Approved Project		Approved Project as % of LSA		Approved Project as % of RSA		Expansion Project		Expansion Project as % of LSA		Expansion Project as % of RSA	
	Growing	Winter	Growing	Winter	Growing	Winter	Growing	Winter	Growing	Winter	Growing	Winter	Growing	Winter	Growing	Winter
High	988.62	16,871.11	20,753.78	258,226.92	30.33	342.26	3.1%	2.0%	0.1%	0.1%	37.76	613.82	3.8%	3.6%	0.2%	0.2%
Medium	19,813.11	2,899.82	320,614.57	50,612.04	420.51	70.70	2.1%	2.4%	0.1%	0.1%	741.01	100.14	3.7%	3.5%	0.2%	0.2%
Low	1,414.12	8,444.01	21,421.82	179,593.47	29.94	407.18	2.1%	4.8%	0.1%	0.2%	49.28	474.16	3.5%	5.6%	0.2%	0.3%
water and disturbance	5,999.11	0	126,396.24	753.98	339.37	0	5.7%	-	0.3%	0.0%	360.07	0	6.0%	-	0.3%	0.0%
not determined	0	0	12,508.37	12,508.37	0	0	-	-	0.0%	0.0%	0	0	-	-	0.0%	
Total	**28,214.95**	**28,214.95**	**501,694.78**	**501,694.78**	**820.14**	**820.14**	**2.9%**	**2.9%**	**0.2%**	**0.2%**	**1,188.11**	**1,188.11**	**4.2%**	**4.2%**	**0.2%**	**0.2%**

Note: Areas in hectares, rounded to nearest 100th.

5.5.3.3 Primary Pathway Indirect Habitat Loss

- **Sensory disturbance from vehicles, on-site equipment, human presence and vibrations, can change the amount of different quality habitats, and alter wildlife movement and behaviour**

While the Expansion Project will lead to direct habitat loss for VCs because of the its footprint, indirect loss will also occur at the local and regional scales. Sensory disturbances (such as noise and movement) that extend beyond the Project footprint will occur during construction and operations. The Expansion Project will extend operations from 2022 to 2025. Changes associated with the Expansion Project are not predicted to exceed the effectiveness of mitigation.

Mitigation to address sensory disturbance is addressed in the Noise Monitoring and Abatement Plan (Volume 8, Appendix 8-E.7), the Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1), the Air Quality and Dustfall Monitoring Plan (Volume 8, Appendix 8-E.1), and the TEMP (Volume 8, Appendix 8-E.9). Mitigation includes managing traffic volumes, enforcing speed limits, providing all employees with wildlife awareness training, site notifications, and providing wildlife with the right-of-way on all roads. This type of mitigation acknowledges concerns raised by communities about how mines and roads might affect caribou (NIRB 2017). The same mitigation applied to the Approved Project will also be present for the Expansion Project and established monitoring plans will be able to evaluate mitigation effectiveness and inform adaptive management.

The effect of indirect habitat loss was a primary pathway for caribou due to their seasonal abundance and cultural importance (Agnico Eagle 2014a), and for upland birds due to their abundance. Other VCs that were present in the Whale Tail area during baseline studies tended to be present in low densities or are known to be less affected by sensory disturbance based on monitoring results at Meadowbank and other mines, resulting in negligible effects. For example, monitoring of muskox, water birds, small mammals predatory mammals, and raptors at both the Meadowbank and Ekati mines has shifted to focus on detecting and mitigating direct interactions with the mine, rather than attempting to detect effects of sensory disturbance or a zone of influence (ZOI; Gebauer et al. 2015; ERM Rescan 2014).

Habitat suitability rankings for the Approved Project are described in Volume 5, Appendix 5-C, Section 4.3.4. As described above, habitat suitability ratings were prepared for caribou (Volume 5, Appendix 5-C), with high and moderate rankings pooled to describe preferred habitat. Indirect effects from the Approved Project are likely to reduce the suitability of these habitats, reducing the proportion of preferred habitat in the LSA and RSA.

Avoidance may also lead to energetic effects. Some studies have shown no responses (e.g., no changes in activity levels from baseline conditions; Telesco and VanManen 2006) or transitory responses (e.g., returning to normal hormone, heart rate, or activity levels within a few minutes; Krausman and Hervert 1983; Weisenberger et al. 1996) by wildlife to human disturbance. Previously completed work in the Canadian Arctic suggests that sensory disturbances from development influence wildlife behaviour, movements, and distributions. For example, monitoring at Ekati suggested that caribou groups with calves spend less time feeding within 5 km of the footprint (BHPB 2004), and that mines cause changes to caribou distribution, leading to lower probability of occurrence within 6 to 14 km (Boulanger et al. 2012). Communities have also suggested that caribou may be deterred by smells, blasting and vibration (Agnico Eagle 2018a, NIRB 2017) and helicopters (Agnico Eagle 2016c, NIRB and NWB 2017). The mechanism causing these effects is not yet understood, but is likely a combination of direct effects (e.g., physical footprint) and indirect effects (e.g., noise, smell, dust). As this avoidance does not preclude compensatory foraging to make up for any additional energy costs, or continued foraging during avoidance, the energetic costs of avoidance are likely to be negligible and not measurable at the population scale. Regardless, effects to caribou and upland bird habitat quality are anticipated to result from the Project.

Changes to noise from the Expansion Project were assessed (FEIS Addendum Volume 4, Section 4.4) and predicted effects would be confined to the RSA, consistent with the Approved Project. Noise associated with the Expansion Project is captured in the existing Noise Monitoring and Abatement Plan (Volume 8, Appendix 8-E.7), which captures all sources of noise and evaluate all mitigation effectiveness.

Changes to air quality from the Expansion Project were also assessed (FEIS Addendum Volume 4, Section 4.3) and predicted to be similar to the Approved Project (e.g., effects of dust emissions on air quality adjacent to the haul road, and the effects of mining activities at the Whale Tail Pit on regional air quality are both limited in spatial extent and regional air quality considered low). An updated Air Quality and Dustfall Monitoring Plan (Volume 8, Appendix 8.E-1) has been prepared to capture dust associated with Expansion Project and evaluate mitigation effectiveness.

Caribou

A ZOI analysis with caribou collar data from Lorillard and Wager Bay caribou herds was completed for Meadowbank Mine as part of the Approved Project FEIS (Golder 2017b). The results indicated caribou may avoid the Meadowbank Mine and AWAR up to 35 km in winter but not in fall when more collared caribou were present within 50 km of infrastructure (Golder 2017b). Caribou continue to be observed near the Meadowbank Mine and cross the AWAR in large numbers (Table 5.5-3). The analysis below considers only the amount of preferred (high and moderate) habitat within the LSA and RSA that has the potential to be degraded due to the Expansion Project.

Considering only the winter season, when caribou are more frequently observed in the LSA (Volume 5, Appendix 5-C and Appendix 5-D), there is approximately 16,871 ha of high quality habitat and 2,900 ha of medium quality habitat in the LSA (Table 5.5-10). Combined, this indicates that approximately 70% of the LSA is preferred caribou winter habitat. Approximately 614 ha of high quality and 100 ha of medium quality habitat will be directly disturbed by the Expansion Project (Table 5.5-10), or approximately 3.6% of the preferred habitat in the LSA. Within the RSA, approximately 62% of the landscape is preferred caribou winter season habitat (approximately 258,227 ha of high quality and 50,612 ha of medium quality habitat during the winter season), and direct loss of preferred caribou winter season habitat accounts for 0.2% of the available preferred habitat in the RSA. Similarly, for the summer season, direct disturbance will lead to a loss of approximately 3.7% of the preferred habitat in the LSA, and less than 0.2% of the preferred habitat in the RSA.

Sensory disturbance and the resulting indirect habitat loss may cause some of the preferred habitat surrounding the Expansion Project to be avoided, in effect reducing preferred habitat to low quality habitat. If the Expansion Project were to cause all of the preferred habitat in the LSA to become low quality or avoided habitat, it would reduce the amount of preferred habitat in the RSA by approximately 6% for caribou, for both summer and winter habitat preferences and less than 6% at the scale of seasonal ranges which are larger than the RSA. This change is well below the 40% threshold value identified for habitat loss associated with declines in bird and mammal species (Andrén 1994, 1999; Fahrig 1997; Mönkkönen and Reunanen 1999; Flather and Bevers 2002; Swift and Hannon 2010). This reduction in habitat quality may be accompanied by only a limited loss of habitat connectivity due to barriers to movement. Similarly, the reduction in habitat quality would not be accompanied by a reduction in survival, as harvesting from the haul road will be discouraged. Finally, the RSA is not frequently used by caribou, as the most frequently occurring herd (i.e., Wager Bay herd) spend only 2.1% of their time in the RSA, as estimated from collars (Volume 5, Appendix 5-D, Table 5-D-1). In addition, there are very few other disturbances in the RSA that caribou would interact with. During the most sensitive seasons (i.e., calving and post-calving), caribou spend very little time in the RSA during these periods (Volume 5, Appendix 5-D, Table 5-D-1). The Ahiak herd spends the most amount of time in the RSA during the calving (i.e., 0.05%) and post-calving (i.e., 0.22%) seasons, and it is a very low amount. Consequently, an increase in energetics as a result of disturbance-related effects from the Expansion Project during these sensitive seasons is likely negligible. The effect of indirect habitat loss on caribou is anticipated to be limited, considering the following:

- this effect would diminish with distance from the Approved or Expansion Project;
- the LSA and RSA currently contain high proportions of preferred habitat;
- caribou are in the LSA and RSA seasonally;
- direct loss of preferred habitat will be limited;
- caribou are anticipated to continue using and passing through the LSA (based on the results of monitoring at Meadowbank);
- caribou will be free to cross the haul road;
- there are no other barriers to movement; and
- caribou survival within the ZOI is unlikely to be affected.

These conclusions remain unchanged for the Expansion Project.

Upland Birds

Upland birds are a diverse array of species with a range of habitat requirements. Indirect effects from the Approved Project on upland birds were estimated using density from baseline studies (Volume 5, Appendix 5-C, Section 4.3.3.1) and from monitoring at Meadowbank Mine (Table 5.5-8). A 200 m ZOI was applied to estimate possible loss of density and productivity near the Approved Project, as a conservative means of assessing effects. This distance was expanded from the 100 m ZOI used in the Meadowbank EA (Cumberland 2005e) to reflect potential disturbances related to haul truck traffic. It is assumed that the upland bird density will decrease by 50% within this 200 m area adjacent to the Approved Project footprint.

The average number of upland breeding birds observed on PRISM plots at Meadowbank Mine between 2003 and 2015 was 1.15 birds per ha (Table 5.5-8) and 1.41 birds per ha in 2014 and 2015, as reported during baseline studies (Volume 5, Appendix 5-C, Section 4.3.3.1). In 2016 baseline studies, the average number of birds was 0.97 per ha (Dougan and Associates 2017). The area of a 200 m buffer surrounding the Whale Tail Pit and the haul road encompasses 372 ha and 3,895 ha respectively (not including the footprint). Using the higher baseline density of 1.41 birds per ha (Volume 5, Appendix 5-C, Section 4.3.3.1), sensory disturbance from the Approved Project may affect approximately 500 upland birds surrounding the Whale Tail Pit and a further 5,500 upland birds surrounding the haul road. This represents approximately 15% and 1% of the estimated number of birds in the LSA and RSA, respectively. In other words, approximately 15% of the upland bird population in the LSA may be affected by the Approved Project. For the Expansion Project, application of a 200 m buffer (excluding the footprint) encompasses an additional 297 ha area beyond the Approved Project and may affect 419 more upland birds than predicted for the Approved Project. However, the studies described above indicate that changes to upland bird density or productivity are unlikely to be detectable.

5.5.3.4 Primary Pathway Barriers to Migration

- **Barriers to migration, which may affect population connectivity and distribution**

Roads can be a barrier to wildlife migration due a to range of factors including the road structure, dust, noise, presence of moving vehicles, and learned avoidance due to hunting. Disruption of migration can affect wildlife ability to use the area surrounding the Approved and Expansion Project or lead to energetic costs. Communities have expressed concerns that traffic or the physical presence of the roads may deter caribou (NIRB 2017). The Elders also noted that caribou are not as afraid of both human activity and development as they previously were (Agnico Eagle 2014a, Kendrick and Manseau 2008) and others indicated they believe that caribou have not been affected (NIRB 2017). Conversely, Elders have also indicated a concern about the potential effect of the road on caribou, after observing a large caribou herd attempting to cross the existing Meadowbank road for many days (Agnico Eagle 2015b). As a result of these findings and for the purposes of this assessment, the haul road is expected to be a potential barrier to wildlife (primarily caribou), which may affect population connectivity and distribution. This pathway was assessed for the Approved Project (Volume 3, Appendix 3-C).

To avoid disrupting movement patterns of caribou at the Approved and Expansion Project, particularly during the spring and fall migratory period, mitigation includes designing roads with low profiles, avoiding build-up of snowbanks in winter, and enforcing speed limits (see TEMP [Volume 8, Appendix 8-E.9; Project Certificate No. 008, T&C #27], Whale Tail Pit Haul Road Management Plan [Volume 8, Appendix 8-C.1], and Borrow Pits Management Plan [Approved Project FEIS Volume 8]). In addition to providing all wildlife with right-of-way, when large aggregations of caribou are observed on or adjacent to roads during construction or operations, activities will cease until animals have moved past the area of activity (or disturbance). Upon closure (see Interim Closure and Reclamation Plan, Volume 8, Appendix 8-F.1), the haul road will be decommissioned and re-contoured to facilitate caribou crossings. Further details regarding mitigation is provided in the Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1) and TEMP (Volume 8, Appendix 8-E.9; Project Certificate No. 008, T&C #27). The same mitigation will be equally effective for the Expansion Project so the conclusions about barriers to migration remain the same as for the Approved Project. Effectiveness of mitigation will be verified through the TEMP and engagement (Project Certificate No. 008, T&C #27, #30, #32).

5.5.3.5 Primary Pathway Destruction of Nests

- **Destruction of nests and flooding from construction activities including increased flows or water levels can increase risk of mortality to individual birds, which can affect population sizes.**

Two water diversions were planned as part of the Approved Project's Water Management Plan, including the South Whale Tail Lake diversion and the Northeast diversion. An analysis of the anticipated areas to be flooded was conducted and is presented in Volume 6, Appendix 6-F. As part of the Expansion Project, the Northeast diversion is not required. The amount of terrestrial shoreline habitat predicted to be inundated from diversions will vary year to year and only flooding between the months of May and August is predicted to threaten upland and water bird nests. The total maximum terrestrial area predicted from both diversions of the Approved Project that will be lost to flooding during the nesting period is 176 ha. The design of the Expansion Project will mitigate 27.5 ha (15.6%) of this flooding by eliminating Northeast diversion (Table 5.5-11). Acquisition of higher resolution LiDAR data also allowed the South Whale Tail predictions to be more accurate and predict at maximum of 148.5 ha of terrestrial habitat will be flooded (Table 5.5-11).

Shoreline surveys during the baseline field work examined 62.8 km of shoreline along lakes and streams (Volume 5, Appendix 5-C). In total, 24 species of birds were observed and several nests were located including three semipalmated sandpiper nests, two semipalmated plover nests, one dunlin nest, one herring gull nest and one cackling goose nest. Assuming that observers recorded nests that were observed within a 20 m swath surveyed by two people, the nest density for the Expansion Project is 0.06 nests per ha. Given the area of flooding expected to occur at the Expansion Project, and assuming densities are the same as that observed during baseline studies, approximately seven nests in 2019 and three nests in 2020 of the shorebirds, gulls and waterfowl groups may be displaced by flooding if no mitigation is undertaken (Table 5.5-11).

Table 5.5-11: Predicted Number of Bird Nests Displaced from Flooding by the Expansion Project

Nesting Period Year[a]	South Whale Tail Lake Diversion		
	Change in Flooded Terrestrial Area (ha)	Predicted Number of Nests Displaced	
		Shoreline Survey	PRISM Survey
2018	2.24	0.13	1.12
2019	108.26	6.49	54.13
2020	34.66	2.07	17.33
2021	3.34	0.20	1.67
2022	0	0	0
2023	0	0	0
2024	0	0	0
2025	0	0	0
2026	-95.23[b]	0	0

[a] The nesting period used included the months of May, June, July, and August.

[b] Between May and August 2020 the total flooded habitat area and the flooded terrestrial area is expected to decrease in size.

PRISM = Program for Regional and International Shorebird Monitoring; ha = hectare.

Upland birds have been surveyed at Meadowbank from 2003 to 2015 using PRISM protocols. The Project PRISM surveys found 3.8 pairs of breeding birds per plot during 2015. As PRISM plots are 16 ha in size this indicates a density of 0.24 pairs per ha. The average nests observed per PRISM plot was 0.6 nests, or 0.04 nests per ha. In 2016, the average nests observed per PRISM plot was 0.45 nests, or 0.03 per ha (Dougan and Associates 2017). It is assumed that not all the nests or breeding pairs were detected during baseline studies so a nest density of 0.5 nests per ha was used to conservatively calculate the number of nests displaced due to flooding. It is predicted that approximately 58 upland bird nests will be displaced in 2019 and approximately 18 nests in 2020 if no mitigation is undertaken (Table 5.5-11). Northeast Sector flooding (27.5 ha) will be avoided as part of Expansion Project. This change will avoid displacement of 14 upland bird nests (15.6%) relative to predicted values for the Approved Project. This does not account for possible reduced nesting activity due to sensory disturbance, so this estimate can be considered conservative. There will also be 4.1 ha (displacement of two upland bird nests) of permanent flooding that occurs at North Whale Tail as part of the approved Fish Compensation Plan, which will raise Whale Tail Lake by 1 m during closure.

The *Migratory Birds Convention Act* prohibits the harm of migratory birds and the disturbance or destruction of nests and eggs. Mitigation will be considered as a means to prevent the harm of migratory birds, nests and eggs by reducing the likelihood that birds will nest in the area and will be discussed with ECCC. Bird mitigation from flooding is being addressed through collaboration with ECCC to develop the Waterbird Management Plan. Where practical, natural drainage patterns will be used to reduce the use of ditches or diversion berms. The TEMP (Volume 8, Appendix 8-E.9) and Water Quality Monitoring and Management Plan for Dike Construction Dewatering (Volume 8, Appendix 8-A.4) include additional mitigation such as nest protection zones. Mitigation trials and monitoring of mitigation efficacy are being completed in 2018 in conjunction with ECCC to determine best management practices for deterring nesting and mitigating effects to nesting birds as a result of flooding. While predicted effects to upland birds will be reduced by water diversion changes in the Expansion Project, the conclusions from the Approved Project remain the same.

5.5.4 Residual Impact Classification and Determination of Significance

The purpose of the residual impact classification is to describe the residual effects of the project on VCs using a scale of common words rather than numbers and units. To determine whether or not an impact may have a significant adverse effect on a VC, each impact was assessed according to the criteria and descriptions in Section 3.7 of the FEIS Addendum.

The assessment and classification of residual impacts was based on the predicted cumulative changes from reference conditions through application of the Approved and Expansion Project and into the future case. All sources of information (i.e., existing and collected data, new analyses, existing publications, and IQ) were considered equally in the classification of residual impacts. The spatial boundary of the assessment for impacts is at the regional scale. The incremental effects from the Expansion Project relative to current baseline conditions are also classified. Essentially, the only difference in the outcome of impact criteria between cumulative and incremental effects from the Expansion Project is in the magnitude and geographic extent of impacts. The magnitude for cumulative impacts involves changes from reference conditions through application of the Approved and Expansion Project and into the future case, while incremental impacts are based on changes from the Expansion Project relative to baseline values. Cumulative impacts from the Approved and Expansion Project and other developments influence the entire annual range of wildlife populations (i.e., regional scale). In contrast, the geographic extent of incremental impacts from the Expansion Project may have a local or regional influence on populations. Specific definitions for the criteria used for residual impact classification are provided in Volume 3, Appendix 3-E.

5.5.4.1 Residual Effect Significance

- **Direct loss and fragmentation of wildlife habitat from the Expansion Project footprint**

Direct loss and fragmentation of wildlife habitat due to the Approved Project footprint are expected to have a measurable effect on caribou and upland birds. Overall, the habitat loss is anticipated to have a moderate effect on wildlife populations in the study area (Table 5.5-12). Specifically, for caribou, approximately 2% of the preferred habitat in the LSA will be directly disturbed by the Approved Project, considering both the growing and winter seasons. As this habitat loss is confined to the LSA, it is local in geographic extent. Direct habitat loss for the Expansion Project is similarly low in the LSA and RSA and does not change this conclusion.

Some habitat losses will last for the duration of the Approved Project but the landscape will begin to recover after closure. The Expansion Project will increase the duration of habitat losses from 2022 to 2025). It is not expected that the habitat types within the Approved Project footprint will return to baseline conditions during closure but areas of the footprint will be recolonized, to some degree, through vegetation encroachment and establishment, which will lead to the use of these habitats by upland birds and other wildlife. Other aspects of the Approved Project footprint will lead to permanent and irreversible habitat loss (such as pit lakes and the WRSFs). The amount of habitat that will be changed permanently will be at the local scale and is not likely to have a continuous effect on wildlife populations due to the amount of habitat available for wildlife populations in the RSA and beyond.

Within the ranges of the caribou herds that interact with the Approved Project, there are mines, exploration camps, winter and all-weather roads and communities (Volume 3, Appendix 3-D), exposing caribou to the potential for cumulative effects. Likewise for other wildlife with smaller ranges, the RSA includes the Meadowbank Mine and AWAR, and nearby is the community of Baker Lake. Therefore, the cumulative impacts from direct habitat loss and fragmentation from the Approved Project and other developments on population size and distribution are beyond regional in geographic extent. However, this community, road, mine complex represents an area within the caribou range of unusually high development in relation to the remainder of the caribou herd range, and the Approved Project does not overlap with any known calving grounds (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c); large areas of which remain pristine and unlikely to be developed within the lifetime of the Project. Thus, the magnitude of the cumulative effects of habitat loss to wildlife remains low. The additional incremental effects of the Expansion Project do not change this conclusion.

- **Sensory disturbance from vehicles, on-site equipment, human presence and vibrations, can change the amount of different quality habitats, and alter wildlife movement and behaviour**

Indirect habitat loss due to sensory disturbance (such as noise and movement) will extend beyond the footprint and have negative effects at the regional level (Table 5.5-12). Evidence from existing mines shows that wildlife habituates to sensory disturbance and some wildlife are even attracted to development. This is consistent with Elders noting that caribou are not as afraid of both human activity and development as they previously were (Agnico Eagle 2014a, Kendrick and Manseau 2008). However, indirect changes to preferred habitat from the Approved Project have the potential to affect the population size and distribution of caribou through altered movement and avoidance behaviour, as caribou have been shown to avoid mines and roads. The analysis of indirect effects for the Meadowbank Mine and AWAR indicated that collared Lorillard and Wager Bay caribou may only avoid these developments in winter and remain unaffected in spring and fall (Golder 2017b).

The impact of indirect habitat loss from sensory disturbance to caribou and upland birds is considered moderate as it is assumed that some degradation of habitat quality or reduced wildlife activity at the LSA scale will occur. It was assumed that upland birds within 200 m of the Approved Project footprint may be affected, but monitoring to date does not indicate that this effect will be detectable. If the preferred habitat in the LSA is no longer selected because of its proximity to the Approved Project, this will affect no more than 6% of the preferred habitat in the RSA, for caribou. Further, the RSA is not frequently used by caribou; collared caribou of the Wager Bay herd, which was the herd which spent the greatest amount of time in the RSA, spent only 2.1% of their time in the RSA. Noise created by the Project is anticipated to be similar to that caused by the Meadowbank Mine, indicating that sensory disturbance from the Approved Project will be similar to or less than that of the Meadowbank Mine. Impacts from sensory disturbance will be continuous throughout the life of the Approved Project but are anticipated to be reversed following closure (i.e., medium-term) when dust, noise and activity are no longer present. These conclusions remain the same for the Expansion Project.

Considering other developments and activity that may lead to cumulative effects, caribou encountering the Approved and Expansion Project may also be exposed to the Meadowbank Mine, AWAR, and community of Baker Lake. Other activities such as mineral exploration, winter roads, camps and contaminated sites are, or have been, present within caribou ranges (Volume 3, Appendix 3-D), leading to the possibility of cumulative sensory disturbance to caribou. Caribou calving grounds are respected among the Inuit and this period is considered a critical and sacred time when caribou should be left alone (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). However, as the vast majority of the caribou range is undisturbed and does not overlap with any known calving grounds (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c), the magnitude of the effect is no greater than at the RSA level.

- **Barriers to migration, which may affect population connectivity and distribution**

The Approved Project is likely to have a negative effect on caribou, by presenting barriers to their migration at a regional scale (Table 5.5-12). Mitigation to limit these effects includes designing roads with low profiles, avoiding the build-up of snowbanks in the winter, enforcing speed limits and enacting road closures. Movements of collared caribou near the AWAR indicate that most caribou that approach the road will cross it, an observation supported by monitoring at Ekati (ERM Rescan 2014). However, during the fall 2015 consultation meeting, Elders indicated a concern about the potential effect of the road on caribou, after observing a large caribou herd attempting to cross the AWAR for many days (Agnico Eagle 2015b). Concerns over caribou being affected by mine roads was reiterated during recent community engagement although some community members don’t believe caribou have been affected (NIRB and NWB 2017). The effect of the Project and haul road on caribou migration is expected to be moderate, as some deflections will likely occur as caribou select a crossing point. Upon closure, there will be no remaining traffic and the haul road will be scarified. It is anticipated that caribou will cross the road freely following closure (i.e., medium-term) and that the impact will be reversed at this time. Based on consultations with Elders in 2015 periodic road closures during fall caribou migrations appear to be effective mitigation (Agnico Eagle 2015b). This conclusion does not change for the Expansion Project.

There are historic, existing, and foreseeable future developments that are in the range of the caribou herds likely to interact with the Approved and Expansion Project (Volume 3, Appendix 3-D). However, only one of the foreseeable future projects is within the RSA, and no more than three active mineral exploration operations were identified in any of the herd ranges. There are no other all-weather roads, and few seasonal winter roads. Thus, the cumulative effect of the Approved and Expansion Project and other developments to caribou migration of low magnitude, but beyond regional extent as it extends beyond the RSA.

- **Destruction of nests and flooding from construction activities including increased flows or water levels can increase risk of mortality to individual birds, which can affect population sizes**

Flooding due to the construction of dikes will have a negative effect on upland and water birds due to the loss of breeding habitat and the possible destruction of nests (Table 5.5-12). The Expansion Project will reduce the area flooded in the Northeast Sector by diverting water to Mammoth Lake instead of to Nemo Lake resulting in a smaller effect to upland birds than predicted for the Approved Project. Mitigation will be considered to prevent birds from nesting in the area that will be flooded. Other development components of the Approved Project will be initiated outside of the upland bird nesting season to avoid nest loss. As nest loss also occurs through natural cycles such as storms and predation, the effect is classified as a low magnitude effect to the population. As it is confined to the Approved Project footprint, it is local in geographic extent. Flooding will be isolated and will only take place in the first three years of construction and operations. This is a short-term impact because following the construction of the dikes there will no longer be a risk of nest destruction. The impact of any nests that are destroyed during construction is reversible as these impacts are not anticipated to have a long-term effect on the LSA population. Regionally, no other projects were identified that may lead to destruction of nests, assuming that other developments follow the typical practice of removing upland bird habitat only outside of the nesting season. This conclusion does not change for the Expansion Project.

Table 5.5-12: Residual Impacts Classification and Determination of Significance on Wildlife Valued Components

Effects Pathway	VC	Direction	Magnitude		Geographic Extent		Duration	Frequency	Reversibility	Likelihood	Consequence of Proposed Change: Determining Significance
			Incremental	Cumulative	Incremental	Cumulative					
Direct loss and fragmentation of wildlife habitat from the Project footprint	Caribou Upland Birds	Negative	Moderate	Low	Local	Beyond regional	Permanent	Continuous	Irreversible	Highly likely	No change
Sensory disturbance from vehicles, on-site equipment, human presence and vibrations, can change the amount of different quality habitats, and alter wildlife movement and behaviour	Caribou Upland birds	Negative	Moderate	Moderate	Regional	Beyond regional	Medium-term	Continuous	Reversible	Highly likely	No change
Barriers to migration, which may affect population connectivity and distribution	Caribou	Negative	Moderate	Low	Regional	Beyond regional	Medium-term	Continuous	Reversible	Highly likely	No change
Destruction of nests and flooding from construction activities including increased flows or water levels can increase risk of mortality to individual birds, which can affect population sizes	Water birds Upland birds	Negative	Low	Negligible	Local	Local	Short-term	Isolated	Reversible	Highly likely	No change

Note: For further information on consequence of proposed change: determining significance for the Expansion Project refer to Table 3.4-2.

5.5.4.2 Cumulative Effects

Cumulative effects were considered in all pathways (Table 5.5-12), based on the summary of past, present reasonably foreseeable future projects (Volume 3, Appendix 3-D). The cumulative effects summary indicates past and reasonably foreseeable future developments within the ranges of affected caribou herds, and within the RSA. The cumulative effects summary considered the Ahiak, Lorillard and Wager Bay caribou herds. Within the ranges of these herds, there are several communities, the Meadowbank Mine, mineral exploration camps and tourism lodges currently in operations. Historic developments included camps, fuel caches, mineral exploration camps and contaminated sites. Mineral exploration was the most common type of development, followed by camps and miscellaneous activities. No more than three active mineral exploration operations were identified in any of the caribou ranges. For the purposes of this assessment, it was assumed that these camps were active throughout the year, while exploration camps are more often seasonal. Communities are likely the largest sources of disturbance to caribou in their ranges (from mortality and possibly also from habitat loss), exaggerated by roads providing increased hunting access. There are three communities within the Lorillard caribou range, and one each within the Ahiak and Wager Bay herd ranges.

Additional cumulative effects analysis was completed as part of the Approved Project FEIS regulatory process (Golder 2017a). The analysis included projecting the annual number of potential cumulative development ZOI encounters and residency time by collared caribou from the Ahiak, Beverly, Lorillard, and Wager Bay herds during spring, fall and winter seasons from 1998 to 2017. This analysis showed that neither the Ahiak or Beverly collared caribou ranges overlapped with the Approved Project. The simulation for Approved Project indicated that the projected incremental number of ZOI encounters associated with the Approved Project for either Lorillard or Wager Bay collared caribou averaged no more than 0.2 and cumulatively, including all previous and existing developments, was no more than 1.2 in spring, fall or winter. The amount of time a collared caribou spent in the Approved Project ZOI was projected to be 1.2 days and cumulatively, including all previous and existing developments, was 3.2 days. This analysis was repeated to compare results between Expansion Project with Approved Project (Volume 5, Appendix 5-F; Project Certificate No. 008, T&C #29). For the Expansion Project, the incremental difference of ZOI encounters between Approved Project and Expansion Project averaged 0.1 additional encounters in winter and none in either spring or fall. Cumulatively, including all previous and existing developments, averaged 0.9 encounters or less in spring, fall or winter. The incremental difference in ZOI residency time between Approved Project and Expansion Project was no additional days and cumulatively, including all previous and existing developments, was 1.8 days or less in spring, fall or winter. Thus, the changes associated with Expansion Project will have a negligible influence on caribou and will be the same as for the Approved Project.

Cumulative effects to other wildlife VCs of the terrestrial environment (including upland birds, water birds, raptors, predatory mammals and muskox) were indicated through the other developments present in the RSA. The Meadowbank Mine and AWAR are the only other developments present in the RSA. Beyond the RSA is the community of Baker Lake, a source of hunting activity particularly along the AWAR. The combination of the Approved and Expansion Project, an existing mine, a community and an all-season road connection between them may lead to localized cumulative effects to these VCs.

Considering the reasonably foreseeable future developments, all of the eight possible future projects considered in Volume 3, Appendix 3-D are within the range of either the Ahiak, Lorillard, or Wager Bay caribou herds (Volume 3, Appendix 3-D, Figure 3-D-4). Two of the possible future developments are in the range of all three herds, while the Ahiak herd would be most affected with six projects within its range. Should most or all of these reasonably foreseeable future projects proceed within a similar timeframe, cumulative effects to caribou may become a concern.

Only one reasonably foreseeable future project was located within the RSA; the Greyhound mineral exploration project. The Expansion Project does change the conclusions about cumulative effects.

5.5.4.3 Assessment of Significance

This section considered how the primary pathways would affect the measurement endpoints of changes to wildlife habitat quantity (through direct habitat loss), changes to wildlife quality (through sensory disturbance and barriers to movement) and changes to wildlife survival and reproduction (through the destruction of nests). Secondary pathways were also considered from the perspective of these measurement endpoints. Project effects of low to moderate magnitude are anticipated, extending to the regional scale. The effects will be short-term in cases where the effect only lasts during a particular phase, or permanent in the case of direct habitat loss that may require decades or centuries to recover in the Arctic environment. Cumulative effects were considered, but are not likely to cause noticeable effects as there is very little development in the Kivalliq region or within the range of the caribou herds interacting with the Expansion Project. Overall, the weight of evidence, and the experience from the Meadowbank Mine, indicates that incremental and cumulative effects from the Approved and Expansion Project will not have a significant adverse effect on the existing self-sustaining and ecologically effective wildlife populations. Changes associated with the Expansion Project do not alter this conclusion.

5.5.4.4 Uncertainty

The purpose of the uncertainty section is to identify the key sources of uncertainty in the impact assessment and to discuss how uncertainty has been addressed to increase the level of confidence that impacts are not worse than predicted. Confidence in the assessment of environmental significance is related to the following elements:

- adequacy of baseline data for understanding current conditions and future changes unrelated to the Approved and Expansion Project (e.g., extent of future developments, climate change, catastrophic events);
- understanding of Approved and Expansion Project-related impacts on complex ecosystems that contain interactions across different scales of time and space (e.g., exactly how the Approved and Expansion Project will influence caribou); and
- knowledge of the effectiveness of the environmental design features and mitigation for reducing or removing impacts (e.g., revegetation of wildlife habitat).

Uncertainty has been addressed by applying a conservative estimate of effects in the residual impact classification and in the determination of significance. Like all scientific results and inferences, residual impact predictions must be tempered with uncertainty associated with the data and the current knowledge of the system. It is anticipated that the baseline data is moderately sufficient for understanding current conditions, and that there is a moderate level of understanding of Approved and Expansion Project-related impacts on the ecosystem. Some of the information or knowledge gaps include the following:

- While caribou collar data provide useful insight into caribou movements and Approved and Expansion Project interactions, the portion of the herd that is collared is small, leaving uncertainty surrounding exact spatial and temporal distribution of the herd. The lack of equivalent information for other large mammal VCs (wolves, muskox, and grizzly bears) also leaves an information gap.
- Wildlife populations fluctuate with time, and wildlife movements lead to uncertainty regarding presence near the Approved and Expansion Project from year to year. Changes in populations of caribou, muskox or water

birds through the duration of the Approved and Expansion Project may change the effects assessment to these VCs.

- It is understood that development activities will directly and indirectly affect habitat, and wildlife behaviour and movement; however, long-term monitoring studies documenting the resilience of wildlife to development and the time required to reverse impacts are lacking. Direct disturbance from previous, existing, and future development footprints was calculated to be a small proportion of their range, and the understanding of the success of mitigation policies and practices for limiting impacts to caribou has increased over the past decade. However, uncertainty remains surrounding the degree to which some effects may occur (e.g., magnitude and duration).
- Forecasting a future that may be outside the range of observable baseline environmental conditions is clearly challenging (e.g., climate change). Uncertainty grows with the duration of the forecast. Therefore, there is more certainty in short- term than long-term effects.

The Expansion Project does not influence assessment uncertainty.

5.5.5 Monitoring and Follow-up

5.5.5.1 Adaptive Management

Monitoring and mitigation form part of the adaptive management cycle. The environmental management plans cited in this section outline specific procedures and actions to reduce, eliminate, or control the potential adverse effects from the Project. The environmental management plans include various responses (i.e., mitigation measures and strategies) designed to be commensurate to the potential adverse effects. The environmental management plans also include monitoring provisions and programs designed with the objective of assessing effectiveness of the planned mitigation measures after such measures have been implemented (Project Certificate No. 008, T&C #30). Agnico Eagle will adaptively manage its activities, mitigation measures, and monitoring programs to confirm that its mitigation measures are effective in managing the environment (Project Certificate No. 008, T&C #30). The sections below provide examples of how adaptive management has been implemented at Meadowbank Mine. These learnings will be applied to the Project, and adaptive management will continue at the Project.

5.5.5.1.1 Adaptive Management of Waste

Effective waste management practices and staff education are key to decreasing the availability of wildlife attractants at mine sites. Operations and management of on-site waste is an important component of wildlife management at Meadowbank. Weekly formal inspections and daily inspections of mine facilities were conducted to confirm that garbage is handled appropriately, attractants are not present and personnel are not feeding wildlife. Improved practices for waste segregation and incineration, the use of enclosed food waste facilities and skirting around building seem to have improved wildlife presence and wildlife-human interactions at the Mine (Gebauer et al. 2015). Prevention of wildlife issues through managing attractants and human activity has been more effective than repeatedly monitoring and deterring wildlife from the site.

Implementation of waste management and wildlife education have been effective at limiting the risks of injury and death to wildlife at the Meadowbank Mine.

5.5.5.1.2 Adaptive Management of Raptor Nesting

The Peregrine Falcon Management and Protection Plan provides site-specific protective measure and deterrence options is included in the TEMP (Volume 8, Appendix 8-E.9). Agnico Eagle will engage with the GN to discuss proposed mitigation options prior to removal or deterrence of raptors (Project Certificate No. 008, T&C #36).

5.5.5.1.3 Adaptive Management of Wildlife Incidents and Mortalities

All mortalities are reported immediately to environmental staff and carcasses are removed to avoid attracting scavengers, especially predatory mammals, following protocols in the existing TEMP (Project Certificate No. 008, T&C #27) and the Wildlife Protection and Response Plan. If there is no obvious reason that can be attributed to the mortality, the animal is examined by the environmental supervisor to determine if a necropsy is necessary. All wildlife incidents and mortalities are investigated and reported in the annual wildlife reports and to the GN.

5.5.5.1.4 Noise Mitigation and Monitoring

The updated Noise Monitoring and Abatement Plan (Volume 8, Appendix 8-E.7) captures changes associated with the Expansion Project and evaluates mitigation effectiveness as part of the adaptive management.

5.5.5.2 Terrestrial Ecosystem Monitoring Plan

Terrestrial monitoring at Meadowbank is guided by the TEMP (Volume 8, Appendix 8-E.9). Through the Approved Project regulatory process, as well as collaboration with the TAG (Project Certificate No. 008, T&C #27), the TEMP has been revised and submitted to the NIRB twice since the Approved Project FEIS was submitted in June 2016. Version 4 was submitted in July 2017 to address commitments made during the Whale Tail Technical Meeting and Pre-hearing Conference. Version 5 was submitted in June 2018 to address Project Certificate No. 008, T&C #28. The purpose of the existing TEMP is to manage the interaction between the Approved and Expansion Project and the terrestrial environment so that residual impacts (i.e., effects that remain after mitigation has been implemented) to vegetation, wildlife, and wildlife habitats are acceptable. Detailed monitoring and mitigation procedures are provided in the TEMP, and reporting from the wildlife monitoring is provided in annual reports to NIRB. The Expansion Project will be captured by the existing mitigation and monitoring in the TEMP (Project Certificate No. 008, T&C #28). The adaptive management described above will occur under the TEMP. Ongoing review of the TEMP and annual Wildlife Monitoring Summary Reports by regulatory agencies, technical reviewers, and stakeholders will further confirm that local and regional concerns are adequately addressed as the monitoring work continues (Project Certificate No. 008, T&C #32). The TEMP has been updated (Volume 8, Appendix 8-E.9) for the Expansion Project and will be revised with TAG members. It is anticipated the next TAG meeting will be held in early 2019 and the TEMP will be finalized shortly thereafter.

In addition, aspects of the TEMP have been implemented in 2018 through caribou monitoring programs.

Consistent with Project Certificate No. 008, Agnico Eagle is implementing measures to mitigate, monitor, and adaptively manage potential impacts to wildlife and birds, including:

- Participate in the TAG to continually review and refine mitigation and monitoring details within the Terrestrial Ecosystem Management Plan (T&C #27).
- Update the TEMP throughout all phases of the Project or when there are significant changes in project development plans (T&C #28).
- Collect additional caribou collar data and conduct analyses of this data to quantify the zone of influence and associated effects of project components on caribou movement for a study area (T&C #29).

- Verify the effectiveness of the caribou protection measures within the TEMP (T&C #30).
- Develop and implement a Haul Road Management Plan and maintain traffic monitoring logs along the haul road between the Whale Tail Pit project and the Meadowbank Mine (T&C #31).
- Engage with relevant parties to ensure that safety barriers, berms, and designed crossings associated with project infrastructure, including the haul road, are constructed and operated as necessary to allow for the safe passage of caribou and other terrestrial wildlife (T&C #32).
- Provide the information base necessary to analyze, understand, and appropriately manage project interactions with wildlife (T&C #33).
- Maintain a Migratory Birds Protection Plan (T&C #34).
- Mitigation and monitoring strategies developed for Species at Risk are updated as necessary to maintain consistency with any applicable status reports, recovery strategies, action plans, and management plans that may become available (T&C #35).
- Consultation with GN to discuss proposed mitigation options prior to removal or deterrence of raptors (T&C #36).

Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NIRB. Agnico Eagle considers, the existing terms and conditions of the Project Certificate issued for the Approved Project are sufficient to protect, mitigate and monitor terrestrial wildlife and wildlife habitat impacts associated with the Expansion Project.

Any new required mitigation measures related to primary effects for the Expansion Project are described in relation to the predicted effects and summarized in pathway tables provided in Volume 3, Appendix 3-C.

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan.

6.0 FRESHWATER ENVIRONMENT

6.1 Introduction

The freshwater volume provides an update of the Approved Project in relation to the impacts of the Expansion Project. Agnico Eagle believes the scope defined for the Approved Project FEIS (Agnico Eagle 2016c) has not changed significantly with the proposed expansion. Expansion Project development, operations, and closure scope (refer to Table 1.1-1 of the Project Description) result in changes to the on-site management of water and waste; however, project conditions specified in the Type A Water Licence 2AM-WTP1826 will be met.

Volume 6 addresses Expansion Project water quality and quantity effects on the receiving environment water quality, and fish and fish habitat. Effects of the Expansion Project are primarily related to:

- the expanded footprint generating additional contact water requiring management, treatment, and discharge to the receiving environment and diversion of non-contact water; and
- the increased duration of the closure phase, to refill the pits and underground mine.

No new primary pathways are identified. New water management activities associated with underground mining and additional open pit mining are considered in the assessment of surface water quality and have been added to the primary pathways that were assessed in the Approved Project. Results of the effects assessment were updated for the Expansion Project.

Volume 6 also includes a discussion on VCs, incorporation of IQ, description of the study areas, and an assessment of direct effects to changes to the freshwater environment in the study area. The effects assessment evaluates the maximum footprint for the operational and closure phase, resulting in a conservative assessment.

The Expansion Project water management activities culminate in the discharge of treated mine contact water to the receiving environment. To assess the effect of effluent quality and quantity on the receiving environment Agnico Eagle has applied the same water quality modelling platform as the Approved Project with updates by additional purpose-built and more detailed models on lake mixing and arsenic diffusion to address concerns raised during the NIRB and NWB review of the Approved Project. Furthermore, as potential mitigation for receiving environmental effects, alternate discharge locations are evaluated and included in this assessment. The deeper Whale Tail Pit, the IVR Pit, and the Underground development along with their associated water and waste management infrastructures were added to reflect the Expansion Project. Each flow that could influence site discharge water quality for the Expansion Project was itemized and assigned a chemical source term chemical profile based on baseline water quality, on the geochemical properties of mine waste materials based on laboratory testing, and on anticipated scale up effects from the laboratory to anticipated site conditions informed by observations at the Meadowbank Mine and Meliadine Mine operations. Most of the geochemical assumptions have remained consistent with the model used for the Approved Project. Updates were made to:

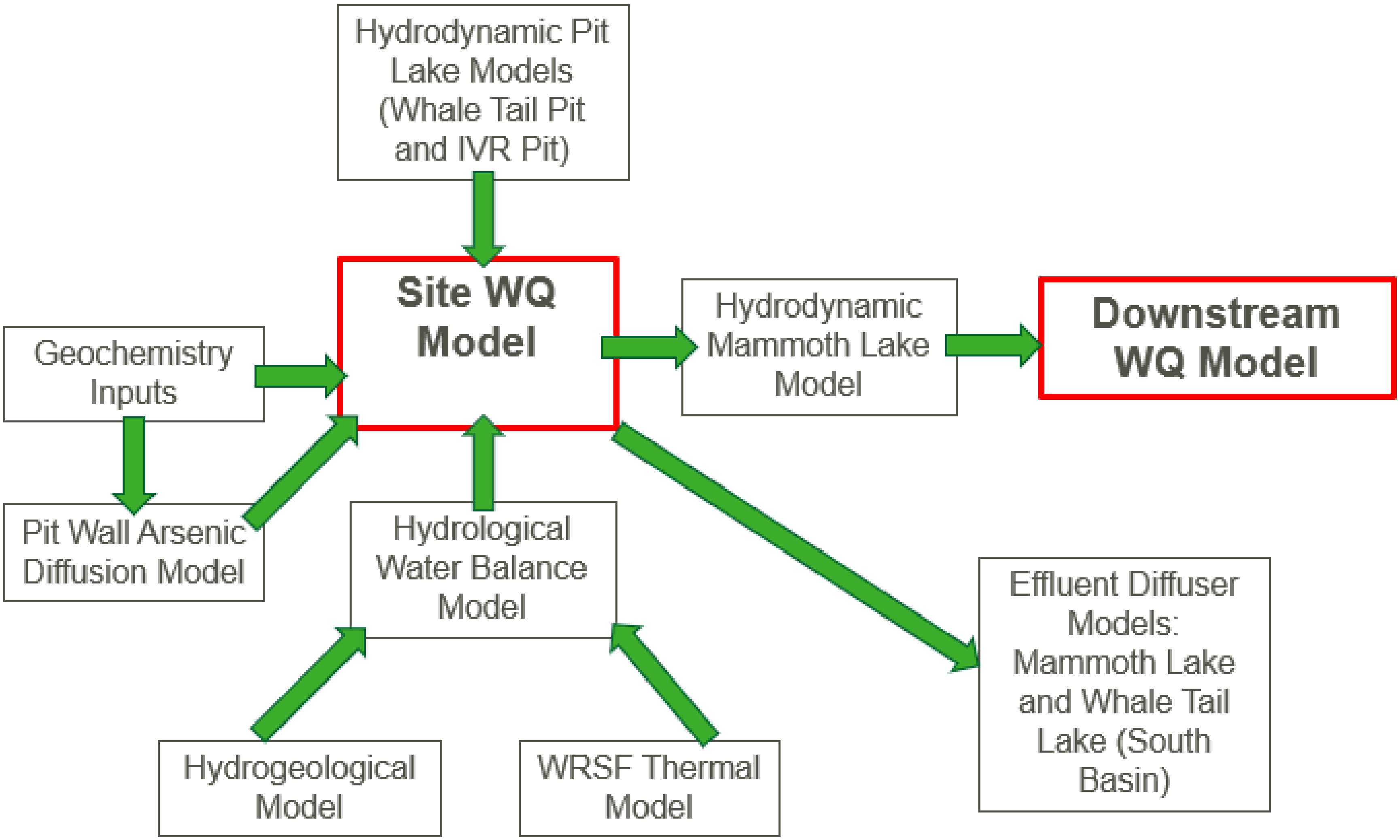
i) constituent leaching rates (from new and on-going test work);

ii) the active thaw depth and cover of the WRSF piles based on recent thermal modelling;

iii) the hydrodynamics of the flooded pit lake and Mammoth Lake, which modelling indicates will be fully mixed with no permanent chemical or thermal layering; and

iv) include groundwater inflows, and deep groundwater quality and salinity. The primary purpose for water quality modelling is to support effective water management decision making throughout all phases of the Expansion Project that will minimize effects to the receiving environment (Figure 6.1-1).

Figure 6.1-1: Components of Expansion Project Water Quality Modeling Used for Freshwater Quality Water Quality Assessment



Since 2016, Agnico Eagle has continued to collect baseline data, update models, and refine engineering optimization of project operations for the Approved Project and Expansion Project. Ongoing work combined with lessons learned from other Agnico Eagle operations has continued to guide the FEIS Addendum water management and mitigation measures considered for the Expansion Project to return the proposed site and affected areas to viable and wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities post-closure. The overall closure goals for the Approved Project continues to be supported in the expansion by the four closure principles of physical stability, chemical stability, no long-term active care requirements, and compatibility with future land uses for each component of the Approved and Expansion Project.

The water quality predication results from an iterative process of assessments, which have led ultimately to mine waste and water management presented in this FEIS, where effects are contained. All contact waters are collected and treated as necessary, discharges meet effluent water quality criteria defined in the Type A Water Licence 2AM-WTP1826 and receiving water quality criteria are met thereby minimize environmental impacts of the Expansion Project.

Agnico Eagle throughout operations will continue to support effective decision making with lessons learned from other Agnico Eagle regional operations, further modelling assessments with iterative valuations to reflect comparative operational data with predicted results and refinement of conservative assumptions to support operational management and mitigation measurers to achieve final closure goals as soon as practical.

To support the review of the FEIS Addendum, Agnico Eagle has provided all appendices in the FEIS Addendum Application. It should be noted that historical baseline reports provided in Appendices 6-D, 6-G, 6-K, 6-M, and 6-N were reviewed and received conformity approval as part of the Approved Project FEIS submission (Agnico Eagle 2016c), and then final approval under Project Certificate No. 008. These baseline reports remain unchanged. Appendices 6-A, 6-B, 6-C, 6-E, 6-F, 6-H, 6-I, 6-L, and 6-0 have been updated to address the Expansion Project.

6.1.1 Valued Components

The identification of VCs and factors considered in their selection are described in Section 3.4.1 of the FEIS Addendum. Freshwater Environment are identified in Table 6.1-1. For fish and fish habitat, Burbot have been added for the Expansion Project.

Table 6.1-1: Summary of Aquatic Environment Valued Components

Valued Component	Rationale for Inclusion
Water Quality	■ The Approved and Expansion Projects are expected to affect the concentration of total and dissolved constituents in water ■ Water quality to support aquatic and human health is defined by the concentration of various constituents ■ Changes in the quality of water can influence aquatic organisms and the use of water as a drinking water source for Inuit or for recreational purposes ■ The quality of water was identified as an issue ■ The quality of water is a pathway to fish and aquatic health ■ IQ highlighted concerns about the effects of mines on the quality of drinking water
Sediment Quality	■ Sediment quality is not considered a VC because changes to sediment quality will be managed by minimizing changes to water quality and best management practices to reduce or minimize erosion and sedimentation ■ Not included as a VC in Cumberland (2005g) ■ It is considered in the impact assessment because of the link between water quality, sediment quality, and aquatic biota

Valued Component	Rationale for Inclusion
Surface water quantity	■ The Approved and Expansion Projects are expected to affect existing availability of the spatial and temporal distribution of water quantity for aquatic and terrestrial ecosystems ■ IQ highlighted concerns about the effects of climate change on precipitation, freeze-thaw cycle, and water level conditions
Arctic Grayling (ᐊᒥᕆᕐᔪᒃᑐᖅ)	■ Fished for traditional/subsistence use in Nunavut ■ Although not captured in the vicinity of the Whale Tail Pit or IVR Pit, the species was recorded in watercourses crossed by the haul road ■ Uses stream habitats for spawning and rearing, but overwinters in lakes; adfluvial life history suitable for assessing potential effects to stream habitats ■ Feeds primarily on aquatic and terrestrial insects, as well as plankton; suitable for assessing how potential changes to lower trophic levels may affect fish
Arctic Char (ᐃᖃᓗᒃᐱᒃ / ᑕᕆᐅᕐᒥᐅᑕᖅ)	■ Fished for traditional/subsistence use, and has been fished commercially in Nunavut at certain locations ■ Found in Lake A17 (Whale Tail Lake). Completes most of its adult life history in lakes, with a portion of its juvenile life history that can be in streams, so suitable for assessing potential changes to lake habitats ■ Long-lived predatory species; primarily piscivorous ■ Often a top predator in an Arctic lake, so suitable for assessing potential effects of water quality changes in lakes
Lake Trout (ᐃᓲᕆᖅ)	■ Fished for traditional/subsistence use, and is a popular sportfish in Nunavut ■ Abundant in Lake A16 (Mammoth Lake) and Lake A17 (Whale Tail Lake) ■ Completes most of its life history in lakes, with occasional movements into streams, so suitable for assessing potential changes to lake habitats ■ Long-lived predatory species; primarily piscivorous ■ Top of food chain, so suitable for assessing potential effects of water quality changes (changes in lower trophic organisms or forage fish will ultimately affect lake trout), as well as for potential effects of metals or other substances that have the potential to bioaccumulate
Round Whitefish (ᓯᔪᒃᐸᐅᒐᓕᒃ)	■ Fished for traditional/subsistence use, and has been fished commercially in Nunavut at certain locations ■ Abundant in Lake A16 (Mammoth Lake) and Lake A17 (Whale Tail Lake) ■ Completes most of its life history in lakes, with occasional movements into streams ■ Feeds primarily on benthic organisms; suitable for assessing how potential changes to sediment quality and benthic invertebrates may affect fish
Burbot (Tiktaaliq)	■ Fished for traditional/subsistence use in Nunavut ■ Found in several lakes and watercourses within the Project area ■ Completes most of its life history in deep water lakes, with occasional spawning and rearing occurring in watercourses; species is typically benthic ■ Adults are primarily piscivorous, with feeding occurring primarily at night. Top predator in waterbodies absent of Lake Trout and Arctic Char

Hydrogeology, groundwater quality and quantity are not considered a VC because sources from the active layer and from the deep groundwater below the permafrost are not currently used. Unlike EAs in the south, where groundwater protection is coupled with the protection of drinking water, the presence of deep permafrost, the seasonal nature of the active layer, and the availability of good-quality drinking water from surface water sources near the Expansion and Approved Project make it unlikely that groundwater will be used as a drinking water source in the future. Notwithstanding this, these aspects are described in this document because groundwater provides a pathway and a link to the surface hydrology and water quality VCs. There is no IQ information for this.

The criteria used to select the fish VC species for the EA were as follows:

- occurrence and relative abundance of species near the Approved Project;
- species conservation status (e.g., COSEWIC 2017; Government of Canada 2018);

- trophic position/life history; and
- species that are part of a commercial, recreational, and/or Aboriginal (CRA) fishery, or support a CRA fishery (DFO 2013).

Candidate VCs included species recorded or expected to occur near Whale Tail area based on IQ studies (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c) and fisheries sampling conducted for the Approved Project (Volume 6 Appendix 6-D and Appendix 6-J; Portt 2018). Previously completed studies in Nunavut were also reviewed (Cumberland 2005a) and combined with any other relevant sources of information on the distribution of species (Scott and Crossman 1998) that have the potential to interact with activities within an area spanning the Meadowbank River, Quoich River, and Thelon River watersheds.

Fish species expected to potentially interact with Approved and Expansion Project activities and the species codes used in this report are presented in Table 6.1-2. Recently completed baseline studies have confirmed that the distribution of Arctic Grayling in the project area does not extend into upper watershed areas where the proposed Expansion Project will be developed. None of the baseline study species listed in Table 6.1-2 are classified as federally listed species under the *Species at Risk Act* (Government of Canada 2018) or species with a designated conservation status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2017). Similarly, none of these species are listed as Species at Risk in the NWT (Working Group on General Status of NWT Species 2016). Arctic Char, Lake Trout, Round Whitefish, and Burbot were identified as species of economic and cultural importance to traditional users in the region during the IQ baseline study associated with the Approved Project (FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c).

Table 6.1-2: Common and Scientific Names of Fish Species with the Potential to Occur in the Expansion Project LSA

Family	Common Name	Code[a]	Scientific Name	Recorded During Baseline Sampling
Salmonidae	Lake Trout	LKTR	*Salvelinus namaycush* (Walbaum)	√
	Arctic Grayling	ARGR	*Thymallus arcticus* (Pallas)	
	Cisco	CISC	*Coregonus artedii* (Lesueur)	
	Arctic Char	ARCH	*Salvelinus arcticus* (Linnaeus)	√
	Lake Whitefish	LKWH	*Coregonus clupeaformis* (Mitchell)	
	Round Whitefish	RNWH	*Prosopium cylindraceum* (Pallas)	√
Esocidae	Northern Pike	NRPK	*Esox lucius* (Linnaeus)	
Gadidae	Burbot	BURB	*Lota lota* (Linnaeus)	√
Catostomidae	Longnose Sucker	LNSC	*Catostomus catostomus* (Forster)	
Gasterostieidae	Ninespine Stickleback	NNST	*Pungitius pungitius* (Linnaeus)	√
	Threespine Stickleback	THST	*Gasterosteus aculeatus* (Linnaeus)	
Cyprinidae	Lake Chub	LKCH	*Couesius plumbeus* (Agassiz)	
Cottidae	Slimy Sculpin	SLSC	*Cottus cognatus* (Richardson)	√
	Spoonhead Sculpin	SPSC	*Cottus ricei* (Nelson)	

Note: All fish species present in the project lakes were included in the fish population VC in the Meadowbank EIS. However, the main fish species VCs were Lake Trout, Arctic Char, and Round Whitefish (Cumberland 2005c).

[a] According to Mackay et al. (1990).

6.1.1.1 Assessment Endpoints and Measurement Indicators

Assessment endpoints and measurement indicators are described in the Approved Project (FEIS Volume 3, Section 3.2.2, Table 3.2-1).

For fish and fish habitat, ongoing fisheries productivity was identified as an important property of the ecosystem that should be protected and consideration of ongoing fisheries productivity as an assessment endpoint is consistent with DFO's scientific framework for EAs (DFO 2014). Arctic Grayling, Arctic Char, Lake Trout, Round Whitefish, and Burbot are part of a CRA fishery, and therefore, the consideration of these five species as VCs in the EA of the Expansion Project is consistent with DFO's legislation and policy (i.e., *Fisheries Act* [2012] and Fisheries Protection Policy [DFO 2013]). Forage fish species, specifically Ninespine Stickleback and Slimy Sculpin, support the CRA fishery; therefore, forage fish are considered in the fish habitat measurement endpoint in the EA of the Expansion Project.

6.1.2 Spatial and Temporal Boundaries

6.1.2.1 Spatial Boundaries

6.1.2.1.1 Hydrogeology and Groundwater

The hydrogeology baseline study area (BSA) also forms the LSA and RSA for the Approved and Expansion Project. The hydrogeology BSA forms an irregular polygon approximately 24,000 ha in area (FEIS Addendum Volume 3, Figure 3.2-3). Whale Tail Lake and the site of the proposed Whale Tail Pit, IVR Pit, and Underground development are located in the central-eastern area of the hydrogeology BSA.

The elevations of large lakes within the hydrogeology BSA range from approximately 99.8 masl at Lake DS1, located over 5 km to the north of Lake A17 (Whale Tail Lake), to 170.5 masl at Lake A60, located approximately 750 m southeast of Lake A17 (Whale Tail Lake).

6.1.2.1.2 Surface Water Quantity

Spatial boundaries were defined to assess the potential effect of the Expansion Project on the surface water quantity. The LSA is the area where there exists the potential for measurable effects due to Approved and Expansion Project activities. The RSA is the area within which there exists the potential for residual effects, including direct and indirect effects, as well as incremental effects from the Expansion Project and cumulative effects from historical, existing, and reasonably foreseeable developments, including the Approved Project. The surface water quantity LSA and RSA are shown on Figure 6.1-2.

The surface water quantity LSA includes the A, C, and D watersheds, and watersheds of each watercourse crossed by the haul road. The D watershed was added to the LSA of the Approved Project to account for potential effects from the alternate discharge location. The Approved and Expansion Project and specifically the haul road, is located within the Meadowbank River, Quoich River, and Thelon River watersheds, and the surface water quantity RSA was defined to consider the effects of the Project with other developments, activities, and natural factors that influence surface water quantity within these watersheds. However, due to the size of these watersheds, the surface water quantity RSA was limited to the following drainage areas, downstream of which potential effects would no longer be measurable:

- Lake 2.1: Lake 2.1 has an approximate drainage area of 21.5 km^2 at its outlet. It is located just downstream of Crossing 2.1, and drains southeast to Quoich River;

- Lake 23.9 (i.e., Tasirjuaraajuk / Pipedream Lake): Lake 23.9 (i.e., Tasirjuaraajuk / Pipedream Lake) has an approximate drainage area of 1,570 km^2 at its outlet. It is located just downstream of Crossing 23.9, and drains north to the Meadowbank River;
- Lake DS2: Lake DS2 has an approximate drainage area of 353 km^2 at its outlet. It is located just downstream of Lake D1, and drains southwest to the Thelon River; and
- Lake DS1: Lake DS1 has an approximate drainage area of 898 km^2 at its outlet and drains north to the Meadowbank River.

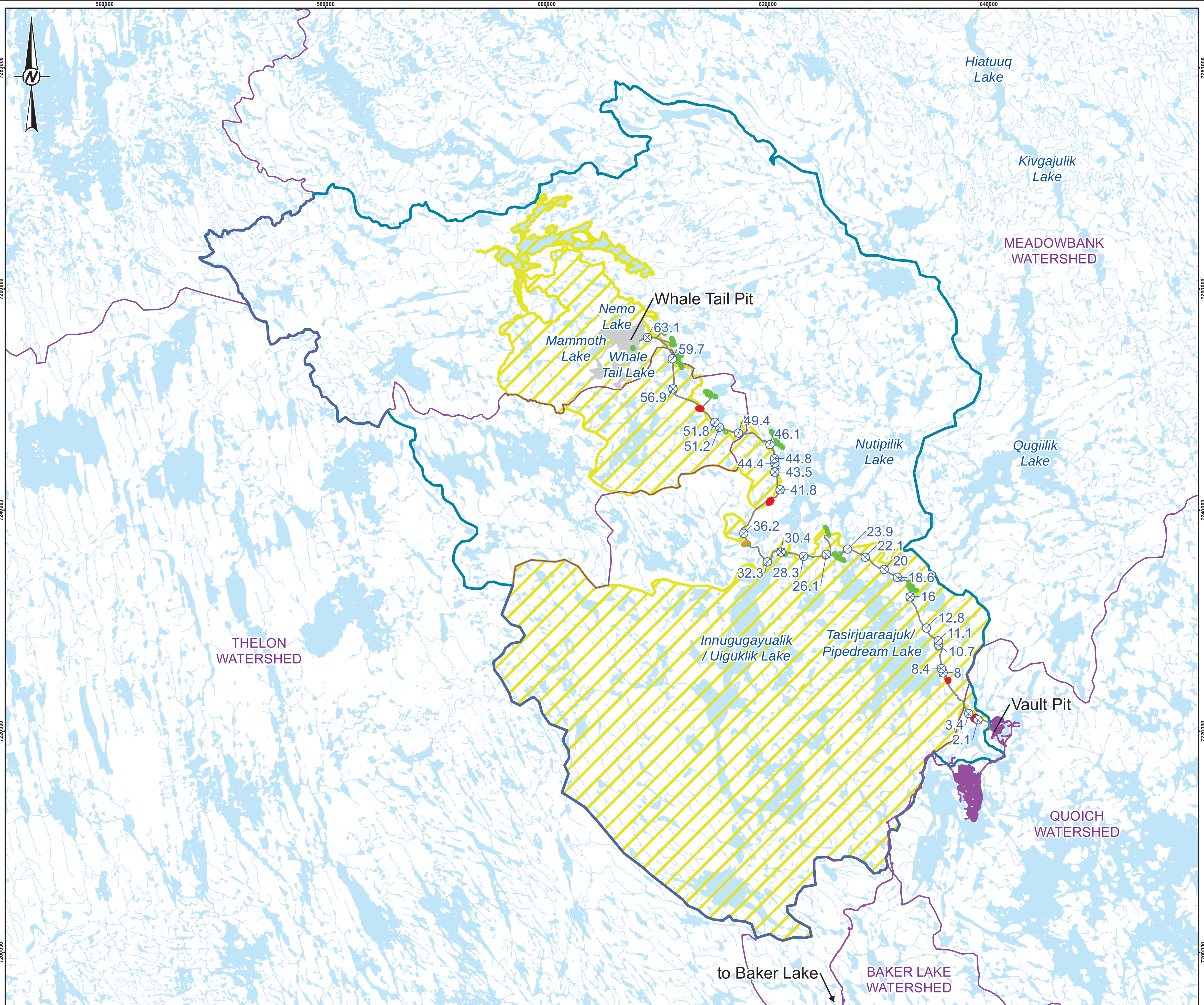
6.1.2.1.3 Water Quality and Fish and Fish Habitat

The Expansion Project LSA for water quality and fish and fish habitat includes the A, C, and D watersheds. Watersheds A and C were included in the Approved Project. The LSA was selected to include all areas of direct physical disturbance from Approved and Expansion Project activities and facilities, such as the personnel camp, maintenance shop, tank farm, waste rock storage facility, pits (IVR and Whale Tail), site-water storage ponds, and water treatment plants, and has been changed from the Approved Project to encompass Expansion Project facilities. The LSA also considered the boundaries of local watersheds and the spatial extent of the potential direct and indirect changes from the Approved and Expansion Project to the physical and biological properties of hydrology, surface water quality, and fish. Thus, the LSA includes headwater lakes and streams near the Whale Tail and IVR pits in upper sections of the A and C watersheds (similar to the Approved Project). The LSA also considers alternative discharge locations (i.e., Lake D1 and Lake D5) in the D watershed as a mitigation option for discharge of treated effluent.

The LSA for the 64.1 km long haul road is a 100 m buffer on either side of the road alignment. The proposed road surface will include three bridges and culverts to direct flows within affected watercourses. No changes in water management infrastructure (i.e., bridges and culverts) are required for the haul road due to the Expansion Project, however, the LSA for the haul road will be expanded to account for a widening of the haul road from 9.5 m to 15 m. The LSA associated with the road alignment (200 m corridor) is anticipated to be large enough to capture the residual effects from the haul road on adjacent aquatic areas and potential fishery units; therefore, no RSA for the road has been defined.

There are many waterbodies and watercourses within the LSA (highlighted on 6.1-2), the large waterbodies directly or indirectly affected by the Expansion Project include the following:

- Lake C38 (Nemo Lake);
- Lake A17 (Whale Tail Lake);
- Lake A16 (Mammoth Lake); and
- Lake A53.



LEGEND

- WATER CROSSING LOCATION
- AQUATICS REGIONAL STUDY AREA
- AQUATICS LOCAL STUDY AREA
- WATERSHED BOUNDARY
- WATERCOURSE
- WATERBODY

WHALE TAIL

- ESKER/QUARRY (APPROVED)
- ESKER/QUARRY (EXPANSION)
- ESKER/QUARRY (NEW)
- INFRASTRUCTURE
- HAUL ROAD
- MEADOWBANK OPERATION AND INFRASTRUCTURE

0 7,000 14,000

1:350,000 METRES

REFERENCE(S)
1. MEADOWBANK INFRASTRUCTURE AND PROPOSED WHALE TAIL HAUL ROAD ALIGNMENT OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
AQUATICS LOCAL AND REGIONAL STUDY AREAS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	JL
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

The lakes which have been identified to support the discharge mitigation option (Lake D1 and Lake D5) are also large waterbodies which, if selected, may be affected by Project operations. No additional watercourse crossings have been identified with potential roads to the alternative discharge locations.

The RSA for water quality is within the RSA for surface water quantity (FEIS Addendum Section 6.1.2.1.2; Figure 6.1-2), and extends to Lake DS1 to the north of the Expansion Project (downstream of Mammoth Lake), and to Lake DS2 to the south of the Expansion Project (downstream of Lake D1). The RSA includes areas downstream of the LSA, along the flow path of water, with consideration effects of the Approved and Expansion Project with other developments, activities, and natural factors that influence water quality.

As a means to reduce uncertainty in the assessment predictions that can then be interpreted at the full scale of the fishery in the region, the RSA for fish and fish habitat is divided into assessment areas to reflect the potential number of fishery (or population) units that may be affected (Table 6.1-3). The key assessment boundaries within the aquatics RSA includes waterbodies and watercourses within subsections of the A and C watersheds of the Meadowbank River Watershed, waterbodies and watercourses within subsections of the D watershed of the Meadowbank River Watershed and the DS2 watershed of the Thelon River Watershed, and considers stream connections (i.e., barriers to fish passage) within each watershed. For example, a large boulder field with dispersed flows (approximately 500 m in length) was identified in the A watershed at Stream A76-A75, which is expected to prevent fish passage between Lake A76 and Lake A75 at any time of the year. Therefore, the assessment area in the A watershed is further divided, where the lakes and streams downstream of Stream A76-A75 and above Lake A69 are include in an assessment area, defined as the A69 assessment area, and the lakes and streams upstream of Stream A76-A75 and above Lake A1 are included in an assessment area, defined as the A1 assessment area (Figure 6.1-2).

The C watershed is also divided into two assessment areas as determined by the Lake C38 (Nemo Lake) outlet (i.e., Stream C38-C12) (Table 6.1-3). The outlet stream is characterized by a steep slope (approximately 2.5%), dispersed flows, and a boulder garden, and therefore, the stream is expected to prevent or impede upstream passage of fish, geographically isolating populations above this point. The resulting assessment areas are defined as the C38 assessment area, and the C1 assessment area (Figure 6.1-2).

Table 6.1-3: Baseline Summary of Surface Water in Drainage Basins in the Regional Study Area

Assessment Areas within Aquatic RSA	Total Sub-Basin Area (ha)	Total Stream Length (km)	Number of Lakes				Lake Area (ha)			
			<1 ha	1 to 10 ha	10 to 100 ha	>100 ha	<1 ha	1 to 10 ha	10 to 100 ha	>100 ha
A1	6,748.9	26.5	22	34	21	2	12.2	119.5	579.1	314.0
A69	4,266.2	24.3	7	24	10	1	3.4	87.9	205.8	131.1
C38	354.6	0.8	8	1	0	1	2.3	1.0	-	118.0
C1	1,407.8	7.3	15	16	4	0	3.9	47.5	135.3	-
A and C combined	12,777.5	59.0	52	75	35	4	21.8	255.9	920.2	563.0
D	11,049.0	34.2	54	58	22	4	17.3	197.2	529.8	1,891.8

Note: The RSA excludes shallow ponds with no upstream or downstream connection to other waterbodies and excludes Lake DS1 where fish assemblages and populations processes are expected to be different from smaller waterbodies located further upstream.

RSA = regional study area; ha = hectare; <= less than; >= greater than; km = kilometre.

6.1.2.2 Temporal Boundaries

For the Approved Project, the temporal boundary for assessment of potential effects on the aquatic environment, for construction, operations, and closure of the Project was a three to four-year LOM, with operations running from 2019 through 2022 and closure culminating in 2029 (FEIS Addendum Volume 3, Section 3.3).

The Expansion Project activities are proposed to be initiated upon receipt of Project approvals. Construction has started in Year 2018 for the Approved Project. The duration of the construction phase will be about 2 years. Construction upgrades to support the Expansion Project will begin as soon as approval and permits for the amendment applications are received (anticipated for early 2020). Operation activities will be from 2020 to 2025, and closure from 2026 to 2051, followed by post-closure starting in 2051.

Although not identified as a standalone Expansion Project phase in Volume 3, dewatering activities can potentially affect surface water quantity and were grouped into the “dewatering” phase as part of the surface water quantity assessment. Dewatering was considered part of construction for other aspects of the assessment.

6.2 Surface Water Quality and Sediment Quality

This section provides an assessment of potential effects of the Expansion Project on water quality, and provides input to the effect assessment of other disciplines including (but not limited to) fish and fish habitat, and human health and ecological risk assessment. As part of this FEIS Addendum, this section focuses primarily on the potential effects of the Expansion Project on the receiving environment, beyond those from the Approved Project.

As in the Approved Project, the assessment of the Expansion Project on water quality considered water management activities which fed into the site water balance (Volume 6, Appendix 6-O) and water quality model (Volume 6, Appendix 6-H). Project activities which could influence water quality were reviewed (Volume 3, Appendix 3-C, Table 3-C-6). The Expansion Project is expected to change the duration of effects previously assessed for the Approved Project, there were no new primary pathways identified. Effects of the Expanded Project are primarily related to:

- the expanded footprint generating additional water requiring management, treatment, and discharge to the receiving environment during the operational phase; and
- the increased duration of the closure phase, to refill the pits and underground mine.

Effects were presented for the maximum footprint for the operations, closure, and post-closure phases, resulting in a conservative assessment. Although mitigation measures are considered, the water quality and subsequent closure predictions are worst case for the purpose of the impact assessment and NIRB review.

A summary of the key changes to the assessment of the surface water quality component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 6.2-0.

Table 6.2-0: Surface Water Quality and Sediment Quality: Approved Project vs Expansion Comparison

Section of FEIS	Approved Project	Section of Addendum	Expansion Project
6.4.1 Incorporation of IQ	Review of: • Whale Tail Pit Project IQ Baseline Report (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c); • Meadowbank Mine Baseline Traditional Knowledge Report (Cumberland 2005a); • Proposed All-weather Exploration Road from the Meadowbank Mine to the Project Site-Baseline Traditional Knowledge Report (Agnico Eagle 2014a); • Community Consultations/Public Information Meeting Summary Reports for 2014 and 2015 (NIRB 2014, 2015).	6.2.1 Incorporation of IQ	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type “A” Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board’s Hearing Regarding the Review of Agnico Eagle Mines Limited’s Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
6.4.2 Existing Environment and Baseline Information	• 2014-2015 CREMP	6.2.2 Existing Environment and Baseline Information	Additional baseline data • CREMP 2014-2017 Baseline Studies (Azimuth 2018a) • CREMP 2018 Addendum (report in preparation) • Mercury study compendium (Azimuth 2018b) and monitoring plan (Agnico Eagle 2018l)
6.4.3 Potential Project-related Effects Assessment	Three primary pathways were identified	6.2.3 Potential Project-related Effects Assessment	No new primary pathways identified. New activities such as underground mining, additional open pit, overall water management, have been added to the primary pathways that were assessed in the Approved Project. Results of the effects assessment were updated for the Expansion Project
6.4.4 Residual Impact Classification	Based on the ratings assigned for duration, geographic extent, and magnitude for the three primary pathways, and the potential effects to the assessment endpoint, which includes a healthy ecosystem and continued traditional use, it was concluded that the Project will not have a significant effect to water quality.	6.2.4 Residual Impact Classification	Unchanged

Section of FEIS	Approved Project	Section of Addendum	Expansion Project
6.4.5 Cumulative Effects Assessment	Cumulative effect is expected to be negligible	6.2.5 Cumulative Effects Assessment	Unchanged
6.4.6 Uncertainty	Uncertainty with respect to the water quality assessment is related to data used in the models, and conservatism applied within the water balance and water quality models developed for the Project. Uncertainty can be reduced through collection of data and updates of the models	6.2.6 Uncertainty	Unchanged
6.4.7 Monitoring and Follow-up	Water quality monitoring will be conducted within the Mine site and the downstream receiving environment through a variety of monitoring plans: • Dike Construction and Monitoring Plan • Water Quality and Flow Monitoring Plan • Water Management Plan • Core Receiving Environment Monitoring Plan	6.2.7 Monitoring and Follow-up	Plans have been updated for the Expansion Project, refer to Volume 8, Table 8.2-1

6.2.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to water quality was provided by community members since the FEIS submission was made in 2016 for the Approved Project. This assessment takes into account review of community consultation notes (Agnico Eagle 2016d, 2018c; NIRB and NWB 2017; and NIRB 2017), and consultation notes for the Expansion Project (Agnico Eagle 2018a). The following Project concerns have been raised by community members related to water quality:

- effects on water quality and toxicity, and water treatment and contingency plans for emergency overflow of contact water (Agnico Eagle 2018a);
- potential adverse effects of mine water (i.e., contact water) on the environment, lakes and fish populations, and to areas downstream because of contamination and sedimentation (Agnico Eagle 2018a);
- current water quality at Whale Tail and Mammoth Lake, and drinking water safety of nearby lakes for camp use (NIRB and NWB 2017);
- water quality monitoring process at Whale Tail, and water treatment to make sure conditions are safe for fish (Agnico Eagle 2016a, 2018c);
- water quality in the pits at closure including after the waterbodies are reconnected, and confidence in the safety of the water for drinking, fish populations and the soil (NIRB 2017); and
- water quality and monitoring in all the waterbodies near Meadowbank and downstream, including the Quoich River (NIRB 2017).

The concerns as they pertain to the Expansion Project have been incorporated into Sections 6.2.2, 6.2.3, 6.2.4, and 6.2.7 of the FEIS Addendum.

6.2.1.1 Existing Environment and Baseline Information

This Expansion Project does not change IQ integration from the Approved Project. Historical IQ and the importance of water and the aquatic ecosystems to the local Inuit communities were considered for the Approved Project FEIS Volume 7, Appendix 7-A and summarized in the Approved Project FEIS Volume 6, Section 6.4.1.1 (Agnico Eagle 2016c).

6.2.1.2 Valued Component Selection

For the Expansion Project, the selection of VCs remains the same as the Approved Project (FEIS Volume 6, Section 6.4.1.2; Agnico Eagle 2016c).

6.2.1.3 Impact Assessment

The primary concerns related to water quality raised during consultation for the Expansion Project were effects on toxicity of the water, treatment of water, and potential effects to downstream lakes and the aquatic environment due to release of mine water.

The issues and concerns identified through IQ were considered in the impact assessment and identification of mitigation.

Secondary and no linkage pathways specific to water quality are included in Volume 3, Appendix 3-C, Table 3-C-6. Further analysis of the primary pathways for water quality is provided in Section 6.2.3 of the FEIS Addendum.

6.2.1.4 Mitigation and Monitoring

Similar concerns and comments from the Approved Project were expressed during consultation for the Expansion Project; specifically, questions regarding monitoring for changes in fish health were raised, and the request to choose options with the least environmental impact was emphasized. Mitigation plans are in place to test the quality of water in the Attenuation Pond prior to discharge, to determine if an alternate discharge location is needed, and to monitor for changes in both site water quality and receiving environment water quality.

6.2.2 Existing Environment and Baseline Information

Baseline water and sediment quality studies for the Whale Tail Pit study area and haul road were completed in 2014 to 2017 (Azimuth 2018a). The updated baseline core receiving environment monitoring program (CREMP) report amalgamates the 2014 and 2015 monitoring data with data collected in 2016 and 2017. Additional data from the Whale Tail Pit study area core lakes and lakes under consideration for the alterative discharge location were collected in 2018 and will be reported at a later date.

In accordance with Condition 63 of Project Certificate No. 008 and Type A Water Licence 2AM-WTP1826 (Part I, Condition 5), a mercury monitoring plan (MMP) was developed to define supplemental sampling methods and data evaluation techniques (Agnico Eagle 2018l). A compendium of mercury data collected to-date for water, sediment, benthic invertebrates, zooplankton and soil is available as a memorandum in the annual report (Azimuth 2018b).

This section provides a summary of the methods and results presented in the baseline study report; the detailed data and quality assurance/quality control information is provided in the baseline report (Azimuth 2018a).

6.2.2.1 Methods

Water Sample Collection

Baseline water quality sampling was conducted at lakes and tributaries in the study area (summarized in Table 6.2-1; details in Azimuth 2018a, Table 1-1) as follows:

- Whale Tail Lake (Lake A17), Mammoth Lake (Lake A16), Nemo Lake (Lake C38), Lake A20, Lake A76, Lake DS1), Lake D1, and Lake D5;
- tributaries within the Whale Tail Pit study area;
- tributaries along the haul road; and
- reference lakes (Innugayualik Lake and Pipedream Lake).

Innugayualik and Pipedream lakes have been identified as culturally important for fishing and as a travel route. The other lakes in the Whale Tail Pit study area have not been specifically identified as culturally important.

Methods used to collect and validate the water samples are documented in the baseline report (Volume 6, Appendix 6-G, Section 2). Water quality samples were analyzed for the following constituents:

- physical constituents (i.e., conductivity, hardness, laboratory pH, total dissolved solids [TDS], total suspended solids [TSS], and turbidity);
- major ions (i.e., bicarbonate, calcium, chloride, fluoride, magnesium, potassium, sodium, and sulphate) and nutrients (i.e., total organic carbon, dissolved organic carbon, total Kjeldahl nitrogen, total ammonia, nitrate, nitrite, total phosphorus, total dissolved phosphorus, orthophosphate, and silicate);
- plant pigments (chlorophyll *a*); and
- total and dissolved metals, metalloids, and non-metals[2] (i.e., aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silicon, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc).

In addition to the monitoring summarized above, arsenic speciation [As(III), As(V), DMA, MMA, AsB] was conducted at selected locations in August 2017 and August 2018. As required by the Approved Project, mercury-specific monitoring program (Agnico Eagle 2018l) was also conducted, where concentrations of mercury and methylmercury in water, sediment, benthic invertebrates were determined (Azimuth 2018b).

[2] Henceforth, metals, metalloids (e.g., arsenic), and non-metals (e.g., selenium) will be referred to as metals.

Table 6.2-1: Baseline Water and Sediment Quality Sampling Summary

Area	Lake or Stream	Name	Water Quality Sampling Effort																	Sediment Quality Sampling Effort Summary: Grab Sampling					Sediment Quality Sampling Effort Summary: Core Sampling	
			2014	2015			2016					2017						2018		2014	2015	2016	2017	2018	2017	2018
			Sep	Jul	Aug	Sep	Apr	Jul	Aug	Sep	Nov	Mar	May	Jul	Aug	Sep	Nov	Aug	Sep	Sep	Aug	Aug	Aug	Aug	Aug	Aug
Whale Tail Pit Area	Lake	Mammoth (Lake A16)	3	2	2	2	2	2	2	2	2	2	2	2	2	-	2	-	-	3	5	5	5	-	10	-
		Whale Tail North (Lake A17)	2	2	2	2	-	-	-	-	-					-	-	-	-	2	10	-	-	-	-	-
		Whale Tail South (Lake A17)	1	2	2	2	2	2	2	2	2	2	2	2	2	-	2	-	-	1	5	5	5	-	10	-
		Nemo (Lake C38)	3	2	2	2	2	2	2	2	2	2	2	2	2	-	2	-	-	3	5	5	5	-	10	-
		Lake A20	-	-	-	-	2	2	2	2	2	2	2	2	2	-	2	-	-	-	-	5	5	-	10	-
		Lake A76	-	-	-	-	2	2	2	2	2	2	2	2	2	-	2	-	-	-	-	5	5	-	10	-
		Lake DS1	-	-	-	-	2	2	2	2	-	2	2	2	2	-	2	-	-	-	-	5	5	-	10	-
		Lake D1[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	5	-	10
		Lake D5[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	5	-	10
	Stream	A18-A17	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Whale Tail Outlet (A17-A16)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Nemo Outlet (C38-C12)	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A14-A13	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A69-DS1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		DS1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A55-A17	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A21-A20	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A76-A75	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A81-A80	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A5-A4	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		C8-C7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		A15-A14	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Haul Road	Lake	C2	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		C14	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		C17	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		C20	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		C41	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reference		Inuggugayualik Lake	2	2	2	2	2	2	2	2	-	2	2	2	2	-	2	-	-	-	5	5	5	-	10	-
		Pipedream Lake	2	2	2	1	2	2	2	2	-	2	2	2	2	-	2	-	-	-	5	5	5	-	10	-

Notes: Summary of stations as reported in Azimuth (2018a).

In addition to the number of water quality samples collected for laboratory analysis, at each station, in situ measurements through the water column were also collected.

[a] Data for these lakes are not included in Azimuth (2018a).

Sediment Sample Collection

Baseline sediment sampling of Whale Tail Lake, Nemo Lake, and Mammoth Lake was completed in 2014 to 2017 (August or September). The sampling locations for the 2014 baseline study were consistent with the benthic invertebrate stations (i.e., stations 1, 3, and 5) in Whale Tail Lake, Nemo Lake, and Mammoth Lake. For 2015, sediment and benthic invertebrate samples were collected from five areas; two areas Whale Tail Lake (North Basin), one area Whale Tail Lake (South Basin), one area in Nemo Lake, and one area in Mammoth Lake. The scope of sediment monitoring expanded in 2016 to include two mid-field locations (Lake A20 and Lake A76) and a far-field location (Lake DS1), in addition to applicable near field waterbodies (Whale Tail Lake [South Basin], Mammoth Lake and Nemo Lake). Sediment samples (grab and core) were also collected from Lake D1 and Lake D5 in August 2018.

Sample collection and sample validation is provided in the baseline report (Volume 6, Appendix 6-G, Section 3).

Sediment samples were collected after the benthic invertebrate sampling. Samples were collected using a Petite Ponar grab sampler and assessed for acceptability before processing. Sediment samples were analyzed by ALS for the following constituents:

- physical constituents (i.e., organic content, particle size distribution [gravel, greater than 2 mm; sand, 0.063 to 2.0 mm; silt, 0.004 to 0.063 mm; and clay, less than 0.004 mm]);
- nutrients (total organic carbon and phosphorus);
- metals (i.e., aluminum, antimony, arsenic, barium, beryllium, bismuth, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc); and
- moisture, pH, mineral oil and grease, hydrocarbons (LEPHs and HEPHs), and PAHs.

As requested by ECCC, sediment cores were collected during the August 2017 field program. In preparation for the future Environmental Effects Monitoring Program, 10 sediment cores were collected in 2017 from each of the following locations: Whale Tail Lake [South Basin], Nemo Lake, Lake A20, Mammoth Lake, Lake A76, and Lake DS1. Sediment core sampling was conducted in the same areas as sampling for benthos and sediment grab sampling (described above). A modified ponar method was used to obtain a 1.5 cm deep slice of sediment from the top of the ponar grab. Sediment samples collected by the coring method were analyzed for moisture, pH, total organic carbon, and total metals.

Data Screening and Analysis

Water chemistry data collated for the baseline report were screened against the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for the protection of freshwater aquatic life (CCME 1999) and Canadian Drinking Water Quality Guidelines (CDWQG; Health Canada 2014). Health-based standards were given priority over aesthetic and operational guidelines. For additional context, the results were also qualitatively compared to the chemistry data from the reference lakes and compared against trigger and threshold values developed for the Meadowbank CREMP – Whale Tail Pit Addendum (Azimuth 2016). For context, thresholds are considered regulatory guidelines or benchmarks below which adverse effects are not expected; triggers are early warning levels and are less than threshold values.

The purpose for comparison to the Meadowbank triggers and thresholds is to set additional context for the Expansion Project local and regional study areas. These trigger and threshold values were not used to determine constituents of potential concern for the Expansion Project.

Data are compared to guidelines and benchmarks as a means to evaluate the quality of water and determine the suitability of the water for aquatic life, including fish, waterfowl, and as a drinking water source.

Sediment data were screened against the CCME interim sediment quality guidelines (ISQGs) and probable effect level (PEL) concentrations (CCME 2002). The results were also qualitatively compared to the chemistry data from the reference lakes for additional context and the triggers/thresholds developed for the Meadowbank CREMP lakes (Azimuth 2016).

6.2.2.2 Results

This section provides a high-level summary of the water and sediment quality results; for more details please see the baseline report (Volume 6, Appendix 6-G).

Water Quality

The majority of water chemistry constituent concentrations were below the analytical detection limit for samples collected in 2014 and 2015. Constituents that were below the detection limit across all samples included carbonate, hydroxide, nitrite, total cyanide, four total metals (boron, lithium, selenium, and silver), and eight dissolved metals (antimony, bismuth, boron, selenium, silver, thallium, vanadium, and zirconium).

Similar results were observed in 2016 and 2017. Chemical constituents with concentrations below the analytical detection limit included cyanides (free and total), most metals (total and dissolved), nitrate, nitrite and ammonia. No guideline exceedances of the drinking water or aquatic life guidelines were observed for metals. Minor seasonal fluctuations were noted, as well as a slight increasing trend in specific conductivity at Whale Tail Lake (South Basin) and Mammoth Lake.

The following sections provide a summary of results by study area.

Lakes

Water temperature in lakes ranged from 6.3 to 15.3°C during the summer months (2014 to 2017) with minor thermal stratification evident at some deeper locations (Azimuth 2018a, Appendix B Tables B1-1 to B1-9). The water column was generally well mixed with uniform specific conductivity (generally less than 25 µS/cm) and sufficient oxygen to support aquatic life (i.e., above the CEQG threshold). Lake water pH was circum-neutral (6.2 to 7.7) in all lakes.

Surface water collected during the open water season was characteristic of low productivity headwater lakes in the Arctic; soft, with low alkalinity, low TDS (less than 45 mg/L), low turbidity (and corresponding high Secchi depth) and low TSS (less than 2 mg/L) (Azimuth 2018a, Appendix C Tables C-1 to C-5).

Nutrient concentrations were generally very low in all lakes (2014 to 2017), with most samples having concentrations below detection limits. The highest concentration of ammonia was measured in Whale Tail North Basin (0.1 mg-N/L) during September 2014, while the maximum concentration of total phosphorus (0.032 mg-P/L) was measured in Lake A76 during April 2016. Most samples had ammonia and total phosphorus concentrations that were less than 0.02 mg-N/L and 0.004 mg-P/L, respectively.

Concentrations of metals were below analytical detection limits in most samples; when concentrations were quantifiable, values were below the CDWQG and CEQG. Samples collected for arsenic speciation in August 2017 contained low concentrations of the five species tested. Arsenite [As(III)] was the predominant form determined, with only minor contributions of DMA (<6% of dissolved As) determined in samples from Nemo Lake and Mammoth Lake. All other species [MMA, As(V), AsB] were below the analytical detection limit (≤0.020 µg/L).

There were a small number of constituents with concentrations that exceeded the Meadowbank trigger values (i.e., conductivity, hardness, calcium, magnesium, and potassium); however, triggers for these constituents were based on baseline/reference data from the Meadowbank project lakes and were provided for context only. Overall, the 2014 to 2017 water quality results from the lakes in the Whale Tail Pit study area were similar to results from the reference lakes. For some constituents (e.g., chloride, electrical conductivity), a subtle increasing trend was noted at Whale Tail South and Mammoth when comparing data obtained from 2014 to 2017; the source of which is unknown at this time (Azimuth 2018a).

Water quality in Lake D1 and Lake D5 were similar to that observed in other lakes of the Whale Tail Pit study area. Limnology profiles and surface water samples were collected in mid-August 2018. Surface water samples were also collected in late-September, when water temperatures had dropped to near freezing. Limnology profiles in mid-August indicated that the water column was well-mixed with dissolved oxygen concentrations within CEQG ranges, circumneutral pH, and similar conductivity as observed in the other lakes (lower in Lake D1 at approximately 15 µS/cm compared to Lake D5 at approximately 25 µS/cm).

Surface water in Lake D1 and D5 during the open-water season was characterized as having soft water (hardness less than 11 mg/L), low alkalinity (less than 10 mg/L), low TDS (less than 23 mg/L), low turbidity (less than 1 NTU), and low TSS (less than 2 mg/L). Most nutrients had concentrations reported results at less than or near detection limits. The exceptions were two samples (one from each lake) collected in late September that had total phosphorus concentrations of 0.007 mg-P/L. Concentrations of metals were below detection limits in most samples; when concentrations were quantifiable, values were below the CDWQG and CEQG. Conductivity, hardness, calcium, and magnesium concentrations in Lake D5 (but not in Lake D1) were greater than the CREMP (Azimuth 2016) trigger values. One sample from each lake was collected for arsenic speciation. Concentrations of all species were less than detection limits (≤0.020 µg/L) with the exception of arsenite [As(III)] in the sample from Lake D5, which was 0.048 µg/L or 37% of the total arsenic concentration.

Tributaries

In situ water quality measurements taken at the tributary stations in the Whale Tail Pit study area and the haul road study area show the water to be well oxygenated with dissolved oxygen concentrations consistently above 9.5 mg/L and low specific conductivity at all stations (i.e., less than or equal to 34 µS/cm). Tributary pH was circum-neutral (6.2 to 7.3) across all stations (Volume 6, Appendix 6-G, Tables 2-3 and 2-4).

Nutrient concentrations were low in the tributaries with results less than the detection limit in most samples. Ammonia was less than the detection limit in most samples with a higher maximum concentration detected in a tributary from the Whale Tail Pit study area (0.007 mg-N/L) as compared to the maximum detected in the haul road study area (0.005 mg-N/L). Phosphorus was detected more frequently in the tributary samples as compared to the lake samples. In the Whale Tail Pit study area, total phosphorus ranged from less than the detection limit to 0.004 mg-P/L and ranged from less than the detection limit to 0.007 mg-P/L in the haul road study area. The median value in tributaries (in both study areas) was 0.002 mg-P/L while the median was less than the detection limit in the lakes.

Metals were below the analytical detection limit in most samples, and when they were detected, concentrations were below the CDWQG and CEQG, with two exceptions. Aluminum was above the CEQG at two stations (A55-A17 and A5-A4) in August; all other detectable metal concentrations were less than the CEQG and the CDWQG.

Concentrations in the tributary samples did not exceed the Meadowbank triggers and thresholds.

Sediment Quality

Sediment collected from lakes in the Whale Tail Pit study area contained similar concentrations of metals as sediment from reference lakes. Arsenic and chromium concentrations exceeded either ISQG or PEL in sediment samples collected in 2014 to 2017 from the Whale Tail Pit study area (Whale Tail Lake, Mammoth Lake, Nemo Lake) and in the reference lakes (Inuggugayualik Lake and Pipedream Lake) (Azimuth 2018a, Appendix D, Tables D-1 to D-9). Chromium concentrations were also above Meadowbank trigger values at Pipedream Lake, Mammoth Lake, and select locations in Whale Tail Lake. Arsenic concentrations were above Meadowbank trigger values at Inuggugayualik Lake, Mammoth Lake, and Whale Tail Lake. Maximum arsenic and chromium concentrations were observed in the north basin of Whale Tail Lake (i.e., 1,760 mg/kg arsenic dry weight and 210 mg/kg chromium dry weight). Copper concentrations were above the ISQG in most samples from lakes sampled during 2014 to 2017. Concentrations of zinc, cadmium, lead and mercury were below ISQG guidelines at most locations and were below PEL guidelines in all samples (Azimuth 2018a, Appendix D, Tables D-1 to D-9). Similar concentrations of metals and guideline exceedances were observed for sediment obtained via grab sample compared to coring.

The particle size distribution in the top 3 to 5 cm of sediment from south Whale Tail Lake, Mammoth Lake, Pipedream Lake, and Inuggugayualik Lake was predominantly silt/clay, and characteristic of depositional areas in lakes from this region (Volume 6, Appendix 6-G). A coarser particle size distribution was evident in samples collected from Nemo Lake and north Whale Tail Lake with sediment collected at similar depth (i.e., 8 ± 1.5 m) being predominantly silt/sand.

Sediment concentrations of hydrocarbons and polycyclic aromatic hydrocarbons were consistently low at all lakes sampled and below analytical detection limits.

Sediments collected from Lake D1 and Lake D5 in August 2018 were similar to sediment from other lakes in the Whale Tail Pit study area. As observed in the core and reference lakes, arsenic and chromium concentrations exceeded the ISQG and frequently also exceeded the PEL. Copper concentrations frequently exceeded the ISQG but did not exceed the PEL, and cadmium concentrations occasionally exceeded the ISQG. Chromium concentrations occasionally exceeded the CREMP (Azimuth 2016) trigger values in both lakes. Concentrations of lead, mercury, and zinc were below ISQG. Similar concentrations of metals and guideline exceedances were observed for sediment obtained via grab sample compared to coring. Particle size distribution was predominantly silt/clay. Concentrations of hydrocarbons and polycyclic aromatic hydrocarbons were consistently low in both lakes and below analytical detection limits.

6.2.3 Potential Expansion Project-related Effects Assessment

Methodology for the effects assessment for the Expansion Project is outlined in Section 3.5. Pathway analysis with identification of no linkage, secondary, and primary pathways for water quality (with links to sediment quality where appropriate) is provided in Volume 3, Appendix 3-C, Table 3-C-6. Pathway analysis identifies and assesses the linkages between Project components or activities, and the corresponding potential residual effects to the VCs. A comprehensive analysis of the potential pathways for effects on water quality during the construction, dewatering, operational, closure, and post-closure phases, is provided in Volume 3, Appendix 3-C, Table 3-C-6. This pathway analysis includes the use of environmental design features and mitigation to remove a pathway (i.e., no linkage) or to limit (i.e., mitigate) the effects of the pathway and reduce it to a secondary pathway (i.e., minor measurable change). Primary pathways (i.e., those pathways likely to result in a measurable change to measurement indicators that could contribute to residual effects on a VC relative to the Baseline Case or guideline values) are carried through for further evaluation of effects.

Primary pathways that require further effects analysis to determine the environmental significance from the Project on water quality are grouped into effects statements that link Project activities with a change in water quality (Table 6.2-2).

Table 6.2-2: Effects Statements for Water Quality

Effects Statement	Pathway	Phase
Air emissions and the deposition of dust and acidifying air emissions to waterbodies	Activities from construction activities and mining operations (e.g., equipment, vehicles, buildings, open-pit mining, blasting) can create fugitive dust and alter air emissions (including sulphur dioxide, nitrogen oxides, and particulate matter) and subsequent deposition may cause a change in water and sediment quality.	Construction through operations
Water management and flooding	Water management activities (dams, drainage, diversion, discharge, and dewatering) that will alter watershed areas, natural drainage paths, and create a reservoir may cause a change in water quality (mercury cycling and bioaccumulation).	Construction through closure, but primarily operations
Development of the Project footprint, water management and effluent discharge	Expansion Project footprint will physically alter watershed areas and drainage patterns, rates and quantities of diverted non-contact water to new watersheds, change downstream flows through flooding and dewatering, water levels, channel/bank stability in streams and may affect water and sediment quality.	Operations and closure
	Activities from mining operations (e.g., open-pit mining, blasting, collection of runoff from the waste rock storage facility, sewage treatment effluent) that will generate effluent and the subsequent discharge of effluent may cause a change in water and sediment quality.	Operations

The analyses of residual effects from the Expansion Project on water quality are quantitative, where possible, and included data from field studies, scientific literature, monitoring programs at existing mines, government publications, and personal communications. Traditional knowledge and community information were incorporated where available. Sediment quality is considered a measurement indicator for the water quality assessment endpoint; analyses of residual effects on sediment quality are qualitative. Due to the amount and type of data available, some analyses of residual effects were qualitative and included professional judgement or experienced opinion. Analyses of each effects statement are provided in Sections 6.2.3.1, 6.2.3.2, and 6.2.3.3 of the FEIS Addendum.

6.2.3.1 Effects of Air Emissions and Deposition

Project related air emissions have the potential to deposit to local terrestrial and aquatic ecosystems. Atmospheric deposition of acidic gases and fugitive dust therefore have the potential to affect soil and water quality, local flora and fauna, and the Inuit communities that depend on these resources for their cultural, social, and economic well-being.

The effect of air emissions and deposition on water quality for the Approved Project was determined through the air quality assessment (Approved Project FEIS Volume 4, Appendix 4-C, Agnico Eagle 2016c) and review of monitoring results for the Meadowbank Mine (Volume 6, Appendix 6-G). A similar assessment was conducted to determine changes in air quality as a result of the Expansion Project (Volume 4, Appendix 4-C, Section 4.C-7-3). The air quality assessment provided predictions of emissions and deposition of TSP matter and PM_{10} for the haul road and the Whale Tail Pit, and compared these predictions to baseline concentrations and air quality criteria. Effect of air emissions and deposition on water quality was retained as a primary pathway in the Approved Project and the Expansion Project because the IQ identified water quality that could be affected by dust deposition as a concern.

Measured dust deposition (TSP) at the Meadowbank Mine site was less than the Government of Nunavut standard of 120 µg/m^3 in all samples except one (Agnico Eagle 2016a). Background concentrations of NO_2 reach values 5% to 10% of the 24-hour Nunavut air quality standard; average $PM_{2.5}$ concentrations can reach 25% of the 24-hour air quality standard (Approved Project FEIS Volume 4, Section 4.3.2).

Along the haul road, the predictions suggest the deposition will be less than the Alberta guideline for residential and recreation areas within 500 m of the road and less than the Ontario standard within 75 m from the road, and appear comparable to the Meadowbank observations (FEIS Addendum Volume 4, Section 4.3.3). Geochemical analysis of the haul road material did not suggest that generated dust would have an adverse effect on soil and water quality (Golder 2014).

Predictions for maximum TSP concentrations adjacent to the haul road exceed the 24-hour average ambient air quality standard (120 µg/m^3) at distances of up to 750 to 1,000 m from the road. Maximum annual TSP concentrations are predicted to exceed the ambient air quality standard (60 µg/m^3) within approximately 100 to 300 m from the road (Volume 4, Appendix 4-C).

In the Whale Tail Pit study area, the air quality predictions suggest that the effects of mining activities at the Whale Tail Pit on regional air quality are limited in spatial extent and occur primarily on dry windy days in summer. For TSP, the worst year of the 5-year simulation includes one 24-hour TSP exceedance. These effects are reversible because emissions will no longer affect air quality once the Whale Tail Pit is decommissioned and the haul road become inactive.

The deposition of acidifying air emissions can change water quality in receiving lakes if deposition is high and lakes have high acid sensitivity (based on the rating scale of Saffran and Trew 1996). Emissions of nitrogen oxide and sulfur dioxide were modeled. Consistent with the Approved Project, the maximum 1-hour, 24-hour, and annual NO_2 concentrations and the concentrations at the selected receptors (Volume 4, Appendix 4-C, Table 4.C-12) are all lower than the respective air quality standards. Likewise, the maximum 1-hour, 24-hour, and annual SO_2 concentrations and the concentrations at the selected receptors (Volume 4, Appendix 4-C, Table 4-C-14) are all lower than the respective air quality standards. Acid deposition modelling was not conducted because results of the air quality emissions did not suggest there would be significant deposition, nor measurable effects to receptors.

Consistent with the Approved Project, the air quality assessment for the Expansion Project concluded that the effects of the Expansion Project on air quality are limited in spatial extent and temporal extent.

Mitigation will be applied to manage the generation of dust and acidifying air emissions. Mitigation will include measures such as:

- Dust control systems will be used to limit dust emissions.
- Compliance with regulatory emission requirements are expected to be met based on modelling.

- Exhaust emissions from non-road vehicles will be managed through regular and routine maintenance of vehicles.
- If effects on water quality due to dust deposition are observed from water quality monitoring at upstream and downstream locations, then other dust abatement measures at sensitive watercourses or waterbodies will be implemented.

Water quality is routinely measured at Meadowbank Mine through the CREMP (Azimuth 2016) and as part of general site monitoring (Agnico Eagle 2016d). Through the CREMP, changes in water quality have been identified for alkalinity, conductivity, hardness, major cations, TDS, and total Kjeldahl nitrogen at one or more near-field station. While concentrations have changed since baseline due to dewatering and operations, the changes are localized, concentrations are still low, and thus the change is not ecologically relevant (refer to updated CREMP; Volume 8, Appendix 8-E.10). This suggests that mitigation, such as dust suppression on haul roads and on the airstrip, used at Meadowbank Mine is sufficient to reduce or eliminate effects of dust and air quality emissions on water quality. Changes to water quality can cause a change to sediment quality. Management of dust to minimize effects to water quality will also minimize effects to sediment quality. The effect of dust and air quality emissions on sediment quality are expected to be negligible.

The Inuit are concerned about the effects of dust from the Approved and Expansion Project and how it can change the colour and quality of water as a drinking source and to support the aquatic ecosystem. Based on the results of the air quality predictions, water quality monitoring at Meadowbank, and monitoring at other mines in the North, and the use of best management practices and mitigation (Volume 3, Appendix 3-C, Table 3-C-6), the generation of dust and acidifying air emissions can be managed.

It is assumed that the activities related to construction and mining operations will not change if Lake D1 or Lake D5 are used as mitigation measure for discharge. That is, the magnitude and type of air emissions and dust deposition will be similar and limited in spatial area and temporal extent. The same mitigation strategies as described above will be applied and will be as effective. Therefore, the air quality assessment will yield similar results regardless of which lakes are used as the discharge locations. The effect of dust and air quality emissions on water and sediment quality are expected to be negligible.

6.2.3.2 Effects of Water Management and Flooding

The approved diversion of Whale Tail Lake (South Basin) to the Mammoth Lake watershed will increase the surface water elevation of Whale Tail Lake (South Basin), resulting in flooding of tributary lakes and an increase to the lake water surface fraction of the Whale Tail Lake (South Basin) watershed (FEIS Addendum Section 6.3.3.1.4.2). The anticipated effects of flooding as part of the planned diversion on water quality in the Approved Project are erosion along new shorelines with mobilization of TSS, and mobilization of mercury from decomposition of flooded vegetation with subsequent increases in the water column and biota (particularly piscivorous fish, such as Lake Trout); these are temporally extended in the Expansion Project. The potential related to discharge of treated effluent to Whale Tail Lake (South Basin) are captured in Section 6.2.3.3 of the FEIS Addendum.

A preliminary literature review was completed for the Approved Project to assess the potential impact of mercury mobilization and the potential for methylmercury increases in the water column and biota as a result of the temporary flooding of Whale Tail Lake (South Basin). The literature review was limited to studies on reservoirs to evaluate how mercury concentrations may change as a result of impoundment. In support of the FEIS and Type A Water Licence for the Approved Project, a comprehensive study was conducted to predict the magnitude of change in fish mercury concentrations associated with the (temporary) flooding (Azimuth 2017); the report was submitted to the NIRB in response to technical comment HC 18. Sampling was also conducted during August 2016, 2017, and 2018 in the Whale Tail Lake to provide a stronger baseline for comparison and to support predictions for potential impacts related to mercury. As a requirement in annual reporting, samples of surface water, sediment, benthic invertebrate tissue, zooplankton, and soil were obtained and analyzed for both total mercury and methylmercury, the results of which have been summarized (Azimuth 2018b).

As described in the Approved Project, flooding of Whale Tail Lake (South Basin) will be temporary during the Project. Construction of the Whale Tail Dike has diverted discharges to the South Basin. As per the Approved Project, Whale Tail Lake (South Basin) will slowly flood and eventual spill-over to Mammoth Lake through the South Whale Tail Diversion Channel from 2020 (i.e., once Whale Tail Lake [South Basin] has reached the elevation of 156.0 masl) to 2026 (i.e., at the onset of closure when the Basin water level is lowered). This diversion will increase the surface elevation of Whale Tail Lake (South Basin) by 3.5 m (i.e., from 152.5 masl to 156.0 masl) and increase the lake water surface fraction of the Whale Tail Lake (South Basin) watershed by approximately 6% (Section 6.3.3.1.4.2 of the FEIS Addendum); these effects were already assessed but temporally extended as a result of the expansion.

As part of the closure phase, there will be draw-down of Whale Tail Lake (South Basin) to an elevation of 153.5 masl by November 2026 and flow through the diversion to Mammoth Lake will cease.

Background

A full summary of the literature review conducted for the Approved Project is provided in Volume 6, Section 6.4.3.2 of the Approved Project FEIS.

Mercury is a naturally occurring element found at low concentrations in air, soil, animals, and vegetation, as well as in lakes and rivers. It can be released into the air naturally, by volcanoes and forest fires, or as a result of human activity.

Conclusions

The literature review, which focused on studies of flooded reservoirs in northern environments, and a comprehensive site-specific study that was conducted to predict the magnitude of change in fish mercury concentrations associated with the (temporary) flooding (Azimuth 2017) were conducted for the Approved Project; specific studies with culturally important fish for the study area were not available. A review of findings presented in the literature suggests that flooding associated with the Project (Approved and Expansion) has the potential to result in an increase in aqueous methylmercury production and an increase in fish tissue mercury concentrations.

Limited data exist that report on the mechanism for methylation and demethylation in sediments. Thus, there is currently no reliable means of predicting mercury methylation rates specific to a particular waterbody. Currently, the optimum approach for anticipating potential change is to draw on experience from other flooding situations, as provided in this literature review. These literature-based findings provide a range of rates of increase and time periods over which mercury levels change.

Flooding and impoundment of Whale Tail Lake (South Basin) is temporary for the Project. The diversion of Whale Tail Lake (South Basin) to the Lake A16 (Mammoth Lake) watershed is expected from 2020 to 2026 (Volume 6, Appendix 6-F). The drawdown period of Whale Tail Lake (South Basin) will be completed by November 2026 and all lakes previously affected will return to an elevation of 153.5 by November 2026 (FEIS Addendum Section 6.3.3.1.5.1). Due to the extended period of flooding necessary for the Expansion Project, a greater amount of mercury accumulation in water and aquatic biota is possible.

Based on these Project-specific conditions, it is expected that there would be some increase in methylmercury in water and fish tissue but that increases would not be as high as the literature references since data from the literature was based on permanent reservoirs (i.e., Bodaly et al. 1997 considered 10 to 30 years post flooding) and not temporary reservoirs.

Based on the literature for permanent reservoirs, methylmercury concentrations could increase 10 to 20 times in water and two to nine times in fish, relative to baseline, after impoundment. Based on modelled predictions for the Approved Project (Azimuth 2017), it was predicted that lake trout mercury concentrations could increase up to two to three times of baseline values.

Concentrations of total and dissolved mercury in water samples from Whale Tail Lake collected as part of Baseline CREMP monitoring in 2014 to 2017 were less than detection limits (i.e., <0.005 µg/L) (Azimuth 2018a, Appendix C, Tables C-1 to C-5). Methylmercury and total mercury concentrations in samples obtained for ultra-low level mercury analysis in 2016 and 2017 were less than or near the improved detection limit (0.0005 µg/L) with only one measurable result (0.00052 µg/L) for total mercury in 2017 (Azimuth 2018b). Assuming a literature based increase (for permanently flooded reservoirs, which is a conservative assumption given that the flooding will occur for six years), as well as information obtained using the lower detection limit, maximum total mercury in water could increase to a maximum of 0.05 to 0.1 µg/L; the lower limit of this range is above the aquatic life guideline (0.026 µg/L; CCME 1999) but the upper limit is below the drinking water quality guideline (1 µg/L; Health Canada 2014). Baseline total mercury in Lake Trout (not adjusted for size), in Whale Tail Lake, ranged from 0.077 to 2.19 µg/g ww, with an average of 0.49 µg/g ww (just below the guideline of 0.5 µg/g; CFIA 2014) (Volume 6, Appendix 6-K, Appendix C). Assuming a literature-based increase (for permanently flooded reservoirs, which is a conservative assumption given that the flooding will occur for six years), maximum total mercury in Lake Trout could range from 4.4 to 19.7 µg/g ww, with an average ranging from 1.0 to 4.41 µg/g ww. Based on modelled predictions (Azimuth 2017), maximum mercury in Lake Trout could range from 4.4 to 6.6 µg/g ww, with an average ranging from 1.0 to 1.5 µg/g ww. It is assumed that any increases would be temporary.

Although the period of flooding has been increased (two to six years), the duration is still brief relative to the described literature and is a temporary feature. Similar to the Approved Project, flooding of the Whale Tail Lake (South Basin) has the potential to increase mercury concentrations in the flooded basin. Management of the flooding activities (including management of the amount of organic material present in the flooded basin) may decrease the effect of mercury mobilization. Monitoring of mercury in water and fish (Agnico Eagle 2018l) will be used to guide further management actions.

The selection of the discharge location will not affect the diversion plans or the effects of flooding of tributary lakes and Whale Tail Lake (South Basin). Therefore, the above assessment of the effects of flooding and methylmercury production is not affected should discharge location mitigation measures be implemented.

6.2.3.3 Effects of Project Footprint Development, Water Management, and Effluent Discharge

This pathway considers water management related Expansion Project activities in operations through post-closure that could disturb lakes and result in the accumulation of toxic substances both of which have been identified through consultation as Inuit concerns. This pathway provides an interpretation of the potential effects to downstream waterbodies from the management of water around the Whale Tail Pit, IVR Pit, Whale Tail Attenuation Pond, IVR Attenuation Pond, and the release of treated effluent to Mammoth Lake and Whale Tail Lake (South Basin).

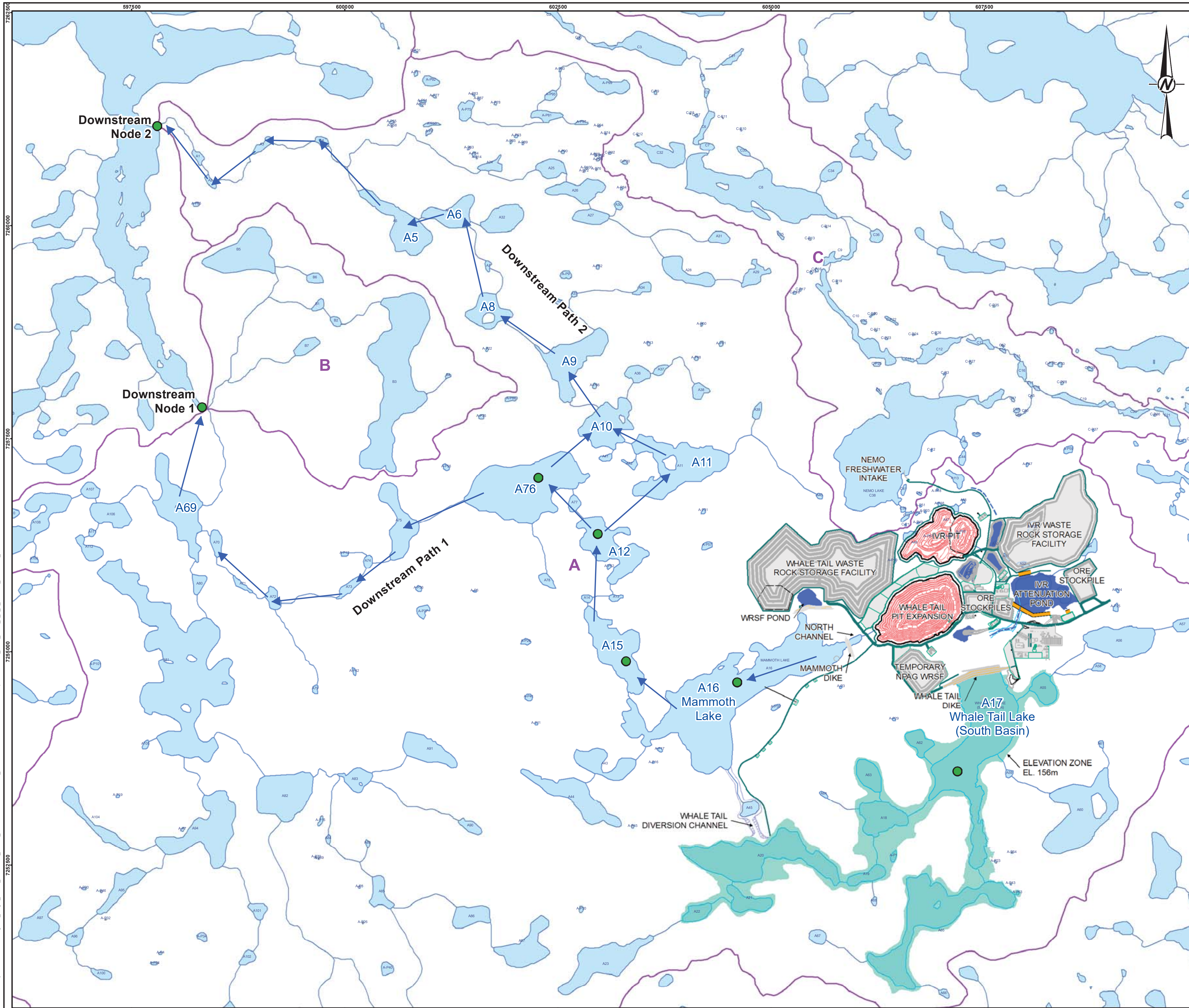
This pathway also considers the mitigation option of alternative effluent discharge to Lake D1 and D5. For this pathway, the approach was qualitative only.

6.2.3.3.1 Methods

Mine effluent will be discharged to Mammoth Lake and Whale Tail Lake (South Basin) via diffusers. Water quality predictions for the Expansion Project (mine site and receiving environment) were developed with a GoldSim mass balance model for operations through closure. A summary of the predictions, and how they were used in the assessment are provided in this section, while the details of the model and generation of predictions are provided in Volume 6, Appendix 6-H.

Water quality predictions were developed for locations within the mine footprint (attenuation ponds [Whale Tail and IVR], flooded Whale Tail Pit, flooded IVR Pit) and the downstream receiving environment (Mammoth Lake, Lake A15, Lake A12, Lake A76, Downstream Node 1, and Downstream Node 2) (Table 6.2-3 and Figure 6.2-1). This section focusses on predictions for site water quality during operations (effluent; i.e., the accumulation of managed site water before discharge to the receiving environment) and closure (i.e., flooded pits and attenuation pond that will be connected to the receiving environment), and predictions for receiving environment water quality during operations to closure. Further details on site water quality predictions at all prediction nodes and during all project phases are provided in Volume 6, Appendix 6-H.

The sensitivity of water quality to an added TSS load was evaluated outside of the GoldSim mass balance model. Concentrations of total metals were predicted for locations that discharge to the receiving environment (i.e., treated effluent during operations, and flooded Whale Tail Pit, IVR Pit, and the Whale Tail Attenuation Pond during post-closure) based on an addition of 15 mg/L TSS; results of this sensitivity analysis are presented in Volume 6, Appendix 6-H. Given the uncertainties associated with the modelling exercise (i.e., the development stage of the Project, laboratory-based input values, assumptions where data do not exist and consideration of an average climate year), the predicted concentrations are considered to be order-of-magnitude estimates. The estimates are sensitive to the assumptions and design elements considered.



LEGEND

- RECEIVING ENVIRONMENT PREDICTION LOCATION
- FLOW PATH
- WATERCOURSE
- WATERSHED
- WATERBODY
- FLOODED WHALE TAIL SOUTH

0 900 1,800

1:45,000 METRES

REFERENCE(S)
1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM AMQ_2025Q4V7.DWG
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT
WHALE TAIL PIT - EXPANSION PROJECT

TITLE
WATER QUALITY PREDICTION MODELLING NODES

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	MD
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	2200/2205	0	6.2-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Table 6.2-3: Water Quality Modelling Prediction Locations

Mine or Downstream	Prediction Location	Operations	Closure[b]
Whale Tail Mine Site	Treated Effluent[a]	Represents site managed water that will be treated and discharged to the receiving environment.	-
	Flooded Whale Tail Attenuation Pond	-	Flooding by run-off or passive filling; spill over into Whale Tail Pit
	Flooded Whale Tail Pit	-	Flooding of pit (fills from run-off, spillover of IVR Pit and the Whale Tail Attenuation Pond)
	Flooded IVR Pit	-	Flooding of pit (active pumping from Whale Tail Lake [South Basin] and other site managed water)
Downstream Receiving Environment	Whale Tail Lake (South Basin)	Background water quality and starting in June 2021 to 2025, pumped (treated) effluent flows (IVR Attenuation Pond [formerly Lake A53], TDS water treatment plant [S-WTP] and seepage through Whale Tail Lake dyke)	Receives natural flow from surrounding watershed
	Mammoth Lake (Lake A16)	Background water quality, pumped treated effluent (Whale Tail Attenuation Pond) from 2019 to May 2021, and overflow of Whale Tail Lake (South Basin) through the diversion channel from 2020 to 2025	Receives natural flow from surrounding watershed
	Lake A15	Receives flow from Mammoth Lake	Receives flow from Mammoth Lake
	Lake A12	Receives flow from Lake A15	Receives flow from Lake A15
	Lake A76	Receives flow from Lake A12	Receives flow from Lake A12
	Downstream Node 1	Receives flow from Lake A76 via downstream path 1	Receives flow from Lake A76 via downstream path 1
	Downstream Node 2	Receives flow from Lakes A12 and A76 via downstream path 2	Receives flow from Lakes A12 and A76 via downstream path 2

[a] Treated effluent will be discharged to Mammoth Lake (i.e., 2019 to 2021) and Whale Tail Lake (South Basin) (i.e., 2021 to 2025) during operations.

[b] For closure (2026 to 2051), results are summarized for early closure (i.e., 2026 to 2041), mid-closure (i.e., 2045), and late-closure (i.e., 2050). For the assessment, the modelled scenario presented includes reconnection of the flooded pits to the downstream environment starting in 2041 via active pumping.

Water quality predictions were generated for the operations and closure phases for groups of constituents including major ions, nutrients, and metals.

Post-closure is defined as the timeline when water quality in the flooded area (Whale Tail Pit, IVR Pit, and Whale Tail Attenuation Pond) meets discharge criteria, the North and South basins of Whale Tail Lake will be reconnected, and water will be allowed to flow downstream to Mammoth Lake. The modelled scenario presented in this assessment for the closure phase was based on reconnecting the flooded area to the downstream environment before water quality in the flooded area was less than generic water quality guidelines or the site-specific water quality objective for arsenic. For this scenario, the flooded area was reconnected to the downstream environment in 2041. The results presented for early-closure represent the period of time before the flooded area is reconnected to the downstream environment, while the results presented for mid-closure and late-closure represent the period of time after the flooded area is reconnected to the downstream environment.

The predictions were compared to various standards; for purposes of this assessment, the standards included the following:

- Type A Water Licence 2AM-WTP1826;
  - Used to evaluate the treated effluent predictions.
- Site-specific water quality objective for arsenic, developed for the Project (Golder 2017e); CEQG (CCME 1999), and CDWQG (Health Canada 2014);
  - Used to evaluate predictions at the downstream locations and the mid-and late-closure predictions for flooded Whale Tail Pit, IVR Pit and the Whale Tail Attenuation Pond.
- Triggers and thresholds developed for the Meadowbank CREMP (Azimuth 2016);
  - Used to evaluate predictions at the downstream locations and the mid-and late -closure predictions for flooded Whale Tail Pit, IVR Pit, and the Whale Tail Attenuation Pond.
- Baseline concentrations (Azimuth 2018a);
  - Used to evaluate predictions at the downstream locations and the mid-and late-closure predictions for flooded Whale Tail Pit and IVR Pit.

Prediction results are summarized as average and maximum concentrations representing each phase as follows: operations (2019 to 2025), early-closure (2026 to 2041), mid-closure (2045), and late-closure (2050). The average and maximum concentrations as compared to the standards are in Volume 6, Appendix 6-I with results discussed in Section 6.2.3.3.2.The water quality predictions were compared to various combinations of these standards to identify constituents of potential concern (COPCs) for the water quality assessment. The screening process to identify COPCs was as follows:

- Treated effluent (operations only):
  - If maximum concentrations in the effluent are less than the Type A Water Licence 2AM-WTP1826 effluent limits but more than CEQG (CCME 1999) and CDWQG (Health Canada 2014) guidelines, the constituent is retained as a COPC for further evaluation to support evaluation of the receiving environment results.
  - If maximum concentrations in the effluent are less than Type A Water Licence 2AM-WTP1826 effluent limits and less than CEQG (CCME 1999) and CDWQG (Health Canada 2014) guidelines, the constituent is not retained as a COPC and no further action is required.
- Whale Tail Pit, IVR Pit, and Whale Tail Attenuation Pond (closure only) and Downstream Receiving Environment (all phases)

- If maximum concentrations are more than CEQG (CCME 1999) and CDWQG (Health Canada 2014) guidelines, the constituent is retained as a COPC and may be carried forward into an aquatic health risk assessment [Volume 3, Appendix 3-B]).
- If average and maximum concentrations are less than CEQG (CCME 1999) or CDWQG (Health Canada 2014) guidelines, no further action is required.

Type A Water Licence 2AM-WTP1826 effluent limits were the main criterion to determine if predicted water quality for treated effluent was suitable for discharge. Predicted effluent concentrations were also compared to the MDMER that will be applied to approved mines as of 2021 to confirm that the project can meet the future regulatory requirements; for most constituents, the Type A Water Licence 2AM-WTP1826 effluent limits were less than the effluent regulation limits. The second step was to compare treated effluent water quality to CEQG (CCME 1999) and CDWQG (Health Canada 2014) guidelines; this step is completed to address IQ as it provides a means to evaluate COPCs identified in the downstream environment.

The arsenic site-specific water quality objective, aquatic life and drinking water quality guidelines were the main criteria to determine COPCs in Whale Tail Pit, IVR Pit, and Whale Tail Attenuation Pond (closure only) and in the downstream receiving environment because water quality guidelines are designed to provide a high level of protection to aquatic life, or human health. Therefore, constituents at or less than guidelines can be excluded as no impacts to aquatic life, or human health, are anticipated. Predictions for the downstream receiving environment were developed for the dissolved constituents but guidelines for the total constituent were applied; the exception was zinc where the new dissolved zinc guideline was used to evaluate the predictions. Water quality predictions were also compared to Meadowbank triggers and thresholds (Azimuth 2016), but these were not used to define COPCs as it is yet to be determined if the triggers and thresholds for the Meadowbank site are applicable to the Whale Tail site. Finally, water quality predictions were also compared to baseline conditions to evaluate the amount of potential change. If a constituent has an aquatic life or drinking water guideline, the guideline was the main driver in the identification of COPCs because a change from background alone is not enough to identify a COPC for the water quality assessment. Results of the water quality predictions were evaluated further in the human health and ecological risk assessment (Volume 3, Appendix 3-B) through consideration of exposure and receptors.

A mitigation option being considered is discharge of treated effluent to Lake D1 or D5 in the D watershed. The scenario considered for this option included the following:

- Predicted effluent quality and quantity will be the same.
- Treated effluent will be discharge to Mammoth Lake (the Approved receiving environment) during the open-water season from 2019 to May 2021.
- Effluent from the TDS water treatment plant (S-WTP) will be discharged to Mammoth Lake until May 2021.
- From 2021 onwards throughout operations, if needed treated effluent could be discharged to Lake D1 or Lake D5.
- Whale Tail Dike seepage would continue to be returned to Whale Tail Lake (South Basin) during operations.

6.2.3.3.2 Results

This section provides a summary of the water quality predictions for the site and downstream receiving environment. A summary of the water quality predictions (average and maximum), for each prediction location is provided in Volume 6, Appendix 6-I.

6.2.3.3.2.1 Site Water Quality

Site water quality predictions were developed for operations (treated effluent) and closure (flooded Whale Tail Pit, IVR Pit, Whale Tail Attenuation Pond). This section provides a review of predictions and discharges that could influence the downstream receiving environment.

Water quality of treated effluent is predicted to be below the Type A Water Licence 2AM-WTP1826 effluent limits for all parameters (Volume 6, Appendix 6-I, Table 6-I-1; Table 6.2-4). The only COPCs identified for treated effluent were for those constituents with predicted average and maximum concentrations above the aquatic life and/or drinking water quality guidelines. These COPCs included chloride, fluoride, nitrate, phosphorus, arsenic, chromium, copper, mercury and selenium. These constituents were carried forward into the evaluation of the downstream water quality predictions for the operations phase.

Predictions are not discussed for treated effluent in as treated effluent will not be released to downstream environment during this phase.

In closure, water will be pumped from Whale Tail Lake (South Basin) to gradually flood Whale Tail Pit, IVR Pit, and the Whale Tail Attenuation Pond to an elevation of 153.5 masl (Volume 6, Appendix 6-H). In closure, once water quality in the flooded area (Whale Tail Pit, IVR Pit, and Whale Tail Attenuation Pond) meets discharge criteria, the North and South basins of Whale Tail Lake will be reconnected, and water will be allowed to flow downstream to Mammoth Lake.

Predicted water quality for the flooded Whale Tail Pit was compared to the arsenic site-specific water quality objective, CEQG and CDWQG, Meadowbank CREMP triggers and thresholds, and baseline water quality in Whale Tail Lake. The COPCs identified for Whale Tail Pit during mid-closure include dissolved phosphorus and arsenic; the only COPC identified in late-closure was dissolved phosphorus (Volume 6, Appendix 6-I, Table 6-I-3; Table 6.2-4). Mean and maximum dissolved phosphorus concentrations for mid and late-closure are predicted to be greater than the oligotrophic trigger level (i.e., 0.01 mg-P/L). Concentrations of other constituents (e.g., major ions, nitrate, and metals such as antimony, cadmium, copper, and selenium) are predicted to be higher than baseline concentrations recorded in Whale Tail Lake, but at concentrations less than the guidelines, where guidelines are available. Concentrations are predicted to decrease through the closure phase. No COPCs were identified during closure for the flooded IVR Pit (Volume 6, Appendix 6-I, Table 6-I-4; Table 6.2-4) and Whale Tail Attenuation Pond (Volume 6, Appendix 6-I, Table 6-I-3; Table 6.2-4).

6.2.3.3.2.2 Downstream Receiving Environment

For the downstream receiving environment, water quality predictions were produced for the operations and closure (early, mid, and late) modelled phases for Whale Tail Lake (South Basin), Mammoth Lake, Lake A15, Lake A12, Lake A76 and two Downstream Nodes DS1 and DS2 (Volume 6, Appendix 6-I, Tables 6-I-5 to 6-I-11; Table 6.2-4). Lakes that have been identified as culturally important (e.g., Innugugayualik and Pipedream lakes; Approved Project FEIS Section 6.4.1.1; Volume 7, Appendix 7-A, Agnico Eagle 2016c) will not be affected by water discharged from the Whale Tail Pit area. Predicted water quality for the downstream environment was compared to the arsenic site-specific water quality objective, CEQG and CDWQG, CREMP triggers and thresholds, and baseline water quality. COPCs were not identified if the constituent only exceeded the CREMP triggers and thresholds as it has yet to be determined if these triggers and thresholds are applicable to the Expansion Project or if new triggers and thresholds need to be developed. This screening was included for information purposes only.

In operations effluent will be discharge into Mammoth Lake for the first two years and then into Whale Tail Lake (South Basin) for the next five years. Once water in Whale Tail Lake (South Basin) is flooded to an elevation of 156.0 masl (by year 2020), water from Whale Tail Lake (South Basin) will flow into Mammoth Lake through the diversion channel. Agnico Eagle will respect receiving water quality and Type A Water Licence 2AM-WTP1826 criteria to determine if discharge to Whale Tail Lake (South Basin) should alternatively move to either Lake D1 or D5. As part of the closure phase, there will be draw-down of Whale Tail Lake (South Basin) to flood Whale Tail Pit, IVR Pit, and Whale Tail Attenuation Pond, and by November 2026 flow through the diversion to Mammoth Lake will cease. Once water quality is acceptable, water from South Whale Tail will flow into the flooded Whale Tail Attenuation Pond area, Whale Tail Pit, and IVR Pit; water from Whale Tail Pit will then spill over to Mammoth Lake and the downstream environment.

Water will flow from Mammoth Lake following the natural drainage path. From Mammoth Lake, water flows to Lake A15 and the Lake A12. As illustrated in Figure 6.2-1, the water flow path downstream of Lake A12 splits. There are two outlets in Lake A12 and Lake A76. The main outlet of Lake A12 is to Lake A11 (northeast) with a secondary outlet to Lake A77 (northwest); the main outlet of Lake A76 is to Lake A10 (northeast) with a secondary outlet to Lake A75 (west) (Approved Project FEIS Volume 6, Appendix 6-C; Agnico Eagle 2016c). Downstream Node 1 receives water from Lake A76 via the secondary drainage pathway. Downstream Node 2 receives water from the main drainage pathways of Lake A12 and Lake A76. Water flows from Downstream Nodes 1 and 2 into the larger lake DS1 where it is anticipated that these loads will have a negligible effect on nutrient concentrations in a large lake.

During operations, treated effluent will be discharged into Mammoth Lake and Whale Tail Lake (South Basin). The COPCs identified from screening of the predicted treated effluent included chloride, fluoride, nitrate, phosphorus, arsenic, chromium, copper, mercury and selenium. Of these, phosphorus is a COPCs in the receiving environment. Other constituents are predicted to change from baseline conditions, but concentrations are not predicted to exceed guidelines.

The source of arsenic is contact water from the WRSFs and the pits requiring mine site contact water quality to be captured and treated for this constituent prior to discharge to the receiving environment. Arsenic was identified as a COPC in Whale Tail Lake (South Basin) in the last year of operations and in early-closure due to its maximum predicted concentration exceeding the SSWQO (25 µg/L) (Volume 6, Appendix 6-I, Figure 6-I-2); this water will not be released downstream, and will be used to flood the open pit.

Phosphorus was also identified as a COPC in Whale Tail Lake (South Basin) during operations and early-closure due to either its maximum or average predicted concentrations exceeding the oligotrophic trigger range (4 to 10 µg/L) (Volume 6, Appendix 6-I, Figure 6-I-1). Phosphorus and arsenic are predicted to decrease in Whale Tail Lake (South Basin) during early-closure; this water will be used to flood the mine openings.

Sources of phosphorus to the effluent include treated sewage water, and contact water from the WRSFs the open pits. It is assumed that phosphorus from the WRSFs and the open pits is largely in a form that is not biologically available, while phosphorus from sewage is in a form that is biologically available, thus sewage water will be treated. Release of treated effluent will only occur during the operations phase.

Phosphorus was also identified as a COPC for Mammoth Lake during operations and early-closure as maximum concentrations are predicted to be slightly above the upper end of the oligotrophic trigger range (4 to 10 µg/L). Phosphorus was identified as a COPC in lakes downstream of Mammoth Lake (to Lake A76, not at prediction node

DS1 but downstream of Lake A76 to prediction node DS2) in operations and early-closure but with concentrations decreasing through closure.

In mid-closure and only for Mammoth Lake to Lake A12, phosphorus is a COPC (i.e., maximum concentrations are predicted to be slightly above the upper end of the oligotrophic trigger range of 4 to 10 µg/L), but concentrations are on a decreasing trend. By late-closure, no COPCs were identified for the receiving environment. Compared to the Approved Project, maximum concentrations of dissolved phosphorus in operations are predicted to be similar (i.e., within 0.001 mg/L, or the analytical detection limit) in the Expansion Project for all prediction nodes except Mammoth Lake. For both the Approved and the Expansion projects, maximum predictions are predicted to be within the low to middle range of the mesotrophic range (0.02 to 0.035 mg/L; CCME 2004).

For the closure phase, maximum predicted dissolved phosphorus concentrations are lower in the Expansion Project as compared to the Approved Project. In addition, for the Expansion Project, the spatial extent of change has been reduced for closure. For the Approved Project, maximum phosphorus was predicted to be above the oligotrophic trigger value (i.e., more than 0.01 mg/L) in Mammoth Lake and Lake A15, but for the Expansion Project, maximum phosphorus is predicted to be below the oligotrophic trigger value at all prediction nodes.

If the mitigation option to discharge effluent to Lake D1 or D5 was implemented, Mammoth Lake would still receive treated effluent for the first part of operations, so the potential effects on water quality for this period would be the same as described above, that is, there is a potential for increased phosphorus concentrations in operations. However, because treated effluent discharge would be reduced in duration and total volume, the magnitude of the increase is likely to be reduced both during operations to closure. Updated water quality modelling is needed to quantify the magnitude of average and maximum concentrations in Mammoth Lake under this mitigation.

If effluent was discharged to one of the proposed alternative lakes, Whale Tail Lake (South Basin) would not receive treated effluent during operations and thus the potential effects on water quality in Whale Tail Lake (South Basin) would also be reduced during operations and closure, such that exceedances of arsenic and phosphorus would likely not occur in the last year of operations. It is assumed that, although Whale Tail Lake (South Basin) would continue to receive Whale Tail dike seepage, the seepage water would be small in volume and relatively similar in quality to Whale Tail Lake (South Basin) such that no measurable effects due to seepage water would be measurable in Whale Tail Lake (South Basin). In addition, quality of the flooded pits would be better under this scenario such that water quality in closure would be better than described above.

If effluent was discharged to one of the proposed alternative lakes, it is expected that there would be a change in water quality in the new receiving environment. As described in Section 6.2.3.3.2.1 of the FEIS Addendum, effluent concentrations are predicted to exceed CEQG or CDWQG for chloride, fluoride, nitrate, phosphorus, arsenic, chromium, copper, mercury, and selenium (i.e., these are the constituents of potential concern brought forward to the receiving environment assessment). Of these parameters, phosphorus and arsenic are predicted to exceed the water quality guideline and site-specific water quality objective in Whale Tail Lake (South Basin).

The available baseline data demonstrate that water quality in Lake D1 and D5 are similar to other lakes in the study area, including Mammoth Lake and Whale Tail Lake (South Basin). Assuming that the alternative lake is similar in size, watershed area, and lake turnover to Mammoth Lake and Whale Tail Lake (South Basin), then it is possible that treated effluent discharge would cause increased concentrations of arsenic and phosphorus, as well as other parameters. In contrast, if the alternative lakes are larger, have a larger watershed area, and a faster turnover time, then it is possible that water quality in the alternative receiving environment would be better than predicted for

Mammoth Lake and Whale Tail Lake (South Basin). The duration of the effect on water quality is unknown and would need to be determined with collection of additional physical lake data and water quality modelling.

6.2.3.3.2.3 Summary

The COPCs identified for each location and modelled phase are summarized in Table 6.2-4. The predictions presented above and summarized below were based on the modelled scenario of reconnecting the flooded area (Whale Tail Pit, IVR Pit, and Whale Tail Attenuation Pond) to the downstream environment before water quality in the flooded area was less than generic water quality guidelines or the site-specific water quality objective for arsenic.

These constituents were modelled in the downstream receiving environment and compared to the site-specific water quality objective, CEQG and CDWQG to identify COPCs. In the receiving environment, arsenic was identified as a COPC during operations and closure at Whale Tail Lake (South Basin). Dissolved phosphorus was identified as a COPC at all prediction locations in the receiving environment, except DS1, where no COPCs were identified (Volume 6, Appendix 6-I, Figure 6-I-1). The summary tables (Volume 6, Appendix 6-I, Tables 6-I-1 to 6-I-11) highlighted the average and maximum predicted values for each phase with notation to indicate if the predicted value was higher than the comparison standard. Figures to illustrate the spatial and temporal changes in the two COPCs identified for the receiving environment (i.e., phosphorus and arsenic) are provided in Volume 6, Appendix 6-I, Figure 6-I-1 and Figure 6-I-2.

Table 6.2-4: Summary of Constituents of Potential Concern by Modelled Phase and Location

Mining Phase	Operations	Early-Closure	Mid-Closure	Late-Closure
Treated Effluent	chloride, fluoride, nitrate, phosphorus, arsenic, chromium, copper, mercury, and selenium	-	-	-
Flooded Whale Tail Attenuation Pond	-	-	*none*	*none*
Flooded Whale Tail Pit	-	-	Arsenic, phosphorus	Phosphorus
Flooded IVR Pit	-	-	*None*	*none*
Mammoth Lake (Lake A16)	Phosphorus	Phosphorus	Phosphorus	*none*
Whale Tail Lake (South Basin)	Arsenic, Phosphorus	Arsenic, phosphorus	*None*	*none*
Lake A15	Phosphorus	Phosphorus	Phosphorus	*none*
Lake A12	Phosphorus	Phosphorus	Phosphorus	*none*
Lake A76	Phosphorus	Phosphorus	*none*	*none*
Downstream Node 1	*none*	*none*	*none*	*none*
Downstream Node 2	Phosphorus	*none*	*none*	*none*

Note: For closure, results are summarized for early closure (i.e., 2026 - 2041), mid-closure (i.e., 2045), and late-closure (i.e., 2050). For the assessment, the modelled scenario presented includes reconnection of the flooded pits to the downstream environment starting in 2041.

\- = predictions not summarized as not required for this phase to support the water quality assessment

As discussed in Section 6.2.3.3.2.2 of the FEIS Addendum, dissolved phosphorus was compared to the CCME (2004) triggers developed for total phosphorus.

In operations, phosphorus is predicted to be higher than the oligotrophic trigger value at all receiving environment prediction nodes except downstream node DS1. Concentrations are predicted to decrease through closure where concentrations at the downstream nodes improve and by late-closure, phosphorus concentrations at all prediction nodes are anticipated to be less than the oligotrophic trigger value.

These modelling results suggest there will be temporal and spatial variability of phosphorus concentrations within the local and regional study areas due to the Expansion Project with potential changes from an unproductive to a slightly more productive system at least in Mammoth Lake and lakes A15 and A12. Change to water quality can cause a change to sediment quality. An increase in aqueous phosphorus can lead to an increase in biological productivity and subsequently, through decomposition of organic material, an increase in sediment bound phosphorus. Based on these predictions there is the potential for an effect to aquatic health and traditional and non-traditional use. The changes are predicted to be temporary and reversible, and the predictions were based on conservative assumptions.

6.2.4 Residual Impact Classification

6.2.4.1 Methods

The impacts that remain following mitigation, or residual impacts to the measurement indicators, for the assessment endpoint of the VC were classified using criteria to determine the overall effect, termed the environmental consequence (i.e., significant or not significant). For water quality, the measurement endpoint was concentration of a particular constituent, but the assessment endpoint was protection of surface water quality for aquatic and terrestrial ecosystems, and human use (FEIS Addendum Section 6.1.1). Measurement endpoints are quantifiable, while assessment endpoints are properties of the VC that should be protected for use by future human generations or to support an aquatic ecosystem.

The purpose of the residual effect classification is to describe the residual effects from the Expansion Project on water quality using a scale of common words, rather than numbers or units. The seven criteria used include direction, magnitude, geographic extent, duration, reversibility, frequency, and likelihood. These criteria as they apply to water quality are defined in Volume 3, Appendix 3-E.

Results from the residual impact classification for water quality, plus results from the fish and fish habitat assessment (FEIS Addendum Section 6.5), the human health and ecological risk assessment (Volume 3, Appendix 3-B), and the traditional land use/IQ assessment (FEIS Addendum Volume 7, Section 7.3) were used to determine the environmental significance of the Expansion and Approved Project and other developments on the assessment endpoint of water quality (i.e., protection of surface water quality for other users). The evaluation of significance for water quality considered the entire set of pathways that influence the opportunity for traditional and non-traditional use of fish, species health, and the continued opportunity for use of surface water for traditional and non-traditional uses. Changes in concentration of water quality constituents relative to aquatic life and water quality guidelines does not provide the full context to evaluate the standalone significance of change. Thus, changes to water quality were evaluated in the framework of how changes could affect the end receptors (i.e., aquatic life, and traditional and non-traditional uses of water).

The key drivers to determining significance are magnitude, duration, and geographic extent. Other criteria, such as the conservative nature of the predictions were also considered when determining significance.

The evaluation of significance for water quality considers the entire set of primary pathways (Table 6.2-2) that influence the assessment endpoint. Thus, the relative contribution of each pathway is used to determine the significance of the Expansion Project on water quality; the pathways are not rated for significance in isolation.

The outcome is either a rating of Not Significant or Significant which, for purpose of this assessment, are defined as follows:

- Not Significant – impacts are measurable but are not likely to increase the risk to aquatic health, and to traditional and non-traditional use. Impacts occur at the local scale and may extend to the regional scale. Impacts are reversible within the timeline of the Project.
- Significant – impacts are measurable (i.e., high magnitude) with likely effects to aquatic health, and to traditional and non-traditional use. Effects may not be reversible within the timeline of the Project.

6.2.4.2 Results

Through evaluation and classification of the residual impacts of the three primary pathways on water quality, a single classification of significance of the Expansion Project on water quality was developed. As the pathways and activities overlap, and cumulatively contribute to potential changes in water quality, a classification that encompasses all pathways and activities is appropriate. Based on the predicted magnitude rating, which incorporates water quality, and effects to end users (i.e., fish and people), duration of effect, and geographic extent, the Expansion Project is not expected to have a significant effect on water quality, aquatic health, and traditional and non-traditional use (Table 6.2-5).

Air Emissions

Project related air emissions have the potential to affect local terrestrial and aquatic ecosystems. The Inuit are concerned about the effects of dust from the Project and how it can change the colour and quality of water as a drinking source and to support the aquatic ecosystem. To address this concern, the potential effects of dust and air emissions deposition were evaluated. Generation of dust and air emissions are linked to activities such as operation of diesel powered equipment, blasting, and transportation along the haul roads. The duration of these effects is predicted to be short to medium-term in length, primarily restricted to operations, with some pathways in construction and closure. As based on monitoring data from other Northern mines including Meadowbank Mine operations to date, the spatial extent of dust deposition is expected to be local, and measurable changes in water quality from deposition of dust and acidifying air emissions is expected to be low. Based on the results of the air quality predictions, the use of mitigation such as low-sulfur diesel fuel, the effects of deposition of dust and acidifying air emissions is predicted to have a negligible effect on water quality.

Flooding

The approved diversion of Whale Tail Lake (South Basin) to the Mammoth Lake watershed will increase the surface water elevation of Whale Tail Lake (South Basin), resulting in flooding of tributary lakes and the potential for erosion along new shorelines, with mobilization of TSS, and increased concentrations of mercury in the water and biota, from decomposition of newly flooded vegetation. As a result of the expansion, these effects are temporally extended, and the expansion activities related to water diversion and flooding have the potential to disturb lakes and result in the accumulation of toxic substances. The literature evidence suggests that the amount of organic matter in a flooded reservoir can influence the amount of mercury and methylmercury that is liberated to the water column. Given the short duration of flooding, collection of water and biota samples for mercury analysis can be used to inform the effects of flooding.

The effects of flooding on mercury cycling will be limited to the period of time when Whale Tail Lake (South Basin) is flooding. Based on the Project schedule, Whale Tail Lake (South Basin) will flood and reach maximum elevation by approximately 2020 and it will stay in the maximum elevation stage until the start of closure, where drawdown will commence and last until 2026, at which time the lakes will return to an elevation of 153.5 masl, 1 m higher than baseline conditions. Based on the literature and site-specific modelling, mercury concentrations in water and biota can start to increase one to two years after flooding; the time to return to baseline conditions is unknown, but it is assumed that the time will be less than the time observed in naturally flooded reservoirs because the flooded state will be temporary. Based on these assumptions, the duration of effects was rated as medium-term and the geographical extent of effects was considered local because effects will be limited to Whale Tail Lake. The potential magnitude of the effect was rated as moderate because some parameters may increase above guidelines, but not to a level that could affect the sustainability of the ecosystem or the continued traditional and non-traditional uses.

Effluent Discharge

Management of water in the Whale Tail Pit area and the discharge of effluent to the downstream environment has the potential to change water quality through disturbance of lakes and release of toxic substances. There is the potential to change Mammoth Lake, Whale Tail Lake (South Basin) and the downstream receiving environment from the Project activities related to this pathway. Lakes that have been identified as culturally important (e.g., Innugugayualik and Pipedream lakes; Approved Project FEIS Section 6.4.1.1; Approved Project FEIS Volume 7, Appendix 7-A, Agnico Eagle 2016c) will not be affected by this pathway.

Management of water on site (e.g., reuse of water, separation of contact and non-contact water, treatment if required) is necessary to manage and minimize downstream effects. It is predicted that there will be a change in downstream water quality due to the Project but that changes will be limited to arsenic (in Whale Tail Lake [South Basin] in operations and early-closure and flooded Whale Tail Pit in mid-closure) and phosphorus (all downstream locations except one, from operations through mid-closure). The predictions are conservative but suggest there could be small increases in arsenic, and moderate increases in phosphorus in the downstream lakes which could change productivity.

The duration of the effect was rated as long-term but not permanent because the model predicts a return near to baseline conditions by the end of closure. The geographic extent was rated as regional as there is the potential for changes in nutrients as far as Downstream Node 2. Finally, the magnitude was rated as moderate to high because there is a high degree of conservatism in the predictions, increased phosphorus could affect sustainability of the ecosystem, in a select system of lakes, but may not affect aquatic health.

Under the current conservative scenario of effluent discharge to Mammoth Lake for the first year or two of operations and then one of the proposed alternative lakes for the remainder of operations, there would still be a change in water quality of the receiving environment. In operations, water quality in Mammoth Lake (and potentially the next lake downstream) would be influenced but to a lesser magnitude, and water quality in Whale Tail Lake (South Basin) would be negligibly influenced. This would result in better water quality in closure for the pits and the downstream environment such that magnitude and spatial extent would be reduced. During operation, an alternate discharge to Lake D1 or D5 will mitigate the predicted effects on Mammoth Lake and Whale Tail Lake (South Basin). However, this could result in effects to water quality in Lake D1 and D5 (and potentially the next lake downstream). The magnitude and extent may be similar to that predicted for Whale Tail Lake (South Basin), Mammoth Lake, and the downstream lakes, but modelling is required to quantify the change.

Summary

The determination of significance considers all the primary pathways that may affect water quality and the assessment endpoint (protection of surface water quality for aquatic and terrestrial ecosystems and human use). The assessment endpoint considers effects to aquatic health and continued use for traditional and non-traditional use. As identified through IQ, water and health aquatic ecosystems are important, and larger regional lakes such as Innugugayualik, and Pipedream lakes are used for fishing, but lakes near the Whale Tail Pit study area are not commonly fished. This means that lakes such as Whale Tail and Mammoth may have importance from a general healthy ecosystem perspective but not as high importance as those that are used for fish or waterfowl harvesting.

Based on conservative assumptions for the purposes of the assessment, the ratings assigned for duration, geographic extent, and magnitude for the three primary pathways, and the potential effects to the assessment endpoint, which includes a healthy ecosystem and continued traditional use, it was concluded that the Project will not have a significant effect to water quality.

Table 6.2-5: Residual Impact Classification and Determination of Significance on Surface Water Quality

Effects Statement	Direction	Magnitude[a]	Geographic Extent	Duration[b]	Frequency	Reversibility	Likelihood	Significance for Assessment Endpoint	Consequence of Proposed Change: Determining Significance
Air emissions and the deposition of dust and metals from air emissions to waterbodies	Negative	Low	Local	Short-term to Medium-term	Isolated	Reversible	Possible	Not Significant	No change
Water management and flooding	Negative	Moderate	Local	Medium-term	Continuous	Reversible	Possible		No change
Development of Project footprint, water management, and effluent discharge	Negative	Moderate to High	Regional	Long-term	Continuous	Reversible	Likely		No change

Note: For further information on consequence of proposed change: determining significance for the Expansion Project refer to Table 3.4-2.

[a] Takes into account variability in water quality, conservative nature of generic guidelines, and interpretations from aquatic health.

[b] Takes into account scientific information and expert opinion, and resiliency of an ecosystem to recover after a disturbance.

6.2.5 Cumulative Effects Assessment

The Expansion Project is anticipated to have negligible effects on water quality outside of the LSA. The database of reasonably foreseeable future developments (Volume 3, Appendix 3-D) indicates that there are no planned development in the RSA, and the cumulative effect is expected to be negligible.

6.2.6 Uncertainty

Uncertainty with respect to the water quality assessment is related to data used in the models, and conservatism applied within the water balance and water quality models developed for the Project.

- Baseline data
  - Baseline water quality data were used to characterize existing conditions in the study area and to calibrate the water quality model.
  - Field data collection programs were initiated, and completed prior to the water balance and water quality models being developed. Thus programs were guided based on anticipated data needs for the model. Professional judgement based on northern gold mining experience was used to fill data gaps.
- Water Quality Model Limitations
  - The prediction of water quality is based on inputs such as mine site water flows (Volume 8, Appendix 8-B.2), geochemical characterization (Volume 5, Appendix 5-E), and baseline water quality (Volume 6, Appendix 6-G and Azimuth 2018a) all of which have their own sets of variability and uncertainty.
  - The water quality model predictions reflect this variability and uncertainty and the results are considered appropriate for the impact assessment.
  - Best practices and professional judgement were used to make interpretations about the predictions.
  - Further limitations related to the water quality predictions are provided in Volume 6, Appendix 6-H.

Potential effects of the Project on water quality were based on the conservative site and receiving water quality models. Given the uncertainties and limitations of models, there is overall high level of confidence in the predicted concentrations and as a requirement of the Type A Water Licence 2AM-WTP1826, Agnico Eagle will continue to collect monitoring data to validate the model assumptions.

6.2.6.1 Mitigation

- As per Type A Water Licence 2AM-WTP1826 Part E Item 7, 8 and 9 requirements, a site wide water balance will be updated as part of the annual water management plan and end pit water quality modelling will be conducted to update these predictions.
- The models will be updated with new monitoring data allowing for a check on assumptions and conservatism applied to the models.
- A mitigation option being considered is discharge of treated effluent to Lake D1 or D5 in the D watershed. Effects at the alternate discharge location and downstream lakes were assessed qualitatively and will be confirmed and refined following collection of additional baseline in the D watershed. Furthermore the water quality forecasting will be used to identify if additional mitigations are required or if the predictions are tracking as expected.

6.2.7 Monitoring and Follow-up

On an annual basis, water quality monitoring during all phases of the Expansion Project will be conducted to validate the water quality predictions and assessment conclusions. Water quality monitoring will be conducted within the Whale Tail Pit area and the downstream receiving environment through a variety of monitoring plans. More details are provided in the individual plans, but those applicable to water quality include the following:

- Water Quality and Flow Monitoring Plan (Volume 8, Appendix 8-B.3)
  - The operational Whale Tail Water Quality and Flow Monitoring Plan has been revised for the Expansion Project.
  - The Water Quality and Flow Monitoring Plan summarizes the monitoring locations, sampling frequency, monitored parameters, compliance discharge criteria and an adaptive management plan for water quality at the Whale Tail Pit area.
  - The Plan was amended to include monitoring in the Whale Tail Pit area and the lakes for the alternative discharge location.
- Water Management Plan (Volume 8, Appendix 8-B.2)
  - The purpose of the Water Management Plan is to provide consolidated information on water management, required water management infrastructure, water balance, water quality predictions, and water quality monitoring.
  - The Water Management Plan has been revised in support of the Expansion Project application.
- Core Receiving Environment Monitoring Plan
  - The Core Receiving Environment Monitoring Plan was developed in accordance with the Type A Water Licence to monitor mining-related processes that could potentially impact the aquatic receiving environment surrounding the Approved Project and updated to include the Expansion Project.
  - The Plan includes routine and pit flood monitoring for the Approved Project.
  - A CREMP 2015 Plan Update – Whale Tail Pit Addendum is provided in Volume 8, Appendix 8-E.10.

Consistent with Project Certificate No. 008, Agnico Eagle is required to:

- minimize the use of natural waters as practicable and limit potential impacts to the receiving environment from contact (site) water (T&C #18); and
- mitigate potential impacts to groundwater, surface waters and freshwater aquatic environment (T&C #19).

Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NWB. Agnico Eagle considers, the existing terms and conditions of the Project Certificate issued for the Approved Project are sufficient to protect, mitigate, and monitor impacts associated with the Expansion Project.

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plans and will update these as part of the NWB review process (refer to Volume 8).

6.3 Surface Water Hydrology

This surface water hydrology section provides an assessment of potential effects of the Expansion Project on surface water hydrology, and provides input to the effect assessment of other disciplines including (but not limited to) water quality, and fish and fish habitat. As part of this Addendum, this section focuses primarily on the potential effects of the Expansion Project on the receiving environment, beyond those from the Approved Project.

The assessment was based on consideration of water management activities of the Approved Project, as described in the Expansion Project's water balance report (Volume 6, Appendix 6-O). Effects were assessed quantitively using the Approved Project's baseline water balance model of the receiving environment (Volume 6, Appendix 6-C) and water quantities discharged to the receiving environment provided from the Expansion Project's site water balance (Volume 6, Appendix 6-O). Effects were presented for the maximum footprint for the operations, closure, and post-closure phases, resulting in a conservative assessment.

The Expansion Project is expected to change the magnitude and duration of effects previously assessed for the Approved Project. Thus, there were no new primary pathways identified. Effects of the Expanded Project are primarily related to:

- the expanded footprint generating additional groundwater requiring treatment and discharge to the receiving environment during the operational phase; and
- the increased duration of the closure phase, to refill the pits and underground mine.

A summary of the key changes to the assessment of the hydrology component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 6.3-0.

Table 6.3-0: Hydrology: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
6.3.1 Incorporation of IQ	Review of: • Whale Tail Pit Project IQ Baseline Report (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c); • Meadowbank Mine Baseline Traditional Knowledge Report (Cumberland 2005a); • Proposed All-weather Exploration Road from the Meadowbank Mine to the Project Site-Baseline Traditional Knowledge Report (Agnico Eagle 2014a); • Community Consultations/Public Information Meeting Summary Reports for 2014 and 2015 (NIRB 2014, 2015).	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type “A” Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board's Hearing Regarding the Review of Agnico Eagle Mines Limited's Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018

Section of FEIS	Approved Project	Expansion Project
		• Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
6.3.2 Existing Environment and Baseline Information	• 2015 Hydrology Baseline Report • 2015 Haul Road Baseline Report • Meadowbank Mine baseline physical ecosystem report provides regional baseline hydrology information.	Additional baseline data • 2016 Hydrology Baseline Report
6.3.3 Potential Project-related Effects Assessment	Three primary pathways were identified Potential effects related to: • operations • closure • post-closure	• No new primary pathways identified • Potential effects from operations were increased in magnitude and duration due to current mining schedule, the combination of a slight increase in water withdrawals from, and reduction in diverted water quantities through, Lake C38 (Nemo Lake), and increased discharge to the receiving environment. Potential effects from the alternate discharge locations were also considered. • Potential effects from closure were increased in duration due to the increased pit volume and underground volume requiring refilling • Potential effects from post-closure were related to the increased surface area of Whale Tail Lake; however, effects on the receiving environment are similar to those identified for the Approved Project
6.3.4 Residual Effects Classification	Potential residual effect	Unchanged
6.3.5 Cumulative Effects Assessment	Negligible effects on surface water quantity outside of the LSA and within the RSA	Unchanged
6.3.6 Uncertainty	Uncertainty related to input parameters identified can be addressed through additional monitoring. Refinement of these parameters may affect the magnitude of effects on surface water quantity presented herein; however, conclusions are expected to remain unaffected. • a minor source of uncertainty that arises from the lack of available detailed topographic data resulting in error in calculated drainage areas for these watercourse crossings.	Unchanged
6.3.7 Monitoring and Follow-up	• Monitoring of flows and water levels at key locations in the LSA during all phases of the Project is considered necessary to determine actual runoff and discharge rates Hydrometric monitoring that provides measurements of lake water levels and lake outlet discharges during open water conditions at key locations (e.g., diversion channels at lake outlets; lake outlets augmented by dewatering discharges), will be undertaken using surveying, hydrometric stations or gauging collection processes	Refer to Volume 8, Appendix 8-C.1 for an updated Whale Tail Pit Haul Road Management Plan

Section of FEIS	Approved Project	Expansion Project
	• Hydrology monitoring prior to spring freshet and after major precipitation events as per the Whale Tail Pit Haul Road Management Plan	

6.3.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to hydrology were provided by community members since the FEIS submission was made in 2016 for the Approved Project. This assessment takes into account review of community consultation notes from Agnico Eagle (2016e), NIRB and NWB (2017), and NIRB (2017), and consultation notes for the Expansion Project (Agnico Eagle 2018a).

The following IQ and concerns related to hydrology are summarized below.

- Water levels are much lower in lakes and rivers now because of ‘drain’ and because of climate change, which is affecting fish migration (Agnico Eagle 2018a).
- The importance of ‘big lakes’ that do not freeze to the bottom for supporting fish populations (Agnico Eagle 2018a).
- Concerns related to the dewatering process, and where mine contact water will be stored (Agnico Eagle 2016e, NIRB and NWB 2017).
- Concerns related to water flow around the Approved Project (Agnico Eagle 2016e)

The concerns as they pertain to the Expansion Project have been incorporated into Sections 6.3.3.1 and 6.3.6 of the FEIS Addendum.

6.3.1.1 Existing Environment and Baseline Information

This Expansion Project does not change IQ integration from the Approved Project. Historical IQ and the importance of weather and climate change on water levels, and the resulting indirect efforts on fish and fish habitat, caribou habitat, and behaviour at water crossings, and travel routes were considered for the Approved Project FEIS Volume 7, Appendix 7-A and summarized in the Approved Project FEIS Volume 6, Section 6.3.1.1 (Agnico Eagle 2016c).

6.3.1.2 Valued Component Selection

For the Expansion Project, the selection of of VCs remain the same as the Approved Project FEIS Volume 6, Section 6.3.1.2 (Agnico Eagle 2016c).

6.3.1.3 Effect Assessment

The Expansion Project considers the same potential effects as the Approved Project.

6.3.1.4 Mitigation and Monitoring

Mitigation measures for the Expansion Project included in this FEIS Addendum will be the same as those for the Approved Project. Concerns related weather and climate change were incorporated into monitoring programs to provide input to ongoing water management. Mitigations have been included in the Water Management Plan (Volume 8, Appendix 8-B.2) that specifically address concerns related to the protection of lakes from disturbance due to construction activities, including timing of dewatering.

6.3.2 Existing Environment and Baseline Information

Existing conditions are described to provide context for the surface water quantity assessment in the 2015 (Approved Project FEIS Volume 6, Appendix 6-C; Agnico Eagle 2016c), 2016 Hydrology Baseline Report (Volume 6, Appendix 6-C), the 2015 Haul Road Baseline Report (Volume 6, Appendix 6-D), as follows:

- The 2015 and 2016 Hydrology Baseline Reports provide a review of existing surface water quantity conditions in watersheds potentially affected by water management activities at the proposed Whale Tail Pit.
- The 2015 Haul Road Baseline Report provides a review of watercourse crossings and recommended crossing methods based on conveyance needs and the potential for effects on fish productivity.

6.3.2.1 Baseline Study Methods

6.3.2.1.1 Proposed Expansion Project

The 2015 surface water quantity baseline study provided in the Approved Project FEIS Volume 6, Appendix 6-C (Agnico Eagle 2016c) includes characterization of local watersheds and drainage patterns, flow regimes, and lake shoreline and outlet channel geomorphology, based on a desktop review of available data and five field visits in May (during frozen conditions), June, July, August, and in September 2015. Subsequent work was completed in 2016 and is provided in Volume 6, Appendix 6-C.

6.3.2.1.2 Haul Road

No new information has been collected since the Approved Project was submitted in 2016. Methods are described in detail in Section 2.0 of the 2015 Haul Road Baseline Report (Volume 6, Appendix 6-D).

6.3.2.1.3 Alternate Discharge

Baseline field data were available from the 2015 Haul Road Baseline Report, and from 2018 fish and fish habitat studies. Drainage patterns and watershed areas were derived based on a desktop review following methods described in the 2015 surface water quantity baseline study provided in the Approved Project FEIS Volume 6, Appendix 6-C (Agnico Eagle 2016c). The hydrological characterization of the receiving environment was based on the characterization of regional water resources completed for the proposed Whale Tail Pit and IVR Pit (Volume 6, Appendix 6-C).

6.3.2.2 Baseline Surface Water Quantity

6.3.2.2.1 Proposed Expansion Project

The proposed Whale Tail and IVR Pits are located in the A watershed (i.e., where Lake A17 [Whale Tail Lake] and Lake A16 [Mammoth Lake] are located), and water management activities are planned in the A watershed, and the C watershed (i.e., where Lake C38 [Nemo Lake] is located); these two watersheds drain into Lake DS1, which drains north to the Meadowbank River. These watersheds comprise an extensive network of lakes, ponds, and interconnecting streams, and have lake water surface fractions (i.e., the ratio of lake surface area to watershed area) of 16% (A watershed) and 23% (C watershed).

Shorelines in the LSA exhibit a consistent terrain type related to shorelines that have developed in morainal material. These morainal shorelines were observed at all lakes visited during the field survey. Limited areas of bedrock and shallowly sloped sandy shorelines were also observed. As a general characteristic for the surveyed shorelines, the predominant materials are boulder gardens mixed with cobble with very limited soils or organic materials on top. The outlet channels are short relative to lake dimensions, with a low sinuosity (i.e., close to 1.0), and exhibit the same characteristics for streambed materials. This results in interstitial flow between large boulders or below the surface likely close to the bedrock, making low and moderate flows difficult to observe and measure.

Discharges of watercourses in the LSA typically peak in late-May to mid-June from snowmelt, rapidly decline in July, and low discharges prevail until frozen conditions in October to November, with a secondary peak in September from rainfall events. Watercourses in the LSA are frozen over the winter.

Derived long-term mean annual water yield for selected lakes in the LSA are presented in Table 6.3-1 and vary between 86 mm at Lake C38 (Nemo Lake) to 230 mm at Lake A69. These water yields are similar to regional water yields reported at the Meadowbank Mine (Cumberland 2005c) and that have been found at Meadowbank since operations began in 2010.

Additional baseline information relevant to the proposed Whale Tail and IVR pits is provided in the 2015 (Approved Project FEIS Volume 6, Appendix 6-C; Agnico Eagle 2016c) and 2016 Hydrology Baseline Report (Volume 6, Appendix 6-C).

Table 6.3-1: Derived Long-Term Mean Annual Water Yields in the Local Study Area

Parameter	Lake A5	Lake A15	Lake A17 (Whale Tail Lake)	Lake A18	Lake A69	Lake C8	Lake C38 (Nemo Lake)
Drainage Area (km^2)	57.6	40.8	28.1	8.89	43.4	11.8	3.54
Mean Annual Water Yield (mm)	146	159	136	208	230	158	86.3

km^2 = square kilometre; mm = millimetre.

6.3.2.2.2 Haul Road

Baseline information relevant to the haul road is provided in the 2015 Haul Road Baseline Report (Volume 6, Appendix 6-D).

6.3.2.2.3 Alternate Discharge

The proposed alternate discharge locations, including Lake D1 and Lake D5 (to be determined following additional alternative assessments), are in the D watershed (i.e., the watershed located immediately south of the A watershed). The D watershed is a sub-watershed of the Thelon River watershed.

Lake D1 has a drainage area of 112 km^2. Lake D5 has a drainage area of 5.8 km^2. The hydrological characterization of water resources in the D watershed is expected to be consistent with the regional context, as described for water resources near the proposed Whale Tail Pit and IVR Pit in Section 6.3.2.2.1 of the FEIS Addendum.

6.3.2.2.4 General

As discussed in Section 6.3.1.1 of the FEIS Addendum, Inuit in the region have expressed concerns about warmer temperature throughout the year, short-term temperature fluctuations, changing snow and ice conditions, more frequent severe storms in the fall, and lower water levels in rivers and lakes.

6.3.3 Potential Expansion Project-related Effects Assessment

A comprehensive analysis of the potential pathways for effects on surface water quantity during the operational, closure, and post-closure phases for the Expansion Project, is provided in Volume 3, Appendix 3-C.

Primary pathways are those where effects from the Expansion Project will likely result in a measurable change to measurement indicators that could contribute to residual effects on a VC relative to the Baseline Case or guideline values. Pathways determined to have no linkage or those that are considered secondary are not predicted to result in environmentally significant effects on surface water quantity and are not carried through the effects assessment. Secondary effects pathways and effects pathways with no linkage are summarized in the pathway analysis table in Volume 3, Appendix 3-C, Table 3-C-5. The following are the primary pathways that require further effects analysis to determine the environmental significance from the Expansion Project on surface water quantity:

- Approved and Expansion Project footprint, which will physically alter watershed areas and drainage patterns, may change downstream discharges, water levels, and channel/bank stability in streams, and affect water quality, fish habitat, and fish;
- Dewatering of lakes may change discharges, water levels, and channel/bank stability in receiving and downstream waterbodies, and affect water quality, fish and fish habitat; and
- Alteration of watershed flow paths may change discharges, water levels, and channel/bank stability in diverted and receiving waterbodies, and affect water quantity, water quality, fish and fish habitat.

6.3.3.1 Primary Pathways Effect Analysis

6.3.3.1.1 Methods

The water balance model described in the 2015 Hydrology Baseline Report (Approved Project FEIS Volume 6, Appendix 6-C; Agnico Eagle 2016c) was modified to model the effects of the Expansion Project on LSA watersheds during construction, dewatering, operational, closure, and post-closure phases. Effect analysis results considered primary pathways as identified in Section 6.3.3. Because these primary pathways overlap with a varying degree through time, effect analysis results were presented by Expansion Project phase, in terms of change in discharge and water level regimes, from which additional information can be derived (e.g., flood zones).

Expansion Project activity relevant to surface water quantity, and effect analysis results, are summarized in the following sub-sections. Additional details on methods and assumptions are presented in Volume 6, Appendix 6-E.

6.3.3.1.2 Construction Phase

The construction activities for the Approved Project were assessed in the Approved FEIS and authorized under Type A Water Licence 2AM-WTP1826. This assessment assumes the construction required in support of the Expansion Project activities will occur during operations of the Approved Project. The construction phase of the Expansion Project is therefore not addressed in this amendment.

6.3.3.1.3 Dewatering Phase

The dewatering activities for the Approved Project were assessed in the Approved FEIS and authorized under Type A Water Licence 2AM-WTP1826. This assessment assumes dewatering required for Lake A53 and those within the footprint of IVR Pit in support of the Expansion Project activities will occur during the operational phase. The dewatering phase is accounted for the in the water balance during the operational phase and therefore not addressed in this section.

6.3.3.1.4 Operational Phase

6.3.3.1.4.1 Expansion Project Activities and Potential Effects to Surface Water Quantity

Expansion Project activities and potential effects to surface water quantity during the operational phase are summarized as follows:

- Lake A53 will become part of the water management system as an attenuation pond, referred to as the IVR Attenuation Pond, until it is decommissioned and backfilled at closure. Dikes IVR D-1 and IVR D-2 will provide additional storage to the IVR Attenuation Pond from baseline conditions. Managed water from the IVR Attenuation Pond will be discharged to the receiving environment through the O-WTP further discussed below.
- The IVR Pit footprint will permanently extend over a portion of Lake A46 and Lake A47.
- Lake A45 will become part of the South Whale Tail diversion channel until the South Whale Tail diversion is decommissioned at closure.
- Cumulative effects are expected at Lake A16 (Mammoth Lake) and downstream lakes from the following activities:
  - The Mammoth Dike, built during the construction phase, will reduce the watershed area of Lake A16 (Mammoth Lake) and downstream lakes, resulting in reduced discharges;
  - The Whale Tail Dike will result in the diversion of the Whale Tail Lake (South Basin) watershed to the Lake A16 (Mammoth Lake) watershed, thereby augmenting discharges at Lake A16 (Mammoth Lake) and downstream lakes;
  - The Whale Tail WRSF Dike will reduce the land area of the Lake A16 (Mammoth Lake) and downstream lake watersheds, resulting in reduced discharges;
  - The diversion of runoff upstream the Northeast Dike will temporarily augment discharges at Lake A16 (Mammoth Lake) and downstream lakes until it is decommissioned prior to the initiation of the IVR Pit in 2020; and
  - Treated water from the O-WTP discharged to Lake A16 (Mammoth Lake) through Whale Tail Lake (South Basin) will augment the discharges at Lake A16 (Mammoth Lake) and downstream lakes. Alternatively, discharge of treated water from the O-WTP Plant to Lake D1 or Lake D5 would:
    - Not augment the discharges at Lake A16 (Mammoth Lake) and downstream lakes; and
    - Augment the discharges at the alternate discharge location and downstream lakes.
- Cumulative effects are expected at Lake C38 (Nemo Lake) and downstream lakes from the following activities:
  - The freshwater intake at Lake C38 (Nemo Lake) will withdraw up to 125,143 m^3/year and will result a reduction in discharges at Lake C38 (Nemo Lake) and downstream lakes.
  - The IVR diversion, constructed prior to the initiation of the IVR Pit, will augment discharges at Lake C38 (Nemo Lake) and downstream lakes.

It is also noted that seepage from the Whale Tail Dike will be captured and recirculated to Whale Tail Lake (South Basin). Flows will be recirculated resulting in negligible effects on surface water quantity. Thus, this activity is not further discussed herein.

6.3.3.1.4.2 Assessment Results

The diversion of Whale Tail Lake (South Basin) to the Lake A16 (Mammoth Lake) watershed is expected from June 2020 to May 2026 (Volume 6, Appendix 6-F) and will increase the water surface elevation of Whale Tail Lake

(South Basin) by 3.5 m (i.e., from 152.50 masl to 156.00 masl). Although this was already considered in the approved impact assessment, this increase will result in an extended period of flooding of tributary lakes, including Lake A18, Lake A19, Lake A20, Lake A21, Lake A22, Lake A55, Lake A62, Lake A63, Lake A65, Pond A-P1, and Pond A-P53, increasing the lake water surface fraction of the Whale Tail Lake (South Basin) watershed by approximately 6% (Table 6.3-2).

Table 6.3-2: Comparison of Lake Water Surface Area in the Whale Tail Lake (South Basin) Watershed during Baseline and the Operational Phase

Parameter	Total Watershed Area	Lake Water Surface Area	
		Baseline	Operational Phase
Area (km^2)	22.3	3.69	5.13
Watershed Proportion (%)	100	16.5	23.0

km^2 = square kilometre; % = percent.

<u>Effects on Lake A16 (Mammoth Lake) and Downstream Lakes</u>

Operational activities are expected to increase flood discharges and water levels at Lake A16 (Mammoth Lake) from the combination of diverted Whale Tail Lake (South Basin) and effluent discharge, from 2020 (i.e., once Whale Tail Lake [South Basin] has reached the elevation of 156.00 masl) to 2026 (i.e., at the onset of closure). Effects on discharges and water levels diminish with increases in drainage area, and are not expected to be measurable at Lake A5 or at Lake A69.

If effluent was discharged to one of the proposed alternative lakes (Lake D1 or D5), discharges and water levels would be expected to increase at the alternate discharge location and downstream lakes. The magnitude and spatial extent of these effects are not known at this time and will be assessed following collection of baseline hydrological data and confirmation of the preferred discharge location. Discharge at Lake D5 would approximately double the drainage area of Lake D5 from natural conditions. Discharge at Lake D1 would increase the drainage area of Lake D1 by approximately 6%. Thus, the magnitude and spatial extent of effects on surface water quantity would be expected to be greater with direct discharge to Lake D5 than with direct discharge to Lake D1.

If effluent was discharged to Lake D1 or D5, operational activities would be expected to reduce discharges and water levels slightly at Lake A16 (Mammoth Lake) from 2020 (i.e., once Whale Tail Lake [South Basin] has reached the elevation of 156.00 masl) to 2026 (i.e., at the onset of closure). Effects on discharges and water levels diminish with increases in drainage area and would not be expected to be measurable downstream of Mammoth Lake at Lake A5 or at Lake A69. This alternate discharge scenario would reduce the magnitude of effects from the current operational scenario, thereby providing a mitigation measure.

<u>Effects on Other Lakes</u>

Lake A45 will become part of the South Whale Tail diversion channel until the South Whale Tail diversion is decommissioned at closure.

Freshwater intake activities are expected to decrease discharges and water levels at Lake C38 (Nemo Lake), from 2019 and 2026, with a reduction in effects once the IVR Diversion becomes operational from 2020 to 2026 (i.e., at the onset of closure). Effects on discharges and water levels diminish with increases in drainage area, and are not expected to be measurable at Lake C8. Field inspections, water level and water quality monitoring will follow monitoring and mitigation plans.

Changes in discharge and water level are presented in Table 6.3-3 for Lake A16 (Mammoth Lake), and in Table 6.3-4 for Lake C38 (Nemo Lake) under peak and mean monthly discharge conditions during the operational phase. Additional statistics and results for other lakes are presented in Volume 6, Appendix 6-E.

Table 6.3-3: Changes in Discharge and Water Level at Lake A16 (Mammoth Lake) during the Operational Phase

Change	Project Phase	Peak Daily		Mean Monthly				
		2-Year	100-Year	June	July	August	September	October
Discharge (%)	Approved Project	+13	+8	+7%	-12%	-3%	+8%	+3%
	Expansion Project	+35	+19	+22%	-14%	+23%	+25%	+21%
	Expansion Project*	+6	+4	-3%	-19%	-9%	-5%	-6%
Water Level (m)	Approved Project	+0.04	+0.03	+0.01	-0.02	0.00	+0.01	0.00
	Expansion Project	+0.10	+0.07	+0.05	+0.02	+0.03	+0.04	+0.03
	Expansion Project*	+0.02	+0.02	-0.01	-0.04	-0.01	-0.01	-0.01

* = with alternate discharge location; km^2 = square kilometre; % = percent.

Table 6.3-4: Changes in Discharge and Water Level at Lake C38 (Nemo Lake) during the Operational Phase

Change	Project Phase	Peak Daily		Mean Monthly				
		2-Year	100-Year	June	July	August	September	October
Discharge (%)	Approved Project	+22%	+36%	+17%	+24%	+27%	+26%	+26%
	Expansion Project	-34%	-17%	-30%	-35%	-39%	-34%	-33%
Water Level (m)	Approved Project	+0.09	+0.24	+0.05	+0.08	+0.07	+0.07	+0.04
	Expansion Project	-0.13	-0.11	-0.07	-0.09	-0.08	-0.07	-0.04

m = metre; % = percent.

6.3.3.1.5 Closure Phase

6.3.3.1.5.1 Expansion Project Activities and Potential Effects to Surface Water Quantity

Project activities and potential effects to surface water quantity during the closure phase are summarized as follows:

- Cumulative effects are expected at Lake A16 (Mammoth Lake) and downstream lakes from the following activities:
  - The Mammoth Dike, built during the construction phase, will reduce the watershed area of Lake A16 (Mammoth Lake) and downstream lakes, resulting in reduced discharges; and
  - The Whale Tail WRSF Dike, built during the construction phase, will reduce the land area of Lake A16 (Mammoth Lake) and downstream lakes, resulting in reduced discharges.

- Whale Tail Lake (South Basin) will be drawn-down by November 2026. As such, lakes previously affected by the South Whale Tail diversion (i.e., Lake A18, Lake A19, Lake A20, Lake A21, Lake A22, Lake A55, Lake A62, Lake A63, Lake A65, Pond A-P1, and Pond A-P53), located upstream of Whale Tail Lake (South Basin), will return to baseline conditions by November 2022. This will also remove the diversion to Lake A16 (Mammoth Lake).

The IVR Attenuation Pond will decommissioned and backfilled with clean (i.e., NPAG/NML) waste rock at the onset of closure. This activity will be within the closed-circuited site, with no effects to the receiving environment. Thus, it is not further discussed herein.

6.3.3.1.5.2 Assessment Results

Closure activities are expected to reduce discharges and water levels at Lake A16 (Mammoth Lake), primarily from the reduction in drainage area from the Mammoth Dike, and the Whale Tail WRSF Dike. Effects on discharges and water levels diminish with increases in drainage area, and are not expected to be measurable at Lake A69. A slight reduction in discharges and water levels is expected at Lake A5, are assumed to occur at Lake A4, Lake A3, Lake A2, and Lake A1, and are not expected to be measurable at Lake DS1.

Changes in discharge and water level are presented in Table 6.3-5 for Lake A16 (Mammoth Lake) under peak and mean monthly discharge conditions during the closure phase. Additional statistics and results for other lakes are presented in Volume 6, Appendix 6-E.

Table 6.3-5: Changes in Discharge and Water Level at Lake A16 (Mammoth Lake) during Closure

Change (Approved Project and Expansion Project)	Peak Daily		Mean Monthly				
	2-Year	100-Year	June	July	August	September	October
Discharge (%)	-58%	-55%	-65%	-76%	-69%	-66%	-68%
Water Level (m)	-0.24	-0.29	-0.20	-0.20	-0.14	-0.14	-0.13

m = metre; % = percent.

6.3.3.1.6 Post-Closure Phase

6.3.3.1.6.1 Expansion Project Activities and Potential Effects to Surface Water Quantity

The end pit lake at the final elevation of 153.5 masl (i.e., 1 m higher than baseline conditions) will increase the surface area of Lake A17 (Whale Tail Lake) by 41% from 1.66 km^2 (baseline conditions) to 2.34 km^2 (post-closure conditions), resulting in proportional increases in direct precipitation and evaporative losses, and decreases in runoff from adjacent land areas. All other lakes will be returned to baseline conditions, aside from those encroached by the post-closure surface area of Whale Tail Lake, and Lake A53 which will be backfilled.

6.3.3.1.6.2 Assessment Results

At post-closure, the end pit lake will increase the surface area of Lake A17 (Whale Tail Lake) by 41%, resulting in a proportional increase in direct precipitation and evaporative loss; however, discharge and water level regimes are expected to remain similar to baseline conditions. Statistics and results are presented in Volume 6, Appendix 6-E.

6.3.4 Residual Effect Classification

Infrastructure development, dewatering, and diversion activities will result in effects on discharges, water levels, and channel/bank stability in watersheds of the surface water quantity LSA only, including watersheds A, and C, which will vary over the construction, dewatering, operational, and closure phases. The effects are projected to be negligible following the closure phase. The effects are projected to be negligible beyond the LSA at all times.

Infrastructure development will modify the configuration of a watershed, including drainage area, and lake water surface fractions. Dewatering of waterbodies will augment discharges and water levels of receiving lakes. Diversion of waterbodies will augment discharges of receiving lakes. Resulting effects on discharges, water levels, and channel/bank stability are summarized below by Project phases, just downstream of the Project:

- Operational Phase:
  - The Whale Tail Lake (South Basin) diversion to the Lake A16 (Mammoth Lake) watershed, is expected to increase water levels in Whale Tail Lake (South Basin) from June 2020 to May 2026;
  - Flood discharge and water level regimes are expected to increase from the baseline values at Lake A16 (Mammoth Lake), and negligible effects are expected on channel/bank stability at Lake A16 (Mammoth Lake), in 2020 to 2026;
    - Should an alternate discharge location be considered, discharges and water levels regimes would be expected to decrease slightly at Lake A16 and downstream lakes, and increase at the alternate discharge location and downstream lake, with more pronounced effects expected with direct discharge at Lake D5 than at Lake D1.
  - Discharge and water level regimes are expected to decrease from the baseline values at Lake C38 (Nemo Lake), and no effects are expected on channel/bank stability, from 2019 to 2026.
- Closure Phase: discharge and water level regimes from Lake A16 (Mammoth Lake) and downstream lakes are expected to decrease from the baseline values, and no effects are expected on channel/bank stability.
- Post-Closure Phase: discharge and water level regimes are expected to remain similar to the baseline values, and no effects are expected on channel/bank stability.

These effects are classified in Table 6.3-6, following methods described in Volume 3, Appendix 3-E, and the definition of terms used in the residual effect classification for vegetation, terrestrial wildlife and birds, surface water quality, and fish and fish habitat (Table 3.E-1). Since the assessment endpoint of the surface water quantity VC is the availability of the spatial and temporal distribution of water quantity for aquatic and terrestrial ecosystems, the effect direction was classified and significance was determined in Section 5.0 (Terrestrial Environment) and Section 6.5 (Fish and Fish Habitat) of the FEIS Addendum.

Effects summarized above will result in change of state from baseline conditions, and were assigned magnitude of High. The effects are expected to remain confined to the LSA, and were classified as Local. The effects are expected to be reversible following the closure phase and classified as Medium-term. The effects will continue over the assessment period and were classified as continuous. The effects are probable and were classified as highly likely.

Table 6.3-6: Residual Effect Classification for Surface Water Quantity

Residual Effect	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Likelihood	Consequence of Proposed Change: Determining Significance
Change in discharge rate and the spatial distribution of water	High	Local	Medium-term	Continuous	Reversible	Highly Likely	No change

Note: For further information on consequence of proposed change: determining significance for the Expansion Project refer to Table 3.4-2.

6.3.5 Cumulative Effects Assessment

The Expansion Project is anticipated to have negligible effects on surface water quantity outside of the LSA. The database of reasonably foreseeable future developments (Volume 3, Appendix 3-D) indicates that there are no planned development in the RSA, and the cumulative effect is expected to be negligible.

6.3.6 Uncertainty

Uncertainty with respect to the effects on surface water hydrology are related to limitation of the water balance models and long-term climate trends:

- Water Balance Models
  - The site-wide water balance was developed based on water management activities for the Expansion Project. Thus, the accuracy of effects described herein is directly proportional to the level of definition of water management activities available from the site-wide water balance (Volume 6, Appendix 6-O).
  - The receiving environment water balance models used for the assessment of primary effects was based on long-term derived meteorological input, and hydrological parameters from one year of site-specific hydrological baseline data in 2015 and 2016 supplemented by regional data (Cumberland 2005c). As described in the 2015 Hydrology Baseline Report (Approved Project FEIS Volume 6, Appendix 6-C; Agnico Eagle 2016c), long-term meteorological data were derived based on a correlation of regional meteorological data available from the Baker Lake A meteorological station (Station ID 2300500) operated by the Government of Canada (2015), and of local meteorological data from the Meadowbank Mine from 1997 to 2003 and from 2013 to 2015. The quality of this correlation is directly proportional to the concurrent period of record of local and regional sources, and can be refined based on newly available local and regional data. Hydrological parameters, including stage-discharge outlet rating curves, runoff coefficients for land surfaces, and degree-day models for snowmelt and formation of ice in outlet channels, were based on two years of hydrological baseline data. These parameters can be validated and/or refined based on additional monitoring.
- Effects of Long-term climate trends
  - Climate change predictions are in their nature uncertain. The atmospheric processes involved are complex, as are the models used to develop climate change predictions. Inuit in the region have expressed concerns about warmer temperature throughout the year, short-term temperature fluctuations, changing snow and ice conditions, more frequent severe storms in the fall, and lower water levels in rivers and lakes.

In general, the climate in the region is projected to be warmer with increased precipitation in the long-term when compared to the observed historic values. Increases in temperatures may result in an increase in the open water season characterized by earlier outlet openings and later outlet freeze-ups, and increased evaporative losses. Increases in precipitation is expected to augment water yields; however, the net effects of long-term warming trends on flow regimes are uncertain. For the short duration of the Project, conditions are unlikely to deviate significantly from baseline.

6.3.6.1 Mitigation

The overall uncertainty in the assessment related to components described previously was primarily addressed through the methods of this assessment which included consideration of the most conservative effects during each of the assessed phases. Thus, effects described herein for each phase are expected to be conservative. Mitigation considered the following:

- The site-wide water balance available for the Approved Project was updated prior to this addendum (Volume 6, Appendix 6-O) in consideration of the Expansion Project's water management activities, and covers the construction, dewatering, operations, closure, and post-closure phases on a monthly basis. It is based on the most up-to-date Project description and studies which were advanced in detail since the Approved Project. Thus, input from the site-wide water balance is associated with low uncertainty.
- Uncertainty related to water balance model input parameters described above can be addressed through additional monitoring. Refinement of these parameters may affect the magnitude of effects on surface water quantity presented herein; however, conclusions are expected to remain unaffected.
- Environment Canada monitors weather and climate in the Kivalliq region of Nunavut, and monitoring results will be reviewed periodically to verify conclusions outlined herein and to review operating procedures during the life of the Project, if and as required.
- As discussion in Section 6.2, a mitigation option being considered is discharge of treated effluent to Lake D1 or D5 in the D watershed. Effects at the alternate discharge location and downstream lakes were assessed qualitatively and will be confirmed and refined following collection of additional baseline in the D watershed.

6.3.7 Monitoring and Follow-up

Monitoring of flows and water levels at key locations in the LSA during all phases of the Approved and Expansion Project is considered necessary to determine actual runoff and discharge rates.

To address concerns related to water levels, hydrometric monitoring that provides measurements of lake water levels and lake outlet discharges during open water conditions at key locations (e.g., diversion channels at lake outlets; lake outlets augmented by dewatering discharges), will be undertaken using surveying, hydrometric stations or gauging collection processes similar to those currently used at the Meadowbank Mine and used as part of the baseline program.

All piped and/or pumped discharges to waterbodies will be monitored continuously.

Measurements of rainfall and temperature, will be performed to allow validation of the hydrological model, assessment of seasonal conditions and to provide input to water management.

In addition, a monitoring plan applicable to the haul road is addressed in the Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1). The monitoring plan specifically addresses hydrology monitoring prior to spring freshet and after major precipitation events.

Consistent with Project Certificate No. 008, Agnico Eagle is required to minimize the use of natural waters as practicable and limit potential impacts to the receiving environment from contact (site) water (T&C #18). Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NIRB (refer to Volume 8, Table 8.2-1). Agnico Eagle considers the existing terms and conditions of the Project Certificate issued for the Approved Project are sufficient to protect, mitigate, and monitor impacts associated with the Expansion Project.

Any new required mitigation measures related to primary effects for the Expansion Project are described in relation to the predicted effects and summarized in pathway tables provided in Volume 3, Appendix 3-C.

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan and will update these as part of the NWB review process (refer to Volume 8).

6.4 Hydrogeology and Groundwater Quantity and Quality

Groundwater and hydrogeology is not considered a VC because groundwater is currently not used and is unlikely to be used in the future. Groundwater provides secondary pathways/links to VCs, such as surface water quantity (hydrology), surface water quality, and fish habitat. This section presents the baseline hydrogeology conditions and predictions of groundwater quantity and groundwater salinity, which are inputs in the assessments for the VCs and specifically the Site Wide Water Balance Model and Site Wide Water Quality Model.

Relative to the Approved Project, the primary change to the mine development affecting groundwater flow during mining is the inclusion of the Underground, and the resulting additional management of saline groundwater. Whale Tail Pit is larger and deeper than the mine design in the Approved Project, and although reassessed as part of the Expansion Project, the overall conclusions on potential effects are unchanged. IVR Pit is in permafrost; therefore, there are no effects related to this pit on groundwater flow during mining. During long-term post-closure, the IVR Pit lake will ultimately connect to the groundwater flow system following the slow degradation of the permafrost underlying the pit lake. Predicted groundwater conditions near IVR Pit are similar to those predicted for Whale Tail Pit for long-term post-closure.

A summary of the key changes to the assessment of the hydrogeology component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 6.4-0.

Table 6.4-0: Hydrogeology: Approved Project vs Expansion Comparison

Section of FEIS	Approved Project	Section of Addendum	Expansion Project
6.2.1 Incorporation of IQ		6.4.1 Incorporation of IQ	No new information
6.2.2 Existing Environment and Baseline Information	• Knight Piésold (2015a) Groundwater Inflow Assessment • Knight Piésold (2015b) Whale Tail Pit Permafrost and Hydrogeological Characterization.	6.4.2 Existing Environment and Baseline Information	• Knight Piesold 2016 – Geomechanical Site Investigation • Golder 2016a – Westbay System Installation Summary • Golder 2016b – Groundwater Quality Investigation • Golder 2017c – Thermal Assessment • Golder 2017d – Hydrogeological and Permafrost Field Investigations • Golder 2018c – Pit Lake Thermal Assessment for Post-Closure • SNC Lavalin 2017 – Preliminary Studies for the Water Management and Geotechnical Infrastructures
6.2.3 GW Quantity and Quality and Project Interactions	Groundwater and hydrogeology is not considered a VC because groundwater it is not currently used and is unlikely to be used in the future. However, groundwater provides secondary pathway/links to VCs, such as surface water quantity (hydrology), surface water quality, and fish habitat.	6.4.3 GW Quantity and Quality and Project Interactions	Groundwater and hydrogeology is not considered a VC because groundwater it is not currently used and is unlikely to be used in the future. However, groundwater provides secondary pathway/links to VCs, such as surface water quantity (hydrology), surface water quality, and fish habitat.
6.2.4 Uncertainty	• Inflow sensitive to bedrock hydraulic conductivity. • TDS concentrations in groundwater uncertain due to lack of site-specific data, uncertainty to be addressed through additional groundwater quality sampling • Effects assessed using a developed conservative EA Scenario.	6.4.4 Uncertainty	Inflow sensitive to bedrock hydraulic conductivity. Reduced uncertainty in inflow due to higher number of hydraulic conductivity tests (57 tests versus 8) and in groundwater quality due to collection of site-specific data. Reasonable upper bound scenario developed (EA Scenario) to provide high confidence in predicted groundwater inflow and groundwater salinity and assessment of effects based on this conservative scenario. Refinement of these parameters may affect the magnitude of effects on groundwater quantity/quality presented herein; however, conclusions are expected to remain unaffected.
6.2.5 Monitoring and Follow-up	• May 2018 Monitoring Plan submitted. • Groundwater inflow quantity and quality to Whale Tail Pit to be monitored monthly during mining and supplemented by periodic (biannual in first year, annual in subsequent years) seepage surveys to identify preferential groundwater flow paths in walls of open pit, if present, and determine their relative contribution to groundwater inflow to the pit • Closure and Post-closure monitoring part of Site Water Management Plan	6.4.5 Monitoring and Follow-up	Updated groundwater monitoring plan included in submission. • Whale Tail Pit monitoring unchanged. Monthly monitoring in sump, biannual seepage monitoring in pit walls in first year, annual seepage monitoring in pit walls every year thereafter. • IVR Pit in permafrost and monitoring not proposed under groundwater monitoring plan as groundwater inflows not expected. Monitoring will be conducted as part of Water Management Plan. • Underground monitoring added. Monthly monitoring of groundwater inflow to underground. Monthly water quality sampling of inflow transferred to surface water management system from Underground. Groundwater quality to be monitored at mine seeps to verify quality of formation water flowing into the mine. Samples anticipated to be collected quarterly but actual sampling frequency may vary depending on rate of progress and observed trends in groundwater flow and quality with time. • Conservatism considered in water management structures to address uncertainty (e.g., allowance for extra storage pond)

6.4.1 Incorporation of Inuit Qaujimajatuqangit

No additional IQ or concerns related to hydrogeology and groundwater was provided by community members since the FEIS submission of the Approved Project, in the review of community consultation notes (NIRB and NWB 2017; NIRB 2017), or during consultation for the Expansion Project (Agnico Eagle 2018a).

6.4.1.1 Existing Environment and Baseline Information

Collection of baseline information and development of the existing environment for groundwater and hydrogeology was informed by the TK collected on VCs such as surface water quality and fish habitat.

6.4.1.2 Valued Component Selection

Unlike EAs in the south, where groundwater protection is coupled with the protection of drinking water, due to the presence of deep permafrost, the seasonal nature of the active layer, and the availability of good-quality drinking water from surface water sources near the Approved and Expansion Project make it unlikely that groundwater will be used as a drinking water source in the future. As a result, groundwater and hydrogeology is not considered a VC because groundwater it is not currently used and is unlikely to be used in the future. However, groundwater provides pathway/links to VCs, such as surface water quantity (hydrology), surface water quality, and fish habitat and IQ related to those VCs are provided in subjects in Sections 6.2, 6.3, and 6.5.

6.4.1.3 Mitigation and Monitoring

Although groundwater is not a VC and there is no IQ specific for groundwater and hydrogeology, IQ for VCs affected by groundwater pathways were considered in the development of monitoring plans.

6.4.2 Existing Environment and Baseline Information

6.4.2.1 Baseline Study Methods

Existing conditions were described to provide context for groundwater quantity and quality assessment within the 2016 Hydrogeology Baseline Report (Approved Project FEIS Volume 6, Appendix 6-A; Agnico Eagle 2016c). The Approved Project baseline study was an update to a previous conceptual model and preliminary estimate of groundwater inflows completed by Knight Piésold (2015a, b). Primary changes that were made to Knight Piésold's conceptual model included the expansion of the conceptual model to the regional study limits and some modification to the hydrostratigraphy. Modifications to the hydrostratigraphy included the incorporation of overburden, from which groundwater storage can significantly affect groundwater inflow/outflow predictions during pit dewatering and pit refilling, and refinement in the estimated hydraulic conductivity of the competent bedrock with depth. Where changes were made to the hydrostratigraphy, these changes were designed to provide conservative estimates with respect to the prediction of groundwater inflow and the prediction of potential project impacts on groundwater during closure.

The hydrogeology baseline study included characterization of the hydrogeological setting, hydrostratigraphy, and groundwater quality. Available hydrogeological data collected at the site by Knight Piésold (2015a, b), together with the information collected elsewhere in the Canadian Shield, were used to develop a conceptual hydrogeological model of the Project site. A conceptual hydrogeological model is a pictorial and descriptive representation of the groundwater regime that organizes and simplifies the site conditions so they can be readily quantitatively modelled. The conceptual model must retain sufficient complexity so that the analytical or numerical models developed from it adequately simulate the actual components of the groundwater flow system to the degree necessary to satisfy the objectives of the modelling study. The baseline conceptual model was developed to describe key features of the hydrogeological regime in the baseline study area before mining. The key features include the groundwater flow, groundwater quality, and dominant groundwater flow direction.

For the Expansion Project, additional data was collected to verify baseline data and assumptions in the predictive hydrogeological modelling. These data included:

- Installation of a Westbay well system in the talik zone below Whale Tail Lake in 2016 to monitor hydraulic heads, test hydraulic conductivity, and collect groundwater samples from multiple intervals in the open talik (Golder 2016a, b).
- Collection of 49 additional measurements of hydraulic conductivity in unfrozen areas of bedrock (Knight Piesold 2016; Golder 2016b, 2017d; SNC 2017).
- Thermal analysis in 2017 to refine the understanding of permafrost and talik characteristics near Whale Tail Lake and to provide input into the planning of a 2017 field thermistor installation program in the northern portion of the Lake (Golder 2017a).
- Thermal analysis in 2018 to forecast the evolution of permafrost beneath Whale Tail Pit and IVR Pit post-closure (Golder 2018c).

The above data collection is summarized in Volume 6, Appendix 6-A and was used to update the conceptual hydrogeological model.

6.4.2.2 Conceptual Hydrogeological Model

The following describes the conceptual hydrogeological model and baseline hydrogeology conditions at the Expansion Project. Additional detail is presented in the Hydrogeology Baseline Report (Volume 6, Appendix 6-A) and in the Hydrogeological Assessment and Modelling Report (Volume 6, Appendix 6-B).

The Approved and Expansion Project is located within a region of continuous permafrost. In this region, the layer of permanently frozen subsoil and rock is generally deep and overlain by an active layer that thaws during summer. The depth of the active layer is estimated to range between 1 and 3 m. Permafrost thickness (defined by the depth of the zero degree isotherm) in the baseline study area, away from the influence of lakes, is expected to be approximately 425 to 495 mbgs. Based on the calculated salinity concentration of 0.3% to 0.4% from the groundwater samples collected at depths from 276 m to 392 m from a Westbay well system installed in borehole AMQ16-626 (Volume 5, Appendix 5-A), a freezing point depression of about 0.2 °C was calculated, which may reduce the frozen-solid portion of the permafrost at its base by approximately 20 m. This reflects the thickness of the basal cryopeg.

For the Whale Tail Lake area, more detailed information is available from the collection and analysis of thermal data from 10 thermistors (Knight Piésold 2015b; Golder 2017c, 2018). Based on this data analysis, the following summarizes the understanding of permafrost conditions in the Project.

- In the area of Whale Tail Lake, data from thermistor AMQ17-1265A suggests that the talik near the central portion of the North Basin of Whale Tail Lake extends about 112 m below the lake water level of 152.5 masl. Toward the South Basin, the closed talik below the North Basin is predicted by thermal modelling to transition to open talik with direct connection to the deeper sub-permafrost groundwater flow system.

- Whale Tail Pit is present in the North Basin in the area of the closed talik. The pit extends through this talik and into the underlying permafrost, with the base of the pit located in permafrost.
- The IVR Pit, which has a maximum depth of approximately 105 m, is located within the regional permafrost that extends to 425 m to 495 mbgs. The edge of this pit slightly intersects the north eastern edge of Whale Tail Lake; however, thermistors at two locations (AMQ17-1277A and AMQ15-294) do not indicate significant open talik is present in this area. These two thermistors are drilled at an angle from shoreline and it is possible that thermistors have missed a shallow bulb of talik. If this shallow talik is present, groundwater in this localized area would drain towards the deeper portions of Whale Tail Lake during lake dewatering.
- With the formation of the Whale Tail Pit lake during closure, permafrost near and beneath Whale Tail Pit is predicted to start melting. After approximately 11 years of refilling, the base of the Whale Tail Pit lake is predicted to be hydraulically connected to the sub-permafrost groundwater flow system, and after 50 years, the permafrost below a significant portion of the pit footprint is predicted to have nearly completely melted.
- The formation of the IVR Pit lake during closure is also predicted to melt the underlying permafrost. Unlike Whale Tail Pit, the IVR Pit is located within the regional permafrost and it is predicted that it will take approximately 1,000 years to fully melt the permafrost below the pit footprint.

The conceptual model for the site consists of three hydrostratigraphic units composed of overburden, weathered rock, and competent rock. In developing the conceptual model, a reasonably conservative approach was taken so that the actual magnitudes of groundwater inflows (quantity and quality) to the open pits and underground during mining are expected to be less than simulated by the model. The uncertainty in the predictions was captured in the developed of an EA conservative scenario (hereafter referred to as the EA Scenario) that evaluated potential inflows to the pit if the hydraulic properties of the hydrostratigraphic units were near the upper bound of their expected uncertainty range. In the Approved Project, limited hydraulic conductivity test results (6 in unfrozen rock) were available, and therefore, the presence of a zone of enhanced permeability (EPZ) was assumed in the predictive analyses to be conservative. For the Expansion Project analysis, an additional 49 test results were available. Hydraulic conductivity measurements do not indicate that the permeability of the structures intersected to date are higher than the surrounding competent bedrock, and therefore an EPZ was not considered for the Expansion Project.

Overburden and weathered bedrock are limited to the near surface, while the majority of the rock domain consists of relatively competent bedrock. The hydraulic conductivity of competent rock decreases with depth.

Consistent with the Approved Project, model predictions were completed for two scenarios:

- Base Case Scenario: This scenario is based primarily on site-specific measurements of hydrogeological parameters controlling groundwater conditions near the open pits and Underground, as presented in Table 6.4-1. Where measurements were not made, the estimates were supplemented by published data and experience at Meadowbank. These predictions represent the best estimate of groundwater inflow and groundwater salinity based on the measured data and are the expected condition during actual mining activities.
- EA Scenario: This scenario is designed to be a reasonable, yet more conservative assessment, of potential groundwater inflow quantity and quantity such that the potential effects of the project on groundwater can be assessed. Hydraulic conductivity values adopted in the EA Scenario consider the available field measurements

of hydraulic conductivity and the results of sensitivity analysis that was conducted to evaluate the potential effects of the uncertainty in hydraulic conductivity parameters on the Base Case model predictions. There is a high level of confidence that the EA Scenario does not underestimate the effects to groundwater. Results of the sensitivity analysis used to evaluate uncertainty are presented in Volume 6, Appendix 6-B.

The assumed hydraulic properties of hydrostratigraphy units near the Whale Tail Pit are summarized in Table 6.4-1 for the Base Case and EA Scenario. Permafrost is essentially impermeable.

Table 6.4-1: Hydrogeological Parameters for Base Case and EA Scenario

Unit	Depth Interval (m)	Hydraulic Conductivity (m/s)		Specific Storage (1/m) [b]	Specific Yield (-) [b]	Effective Porosity (-) [b]	Longitudinal Dispersivity (m) [c]	Transverse Dispersivity (m)[c]	Effective Diffusion Coefficient (m^2/s)
		Base Case [a]	EA Scenario						
Overburden	0 to 6	2×10^{-6}	2×10^{-6}	1×10^{-4}	0.2	0.2	10	1	2×10^{-10}
Weathered bedrock	6 to 40	1×10^{-5}	1×10^{-5}	2×10^{-4}	0.03	0.03	10	1	2×10^{-10}
Competent bedrock	40 to 100	7×10^{-8}	1×10^{-7}	1×10^{-5}	0.0006	0.001	10	1	2×10^{-10}
	100 to 200	9×10^{-9}	3×10^{-8}	1×10^{-5}	0.0006	0.001	10	1	2×10^{-10}
	>200	1×10^{-9}	4×10^{-9}	1×10^{-5}	0.0006	0.001	10	1	2×10^{-10}

[a] Derived from hydraulic testing results as presented in Golder (2016b, 2017b), Knight Piesold (2015, 2016) and SNC (2017). Ratio of vertical to horizontal hydraulic conductivity assumed to 1:1.

[b] Parameter values within ranges documented in literature (Maidment 1992; Stober and Bucher 2007).

[c] Values are consistent with literature values (Schulze-Makuch 2005).

m = metre; m/s = metres per second; m^2/s = square metres per second.

Two groundwater flow regimes occur at the Approved / Expansion Project: a deep groundwater flow regime beneath permafrost, and a shallow groundwater flow regime located in the active (seasonally thawed) layer near the ground surface. With the exception of areas of open taliks beneath lakes, the two groundwater regimes are isolated from one another by thick permafrost.

The shallow groundwater regime is active only seasonally during the summer months, and the magnitude of the flow in this layer is expected to be several times less than runoff from snowmelt (Woo 2011). Groundwater in the active layer primarily flows to local depressions and ponds that drain to larger lakes; therefore, the total travel distance would generally extend only to the nearest pond, lake, or stream. Water in the active layer is stored in ground ice during the cold season and is then released with the ice thaws in late spring or early summer, thus providing flow to surface waterbodies (Woo 2011). During the warm season, groundwater in the active layer is recharged primarily by precipitation.

Groundwater flow within the deep groundwater flow regime is limited to the sub-permafrost zone. This deep groundwater flow regime is connected to the ground surface by open taliks underlying larger lakes. The elevations of these lakes will be the primary control of groundwater flow directions in the deep groundwater flow regime, with density gradients (density differences are the results of water chemistry, specifically salinity) providing a secondary control on groundwater flow directions. Evaluation of density gradients versus elevation gradients indicates that density driven flow in this Approved / Expansion Project is not significant near the mine development, largely because groundwater is not highly saline. The elevations of lakes with underlying open taliks in the baseline study area indicate that Whale Tail is likely both a groundwater recharge and discharge zone. Hydraulic gradients are expected to range from slightly downward to slightly upward, with a downward gradient present in the north basin (flow of water from Whale Tail Lake to DS1) and an upward gradient present in the south basin (flow of water from Lake A70 to Whale Tail Lake). The TDS of groundwater (or salinity) is expected to increase with depth, resulting in increased density of groundwater with depth. This increase in density with depth can result in fluid density gradients which will tend to lessen the upward flow of denser groundwater water due to the buoyancy effect. Density related effects were evaluated (Volume 6, Appendix 6-B) and were concluded to be negligible near the mine development in comparison to hydraulic gradients.

Groundwater Quality

Groundwater quality for the Approved Project has been inferred to be similar to the Meadowbank Mine based on similar geology and permafrost conditions (Knight Piésold 2015b), namely, that the majority of groundwater inflow to the Whale Tail Pit is from a shallow closed talik. These data characterize the shallow groundwater quality (i.e., in the unfrozen portion of the talik bulb and in the shallow portion of the through talik) for the Expansion Project. Site-specific information on groundwater quality at depth was obtained in 2016 through the installation and sampling of a Westbay system which provided groundwater flow and quality information at various depth intervals. This information is used to represent deep, sub-permafrost groundwater inflow to the base of the Whale Tail Pit and to the Underground workings. IVR Pit is within permafrost and is not expected to have groundwater inflow during mining.

Shallow groundwater quality: Groundwater quality in the shallow, closed talik at the Whale Tail pit is assumed to be that of the Meadowbank Mine as previously defined (Knight Piésold 2015b). It has high to very high hardness, neutral to slightly basic pH and good buffering capacity. Total dissolved solids concentrations range from 193 to 1,900 mg/L. Concentrations of fluoride, copper, iron, and selenium are elevated in comparison to guidelines for the protection of aquatic life and drinking water. The higher percentile values for nitrogen-containing compounds, aluminum, arsenic, boron, hexavalent chromium, molybdenum, and zinc exceed the CEQGs. Additionally, several of these parameters as well as chloride, manganese and sodium exceed aesthetic drinking water guidelines.

Sub-permafrost groundwater quality: The groundwater quality results obtained from the Westbay well system at Whale Tail provide reliable information on site-specific composition of groundwater to depths of 392 mbgs. This data is summarized in the Hydrogeology Baseline Report (Volume 6, Appendix 6-A).

Salinity profile with depth: Site-Specific groundwater samples collected from the Westbay system at depths between 276 m and 392 m indicate that the TDS content in the groundwater was between 3,198 mg/L and 4,042 mg/L (Golder 2016c). This range is slightly higher than the groundwater TDS concentration measured at Meadowbank from shallower depths (less than 200 m vertical depth), which is expected based on the deeper sample collection. The Westbay well data along with data from other sites in the Canadian shield were used to help extrapolate the TDS concentrations to deeper depths for the Project area. Consistent with other sites in the Canadian Shield, concentrations of TDS in groundwater are inferred to increase with depth, primarily in response to upward diffusion of deep-seated brines. The interpreted groundwater salinity profile is provided in Figure 6.4-1, along with profiles developed for other mines in the Arctic.

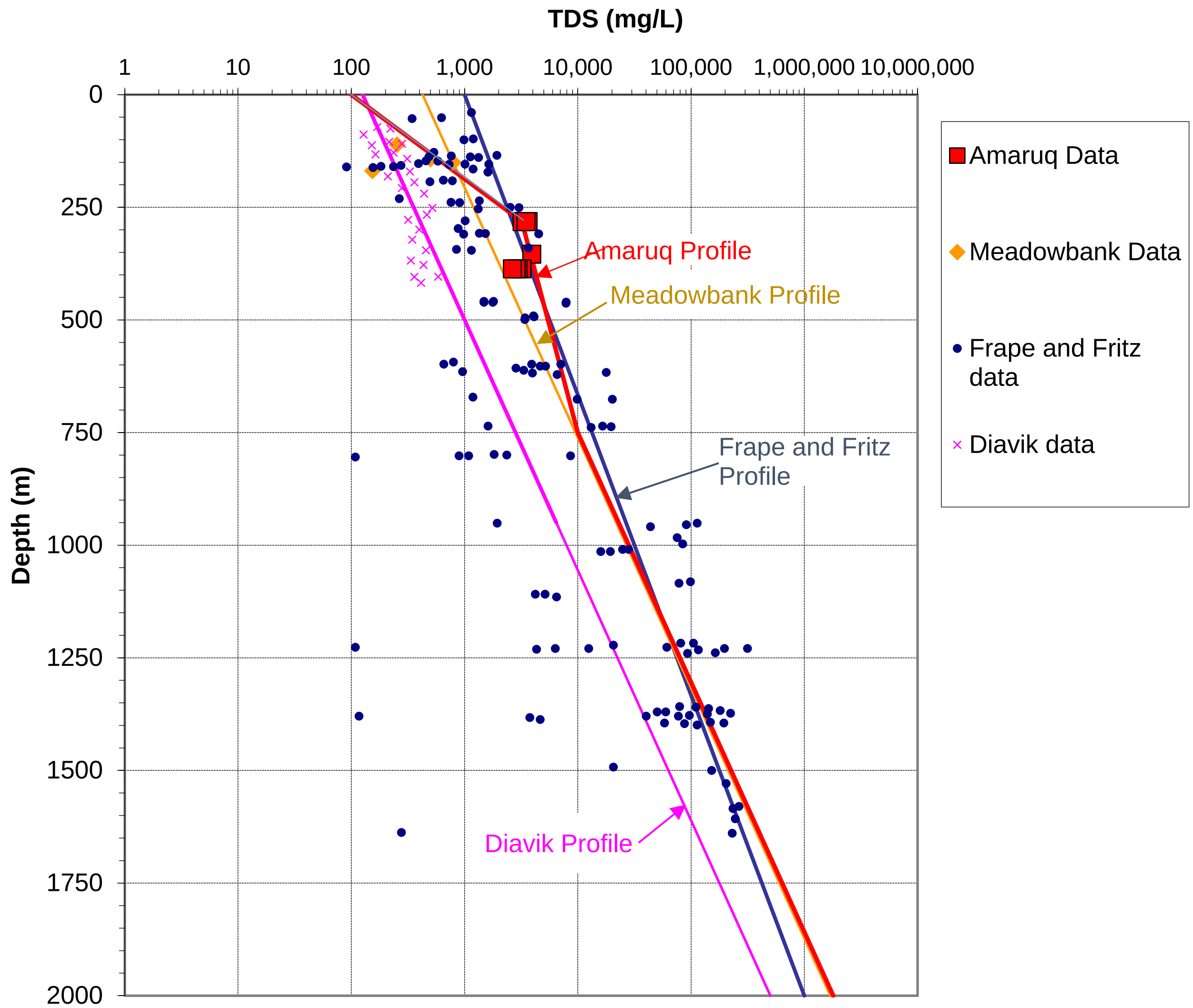


Figure 6.4-1: TDS Concentration vs Depth Profile, adapted from Golder (2016b)

6.4.3 Groundwater Quantity and Quality and Project Interactions

A comprehensive analysis of the potential pathways for effects on groundwater and hydrogeology during the construction, dewatering, operations, closure, and post-closure phases, is provided in Volume 3, Appendix 3-C, Table 3-C-4. No primary pathways were identified. Changes in hydrogeology and groundwater quantity and quality were evaluated in the context of how these changes in turn may result in changes to VCs (i.e., surface water hydrology and surface water quality). Therefore, no effects analysis was made for hydrogeology and groundwater quantity and quality as impacts to these components directly influence, and therefore are captured in, the assessment of impacts on VCs.

The Expansion Project related effects to surface water quantity from groundwater and surface water interaction is examined under surface water hydrology. The Expansion Project related effects to surface water quality from interaction of surface and groundwater is examined under site-wide water quality. These interactions were predicted through the use of a numerical hydrogeological model that is described in Volume 6, Appendix 6-B, and the subsequent incorporation of these predictions into the Mean Annual Water Balance (Volume 6, Appendix 6-O), Mine Site and Downstream Receiving Water Quality Predictions (Volume 6, Appendix 6-H).

Results of the EA Scenario are presented in the following section for the purpose of evaluating the Project related effects to surface water quantity and quality. Results of the Base Case Scenario and sensitivity analysis are provided in Volume 6, Appendix 6-B. Results from the EA Scenario are used in the Mean Annual Water Balance (Volume 6, Appendix 6-O) and Mine Site and Downstream Receiving Water Quality Predictions (Volume 6, Appendix 6-H).

6.4.3.1 Predicted Groundwater Inflow and Groundwater Salinity – Dewatering, Mining and Filling Phases

The IVR Pit, which has a maximum depth of approximately 105 m, is located within the regional permafrost that extends to 425 m to 495 m bgs. The edge of this pit slightly intersects the north eastern edge of Whale Tail Lake; however, thermistors at two locations (AMQ17-1277A and AMQ15-294; Appendix 6-A) do not indicate significant open talik is present in this area. These two thermistors are drilled at an angle from the shoreline and it is possible that thermistors have missed a shallow bulb of talik. If this shallow talik is present, groundwater in this localized area would be expected to drain towards the deeper portions of Whale Tail Lake during lake dewatering.

Because IVR Pit is located within the regional permafrost, groundwater inflow during IVR mining and refilling will be negligible and was not modelled. Long-term post-closure predictions for the IVR pit lake were completed as the permafrost below the pit lake will degrade over time.

Groundwater inflow and groundwater TDS for Whale Tail Pit and Underground were provided for the operational, refilling and flooded phases of the Project as portions of these developments intersect talik at all stages of the Project. Predictions of groundwater contributions to the Whale Tail Attenuation Pond, and general discharge of groundwater to the North Whale Tail Basin are also provided for periods prior to the reflooding of the Whale Tail Lake basin. A summary of the groundwater modelling predictions for the dewatering, mining, and filling phases are presented in Table 6.4-2 to Table 6.4-5.

Table 6.4-2: Predicted Groundwater Inflow and Groundwater Salinity (TDS) during Operations - EA Scenario – Whale Tail Pit and Underground

Phase	Time Period	Whale Tail Pit				Underground			
		Groundwater Inflow (m^3/day)	Inflow TDS Concentration (mg/L) [b]	Portion of Inflow from Attenuation Pond (%)	Portion of Inflow from South Basin of Whale Tail Lake (%)	Net Groundwater Inflow (m^3/day)	Inflow TDS Concentration (mg/L) [b]	Portion of Inflow from Attenuation Pond (%)	Portion of Inflow from South Basin of Whale Tail Lake (%)
Lake Dewatering	March-July 2019	NA	NA	NA	NA	NA	NA	NA	NA
Mining	August-December 2019[a]	1140	120	1%	<1%	NA	NA	NA	NA
	2020	1200	50	62%	<1%	70	4200	<1%	<1%
	2021	1340	30	79%	3%	80	4770	<1%	<1%
	2022	1370	20	80%	9%	300	6460	<1%	<1%
	2023	1370	20	81%	12%	510	8270	<1%	<1%
	2024	1360	10	81%	14%	510	9810	<1%	<1%
	2025	1360	10	81%	15%	430	11200	<1%	<1%

a) Mining prior to Q4 2019 is within permafrost and groundwater inflow will be negligible.

b) TDS concentrations do not account for loading from lakes and Whale Tail Attenuation Pond. TDS from these sources to be accounted for in Site Wide Water Quality analysis.

NA = not applicable; TDS = total dissolved solids; m^3/day = cubic metres per day; mg/L = milligrams per litre; % = percent.

Table 6.4-3: Predicted Groundwater Inflow and Groundwater Salinity (TDS) during Mine Operations - EA Scenario – Whale Tail Attenuation Pond and Whale Tail Lake (North Basin)

Phase	Time Period	Whale Tail Attenuation Pond				North Basin of Whale Tail Lake (within the diked area)[a]		
		Groundwater Inflow (m^3/day)	Inflow TDS Concentration (mg/L) [b]	Portion of Inflow from South Basin of Whale Tail Lake (%)	Pond Outflow (m^3/day)	Net Groundwater Inflow (m^3/day)[3]	TDS Concentration (mg/L) [b]	Portion of Inflow from South Basin of Whale Tail Lake (%)
Dewatering	Match-August 2019	NA	NA	NA	NA	1350	80	1%
Mining	August-December 2019	350	100	0%	180	650	70	39%
	2020	120	160	0%	860	720	30	86%
	2021	90	150	5%	1050	730	20	98%
	2022	90	130	22%	1090	720	10	99%
	2023	90	110	47%	1090	720	10	99%
	2024	90	90	70%	1090	720	10	>99%
	2025	90	70	89%	1090	720	10	>99%

a) Predictions of groundwater inflow to North Basin of Whale Tail Lake represents the discharge of groundwater to the lake basin during dewatering and mining. This excludes discharges to the pit and Whale Tail Attenuation Pond, which are within the North Basin of Whale Tail Lake.

b) TDS concentrations do not account for loading from lakes and Whale Tail Attenuation Pond. TDS from these sources are accounted for in the Site Wide Water Quality model.

NA = not applicable; TDS = total dissolved solids; m3/day = cubic metres per day; mg/L = milligrams per litre; % = percent.

Table 6.4-4: Predicted Groundwater Inflow and Groundwater Salinity during Reflooding - EA Scenario – Whale Tail Pit, Whale Tail Attenuation Pond, North Basin of Whale Tail Lake

Phase	Approximate Time Period	Water Level in Pit (masl)		Whale Tail Pit				Whale Tail Attenuation Pond				North Basin of Whale Tail Lake (within the diked area)		
		From	To	Net Groundwater Inflow/Outflow[a] (m^3/day)	Inflow TDS Concentration[b] (mg/L)	Portion of Inflow from Attenuation Pond (%)	Portion of Inflow from South Basin of Whale Tail Lake (%)	Groundwater Inflow (m^3/day)	Inflow TDS Concentration (mg/L)[b]	Portion of Inflow from South Basin of Whale Tail Lake (%)	Pond Outflow (m^3/day)	Net Groundwater Inflow/Outflow[a] (m^3/day)	TDS Concentration (mg/L)[b]	Portion of Inflow from South Basin of Whale Tail Lake (%)
Filling	2026	-130	-76	NA	NA	NA	NA	150	35	0%	<5	340	<10	>99%
	2027	-76	-39	NA	NA	NA	NA	170	30	2%	<5	340	<10	>99%
	2028	-39	3	NA	NA	NA	NA	180	25	11%	<5	340	<10	>99%
	2029	3	26	NA	NA	NA	NA	180	20	28%	<5	340	<10	>99%
	2030	26	43	20	25	46%	41%	185	20	46%	<5	340	<10	>99%
	2031	43	61	100	25	46%	41%	170	20	64%	25	340	<10	>99%
	2032	61	73	140	20	42%	49%	160	20	76%	55	340	<10	>99%
	2033	73	87	180	20	44%	51%	150	20	84%	80	340	<10	>99%
	2034	87	101	180	20	48%	47%	150	20	89%	90	335	<10	>99%
	2035	101	111	750	<10	69%	31%	120	25	92%	530	330	<10	>99%
	2036	111	124	1180	<10	81%	19%	85	30	95%	950	300	<10	>99%
	2037	124	133	920	<10	82%	18%	90	20	96%	740	300	<10	>99%
	2038	133	142	350	<10	82%	18%	115	15	97%	320	320	<10	>99%
	2039	142	149	-40	NA	NA	NA	70	20	97%	140	370	<10	>99%
	2040	149	153.5	-10	NA	NA	NA	0	NA	NA	10	160	<10	>99%
	2041	153.5	153.5	0	NA	NA	NA	0	NA	NA	5	-10	NA	NA

Note: IVR Pit is located in permafrost and was therefore not modelled. Interception of runoff / direct precipitation accounted for in Site Wide Water Balance.
a) Positive values indicate flow to the pit/pond and negative values indicate flow to bedrock.
b) TDS concentrations do not account for loading from lakes and Whale Tail Attenuation Pond. TDS from these sources to be accounted for in Site Wide Water Quality analysis.
NA = not applicable; TDS = total dissolved solids; m^3/day = cubic metres per day; mg/L = milligrams per litre; % = percent.

Table 6.4-5: Predicted Groundwater Inflow and Groundwater Salinity during Reflooding - EA Scenario – Underground

Phase	Time Period	Water Level in Underground (masl)		Underground			
		From	To	Net Groundwater Inflow/Outflow[a] (m^3/day)	Inflow TDS Concentration[b] (mg/L)	Portion of Inflow from Attenuation Pond (%)	Portion of Inflow from South Basin of Whale Tail Lake (%)
Filling	2026	-505	-76	35	11200	<1%	<1%
	2027	-76	-39	50	13600	<1%	<1%
	2028	-39	3	35	14300	<1%	<1%
	2029	3	26	25	15100	<1%	<1%
	2030	26	43	20	15500	<1%	<1%
	2031	43	61	15	15800	<1%	<1%
	2032	61	73	10	16200	<1%	<1%
	2033	73	87	5	16200	<1%	<1%
	2034	87	101	-5	NA	NA	NA
	2035	101	111	-10	NA	NA	NA
	2036	111	124	-15	NA	NA	NA
	2037	124	133	-20	NA	NA	NA
	2038	133	142	-40	NA	NA	NA
	2039	142	149	-30	NA	NA	NA
	2040	149	152.5	-30	NA	NA	NA
	2041	153	152.5	-25	NA	NA	NA

Note: IVR Pit is located in permafrost and was therefore not modelled. Interception of runoff / direct precipitation accounted for in Site Wide Water Balance.

a) Positive values indicate flow to the underground and negative values indicate flow to bedrock.

b) TDS concentrations do not account for loading from lakes and Whale Tail Attenuation Pond. TDS from these sources to be accounted for in Site Wide Water Quality analysis.

NA = not applicable; TDS = total dissolved solids; m^3/day = cubic metres per day; mg/L = milligrams per litre; % = percent.

6.4.3.2 Predicted Groundwater Flow – Flooded Mine Development

Following flooding of the pits, the Underground, and the previously dewatered portion of Whale Tail Lake, natural drainage patterns will be re-established by decommissioning the Whale Tail Dike, Mammoth Dike, and Whale Tail WRSF Dike. When the groundwater level returns to near pre-mining conditions, the regional hydraulic gradients in the Approved and Expansion Project area are expected to return to conditions similar to what was present prior to mining but with the final elevation of Whale Tail Lake at 153.5 masl, which is slightly higher than the pre-development elevation of 152.5 masl. This 1 m increase in lake level is expected to have negligible affect on hydraulic gradients and lake base flow within the study area, as the change is small in comparison to the long travel distance to nearby lakes (generally over 1,000 m).

The flooded mine developments are predicted to provide recharge to the regional groundwater system. The permafrost at the base of the Whale Tail Pit will begin melting during pit refilling and may be completely degraded in approximately 50 years. Open talik was also predicted to form long-term below the IVR Pit, although at a significantly slower rate (i.e., over approximately 1,000 years) due to the pit being located within the regional permafrost.

Table 6.4-6 presents predicted outflow from the flooded Whale Tail Pit following the reflooding of the Whale Tail Pit, Underground and North Basin of Whale Tail Lake. The flooded Whale Tail Pit was predicted to recharge the regional sub-permafrost groundwater system towards the end of the reflooding and over the sub-sequent 300 years post flooding. Over time, as the groundwater flow system near the mine workings re-equilibrates and the shallow bedrock re-saturates and/or re-pressurizes, the amount of recharge to the sub-permafrost flow system decreases from 4.1 m^3/day in Year 1 to 1.5 m^3/day after 200 years. The long-term predicted pit lake discharge to the groundwater flow system is predicted to be 1.5 m^3/day. No significant groundwater inflows to the pit lake were predicted following reflooding of the pit and North Basin of Whale Tail Lake.

Table 6.4-6: Predicted Pit Lake Outflow following Reflooding of the Whale Tail Pit, Underground and North Basin of Whale Tail Lake

Time (Years after Reflooding)	Pit Lake Outflow to Groundwater (m^3/day)
1	4.1
50	3.1
100	2.3
200	1.5
300	1.5

In consideration of the long time-line associated with the decay of the permafrost, the analysis of the IVR Pit was limited to a prediction of the long-term steady-state groundwater flow environment that would develop near the pit lake following the full melting of permafrost below the pit footprint. The long-term predicted discharge from the IVR Pit lake to the groundwater flow system was approximately 0.7 m^3/day.

6.4.3.3 Predicted Groundwater Inflow / Lake Outflow – Long-Term Post-closure

Budget analyses were performed to estimate the changes to pre-mining groundwater inflows and outflows from Lakes within the hydrogeology BSA during mining and following refilling (i.e., after the pits, Underground, and Whale

Tail Lake is flooded back to 153.5 m). Table 6.4-7 presents a summary of lakes within the hydrogeology BSA that had a predicted change (greater than 1 m^3/day) in groundwater inflow and outflow relative to pre-Project (current) conditions. Long-term post-closure conditions consider the potential formation of an open talik below the pit footprints, as a result of the widening / deepening of the lake in this area.

Table 6.4-7: Predicted Groundwater Inflows and Outflows from Lakes at End of Mining and Post-closure

Lake	Pre-Project (Current) Conditions	End of Mining (2025)		Long-Term Post-closure	
	(m^3/day)	(m^3/day)	(% change of Pre-Project)	(m^3/day)	(% change of Pre-Project)
A16	2.7	1.9	-20	2.7	0
A60	4.3	3.1	-28	4.3	0
A81	-5.2	-3.1	-40	-5.2	0
DS1	-49.4	-32.5	-34	-49.4	0
DS2	-2.6	-1.1	-57	-2.6	0
Nemo	6.5	4.6	-29	6.5	0

Note: Positive number denotes that the lake is a source of groundwater recharge. Negative number denotes that the lakes is a groundwater discharge zone.

m^3/day = cubic metres per day; % = percent.

Following reflooding, near to pre-mining hydraulic gradients and groundwater flow directions will be re-established once the open pit and dewatered portion of Whale Tail Lake are flooded. Consistent with pre-development conditions, groundwater from Whale Tail Lake and the open pits is predicted to discharge to Lake DS1. Groundwater inflow to the southern portion of Whale Tail Lake will occur from Lake A60 to the southeast. Hydraulic gradients following reflooding (long-term post closure) were used to estimate groundwater travel times from the Whale Tail Lake and the open pits to DS1. Based on the shortest travel time, water from Whale Tail Lake or the flooded open pits was predicted to take over 1,000 years to reach Lake DS1.

6.4.4 Uncertainty

Sensitivity analysis conducted as part of the numerical modelling indicate that quantity and TDS of groundwater inflow predicted for the Whale Tail Pit was sensitive to the hydraulic conductivity assigned to the shallow weathered bedrock but relatively insensitive to the hydraulic conductivity of the deeper competent bedrock.

Results of the sensitivity analysis indicate that the quantity and TDS of groundwater inflow predicted for the Underground was sensitive to the hydraulic conductivity assigned to the deep competent bedrock (below 200 m). The unfrozen weathered bedrock is not encountered in the Underground mine (that portion of the bedrock is frozen) and therefore, hydraulic conductivity of this shallow bedrock does not affect groundwater inflow predictions to the Underground.

Results of the sensitivity analysis were incorporated in the section of the parameters adopted in the EA Scenario, such that the EA Scenario predictions provide a reasonable yet conservative estimate of groundwater inflow and that there is a high level of confidence that the potential effects of the Expansion Project on groundwater inflow quantity and TDS have not been underestimated. Refinement of the model input parameters may affect the magnitude of effects on groundwater quantity/quality presented; however, conclusions are expected to remain unaffected.

Although direct thermistor measurements are not available for inferred open talik area in the South Basin of Whale Tail Lake, 1-D analytical and 2-D thermal analysis predict the open talik would be present. The assumption of an open talik below the South Basin is conservative with respect to the prediction of potential groundwater inflow to the dewatered open pit, as it allows for higher inflows and the potential interception of deeper saline groundwater by the open pit. If open talik is not present, groundwater inflows could be less than predicted and of better TDS quality.

Long-term post-closure predictions of groundwater flow to the Whale Tail Pit Lake would not be expected to be affected by the assumption of an open or closed talik, as the permafrost will eventually degrade below the pit foot print and connect the shallow talik to the deeper flow system. Predicted long-term post-closure flows from the pit lakes to the groundwater flow system were less than 2 m^3/day, which is negligible relative to the surface water exchange in Whale Tail Lake when water levels are re-established. These predictions are reasonable considering the low hydraulic conductivity of the competent bedrock and the potential hydraulic gradients that may be present between the regional lakes and Whale Tail Lake. This indicates long-term lake level in Whale Tail Lake will not be affected by the permafrost degradation, regardless of the current connection of the lake to the deep sub-permafrost groundwater flow system.

6.4.4.1 Mitigations

Although uncertainty exists in the model input parameters, steps have been taken to mitigate these uncertainties. Groundwater inflow predictions were completed using hydraulic conductivity values that are higher then expected conditions, thus resulting in conservative estimates of predicted inflow rates during operations, closure and post-closure. As additional mitigation, an extra storage pond is planned for the event that actual inflows (quantity or quality) are higher than predicted.

6.4.5 Monitoring and Follow-up

Monitoring programs implemented during the life of the Approved and Expansion Project may be a combination of environmental monitoring to meet conditions and follow up monitoring to verify the accuracy of effect predictions and adaptively manage and implement further mitigation as required.

In addition, upon issuance of Project Certificate No. 008, Agnico Eagle is required to undertake measures to protect, mitigate and monitor hydrogeological features, including:

- Providing information on potential project impacts on talik distribution and flow, through development and implementation of a Thermal Monitoring Plan (T&C #14; refer to Volume 8, Appendix 8-A.3);
- Understanding potential project effects on site-specific hydrogeological conditions and better understanding the potential effects of the existing environment on the Project through preparation of a Groundwater Monitoring Plan (T&C #15);
- Within two years of commencing operation, assess the potential for arsenic diffusion from the walls of Whale Tail Pit, in the Groundwater Monitoring Plan (T&C #16; refer to Volume 8, Appendix 8-E.3);

- Minimize the use of natural waters as practicable and limit potential impacts to the receiving environment from contact (site) water, including shallow groundwater, as outlined in Water Management Plan (T&C #18; refer to Volume 8, Appendix 8-B.2); and
- Within the CREMP, mitigate potential impacts to groundwater, surface waters and freshwater aquatic environment (T&C #13; refer to Volume 8, Appendix 8-E.10).

An updated monitoring plan for groundwater quantity and quality for the Expansion Project is provided in Volume 8, Appendix 8-E.3. This update is an addendum to the May 2018 Groundwater Monitoring Plan submitted following receipt of the Project Certificate No. 008 and outlines proposed seepage and sump monitoring in the open pits and underground to verify groundwater quality and quantity is consistent with model predictions, and triggers for reassessment.

Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NIRB. Agnico Eagle considers, the existing terms and conditions of the Project Certificate issued for the Approved Project are sufficient to protect, mitigate and monitor geological features, soils and permafrost impacts associated with the Expansion Project.

Any new required mitigation measures related to primary effects for the Expansion Project are described in relation to the predicted effects and summarized in pathway tables provided in Volume 3, Appendix 3-C.

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan and will update these as part of the NWB review process (refer to Volume 8).

6.5 Fish and Fish Habitat

This section provides an assessment of potential effects of the Project on fish and fish habitat (including lower trophic level organisms). As part of this FEIS Addendum, this section focuses primarily on the potential effects of the Expansion Project on the area within the Expansion Project footprint, as effects outside of the footprint have remained largely unchanged from the Approved Project.

The Expansion Project is expected to change the duration of effects previously assessed for the Approved Project. Thus, there were no new primary pathways identified. Effects of the Expansion Project are primarily related to:

- the direct loss of fish and fish habitat in lakes and watercourses within the footprint of the IVR Pit, WRSF, and Attenuation Pond;
- an increase to the duration of the effects caused by dike installations on Whale Tail and Mammoth lakes due to an extended operations timeline;
- the change in resulting habitat in Whale Tail Lake following post-closure, where the addition of the IVR Pit will increase the size of the lake compared to baseline;
- impacts to potential alternate discharge locations within the D watershed, which may be used to limit the impacts to the ecosystems in the A1 watershed by limiting the overall amount of phosphorus being added; and
- the increased duration of the closure phase, to refill the pits and underground mine.

A summary of the key changes to the assessment of the fish and fish habitat component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 6.5-0.

Table 6.5-0: Fish and Fish Habitat: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
6.5.1 Overview of VC Species Biology	Review of VC Species Biology • Arctic Grayling, Arctic Char, Lake Trout, and Round Whitefish	Additional VCs added • Burbot • Forage fish species (Ninespine Stickleback and Slimy Sculpin) added as an assessment endpoint (as part of fish habitat)
6.5.2 Incorporation of IQ	Review of • Whale Tail Pit Project IQ Baseline Report • Meadowbank Mine Baseline Traditional Knowledge Report • Proposed All-weather Exploration Road from the Meadowbank Mine to the Project Site-Baseline Traditional Knowledge Report • Community Consultations/Public Information Meeting Summary Reports for 2014 and 2015	Review of: • provided by community members since the Approved Project FEIS submission • Summary of meetings held with Agnico Eagle, DFO, and KIA • identified through a review of community consultation notes • during community consultation with Baker Lake and Chesterfield Inlet for the Expansion Project
6.5.3 Existing Environment and Baseline Information	Baseline fish and fish habitat summary from • 2014 Amaruq Exploration Road Baseline • 2015 Haul Road Baseline • 2015 Whale Tail Pit Baseline Report	Additional baseline data: • 2016 fish and fish habitat field investigations • 2016 and 2017 lower trophic field investigations • Whale Tail Pit Core Receiving Environment Monitoring Plan (CREMP) • 2018 fish and fish habitat sampling at potential alternative discharge locations
6.5.4 Effects Assessment	Primary pathways were assessed under the subheadings of • Direct Effects to Fish • Indirect Effects to Fish Methods and results were described.	Updates to the assessment were completed where changes to the mine plan for the Expansion Project affected fish and fish habitat (e.g., addition of IVR Pit, IVR WRSF, IVR Attenuation Pond, alternative discharge locations, updated water quantity and water quality predictions).
6.5.5 Residual Impact Classification	Residual impacts were classified for incremental and cumulative effects; cumulative effects not considered for fish and fish habitat as there were no other reasonably foreseeable developments in the assessment area where residual effects were predicted. Impacts ranged from low to moderate in magnitude, local to regional in geographic extent, and short-term to permanent in duration.	Residual impacts were reviewed, and the section was updated. Classification of impacts unchanged from the Approved Project.
6.5.6 Cumulative Effects Assessment	As no other reasonably foreseeable developments were present in the assessment area, any measurable effects of the Project to the productivity of the fishery (or support for the productivity of the fishery) would be restricted to the A1 assessment area within the RSA.	Unchanged
6.5.7 Assessment of Significance	The effects from the Project are expected to not have a significant adverse effect on fish and fish habitat VCs based on the weight of evidence from the analysis of primary pathways. Although Project-related effects were expected to be measurable at the population level for the VCs, the likelihood of any risk to the ongoing productivity of the fishery (or ongoing support for the productivity of the fishery) in the RSA was low.	Unchanged
6.5.8 Uncertainty	Key sources of uncertainty were identified.	The main sources of uncertainty were unchanged. It is recognized that additional sampling will be conducted, along with water quality modelling, to support the selection of Lake D1 or Lake D5 as an alternative discharge location.

Section of FEIS	Approved Project	Expansion Project
6.5.9 Monitoring and Follow-up	Monitoring plans relevant to fish and fish habitat include: • Dike Construction Monitoring Plan • Water Management Plan • Water Quality and Flow Monitoring Plan • Spill Contingency Plan • Core Receiving Environment Monitoring Plan • Habitat Compensation Monitoring Plan developed in during the Phaser Lake authorization phase • Conceptual Fisheries Offsetting Plan	Where appropriate, plans have been updated for the Expansion Project, including the Whale Tail Pit Expansion- Conceptual Fisheries Offsetting Plan (Volume 8, Appendix 8-E.4)

6.5.1 Overview of VC Species Biology

For an overview of Arctic Grayling, Arctic Char, Lake Trout, and Round Whitefish refer to the Approved Project FEIS Volume 6, Sections 6.1.2.1.1 to 6.1.2.14 (Agnico Eagle 2016c).

6.5.1.1 Burbot

Burbot spawning in Canada occurs in winter, usually between January and March when the water temperature is between 0.6°C and 1.7°C (Scott and Crossman 1998). Burbot are broadcast spawners and typically prefer shallow areas (up to 3 m deep) with sand, gravel, and/or cobble substrates (Scott and Crossman 1998; Richardson et al. 2001). After fertilization, the eggs settle into interstices of the substrate and will incubate from three weeks to three months depending on water temperature (Goodyear et al. 1982; Scott and Crossman 1998). Burbot may also spawn under the ice in watercourses, although the watercourses within the RSA likely freeze to bed during the typical Burbot spawning period.

Burbot fry are found primarily in pelagic habitat dominated by sand and gravel substrates, and transition to benthic littoral feeding and more nocturnal activity when they reach 20 to 40 mm in length (McPhail 1997; Richardson et al. 2001). Burbot are known to be sensitive to sub-surface illumination; they will seek shelter under stones, roots, and in aquatic vegetation during the day (McPhail and Lindsey 1970). Adult Burbot are primarily piscivorous, likely feeding on forage species (Ninespine Stickleback and Slimy Sculpin) and juvenile whitefish in the RSA.

6.5.2 Incorporation of Inuit Qaujimajatuqangit

Available IQ was included throughout the EA for fish, beginning with the identification of the VC fish species, such as Lake Trout and Arctic Char, which are the preferred fish species harvested for food that occur in several of the lakes located in the Project area. Arctic Grayling are also harvested but are not found within the LSA (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c).

During the Approved Project FEIS submission, it was noted by Baker Lake Elders that fishing occurs in both lakes and rivers, depending on the season and the availability of fish (Agnico Eagle 2014d). Fish provide an important secondary source of food after caribou to the residents of Baker Lake, and fishing is a year-round activity that occurs throughout the area. During the famine times when caribou were scarcely available, some families are completely dependent on fish for sustenance (Mannik 1998).

The IQ Baseline Report was considered when evaluating the Expansion Project effects for the impact assessment (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Good fishing sites are located to the east of the footprint, including at Nutipilik Lake, Qugiilik Lake, and Tahinajuk Lake (Figure 6.1-2). Elders noted that although Lake Trout are found throughout the region, the lakes near Whale Tail Pit are not commonly fished as there are other preferred lakes. Several lakes were also identified as areas used in the past for fishing, including Hiatuuq Lake, Kivgajulik Lake, Haninajuq Lake, Uiguklik Lake, and Tasirjuaraajuk Lake (Pipedream Lake) (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c) (Figure 6.1-2). Several Elders noted that they or other community members used the area along the haul road for fishing with their families when they were younger. Youth stated that fishing occurs throughout the year, in open water and under ice, and sometimes using nets (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c).

Elders noted that Arctic Char run from the middle to the end of August, and spawn later in October after the ice forms. Historically, the Elders noted that there were many fish in the area between the Meadowbank River and the Meadowbank Mine (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c), knowledge reinforced by the following story a land user heard when he was younger about a lake in the Approved Project area: “even a blind man could catch fish by scooping them out of the lake, because there were so many fish”. Whitefish (coregonid species) were observed to migrate up the river after trout had finished migrating, and the presence of small birds around camp was an indication that the whitefish would be coming soon (Mannik 1998). Burbot and Northern Pike were also observed near the community, and lamprey were potentially found in Baker Lake (Agnico Eagle 2014d).

Additional IQ and concerns related to fish and fish habitat was provided by community members since the FEIS submission was made in 2016 for the Approved Project. This assessment takes into account review of community consultation notes from Agnico Eagle (2016a, b, e), NIRB and NWB (2017), and NIRB (2017), as well as during community consultation with Baker Lake and Chesterfield Inlet for the Expansion Project (Agnico Eagle 2018a). Baker Lake community members indicated that Arctic Char (non-anadromous and anadromous), whitefish (coregonid species), Arctic Grayling, and Lake Trout are an important part of their diet; however, Arctic Char is the preferred species (Agnico Eagle 2018a). Chesterfield Inlet community members also reported they rely on Arctic Char, including fish caught in salt water, rivers, and/or lakes, but the community relies on their own populations of fish from local lakes (Agnico Eagle 2018a).

Different Inuktitut names are given to the fish based on the stage of their lifecycle (i.e., changing appearance) and type of waterbody they inhabit (e.g., lake versus sea). There are also differences based on regional dialect; for example, Arctic Char has four different names (Agnico Eagle 2018a).

The Baker Lake community members noted that fish species will migrate differently depending on their diets, with some going up rivers, and others travelling downriver (Agnico Eagle 2018a). Fish typically spawn in one main lake, and will travel up and down the east river, and north; however, when the rivers are low, they cannot migrate back to the lake (Agnico Eagle 2018a). Arctic Char are considered the strongest of the fish species which fight to migrate up rivers (Agnico Eagle 2018a). Certain areas of the river are considered hard for Arctic Char to migrate through because of barriers to migration, and the Baker Lake community members have facilitated Arctic Char migration by opening up the creek (i.e., removing boulders) to improve water flow and fish migration.

How Arctic Char migrate, and change from living in salt water to fresh water was explained by the Baker Lake community members:

> *“They don’t go down to Hudson Bay, char we see have their system of going up river for winter and come down for summer. Now, [the] system they go through that they have to before [travelling up] river, [is to] prepare themselves down on the coast to take in freshwater. If they go up the river they don’t go today and [the] next day, they have to acclimatize. Two types of Char* (Agnico Eagle 2018, p.45)

> *Down coast, char will go up rivers up as far as 80 miles, and will go to the same spot every year. That is changing because of climate change* (Agnico Eagle 2018a, p.45)"

It was noted by community members that shallow lakes can also support fish, even when they freeze to the bottom because fish are cold-blooded and will often survive (Agnico Eagle 2018a). The fish freeze into the ice, and in the spring they thaw out and are able to swim again; however, in certain smaller lakes, some fish freeze to death (Agnico Eagle 2018a).

Preferred fishing sites were identified close to the Baker Lake community, and include Airplane Lake, Baker Lake, and Prince River, but it was noted that fish caught further away from town taste better than fish caught close to town (Agnico Eagle 2018a). Airplane Lake is no longer considered as good for fishing because of sewage and poor water quality (Agnico Eagle 2018a). Fishing in Baker Lake occurs year round but primarily in the spring (Agnico Eagle 2018a). Some Arctic Char in Baker Lake migrate down the Prince River and are caught in the rapids (Agnico Eagle 2018a). It was noted that Prince River may have barriers for Arctic Char traveling to their spawning grounds because of low water levels and boulders (Agnico Eagle 2018a).

The Baker Lake community members indicated that the quality of fish depends on the year and their age; during some years, fish are thin and do not provide enough meat, but are still fed to dogs (Agnico Eagle 2018a). Baker Lake Elders explained that if fish are moved from their natural habitat to another habitat, they are unable to get the fat or nutrition they need, and ultimately they become 'different' fish (Agnico Eagle 2018a).

6.5.2.1 Baseline

Baseline information was collected using western scientific methods and information provided through consultations and engagement with Inuit Elders and local community members, refer to the Approved Project FEIS Volume 6, Section 6.5.2 for additional details.

6.5.2.2 Environmental Assessment

Inuit Qaujimajatuqangit was considered in the identification and classification of pathways during the Approved Project FEIS submission and has been considered as part of the Expansion Project. For example, any concerns related to mining development were captured within an appropriate pathway, and then analyzed as no linkage, secondary, or primary.

Engagement with community members after the Approved Project FEIS submission brought forward additional concerns related to fish and fish habitat. These were identified through a review of community consultation notes Agnico Eagle (2016a, b, e), NIRB and NWB (2017), and NIRB (2017), as well as during community consultation with Baker Lake and Chesterfield Inlet for the Expansion Project (Agnico Eagle 2018a). The following Project concerns were expressed by Baker Lake and Chesterfield Inlet community members related to fish:

- Potential adverse effects of mine water (i.e., contact water) on lakes and fish populations, including areas downstream, and contamination of fish eggs (Agnico Eagle 2018a).
- The water treatment process to make sure conditions are safe for fish (Agnico Eagle 2016b).
- Potential effects of blasting on fish (NIRB and NWB 2017).
- Potential effects of noise from bridge construction and use on fish, and the implementation of regulations for bridge construction over fish bearing waters (NIRB and NWB 2017).

- The managing and monitoring of dust and dust suppression chemicals to prevent or minimize harm to fish in the Project area (NIRB and NWB 2017).
- Baker Lake community members expressed disappointment with the fish-out for Meadowbank, including the number of fish that died (NIRB and NWB 2017), and are concerned about the dewatering and fish-out process for the Project in general, including the potential for fish injury and mortality (Agnico Eagle 2016d, e, i; NIRB and NWB 2017; NIRB 2017).
- The potential for increased fish mortality because of their sensitivity to being handled and to being transferred during warm temperatures in the summer (NIRB 2017).
- Fish return at closure, including whether fish transferred to the re-flooded pits after the Meadowbank Dike is decommissioned will have suitable conditions to support healthy fish populations, including water quality and food sources to prevent mortality (Agnico Eagle 2016a, NIRB and NWB 2017, NIRB 2017).

The IQ and Project concerns as they pertain to the Expansion Project have been incorporated into Section 6.5.4 of the FEIS Addendum.

6.5.2.3 Mitigation and Monitoring

Through the pathway analysis, IQ informed mitigation related to any potential effects on fish and fish habitat for the Project (Volume 3; Appendix 3-C, Table 3-C-7). For example, the Spill Contingency Plan (Volume 8, Appendix 8-D.5) will be implemented to prevent effects from emergency spills, a key concern for local Inuit, and the Water Management Plan (Volume 8, Appendix 8-B.2) will address Inuit concerns related to decreases in downstream flows and dewatering and contact with mine water. Losses to fish and fish habitat from dewatering, diversions, and flooding will also be managed.

6.5.3 Existing Environment and Baseline Information

Standard methods for fisheries inventories and lower trophic communities were deployed in the streams and lakes sampled in the RSA (Volume 6, Appendix 6-D, Appendix 6-J, Appendix 6-K; Portt 2018). Fishing efforts were also recorded with catch data to calculate catch-per-unit effort per study site. Fish and fish habitat baseline studies were completed in 2014, 2015, and 2016 in the RSA including the areas in close proximity to the haul road (Volume 6, Appendix 6-D; Appendix 6-J) and Whale Tail Pit area (Portt 2018). Lower trophic community (phytoplankton, zooplankton, benthic invertebrates, and periphyton) baseline studies were completed in close proximity to the Whale Tail Pit in 2014, 2015, 2016, and 2017 (Volume 6, Appendix 6-G; Portt 2018).

6.5.3.1 Haul Road Area

6.5.3.1.1 Methods

Baseline studies for the haul road are summarized in Volume 6, Appendix 6-D and Appendix 6-J. Minor route adjustments were identified for the haul road since 2015 as detailed design continued, and the road width will increase from 9.5 m to 15 m; however, no additional watercourses or waterbodies are crossed and existing crossings are either the same or have moved short distances (i.e., less than 50 m). Crossing methods remain the same for each watercourse, although the increase in road width will result in increased culvert lengths, and potentially bridge widths, at each crossing.

6.5.3.1.2 Results

The results in the Approved Project FEIS focus on those presented in the 2015 Road Baseline Report (Volume 6, Appendix 6-D), which emphasized fish and fish habitat data for the 2015 haul road alignment.

6.5.3.2 Whale Tail Pit, A53, and IVR Pit Area

6.5.3.2.1 Methods

6.5.3.2.1.1 Fish and Fish Habitat

Fish and fish habitat baseline studies were completed in the headwaters of the A and C watersheds in the vicinity of the Whale Tail Pit, A53, and IVR Pit from 2014 to 2016. Detailed baseline data collection methods, dates, and locations can be found in the Whale Tail Pit Baseline Report (Portt 2018) and the CREMP Report (Volume 6, Appendix 6-G), with 2014 and 2015 methods summarized in the Approved Project FEIS. Portt (2018) provides sampling location maps and detailed methods used from 2014 to 2016.

6.5.3.2.1.2 Lower Trophic Communities

Baseline sampling for lower trophic aquatic communities (phytoplankton, zooplankton, benthic invertebrates, and periphyton) was completed between 2014 and 2017 (Portt 2018; Azimuth 2018a) to characterize baseline conditions for lower trophic communities. Additional details related to sampling locations and methods are provided in the Whale Tail Pit CREMP (Azimuth 2018a). Refer also to updated addendum to CREMP in Volume 8, Appendix 8-E.10. A summary of lakes and components sampled during the 2014 to 2017 baseline programs are summarized in Table 6.5-1.

Table 6.5-1: Lakes Sampled for Lower Trophic Communities, 2014 to 2017

Lake	Year[a]	Phytoplankton	Zooplankton	Benthic Invertebrates	Periphyton
Lake A16 (Whale Tail)[b]	2014[a]	✓	-	✓	-
	2015[a]	✓	✓	✓	✓
	2016[c,d]	✓	-	✓	-
	2017[c,d]	✓	-	✓	-
Lake C38 (Nemo)	2014[a]	✓	-	✓	-
	2015[a]	✓	✓	✓	✓
	2016[d]	✓	-	✓	-
	2017[d]	✓	-	✓	-
Lake A16 (Mammoth)	2014[a]	✓	-	✓	-
	2015[a]	✓	✓	✓	✓
	2016[d]	✓	-	✓	-
	2017[d]	✓	-	✓	-
Lake A53	2015	-	-	-	✓
Lake A76	2016[d]	✓	-	✓	-

Lake	Year[a]	Phytoplankton	Zooplankton	Benthic Invertebrates	Periphyton
	2017[d]	✓	-	✓	-
Lake A20	2016[d]	✓	-	✓	-
	2017[d]	✓	-	✓	-
Lake DS1[e]	2016[d]	✓	-	✓	-
	2017[d]	✓	-	✓	-

[a] The 2014 sampling program included one sampling event in September. The 2015 sampling program included three sampling events during the open water period (July, August, and September).
[b] In 2015, Whale Tail Lake was divided into two basins, the Whale Tail Lake (North Basin) and Whale Tail Lake (South Basin) with five replicates sampled within each basin.
[C] The north basin of Whale Tail Lake was not sampled for phytoplankton in 2016 and 2017.
[d] Phytoplankton sampling occurred in April, July, August, September, November 2016 and March, May, July, August, November 2017.
[e] Lake DS1 is located immediately downstream of the RSA
"-" indicates sampling not completed.

6.5.3.2.2 Results

6.5.3.2.2.1 Fish Habitat

Lakes

Bathymetric surveys of 19 lakes (3 large [>100ha] and 16 small [<100 ha]) in the LSA identified Lake A17 (Whale Tail Lake) as the largest lake by both surface area and volume. Coarse substrates (i.e., gravel, cobble, boulder, and bedrock) dominated the littoral zone of both Lake A16 (Mammoth Lake) and Whale Tail Lake. The 16 small lakes surveyed for bathymetry ranged in maximum depths from 1.8 m in Lake A55 to 25.0 m in Lake A20. Surface areas ranged from 3.0 ha in each Lakes A47 and A49 to 63.0 ha in Lake A65 (Volume 6, Appendix 6-M).

Lake Trout spawning habitat was investigated in Whale Tail Lake during late-August 2016 (Portt 2018). A total of 15 high-potential spawning shoals were identified throughout the lake, based on depth, substrate, and slope, A total of 11 underwater video cameras deployed from August 27 to 31, 2016 were used to detect fish presence at these shoals in an attempt to verify spawning shoal locations. Although no spawning was observed, Lake Trout were the most frequently observed fish species at these shoal locations, and one instance of a male Lake Trout following a female was recorded, which is behavior often associated with spawning. Data collection was limited to daylight hours due to technological constraints, which may have attributed to the lack of observed spawning behavior which most frequently takes place after dark. Lake Trout spawning was not assessed at other lakes within the Whale Tail Pit area.

Streams

Fish habitat was assessed at 31 headwater streams of the A watershed, 28 of which are in the LSA. Stream measurements were taken at 12 of these streams during the Hydrology Baseline Study in June 2015 (Volume 6, Appendix 6-C). Habitat was also characterized and quantified along numerous transects (4 to 12 transects per watercourse) at 10 of the 12 streams during the fisheries baseline study in 2016. Stream drainage areas and wetted widths from the June 2015 Hydrology Baseline Study are provided in Volume 6, Appendix 6-C, Appendix A, and the quantified transect data from the 2016 fisheries baseline studies are provided in Portt 2018, Section 5.2. One potential stream (A49-A17) was deemed not to be a watercourse when investigated in the field. Of the remaining 30 streams, 19 were coarse-substrate (i.e., boulder, cobble, or gravel) dominant, and 11 were fine-substrate (i.e., peat, tundra, or sand) dominant. Most streams (*n* = 17) had interstitial flow (i.e., water flowing through the interstitial spaces among boulders and cobbles) at some time during the year. Eight streams had surface flow (i.e., water present above the substrate) year-round. Five streams had ephemeral flows and would likely be dry in late summer (Portt 2018, Table 5-1).

Volume 6, Appendix 6-C describes the Mammoth Lake and Whale Tail Lake outlet channels. For both channels, surface flows are highest when lake levels are high in the spring, with water primarily flowing under boulders during summer and fall, as water levels decline (Portt 2018). Passage of large-bodied fish (e.g., Lake Trout) between Mammoth Lake and Whale Tail Lake is possible, but only during spring conditions.

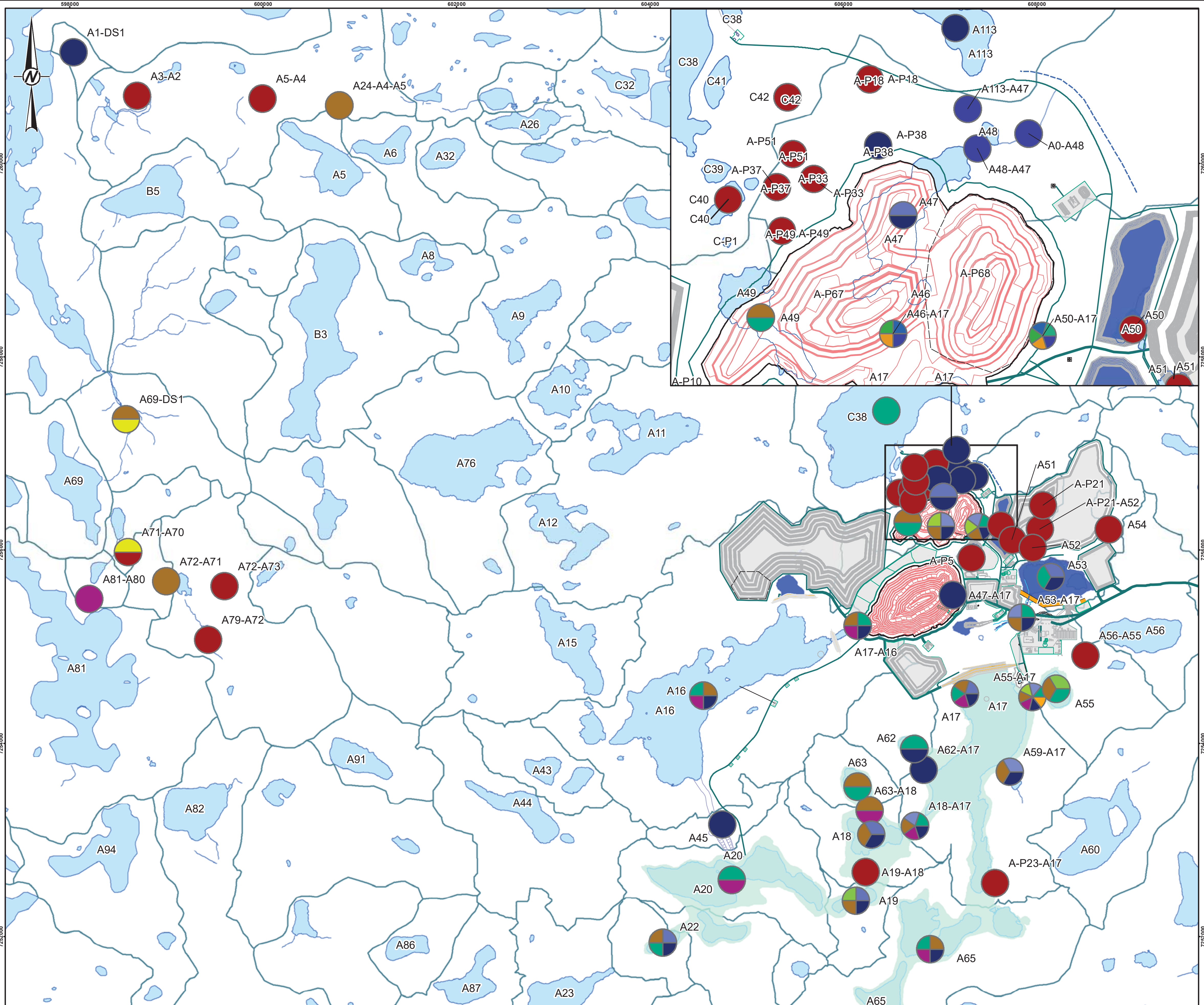
There are two routes whereby water flows between Mammoth Lake and Lake DS1 (Figure 3.2-4). Downstream flows branch off at Lake A12 and again at Lake A76 and flow to Lake DS1 via both Lake A10 and Lake A75. Sufficient surface flow was observed along the primary flow path (via Lake A1 through Lake A15) to allow large-bodied fish to migrate between Lake DS1 and Mammoth Lake, although a long, steep set of rapids identified approximately 300 m upstream from Lake DS1 may act as a migration barrier. Electrofishing along this flow path resulted in five Arctic Grayling captured downstream of the rapids but no Arctic Grayling captured at any site upstream of the rapids. The secondary flow path (via Lake A69 through A15) had migration barriers in the form of interstitial flows through large boulder fields that create poor surface connections between Lake A72 and A73 and between A75 and A76. These barriers would not allow for large-bodied fish migration between Lake DS1 and Mammoth Lake via the secondary flow path.

6.5.3.2.2.2 Fish Populations

A total of 2,270 fish were captured during baseline sampling in lakes and streams in the RSA near the Whale Tail Pit area (Figure 6.5-1) from 2014-2016. Seven species were captured: Arctic Grayling, Arctic Char, Lake Trout, Round Whitefish, Burbot, Slimy Sculpin, and Ninespine Stickleback.

Lakes

In Whale Tail Lake and Mammoth Lake combined, Ninespine Stickleback was the most abundant species captured in the catches (n = 97, 40%), followed by Lake Trout (n = 84, 35%) (Table 6.5-2). Arctic Char were captured in Whale Tail Lake, but not in Mammoth Lake. In Lake C38 (Nemo Lake), only Lake Trout were captured (Table 6.5-2). In small lakes overall, Ninespine Stickleback were the most abundant species in the catches, followed by Lake Trout and Slimy Sculpin (Table 6.5-2).



LEGEND

- WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ROAD
- WATERCOURSE
- WATERBODY

FISH SPECIES CAUGHT

- LAKE TROUT
- ARCTIC CHAR
- BURBOT
- SLIMY SCULPIN
- ROUND WHITEFISH
- NINESPINE STICKLEBACK
- SALMONOID
- ARCTIC GRAYLING
- NO FISH CAUGHT

0 0.8 1.6

1:40,000 KILOMETRES

REFERENCE(S)

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED, DRAWING AMQ_2025Q4V7.DWG.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT/CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

FISH PRESENCE IN LAKES AND STREAMS IN THE A AND C WATERSHEDS OF THE MEADOWBANK RIVER

CONSULTANT

GOLDER

YYYY-MM-DD	2018-11-15
DESIGNED	EH
PREPARED	CDB
REVIEWED	JR
APPROVED	DF

PROJECT NO.	CONTROL	REV.	FIGURE
1896037	2400/2405	0	6.5-1

Table 6.5-2: Fish Captured in Lakes in the A and C Watershed of the Meadowbank River, 2014 to 2016

Lake	GN Effort (h-soak time)	EF Effort (s)	LKTR	ARCH	RNWH	BURB	SLSC	NNST	UNID	Total
Large Lakes (> 100 ha)										
Lake A16 (Mammoth)	90.32	3,922	49	0	20	0	13	42	1	125
Lake A17 (Whale Tail)	91.45	3,403	35	4	7	0	16	55	2	119
Lake C38 (Nemo)	27.31	-	22	0	0	0	0	0	0	22
Small Lakes or Ponds (< 100 ha)[a]										
Lake A47	2.25	244	0	1	0	0	0	100[b]	0	101
Lake A49	2.52	893	3	0	0	0	3	0	0	6
Lake A50	-	284	0	0	0	0	0	0	0	0
Lake A51	-	200	0	0	0	0	0	0	0	0
Lake A52	-	360	0	0	0	0	0	0	0	0
Lake A53	2.38	1,334	1	2	0	0	0	2	0	5
Lake A-P38	-	306	0	0	0	0	0	1	0	1
Grand Total	**216.23**	**10,946**	**110**	**7**	**27**	**0**	**32**	**200**	**3**	**379**

Note: Catches are for all gear types combined. Effort is only reported in table for gill net and backpack electrofishing; hoop net and minnow trap efforts were not included in the table, but are provided in Volume 6, Appendix 6-L; catch data for waterbodies outside of the Expansion Project footprint are included in Volume 6, Appendix 6-L.

[a] Ponds where no fish were caught were not included in the table.

[b] In Lake A47, greater than 100 Ninespine Stickleback were captured. However, field enumeration ceased at 100 individuals. For the purpose of this species summary, only 100 individuals were used in species composition calculations.

GN=gill net, EF=backpack electrofishing, h = hours, s=seconds, LKTR = Lake Trout, ARCH = Arctic Char, RNWH = Round Whitefish, BURB = Burbot, SLSC = Slimy Sculpin, NNST = Ninespine Stickleback, UNID = Unidentified salmonid.

Streams

In streams in the LSA and RSA, Ninespine Stickleback were the most abundant species, followed by Slimy Sculpin, and Arctic Char (Table 6.5-3). The majority of the fish were captured by electrofishing.

Table 6.5-3: Fish Captured in Streams in the A Watershed of the Meadowbank River, 2014-2016

Stream	EF Effort (s)	ARGR	LKTR	ARCH	RNWH	BURB	SLSC	NNST	UNID	Total
Stream A0-A48	196	0	0	0	0	0	0	2	0	2
Stream A113-A47	68	0	0	0	0	0	0	1	0	1
Stream A17-A16	2,639	0	3	0	1	0	5	1	0	10
Stream A46-A17	4,268	0	0	4	0	1	44	919	0	968
Stream A47-A46	136	0	0	0	0	0	1	0	0	1
Stream A50-A17	3,362	0	1	5	0	1	19	96	0	122
Stream A53-A17	9,737	0	4	10	0	0	175	112	0	301
Stream A-P21-A52	78	0	0	0	0	0	0	0	0	0
Stream A47-A17	500	0	0	0	0	0	0	1	0	1
Stream A48 –A47	1,403	0	0	0	0	0	0	6	0	6
Grand Total	**22,387**	**0**	**8**	**19**	**1**	**2**	**244**	**1,138**	**0**	**1,412**

Note: Catches are for all gear types combined. Effort was reported in table for backpack electrofishing; hoop net, minnow trap, and gill netting efforts were not included in the table, but are provided in Volume 6, Appendix 6-L. Catch data for watercourses outside of the Expansion Project footprint are included in Volume 6, Appendix 6-L.

EF=backpack electrofishing, s=seconds, ARCH = Arctic Char, ARGR = Arctic Grayling, BURB = Burbot, SLSC = Slimy Sculpin, NNST = Ninespine Stickleback, UNID = Unidentified salmonid.

6.5.3.2.2.3 Lower Trophic Communities

The results of the baseline sampling programs are presented in Azimuth (2018a). A brief summary of the results is provided in the sections below.

Phytoplankton

Six major taxonomic groups of phytoplankton were present in the lakes, which included Cyanobacteria (blue-green algae), Chlorophyceae (chlorophytes or green algae), Chrysophyceae (chrysophytes or golden-brown algae), Bacillariophyceae (diatoms), Cryptophyceae (cryptophytes or cryptomonads) and Dinophyceae (dinoflagellates). Chrysophytes were the dominant taxonomic group in terms of density and biomass in Whale Tail Lake and Mammoth Lake. Phytoplankton taxonomic richness (at the lowest practical level) was variable among lakes and sampling events but was generally between 30 and 40 taxa in Whale Tail Lake and Mammoth Lake between 2014 and 2017. Phytoplankton density in the Whale Tail Pit study lakes generally exceeded 1 million cells per litre (cells/L) during the open water period (July to September), with total biomass ranging between approximately 60 mg/m^3 and 360 mg/m^3.

Zooplankton

No new data was collected for zooplankton following submission of the Approved Project.

Benthic Invertebrates

Benthic invertebrate abundance and richness in the Whale Tail Pit study lakes were characteristic of depositional areas in northern lakes with low productivity and nutrient cycling. Insects, primarily chironomids in the subfamilies *Chironominae* and *Tanypodinae*, and *Sphaeriidae* (fingernail clams) were the dominant benthic invertebrate groups in the Whale Tail Pit study lakes between 2014 and 2017.

There was spatial variability among station areas, years, and between replicates in benthic invertebrate abundance. Benthic invertebrate abundance and richness were generally low at most stations between 2014 and 2017*.* Average taxonomic richness in the Whale Tail Pit study lakes ranged from 9 to 16 taxa between 2014 and 2017. The highest abundances were observed in Whale Tail Lake in 2017, which also had the highest within lake spatial variability in abundance.

Periphyton

No new data was collected for zooplankton following submission of the Approved Project.

6.5.3.3 Alternative Discharge

6.5.3.3.1 Methods

6.5.3.3.1.1 Fish and Fish Habitat

To support the FEIS Addendum, fish and fish habitat baseline studies were completed at Lake D1 and Lake D5 in August 2018. The field program included reconnaissance of habitat conditions and photographs of both waterbodies. Fish sampling was conducted using backpack electrofishing and short-set gillnetting. Each net set was of two gangs of North American standard gillnets joined with a spanner.

6.5.3.3.1.2 Lower Trophic Communities

Baseline sampling for phytoplankton and benthic invertebrates was completed at Lake D1 and Lake D5 in summer 2018 to characterize baseline conditions for lower trophic communities. An overview of the methods is provided below.

Phytoplankton samples were collected at two locations by Azimuth according to the Meadowbank CREMP SOP (Azimuth 2015). Water samples were collected for phytoplankton biomass (as biovolume), abundance (density) and taxonomy, and chlorophyll *a* (included as part of the water quality monitoring component) concurrent with water sampling. Samples were collected from a depth of 3 m using the pump and tubing system, preserved using Lugol's iodine solution and sent to Plankton-R-Us Inc (Winnipeg, MB).

Benthic invertebrate samples were collected at five locations for abundance and taxonomic richness, according to methods outlined in the Meadowbank CREMP SOP (Azimuth 2015). Samples were collected using a Petite Ponar grab (0.023 m^2) and sieved through a 500-µm mesh bag. Samples were preserved in 10% buffered formalin and sent to ZEAS (Nobleton, ON).

6.5.3.3.2 Results

6.5.3.3.2.1 Fish and Fish Habitat

The proposed alternate discharge locations, Lake D1 and Lake D5, are in the D watershed (i.e., the watershed located immediately south of the A watershed). The D watershed is a sub-watershed of the Thelon River watershed. Lake D1 has a drainage area of 112 km^2 and Lake D5 has a drainage area of 5.8 km^2.

Bathymetric surveys conducted in Lake D1 and Lake D5 indicated that the maximum depth for both lakes was in the 15 to 19 m range. Shorelines generally had a shallow slope and coarse substrates (i.e., gravel, cobble, boulder, and bedrock) dominated the littoral zones of both of these lakes.

Fish sampling results for backpack electrofishing and gillnetting are shown in Table 6.5-4 and Table 6.5-5, respectively. Fish species captured in Lake D1 were: Lake Trout, Burbot, Arctic Char, Round Whitefish, and Slimy Sculpin. Species captured in Lake D5 included: Lake Trout, Arctic Char, Slimy Sculpin, and Ninespine Stickleback.

Table 6.5-4: Fish Captured during Backpack Electrofishing in Lake D1 and Lake D5 in 2018

Lake	Distance Electrofished (m)	Ninespine Stickleback	Slimy Sculpin	Juvenile Burbot	Juvenile Arctic Char
Lake D1	223	0	27	1	7
Lake D5	328	1	23	0	3

Table 6.5-5: Fish Captured during Gillnetting in Lake D1 and Lake D5 in 2018

Lake	Location	Soak time (hrs)	Lake Trout	Arctic Char	Round Whitefish
Lake D1	GN63	3.08	3	0	0
	GN64	3.33	0	0	1
	GN63	3.67	1	0	0
	GN64	2.92	0	0	0
Lake D5	GN65	3.42	3	0	0
	GN66	3.50	3	0	0
	GN65	3.08	0	0	0
	GN67	3.00	1	1	0

6.5.3.3.2.2 Lower Trophic Communities

Results for the phytoplankton and benthic invertebrate analyses will be available in 2019 following taxonomic analyses. These results will be provided in a supplemental report.

6.5.3.4 Baseline Summary

Lake Trout and Round Whitefish are the dominant large-bodied species followed by Arctic Char in the lakes surveyed in the A and C watersheds. Ninespine Stickleback and Slimy Sculpin commonly occur across habitats sampled. Burbot are uncommon in the baseline data, and Arctic Grayling are not found in the Whale Tail Pit LSA in the upper A and C watersheds and are restricted to downstream locations within the RSA. A similar fish species assemblage was found during initial sampling in Lake D1 and Lake D5 in the D watershed.

The lakes in the A and C watersheds had phytoplankton community composition and biomass similar to, but slightly lower than, that observed in the reference lakes (i.e., INUG and PDL). The zooplankton community was dominated by copepods with low abundance of cladocerans and the benthic invertebrate community was dominated by insects with consistently higher densities in the study lakes in the LSA compared to the reference lakes. Periphyton coverage was considered spatially heterogeneous with low to moderate cover.

The nature of the connecting channels (i.e., channel dimensions are wide and flat, flows are shallow or subsurface, extensive boulder fields are common) between lakes and streams in the RSA may prevent fish access to headwater lakes, as similarly described for the fish distributions at the Meadowbank Mine (Cumberland 2005d). Movements of large-bodied fish between lakes may be limited to the spring freshet period; however, juveniles or forage fish species may use stream connections for foraging and migration habitat.

6.5.4 Potential Expansion Project-related Effects Assessment

A comprehensive analysis of the potential pathways for effects on fish and fish habitat during the construction, dewatering, operational, closure, and post-closure phases of the Expansion Project, is provided in Volume 3, Appendix 3-C, Table 3-C-7. The pathways include those that address Inuit concerns on the potential effects of mining development on fish and fish habitat.

The scale of the assessment area for the primary pathways is the A and C watersheds, which includes lakes and streams above Lake A1 but does not include lakes and streams above Stream A76-75, and is limited to Lake C38 (Nemo Lake) in the C watershed. Refer to rationale provided in Section 6.1.2.1 of the FEIS Addendum. The Project activities that may result in residual effects to fish and fish habitat are primarily located in the A watershed of the Meadowbank River, specifically the A1 assessment area. The Project is anticipated to have negligible residual effects on fish and fish habitat outside of the A1 assessment area. The A1 watershed assessment area does not support Arctic Grayling (Section 6.5.3.2.2), and therefore, the primary pathways under examination for the Project include those for Arctic Char, Lake Trout, Round Whitefish, and Burbot. The D watershed was considered as the assessment area for the alternative discharge locations (i.e., Lake D1 or Lake D5); however, only the primary pathway related to operational discharge was relevant for this assessment area.

The following are the primary pathways for Expansion Project that require effects analysis to determine the environmental significance from the Project on fish and fish habitat:

- The construction of the IVR Pit and WRSF will result in the direct loss of fish habitat.
- Dewatering of Lake A53 and its use as the IVR Attenuation Pond will result in the direct loss of fish habitat in Lake A53 and the watercourse immediately downstream of Lake A53 (Stream A53-A17).
- The dewatering of the smaller waterbodies and watercourses in the northeast area will result in the direct loss or alteration of fish habitat.
- The dewatering of the smaller waterbodies in the northeast area will result in the removal and subsequent mortality of fish from the area during the proposed fish-out.
- Water diversions for the Whale Tail Dike during operations will extend the flooding period of tributary lakes and streams and result in the alteration of fish habitat.
- During the construction and operations of the Whale Tail, Mammoth, and WRSF dikes, water diversions will result in a reduction of water levels in Mammoth Lake and downstream locations, affecting fish and fish habitat.
- Refilling of the diked area in Whale Tail Lake and Mammoth Lake at closure will affect water levels in Mammoth Lake and downstream locations, resulting in effects to fish and fish habitat.
- Operational activities and discharge (e.g., discharge of treated domestic wastewater, altered drainage, runoff from facilities, including WRSFs, pit inflows, dike seepage, release of nitrogen compounds from blasting residues) may change trophic status, affecting fish and fish habitat in Whale Tail Lake, Mammoth Lake, downstream waterbodies, and possibly Lake D1 or Lake D5 (potential alternative discharge locations).
- Reconnection of the refilled area of Mammoth Lake and Whale Tail Lake to the remaining watershed may change long-term trophic status in Whale Tail Lake, Mammoth Lake and downstream waterbodies, affecting fish and fish habitat.

6.5.4.1 General Approach

The general approach for the effects assessment for the primary pathways is consistent with the Approved Project, and details are provided in Sections 3.5 to 3.7 of the FEIS Addendum. For fish and fish habitat, the residual impact classification focuses on the assessment endpoints of ongoing fisheries productivity and ongoing support for fisheries productivity.

6.5.4.2 Direct Effects to Fish

Inuit concerns regarding fish populations and their habitat at mining developments include effects from habitat losses, dewatering of waterbodies (Cumberland 2005a), and contact with mine water (Agnico Eagle 2018a). The following primary pathways which have direct effects to fish and fish habitat from the Project were evaluated:

- The construction of the IVR Pit and WRSF will result in the direct loss of fish habitat.
- Dewatering of Lake A53 and its use as the IVR Attenuation Pond will result in the direct loss of fish habitat in Lake A53 and Stream A53-A17.
- The dewatering of the smaller waterbodies and watercourses in the northeast area will result in the direct loss or alteration of fish habitat.
- The dewatering of the smaller waterbodies in the northeast area will result in the removal and subsequent mortality of fish from the area during the proposed fish-out.
- Water diversions for the Whale Tail Dike during operations will extend the flooding period of tributary lakes and streams and result in the alteration of fish habitat.

6.5.4.2.1 Methods

Methods related to changes in available habitat are described in the Approved Project FEIS. The development of the Expansion Project is expected to directly affect the availability of habitat through losses or alterations of fish habitat incurred by footprints in lakes A46, A47, A49 and A53, as well as adjacent smaller lakes and streams. The greatest changes will be a result of the construction of the IVR Pit, as well as dewatering of the northeastern portion of the project area where the IVR Pit, WRSF, and attenuation pond will be located. As a conservative approach to the assessment, it is assumed that the effect to both available habitat and the abundance of fish are proportional to the loss in fisheries productivity in lakes A46, A47, A49, and A53 (DFO 2014).

Habitat Calculations

As described in the Approved Project FEIS, the assessment of fish and fish habitat VCs relied on a baseline database of species distributions in the LSA, combined with available spatial data on existing and proposed developments with surface waters within the LSA. The biological database was used to characterize the fish assemblage of the A1 assessment area, with an emphasis on lakes A46, A47, A49, and A53, as well as surrounding stream and lake tributaries.

Habitat calculations for the lakes and watercourses affected by the Expansion Project were based on surface area for lakes and length for watercourses. These habitat calculations are presented in this document for the assessment of changes to habitat availability in the FEIS. Due to differences in data used, these values may differ slightly from those outlined in the offsetting plan, which may be further refined throughout the regulatory phase of the Expansion Project.

Biomass Estimation

Dewatering of the diked areas in Mammoth and Whale Tail Lake is required as part of the Approved Project. The fish remaining in the diked area following dike construction will be targeted for removal before dewatering, resulting in the direct mortality of fish. Mortality or removal of fish may affect fisheries productivity (e.g., yield) through a reduction in fish production (DFO 2014). Similarly, direct mortality of fish will occur at smaller lakes that will be dewatered due to Expansion Project activities (e.g., IVR Pit, WRSF, and Attenuation Pond).

The abundance of fish to be removed from dewatered areas was estimated. First, the amount of fish biomass in each lake was calculated using the relationship between lake area (ha), species richness (i.e., number of species in lake) and mean annual air temperature (°C) using the following equation (Samarasin et al. 2014):

$$\log_{10}(\text{biomass}) = 1.08 + 1.04\ [\log_{10}(\text{lake area})] + 0.05 * (\text{species in lake}) + 0.03 * (\text{mean annual air temperature})$$

Using the biomass result, and an overall mean weight of 0.26 kg derived from the calculated mean weights of three fish-outs at the Meadowbank Mine (Agnico Eagle 2014f; Appendix G14), the total number of fish in the dewatered area was estimated. Species abundances were generated by multiplying the expected number of fish to be removed from the dewatered area by the species relative abundances reported in Section 6.5.3.2.2.2.

6.5.4.2.2 Results

Habitat Losses

Relative changes in fish and fish habitat in Mammoth and Whale Tail lakes as a result of the dewatering of the diked area, based on substrate type and depth of habitat have not changed between the Approved Project and the Expansion; detailed losses can be found in the Approved Project FEIS Volume 6, Section 6.5.3.2.2 (Agnico Eagle 2016c). The habitat losses and area calculations herein are used for the purposes of the FEIS assessment, to support the NIRB review and may slightly differ from the conceptual offsetting plan (Volume 8, Appendix 8-E.4), which will be finalized in consultation with DFO in the authorization phase of the Project.

The construction of the Northeast Dike in 2019 will intersect with Streams A46-A17 and A50-A17, tributaries of Whale Tail Lake. The dike and subsequent diversion of water will physically alter the configuration of watersheds and existing flow paths, affecting fish habitat within the LSA. Following construction of the Northeast Dike, water from the northeast sector that previously flowed into Whale Tail Lake will be diverted to flow into Mammoth Lake. The diversion will continue until the initiation of the IVR Pit in Q3 of 2020, where the lakes and watercourses within the footprint of the IVR Pit will be dewatered and flows coming into the northeast sector from outside of the footprint will be diverted north into the Nemo Lake watershed. For the purposes of the assessment, the construction of the Northeast Dike and subsequent IVR Pit and IVR WRSF will result in the complete loss of Stream A46-A17, a total of 196 m of habitat, and Stream A50-A17, a total of 485 m of habitat. These predicted losses as a result of the expansion are an increase from the Approved Project by 103 m and 351 m for streams A46-A17 and A50-A17, respectively.

In addition to the losses of streams A46-A17 and A50-A17, the IVR Pit will result in the complete losses of lakes A46, A47, and A49, ponds A-P67 and A-P68, and streams A49-A47, A47-A46, and A-P38-A47. Pond A-P38 is partially affected by the IVR Pit footprint; however, its isolation from the remainder of the A watershed resulting from the loss of Stream A-P38-A47 will result in an effective loss of the entire pond. Although losses for several of these waterbodies and watercourses were accounted for in the Approved Project, they would have been part of a flooded northeast sector as opposed to the permanent loss or alteration caused by the proposed IVR Pit footprint in the expansion plans. For the purposes of the assessment, a total of 7.9 ha of combined lake and pond area and 1,155 m of combined watercourse length will be lost as a result of the expansion (breakdown of individual waterbody and watercourse losses are outlined in Table 6.5-6 and Table 6.5-7, respectively).

Table 6.5-6: Waterbody Habitat Losses as a Result of the Expansion Project[b]

Waterbody	Lake Area (ha)	Approved Project Losses (ha)	Expansion Project Losses (ha)	Fish Species Captured or Expected to Occur
Lake A46	0.3	0.3	0.3	ARCH[a], NNST[a], SLSC[a]
Lake A47	4.5	4	4.5	ARCH, NNST
Lake A48	0.2	0.2	0	NNST[a]
Lake A49	3.2	0	3.2	LKTR, SLSC
Lake A50	0.4	0	0.4	No fish caught
Lake A51	0.6	0	0.6	No fish caught
Lake A53	14.1	0	14.1	LKTR, ARCH, NNST
Lake A0	0.1	0	0.1	NNST[a]
A-P5	0.7	0.7	0.7	No fish caught
A-P10	0.5	0	0.5	No fish expected to occur[a]
A-P21	1.1	0	1.1	No fish caught
A-P38	0.2	<0.1	0.2	NNST
A-P67	<0.1	0	<0.1	No fish expected to occur[a]
A-P68	<0.1	<0.1	<0.1	No fish expected to occur[a]

[a] Not fished; species expected to occur at this location during high flow conditions based on sampling performed in watershed.

[b] The habitat losses and area calculations herein are used for the purposes of the FEIS assessment and may differ from the offsetting plan (which will be finalized in consultation with DFO in the authorization phase of the Project).

ARCH = Arctic Char, BURB = Burbot, SLSC = Slimy Sculpin, NNST = Ninespine Stickleback; LKTR = Lake Trout.

Table 6.5-7: Watercourse Habitat Losses as a Result of the Expansion Project[b]

Watercourse	Stream Length (m)	Approved Project Losses (m)	Expansion Losses (m)	Fish Species Captured or Expected to Occur
A17-A46	196	93	196	ARCH, NNST, SLSC
A17-A50	485	134	485	ARCH, BURB, LKTR, NNST, SLSC
A17-A53	577	32	577	LKTR, ARCH, NNST, SLSC
A46-A47	43	43	43	ARCH[a], NNST[a], SLSC
A47-A49	274	97	274	No fish caught
A50-A51	76	0	76	No fish expected to occur[a]
A51-A52	89	0	11	No fish expected to occur[a]
A53-A54	518	0	24	ARCH[a], LKTR[a], NNST[a]
A-P38-A47	157	157	157	NNST[a]

[a] Not fished; species expected to occur at this location during high flow conditions based on sampling performed in watershed.

[b] The habitat losses and area calculations herein are used for the purposes of the FEIS assessment and may differ from the offsetting plan (which will be finalized in consultation with DFO in the authorization phase of the Project).

ARCH = Arctic Char, BURB = Burbot, SLSC = Slimy Sculpin, NNST = Ninespine Stickleback; LKTR = Lake Trout.

The IVR WRSF, which will be constructed at the same time as the IVR Pit in 2020, has a proposed footprint that will completely overlaps lakes A51 and A52, Pond A-P21, and streams A51-A50 and A52-A51. Fish habitat in these waterbodies and watercourse will be completely lost, accounting for a combined 2.5 ha of lake/pond habitat and 164 m of watercourse habitat, although no fish were captured during sampling of any of these waterbodies or watercourses. The IVR WRSF footprint will not overlap Lake A54.

Pond AP-5 was considered in the Approved Project, and will be affected by the Groundwater Storage Pond. Lake A50 will be affected by the Groundwater Storage Pond. No fish were captured during sampling of these waterbodies.

Lake A53 and Stream A53-A17 will be dewatered and used as the IVR Attenuation Pond starting in 2022. This will result in a permanent loss of the entire 14.1 ha of lake habitat and 577 m of stream habitat, both of which have confirmed presence of Arctic Char and Lake Trout, as well as forage species. Lake A54, upstream of the future attenuation pond site, will be unaffected by the footprint of the expansion, although no fish were captured during fishing efforts. Stream A54-A53 will have 24 m of the total 518 m of its length (5% of total habitat) affected by the creation of the attenuation pond.

Of the waterbodies and watercourses affected by the Expansion Project, only lakes A46, A47, A49, and A53 and streams A17-46, A17-50, and A17-53 have verified presence of large-bodied VC species (e.g., Arctic Char, Burbot, Lake Trout). The affected ponds are all unlikely to contain any fish species other than forage species, based on catch results and habitat assessments, and the watercourses connecting these ponds to larger lakes typically only flow seasonally and would be unlikely to support any large-bodied VC species in areas other than their furthest downstream extents. Although Stream A50-A17 has documented presence of Lake Trout, Arctic Char, Burbot, Ninespine Stickleback, and Slimy Sculpin, no fish were captured during sampling in the lakes and streams upstream of this watercourse (from Lake A50 to Lake A51).

During closure, pumping from South Whale Tail Lake will begin in 2026 to contribute to the refilling of the open pit (i.e., approximately 4 years later than for the Approved Project). The dewatered area of Whale Tail Lake (North Basin) will be refilled and the 69.5 ha of aquatic habitat will be returned to Whale Tail Lake in an altered state. Whale Tail Dike and Mammoth Dike are decommissioned when the South side and the North side of the Whale Tail Dike return to an elevation of 153.5 masl, 1 m higher than baseline conditions, and the water quality monitoring results meet pre-determined discharge criteria to allow water to naturally flow to the receiving environment. The physical and chemical environment of the area will allow re-establishment of a healthy functioning aquatic ecosystem. Natural currents and fish will be able to move in and out of the area.

The areas of the Whale Tail Pit and the IVR Pit within the dewatered area will be 56.8 ha and 37.7 ha, respectively, which will increase the surface area of Whale Tail Lake by 34% after the pits have filled with water during closure. The Whale Tail Pit represents a permanent loss of lake-bottom substrate habitat for benthic feeding or bottom dwelling species such as Round Whitefish and forage species such as Slimy Sculpin, but will include an extended water column as habitat for pelagic species such as Lake Trout. The upper level of the Whale Tail Pit may remain well-oxygenated through the winter due to its depth and may provide additional overwintering refugia for fish and thermal refugia for fish in summer.

Discussions between Agnico Eagle and DFO continue to occur to determine a preferred offsetting option for the Expansion Project. As a conceptual offsetting measure for the Expansion Project, one sill is proposed to be constructed, between Whale Tail Lake and Lake A18. The approved sill between Mammoth and Whale Tail Lake, the sill proposed for the Expansion Project, would maintain water levels, post-closure, in areas south of Whale Tail Lake that are flooded during operations but would otherwise drain during closure as well as allow fish passage. This would increase the lake area to 129.29 ha, which would include both the flooded Whale Tail and IVR pits, which would potentially provide a large portion of the required offsetting.

The recovery or reversibility of effects from habitat losses on VC fish species will begin following closure when the diked area is decommissioned. Although the Expansion Project will delay re-flooding of the diked area by approximately four years, it is not expected to change the ability of the area to regain function as aquatic habitat. Most habitat functions will be recovered at the completion of refilling and before opening the dike, allowing for a quick return of the productivity, abundance, and distribution of fish within the refilled area. The refilled area will initially be populated by most species and life-stages from adjacent habitat areas in Whale Tail Lake and Mammoth Lake. Full use of the habitat by VC fish species is expected to occur quickly and within a few years given the highly mobile behaviour of the species in the assessment area. The maximum period for populations to approach densities of fish similar to other areas of Mammoth Lake and Whale Tail Lake is likely within one generation time[3] of VC fish species.

Fish-Out

As per Type A Water Licence 2AM-WTP1826, Agnico Eagle will have completed the dewatering of Whale Tail Lake (North Basin) from March through May 2019 following the construction of the dike and the fish-out from July through September 2018. A Fish-Out Plan was developed in consultation with DFO and presented in the FEIS (Volume 8; Appendix 8-E.4). DFO and affected Inuit communities will continue to be consulted during the DFO authorization phase of the Project to ensure measures and standards to avoid and mitigate serious harm to fish are approved, are of benefit to Inuit stakeholders and successful. The Final Fish-Out Work Plan may include a fish salvage (or

[3] Generation time can be defined as the average length of time for a sexually mature fish to be replaced by offspring with the same spawning capacity.

transfer) to mitigate effects to fish mortality. As done for Mammoth and Whale Tail lakes, fish-out plans will be developed for lakes A53, A47, and A49.

The estimated fish biomass in small waterbodies and ponds in the IVR Pit and Lake A53 area is presented in Table 6.5-8. Lake A113 is the only fish-bearing waterbody in the northeast area not affected; Lake A113 is 2.1 ha in area, flows into Lake A47, and only Ninespine Stickleback were captured during baseline sampling (Volume 6, Appendix 6-L).

Table 6.5-8: Estimated Fish Biomass for Lakes Affected by the Expansion Project

Waterbody	Footprint Type	Fish Species Captured or Expected to Occur	Affected Lake Area (ha)	Estimated Biomass (kg)[b]
Lake A46	IVR Pit	ARCH, BURB, NNST, SLSC[a]	0.3	2.9
Lake A47	IVR Pit	ARCH, NNST	4.4	34.2
Lake A48	IVR Pit	NNST[a]	0.2	1.2
Lake A49	IVR Pit	LKTR, SLSC	2.9	23.5
Lake A53	IVR Attenuation Pond	LKTR, ARCH, NNST	14.1	125.5
Lake A0	IVR Diversion	NNST[a]	0.1	0.4
A-P38	IVR Pit	NNST	0.2	1.2

[a] Not fished; species expected to occur at this location during high flow conditions based on sampling performed in watershed.

[b] Fish biomass was calculated using the relationship between biomass and lake area (ha), species richness (i.e., number of species in lake) and mean annual air temperature (°C) (Samarasin et al. 2014); where the mean annual air temperature input was -10.7°C (Volume 4; Appendix 4-A).

Habitat Fragmentation

As per the Approved Project, construction and operation of the Mammoth and Whale Tail dikes and diversions will result in effects to habitat connectivity in the A1 assessment area. The Northeast Dike, which is developed as part of the Approved Project, will also affect fish connectivity prior to the development of the IVR Pit as part of the Expansion Project. Fish passage between Mammoth and Whale Tail lakes will be eliminated while the dikes are in place from the beginning of their construction in 2018 to the decommissioning of dikes following refilling in approximately 2041 (i.e., approximately 15 years later than the Approved Project). As described in the Approved Project FEIS, although the abundance of VC fish species may be initially affected by habitat fragmentation, any effects are expected to be minor because of potentially low rates of movement of fish between lakes in the LSA (Section 6.5.3.2.2; Portt 2018). Populations of VC fish species are expected to be maintained in Mammoth and Whale Tail lakes during the construction and operation of the mine, even with the extended period of operations with the Expansion Project. Fish above and below the dewatered area will continue to have access to tributary streams and lakes that have the potential to function as spawning, rearing, and foraging habitat. During closure, the dikes will be decommissioned, connecting habitats for populations in Whale Tail and Mammoth lakes.

Habitat Alteration from Flooding

As described in the Approved Project FEIS, the Project footprint will physically alter the configuration of the Whale Tail Lake watershed and existing flow paths during construction and operations. However, with the Expansion Project, there are no changes to the assessment of habitat alteration flooding from the Approved Project. Refer to Section 6.5.4 of the Approved Project FEIS for the assessment results.

6.5.4.3 Indirect Effects to Fish

Inuit concerns regarding fish populations and their habitat at mining developments include effects from changes to water quality and water flows (Cumberland 2005a). The following primary pathways on the indirect effects to fish and fish habitat from the Project were evaluated:

- During the construction and operations of the Whale Tail, Mammoth, and WRSF dikes, water diversions will result in a reduction of water levels in Mammoth Lake and downstream locations, affecting fish and fish habitat.
- Refilling of the diked area in Whale Tail Lake and Mammoth Lake at closure will affect water levels in Mammoth Lake and downstream locations, resulting in effects to fish and fish habitat.
- Operational activities and discharge (e.g., discharge of treated domestic wastewater, altered drainage, runoff from facilities, including WRSFs, pit inflows, dike seepage, release of nitrogen compounds from blasting residues) may change trophic status, affecting fish and fish habitat in Whale Tail Lake, Mammoth Lake, downstream waterbodies, and possibly Lake D1 or Lake D5 (potential alternative discharge locations).
- Reconnection of the refilled area of Mammoth Lake and Whale Tail Lake to the remaining watershed may change long-term trophic status in Whale Tail Lake, Mammoth Lake and downstream waterbodies, affecting fish and fish habitat.

6.5.4.3.1 Methods

Downstream Flows

Methods related to the assessment of the effects of changes to downstream changes to flows on habitat quantity is provided in the Approved Project FEIS. The assessment of the effects of downstream changes in flows for the Expansion Project relied on a baseline database of species distributions in the LSA (Section 6.5.2; Volume 6, Appendix 6-D; Appendix 6-J; Portt 2018), combined with water level and discharge predictions reported in Hydrology Section 6.3.4. Details of the methods for predicting changes in downstream flows can be found in the Hydrology Baseline Report (Volume 6, Appendix 6-C).

Lake Ecosystem Productivity

Downstream changes to water quality can result in changes to the lower tropic community, affecting the productivity of the fishery. Numerous “fertilization” studies (Morgan 1966; Smith 1969; Welch et al. 1988; Hershey 1992; Jorgenson et al. 1992; Clarke et al. 1997; Johnston et al. 1999) that documented changes in plankton and benthic community structure in sub-Arctic and northern temperate lakes in response to nutrient additions were reviewed as part of the Approved Project FEIS.

Water quality predictions for the Expansion Project (mine site and receiving environment) were developed with a GoldSim™ mass balance model for operations through to post-closure (Section 6.2.3; Volume 6, Appendix 6-H); water quality predictions were compared to various standards (Section 6.2.3.3.1) and to results from the Approved Project. For the alternative discharge locations (Lake D1 and Lake D5), a qualitative approach was used to assess potential changes in water quality (Section 6.2.3.3). The analysis of potential effects related to predicted changes in water quality considered: lower trophic communities, including phytoplankton, zooplankton, and benthic invertebrates; food base changes for fish production; and changes to physical habitat, including the availability of spawning habitat.

Effects on lower trophic and fish communities from changes in water quality were predicted using qualitative methods, including an assessment of trophic classification of aquatic ecosystems based on nutrient concentrations

(CCME 2004; Environment Canada 2004; Wetzel 2001), experience from effects monitoring at operating northern diamond mines, and the scientific literature. Lakes can be classified as oligotrophic, mesotrophic, or eutrophic based on low, moderate, and high levels of productivity (CCME 2004; Wetzel 2001). Evaluation of trophic status in receiving environment lakes considered predicted concentrations of dissolved phosphorus.

6.5.4.3.2 Results

Downstream Changes to Flows

As per the Approved Project, the greatest changes in downstream water quantity are expected during the construction of Whale Tail Dike and Mammoth Dike, and during the refilling of the diked area at closure (Section 6.3.3); these changes are authorized under DFO Authorization 16-HCAA-00370. Potential effects to fisheries productivity include those from a reduction in water levels in downstream lakes and changes in the natural flow regime in stream connections within the A1 assessment area which will be extended as a result of this expansion. Changes in flow can alter fish habitat through loss of available habitat area from reductions in channel width, or changes in habitat characteristics and fish passage through changes to flow depth and velocity conditions.

For the Expansion Project, changes in discharge and water level at Mammoth Lake during the construction period are provided in Table 6.5-9 and compared to the Approved Project. Overall, effects to fish and fish habitat are similar to those assessed for the Approved Project. During the dike construction period, construction activities are expected to reduce discharges and water levels at Lake A16 (Mammoth Lake), primarily from the reduction in drainage area from the Whale Tail Dike from June to August (inclusive), and from an additional reduction in drainage area from the Mammoth Dike. Effects on discharges and water levels diminish with increases in drainage area (i.e., at downstream locations). Discharges and water levels are expected to be slightly reduced at Lake A5, and changes are not expected to be measurable at Lake DS1.

Table 6.5-9: Changes in Discharge and Water Level at Mammoth Lake during the Construction Phase

Change	Project Phase	Peak Daily		Mean Monthly				
		2-Year	100-Year	June	July	August	September[a]	October[a]
Discharge (%)	Approved Project	-50	-47	-55	-65	-59	-66	-68
	Expansion Project	-51	-47	-55	-65	-59	-56	-57
Water Level (m)	Approved Project	-0.19	-0.24	-0.16	-0.16	-0.11	-0.14	-0.13
	Expansion Project	-0.20	-0.24	-0.16	-0.16	-0.11	-0.11	-0.10

[a] Results are based on construction of the Mammoth Dike in September 2018 and may be conservative if construction of the Mammoth Dike is delayed until winter conditions.

m = metre; % = percent.

As per the Approved Project, the closure phase will occur over the period of refilling of Whale Tail Lake to its baseline level, prior to decommissioning of the Whale Tail Dike and Mammoth Dike. Refilling of the diked area (open Whale Tail Pit and Whale Tail Lake [North Basin]) will be accomplished by pumping water from Whale Tail Lake (South Basin) (Volume 6, Appendix 6-F). The Whale Tail Pit and IVR Pit will be filled with a combination of natural runoff and contact water from the entire site, and water pumped from Whale Tail Lake (South Basin). During the spring of 2026, the water accumulated in Whale Tail Lake (South Basin) over the years of operations will be pumped into the underground mine until it is filled and into the IVR Pit thereafter. Refilling of Whale Tail Lake (North Basin) to 152.5 masl is estimated to take from 2026 to 2041.

Changes in discharge and water level at Mammoth Lake during closure (Table 6.5-10) are predicted to be the same for both the Approved and Expansion Projects, but closure is expected to extend until 2051. During refilling, water levels and discharges are expected to be reduced in Mammoth Lake from 2022 to 2041 (2029 in the Approved Project) and effects on discharges and water levels diminish with increases in drainage area (i.e., at downstream locations). A slight reduction in discharge and water levels is expected at Lake A5, but not expected to be measurable at Lake DS1 (Section 6.3.3.1.5.2).

Table 6.5-10: Changes in Discharge and Water Level at Lake A16 (Mammoth Lake) during Closure

Change (Approved Project and Expansion Project)	Peak Daily		Mean Monthly				
	2-Year	100-Year	June	July	August	September	October
Discharge (%)	-58%	-55%	-65%	-76%	-69%	-66%	-68%
Water Level (m)	-0.24	-0.29	-0.20	-0.20	-0.14	-0.14	-0.13

m = metre; % = percent.

As per the Approved Project, changes in water levels in Mammoth Lake and downstream locations are expected to have a moderate effect to population abundance and distribution of Arctic Char, Lake Trout, Burbot, and Round Whitefish.

The duration of the effects on stream habitats and the functions they provide (including migration, rearing, and foraging habitat) have been authorized, but will persist for up to 19 years during closure (from 2022 to 2041) for the Expansion Project. The timing window for fish use of affected streams may be limited to periods of high flow, such as the spring freshet period in June. As per the Approved Project, changes in flows in Mammoth Lake and downstream locations, particularly during the closure phase, are expected to have a moderate effect to population abundance and distribution for Arctic Char, Lake Trout, Burbot, and Round Whitefish.

Changes to Lake Ecosystem Productivity

The effects of increased nutrient concentrations during operations through closure on Mammoth Lake, Whale Tail Lake, and downstream lakes (Lake A15 through Lake A1 and Lake A69; Section 6.4.3.2.2) were assessed in the Approved Project. Updated model results for the Expansion Project were reviewed and potential effects on fish and fish habitat discussed below.

Increases in nutrients may include a general increase in productivity at the lower trophic levels, and shifts in plankton and benthic invertebrate community composition. Phytoplankton, zooplankton and benthic invertebrate biomass may also increase, as these communities take advantage of the increased nutrient supply. Shifts in overall community structure and dominant taxonomic groups may also result. The increased nutrient concentrations may affect fish growth and production as a result of the increase in the food base, as well as potentially causing habitat effects (e.g., changes to conditions of spawning habitat). Any observed effects to the lake ecosystem through changes to water quality are expected to be reversible during closure, following the cessation of discharge and decommissioning of the dikes. As described in Section 6.5.3, the majority of water quality parameters are expected to return to near baseline values in the LSA lakes during mid-closure (2045) or late-closure (2050), and phosphorus concentrations are anticipated to drop below the oligotrophic trigger level in all lakes by late-closure; increased nutrient loads into the large downstream lake DS1 are anticipated to have negligible effects from operations through post-closure.

Similar effects to ecosystem productivity would be expected for the alternative discharge locations (Lake D1 or Lake D5, and lakes downstream) if selected. Refer to Section 6.2.3.3.2.3 of the FEIS Addendum for the qualitative water quality assessment. Discharge to these lakes would be expected to increase phosphorus to levels similar or lower to those modelled for Whale Tail South or Mammoth Lake, and as such, similar effects to productivity would be expected as described below. The use of an alternative discharge location would also reduce effects to Mammoth and Whale Tail lakes compared to current modelled predictions. Detailed water quality modelling will be conducted to support future evaluations of the alternative discharge locations as required.

Phytoplankton

Phytoplankton biomass is expected to increase in Mammoth Lake, Whale Tail Lake, and downstream lakes (Lake A15, A12, A76, and potentially lakes further downstream towards Lake DS1) due to the predicted increase in nutrient concentrations during operations and closure, but return to baseline conditions during late-closure or post-closure. Based on conservative predictions of dissolved phosphorus concentrations, the mesotrophic trigger value will be exceeded in Mammoth Lake, Lake A15, and Lake A12 in operations, with declining concentrations during closure and a subsequent return to oligotrophic conditions expected to occur by 2051. Phosphorus levels in Lake A76 are predicted to return to oligotrophic conditions by mid-closure (in 2045). Similarly, for Whale Tail South, the dissolved phosphorus concentrations are predicted to increase to within the mesotrophic range during operations with a return to oligotrophic conditions in early-closure. The increase in lake productivity may result in altered species composition and shifts in dominance at the major phytoplankton group level (Reynolds 1998).

Phytoplankton biomass is expected to decrease during the late-closure or post-closure period due to decreases in nutrient concentrations. Phytoplankton communities would likely begin to return to baseline conditions during the late closure or post-closure period.

Zooplankton

The predicted increase in primary productivity in Mammoth Lake and downstream lakes is expected to result in increased secondary productivity and biomass of the zooplankton community, reflecting the increased amount of available food for zooplankton. However, because energy transfer between trophic levels is often inefficient (McCauley and Kalff 1981; Kalff 2002), the proportional increase in zooplankton biomass caused by increased nutrient concentrations will be lower than the increases observed in phytoplankton biomass.

The composition of the baseline zooplankton community, which includes rotifer dominance in Mammoth Lake (Section 6.5.2.2.2.3), may also change. However, changes are difficult to predict because zooplankton species composition can be controlled by predation (i.e., top-down processes; McQueen et al. 1986; Carpenter 1989; Carpenter et al. 2001), resource availability (i.e., bottom-up processes; Clarke et al. 1997; O'Brien et al. 2005), or a combination of these factors. As noted for phytoplankton, a decrease in zooplankton biomass will likely occur through the late-closure or post-closure period, as nutrient concentrations and phytoplankton production decrease.

Benthic Invertebrates

The response of the benthic invertebrate community to increased concentrations of nutrients is less predictable than that of plankton. Nutrient enrichment has sometimes been found to result in increased benthic invertebrate biomass (Rasmussen and Kalff 1987; Jorgenson et al. 1992; Clarke et al. 1997), but in some cases, no response to enrichment has also been documented (Dinsmore et al. 1999). Predicted increases in nutrient concentrations and primary productivity during operations and closure may result in an increase in benthic invertebrate abundance and biomass, reflecting an increased food supply. The response by benthic invertebrates may be delayed by several years relative to the response by plankton and the increase in biomass may also be less pronounced because benthic invertebrates, such as chironomids, are also regulated by predation (Hershey 1992).

A decrease in benthic invertebrate biomass and a community shift back to near baseline conditions may accompany the ecosystem response during the late-closure or post-closure period, as nutrient concentrations return to near baseline conditions. The accumulation of food resources in the benthic zone during operations and closure may cause a delayed recovery for benthic invertebrates, compared to the responses of zooplankton and phytoplankton communities.

Implications for Fish

The effect of increased primary and secondary production on fish in lakes is complex and is dependent on several factors including the physical and chemical conditions of the water and lake sediments (Schindler 1974), the complexity of the food web (Schindler 1974; Carpenter et al. 1985; Elser et al. 1990), the efficiency of energy transfers between trophic levels (McQueen et al. 1990; Micheli 1999), and the relative importance of “bottom-up” (i.e., resource availability) or “top-down” (i.e., predation) control of lake productivity (Power 1992; Carpenter et al. 1985; McQueen et al. 1986).

Studies have shown that nutrients, and in particular total phosphorus, control the rate of fish production in lakes (Colby et al. 1972; Plante and Downing 1993), including cold-water fish production (Dillon et al. 2004). Fertilization experiments found increases in the length and weight of fish (Johannessen et al. (1984, cited in Dillon et al. 2004), increases in abundance of fish populations as a result of the fertilization (Jorgenson et al. 1992). And increases in fish growth and average size (Lienesch et al. 2005). Further details regarding the literature review of fertilization experiments on fish can be found in the Approved Project FEIS, as well as in responses to Information Requests.

Consistent with numerous previously completed studies, the predicted effect of increased nutrients using “conservative case” scenarios in Mammoth Lake and downstream lakes during operations and closure may include an increase in productivity of lower trophic levels. The expected increases in the lower trophic food base for fish may potentially result in numerical increases in forage fish such as Slimy Sculpin (through increases in growth and reproduction rates). Because of the increased food base (lower trophic levels and forage fish), there may also be a minor increase in growth and reproduction rates for Arctic Char, Lake Trout, Round Whitefish, and Burbot. Other environmental factors associated with the potential change in trophic status during operations and closure will also play a role in the response of the fishery in the assessment area.

As discussed in the Approved Project FEIS, there may be challenges for coldwater species, such as Lake Trout and Arctic Char, in shallow lakes in the Arctic with respect to oxygen depletion during winter due to the length of the season with ice cover, the depth of the ice, and potential lack of inflows. However, for most of operations and closure, winter DO concentrations in Mammoth Lake and downstream lakes are expected to be within the range of baseline values, and at levels that meet the criteria for optimum habitat for fish spawning and nursery (i.e., that levels remain above 6.5 mg/L; CCME 1999a). A moderate reduction in available overwintering habitat though oxygen depletion is expected in late winter for Mammoth Lake and downstream lakes, and will most likely occur during closure when lake water levels are affected by refilling of the diked areas. It is anticipated that changes to winter habitat conditions may affect populations of Arctic Char, Lake Trout, Burbot, and Round Whitefish. However, effects will be reversible during late-closure or post-closure when nutrient levels return to baseline conditions. It is predicted that residual effects to VC fish species through changes to food resources and available habitat will either not be measurable or will be measurable but minor at post-closure.

Any observed effects to the lake ecosystem components through changes to water quality are expected to be reversible during late-closure or post-closure, following the cessation of discharge and decommissioning of the dikes. As described in Section 6.5.3.3.2, the majority of water quality parameters in the affected lakes are expected to return to near baseline values by late-closure. Although that phosphorus concentrations may be elevated up to approximately 30-year period which is longer than the life cycles of many of the VC species, the water quality modelling indicates that there is an initial peak during operations with a decline during closure and a recovery to near baseline conditions by post-closure (Volume 6, Appendix 6-I). As the peak concentrations in the mesotrophic range are not held for a long period, the stability of the fish population and associated fishery is not expected to be compromised.

Agnico Eagle will test and verify the phosphorus predictions through ongoing monitoring conducted as part of the Water Quality and Flow Monitoring Program (Volume 8, Appendix 8-B.2) and the CREMP (Volume 8, Appendix 8-E.10).

6.5.5 Residual Impact Classification

The assessment and classification of residual impacts was completed as described in the Approved Project FEIS. For fish and fish habitat, the magnitude for cumulative impacts, which involves changes from reference conditions through application of the Project and into the future case, is the same as described for incremental impacts, which are based on changes from the Project relative to baseline values. Specific definitions for the criteria used for residual impact classification are provided in Volume 3, Appendix 3-E.

Expansion Project-related effects on fish and fish habitat (Section 6.5.4) will primarily result from direct habitat losses (i.e., footprint changes) from the construction of the IVR Pit, the dewatering and fish out of the smaller lakes north of Whale Tail Lake (where the IVR Pit will be located), Lake A53 (where the IVR Attenuation Pond will be located), and the flooding of Whale Tail Lake after the diversion.

The smaller, fish bearing lakes north of Whale Tail Lake that will be affected by the IVR Pit (lakes A46, A47, A48, A49, and A0 and pond A-P38) will be completely lost, accounting for a total loss of 8.5 ha of waterbody area. Lakes A46, A47, and A49 have confirmed presence of VC species (Arctic Char, Burbot, and/or Lake Trout) account for 8.0 ha of the lost waterbody area, and the remaining 0.5 ha of fish habitat lost consists of waterbodies that provide habitat for forage species only. Lake A53, which will become the IVR Attenuation Pond, and Watercourse A17-A53, which will be diked off and drained, contains habitat that support both Lake Trout and Arctic Char. The entirety of Lake A53 and watercourse A17-A53, 14.3 ha of lake area and 577 m of watercourse length, will be permanently lost due to the Expansion Project.

The fish-out and subsequent dewatering of lakes in the northeast area and refilling of the Whale Tail and IVR pits is expected to have low residual effects to VCs (Arctic Char, Lake Trout, Burbot, and Round Whitefish) and the associated fishery, occurring on a local scale. Most of the residual effects from direct changes in habitat will be long-term in duration and reversible following refilling, decommissioning of dikes, and reconnection of habitats. Residual effects from the development of open pits and WRSFs are expected to be permanent, but are expected to be low in magnitude and occur at the local scale (Table 6.5-11).

The amount of direct changes to fish habitat and biomass from the Project is expected to result in low residual effects to Arctic Char, Lake Trout, Burbot, and Round Whitefish, and forage species that support the fishery; the effects to the fishery are also expected to be low. Although some habitat losses will be permanent (e.g., Lake A53, used as the IVR Attenuation Pond during operations, will be filled in at closure), most residual effects to the fishery will be reversible. Following closure, recovery may occur within one generation time for populations of VC fish species to approach densities in other regions of the assessment area. The predicted short recovery period assumes environmental conditions are favourable for high recruitment once reconnection has occurred, and that density-dependent compensatory mechanisms play a key role in recovery (Rose et al. 2001). Rapid increases in population growth (i.e., fish production) are expected because of new access to habitat behind the dikes.

Residual effects to fish and fish habitat will result from the Project though indirect pathways (Section 6.5.4) related to hydrology (Section 6.3) and water quality (Section 6.2). The water balance results for Mammoth Lake and downstream lakes (Section 6.3.3) show that lake water levels and outlet discharges will decrease from baseline values during construction and closure phases as described in Section 6.5.3.3.2; changes to hydrology are similar to those from the Approved Project, with a change in timing for the closure period. The main effects of reduced water depths and volumes of Mammoth Lake and downstream lakes include a reduction in available foraging and rearing habitat. A similar effect is expected for streams below Mammoth Lake where the timing window for fish use of the affected streams may be limited to periods of high flow, such as the spring freshet period in June. Expansion Project activities resulting in downstream reductions in flows during construction and closure phases are expected to have a moderate impact on Arctic Char, Lake Trout, Burbot, and Round Whitefish, occurring on a regional scale. Residual effects will be short-term in duration for the construction pathway and medium-term in duration for the refilling pathway (Table 6.5-11).

The effect of increased nutrient concentrations to Mammoth Lake, and downstream lakes during operations and closure may result in a general increase in productivity at lower trophic levels. Biomass of phytoplankton, zooplankton, and benthic invertebrates will likely increase during this period. In addition, possible shifts in overall community structure and dominant taxonomic groups may result due to a potential change in trophic status to mesotrophic in Mammoth Lake, Whale Tail South, Lake A15, and Lake A12 during operations and closure with a subsequent return to oligotrophic conditions expected by post-closure; similar effects would be expected for the alternative discharge lakes and downstream systems. Due to the increased food base (lower trophic levels and forage fish), there may also be a minor increase in growth and reproduction rates in the VC fish species, and the forage fish that support the fishery. An increase in nutrient levels in receiving environment lakes may also result possible reductions in oxygen levels. Reductions in oxygen levels are expected during closure after conservative estimates of multiple years of accumulation of organic debris and when lake water levels are reduced during refilling of Whale Tail Lake.

A general increase in nutrient levels is expected to result in negative residual effects to the fishery in response to any changes in trophic status during operations and closure (Table 6.5-11). Late in the closure period or during the post-closure period, plankton and benthic invertebrate communities are expected to return to baseline conditions. The physical and chemical environment of the diked area will allow re-establishment of a healthy functioning aquatic ecosystem. Natural currents, fish, and other aquatic life will be able to move in and out of the area, connecting habitat for fish and lower trophic communities in Whale Tail and Mammoth lakes. Lakes in the Northeast area that were within the mine footprint will either become part of Whale Tail Lake, connected by the flooded IVR Pit, or remain as lost habitat in the case of the lakes within the IVR WRSF or attenuation pond footprint. Residual effects from changes in nutrient levels are expected to have a moderate impact on fish and fish habitat, occur at the regional scale, and be long-term in duration with effects being reversible late in closure or during post-closure (Table 6.5-11).

Table 6.5-11: Residual Impacts Classification for Arctic Char, Lake Trout, Burbot, and Round Whitefish (Fishery) Valued Components

Effects Pathway	Direction	Magnitude		Geographic Extent		Duration	Frequency	Reversibility	Likelihood	Consequence of Proposed Change: Determining Significance
		Incremental	Cumulative	Incremental	Cumulative					
Construction of the IVR Pit and WRSF, and use of Lake A53 as the IVR Attenuation Pond, will result in the direct loss of fish habitat	Negative	Low	Low	Local	Local	Long-term to Permanent	Continuous	Reversible to Irreversible	Likely	No change
Dewatering of the smaller waterbodies and watercourses associated with the IVR Pit, WRSF, and attenuation pond will result in the direct loss or alteration of fish habitat	Negative	Low	Low	Local	Local	Long-term	Continuous	Reversible	Likely	No change
Dewatering of the smaller waterbodies associated with the IVR Pit and attenuation pond will result in the removal and subsequent mortality of fish	Negative	Low	Low	Local	Local	Short-term	Infrequent	Reversible	Highly likely	No change
Water diversions during construction and operations will result in a reduction of water levels and flows at downstream locations	Negative	Moderate	Moderate	Local	Local	Short-term	Continuous	Reversible	Likely	No change
Refilling of the diked area at closure will affect water levels and flows at downstream locations	Negative	Moderate	Moderate	Local	Local	Medium-term	Continuous	Reversible	Likely	No change
Operational activities and discharge may change trophic status in receiving and downstream waterbodies	Negative	Moderate	Moderate	Regional	Regional	Long-term	Continuous	Reversible	Likely	No change

Effects Pathway	Direction	Magnitude		Geographic Extent		Duration	Frequency	Reversibility	Likelihood	Consequence of Proposed Change: Determining Significance
		Incremental	Cumulative	Incremental	Cumulative					
Reconnection of the refilled area of Mammoth Lake, Whale Tail Lake, and the northeast lakes to the remaining watershed may change long-term trophic status in the lakes and downstream locations	Negative	Moderate	Moderate	Regional	Regional	Long-term	Continuous	Reversible	Likely	No change

Note: The Project is anticipated to have negligible residual effects on fish and fish habitat outside of the A1 assessment area

For further information on consequence of proposed change: determining significance for the Expansion Project refer to Table 3.4-2.

6.5.6 Cumulative Effects Assessment

The database of existing and reasonably foreseeable future developments (Volume 3, Appendix 3-D) indicates that there are no existing or planned developments (other than the Approved and Expansion Projects) that would contribute to cumulative effects to fish and fish habitat within the RSA. Any measurable effects of the Expansion Project to the productivity of the fishery (or support for the productivity of the fishery) will be restricted to the A1 assessment area within the RSA, or the D watershed for operational discharge at the alternative discharge locations.

6.5.7 Assessment of Significance

The effects from the Expansion Project are expected to not have a significant adverse effect on fish and fish habitat VCs based on the weight of evidence from the analysis of primary pathways. Although Expansion Project-related effects are expected to be measurable at the population level for Arctic Char, Lake Trout, Burbot, and Round Whitefish, the likelihood of any risk to the ongoing productivity of the fishery (or ongoing support for the productivity of the fishery) in the RSA are low. The Expansion Project is anticipated to have negligible effects on fish and fish habitat outside of the A1 assessment area. Furthermore, loss or alteration of habitat is not expected to cause permanent adverse changes to survival or reproduction at a population level. Loss or alteration of habitat is also not expected to cause permanent adverse changes to survival or reproduction at a population level through any effects to fish movement and population connectivity that would otherwise disrupt the potential for demographic rescue between adjacent lakes. Any unavoidable effects to the productivity of the fishery, for example, from the construction of dikes and subsequent fish-out and dewatering of the diked area, will include offsetting measures, described in the conceptual offsetting plan (Volume 8, Appendix 8-E.4), with the goal of maintaining or improving the productivity of a fishery. The resilience of the regional fishery will be maintained through the implementation of environmental design features and mitigation for the Expansion Project.

6.5.8 Uncertainty

Confidence in the assessment of environmental significance is related to the adequacy of the baseline data for understanding current conditions and future changes, the water balance and water quality modelling, the understanding of Expansion Project-related impacts on complex ecosystems, and the knowledge of the effectiveness of environmental design features and mitigation measures.

For the Expansion Project, there is a high level of certainty in the adequacy of the baseline fish and fish habitat data collected within the A1 assessment area, and trends in the data are consistent with other baseline programs in the region. Furthermore, baseline data were collected over a wide spatial scale, and include information on fish relative abundance, species distributions, habitat, species life history, and lower trophic communities for a region where there is very little historical and existing development. Although only limited fish and fish habitat sampling has been conducted in the lakes selected for alternative discharge (Lake D1 and Lake D5), the initial sampling has indicated that these lakes have a fish species assemblage and habitat conditions similar to other similar-sized lakes in the area. The lower trophic level data will be reviewed once they are available, and additional fish and fish habitat sampling will be conducted to support the selected location.

Direct disturbance to habitat was calculated to be a small proportion of the LSA, and there is a high level of confidence that the calculation represents a reasonable estimate of the aquatic footprint. The relative loss of habitat compared to that available within the assessment area will remain similar even if the footprint area is refined as the Approved and Expansion Projects advance the detailed design. Losses to habitat are also considered in the offsetting plan to counterbalance losses to fisheries productivity from the Expansion Project.

There is some uncertainty related to “conservative case” phosphorus predictions and the response of the aquatic community to increased nutrients. It is expected that the biomass of phytoplankton, zooplankton, and benthic invertebrates will increase; however, there is some uncertainty in the level of response to the fish community due to the increased food base (i.e., whether there would be a measurable increase in growth and reproduction rates in forage fish or VC species). The water quality assessment for the alternative discharge lakes was completed using a qualitative approach; detailed water quality modelling would be required to support the future evaluation of the effects of discharge on the aquatic environment in Lake D1 or Lake D5 if selected as an alternative discharge location.

Although there is a moderate to high level of certainty that the productivity of the fishery will recover when the diked area is reconnected to Mammoth and Whale Tail lakes, there is a level of uncertainty with respect to the duration of effects post-closure. Key factors to consider include the capacity of the population to recover (i.e., resiliency), potential functions of reclaimed habitat for fish, and future environmental conditions. It is expected that most species and life stages of fish in Mammoth and Whale Tail lakes will be able to move into and exploit the recovered habitat immediately after the dike has been decommissioned, initiating the population recovery. Furthermore, the Whale Tail and IVR pits will extend the surface area of Whale Tail Lake after the pits have filled with water during closure; the Whale Tail and IVR pits will represent only a small proportion of the area of Whale Tail Lake in post-closure, such that most of the littoral habitat in the lake will remain intact.

There is a high level of confidence that the plankton, benthic invertebrate, and fish populations and communities in the RSA will be different with or without the Project in future decades, mainly because of climate change (Walther et al. 2002; Mawdsley et al. 2009), and that the magnitude of effects and spatial scales associated with climate change are much greater than those related to interactions between the Expansion Project and fisheries productivity.

6.5.8.1 Mitigation

Mitigation will be used to reduce uncertainty and to minimize or avoid effects on fish and fish habitat. Examples of mitigation include: sediment and erosion control planning, spill management, consideration of timing windows for in-stream construction (e.g., road crossings), fishing restrictions for staff, and use of setbacks for blasting. Fish-out plans will be developed for lakes A53, A47, and A49.

Discharge will meet limits identified in the Water Licence to be protective of the receiving environment. Agnico Eagle will test and verify the phosphorus predictions through ongoing monitoring conducted as part of the Water Quality and Flow Monitoring Program (Volume 8, Appendix 8-B.3) and the CREMP (Volume 8, Appendix 8-E.10). Direct monitoring of nutrient concentrations and phytoplankton biomass will be conducted according to the CREMP Study Design described in Volume 8, Appendix 8-E.10. Actual water quality will largely depend on the mine plan and management practices followed during mining and on-site conditions related to water movement and chemical loading (Volume 6, Appendix 6-H), and Agnico Eagle will implement water treatment or other mitigation options if phosphorus concentrations are observed to increase to unacceptable levels that may affect the local fishery. The alternate discharge location in the D watershed will be further evaluated and may be used to limit the amount of phosphorus entering the A watershed by discharging a portion of the affected water to another location.

Discussions between Agnico Eagle and DFO continue to occur to determine a preferred offsetting option for the Expansion Project. The conceptual offsetting measure includes the construction of two sills to permanently increase upstream water levels in areas south of Whale Tail Lake that are flooded during operations but would otherwise drain during closure. Agnico Eagle will continue to consult with DFO and the KivIA so that offsetting measures are identified and implemented to counterbalance losses associated with the Expansion Project.

6.5.9 Monitoring and Follow-up

Aquatic ecosystem monitoring during all phases of the Approved and Expansion Projects will be conducted to validate assessment conclusions. This Addendum includes plans where monitoring activities for evaluating the short-term and long-term effects on the physical, chemical, and biological components of the aquatic ecosystems will provide the necessary input for the implementation of adaptive management through the lifespan of the Approved and Expansion Project. Section 6.2.7 describes the monitoring and management plans applicable to water quality.

Aquatic ecosystem monitoring will be implemented through a variety of monitoring plans. More details are provided in the individual plans, but those applicable to fish and fish habitat include:

- Whale Tail Pit – Water Quality Monitoring and Management Plan for Dike Construction Dewatering (Volume 8, Appendix 8-A.4);
- Whale Tail Pit – Water Management Plan (Section 6.2.7; Volume 8, Appendix 8-B.2);
- Whale Tail Pit – Water Quality and Flow Monitoring Plan (Section 6.2.7; Volume 8, Appendix 8-B.3);
- Spill Contingency Plan (Volume 8, Appendix 8-D.5), which will be implemented to prevent effects from emergency spills and help address Inuit concerns related to effects to fish and fish habitat;
- CREMP (Volume 8, Appendix 8-E.10), developed to monitor mining-related processes that could potentially impact the aquatic receiving environment, including fish;
- Habitat Compensation Monitoring Plan developed in consultation with DFO during the Phaser Lake authorization phase (Agnico Eagle 2016i); and
- Whale Tail Pit Expansion - Conceptual Fisheries Offsetting Plan (Volume 8, Appendix 8-E.4) which includes monitoring to confirm that offsetting measures are implemented and effectively counterbalancing the habitat losses from the Expansion Project.

Agnico Eagle will continue to consult with DFO on the offsetting plan and associated monitoring requirements during the development of final Offsetting Plan and the *Fisheries Act* Authorization for the Expansion Project.

Consistent with Project Certificate No. 008, Agnico Eagle is required to:

- mitigate potential impacts to groundwater, surface waters, and freshwater aquatic environment (T&C #19);
- mitigate impacts of runoff/sedimentation from project quarries and borrow pits into freshwater aquatic habitat (T&C #20);
- prevent blockages or restrictions to fish passages (T&C #21);
- mitigate impacts of explosives use on fish and fish habitat (T&C #22);
- minimize potential project impacts to freshwater ecosystem productivity (T&C #23); and
- determine the viability of the flooded south basin of Whale Tail Lake as an effective offsetting measure for habitat losses (T&C #24).

Where applicable to the Expansion Project, Agnico Eagle has updated the associated plans or reports as may be directed by the NIRB. Agnico Eagle considers, the existing terms and conditions of the Project Certificate issued for the Approved Project are sufficient to protect, mitigate, and monitor impacts associated with the Expansion Project.

Any new required mitigation measures related to primary effects for the Expansion Project are described in relation to the predicted effects and summarized in pathway tables provided in Volume 3, Appendix 3-C.

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan and will update these as part of the NWB review and DFO authorization process (refer to Volume 8).

7.0 HUMAN ENVIRONMENT

7.1 Introduction

Volume 7 focuses on heritage resources, Traditional Land and Resource Use (TLRU), and socio-economics.

7.1.1 Valued Components

The identification of VCs and factors considered in their selection are described in Section 3.4.1 of the FEIS Addendum. A summary of the human environment VCs and rationale for inclusion in the Expansion Project are provided in Table 7.1-1. Marine resource harvesting was added to the VC for TLRU for the Expansion Project. There is no change to Heritage Resources or Socio-Economic VCs.

Table 7.1-1: Summary of Cultural Valued Components

Valued Component	Rationale for Inclusion
Heritage Resources	▪ Identified as a VC in Approved Project FEIS ▪ Territorial and Federal Legislation protects archaeological and palaeontological sites (Nunavut Archaeological and Palaeontological Sites Regulations 2001of the *Nunavut Act*; Territorial Land Use Regulations 2013 of the *Territorial Lands Act*; *Canada Oil and Gas Operations Act* in the Canada Oil and Gas Geophysical Operations Regulations 2012) ▪ Inuit Qaujimajatuqangit identified heritage resources as VC with a request that archaeological surveys be conducted and identified archaeological and grave sites not be disturbed (Agnico Eagle 2014a; Cumberland 2005a; NIRB 2015a; Approved Project FEIS Volume 7, Appendix 7-A, Agnico Eagle 2016c)
Traditional Land and Resource Use ▪ Wildlife harvesting (hunting and trapping) ▪ Fishing ▪ Plant Harvesting ▪ Use of Culturally Important Sites ▪ Marine Resource Harvesting	▪ The maintenance of cultural ties to traditional and subsistence activities is essential to the social and emotional wellbeing of Inuit people today[a]. ▪ Traditional activities are important to the traditional economy, for maintaining social relationships and cultural identity among Inuit populations[b]. ▪ IQ encompasses knowledge of the land and its resources and the passing down of this knowledge through generations, the skills in applying this knowledge to livelihoods, and a value system rooted in responsible resource use, respect, sharing, collaboration, collective decision-making, and the development of skills[c]. ▪ IQ provides cultural grounding and a sense of purpose and wellbeing; the ability to continue traditional land use activities and to retain traditional knowledge and skills is an integral part of IQ[d]. ▪ Project activities have the potential to affect TLRU activities, including hunting, trapping, fishing and plant harvesting due to disturbance to preferred land use areas, changes in the availability of wildlife, fish and vegetation resources, and changes in access to traditional land use areas. Project activities may also affect the use of culturally important sites or areas, including historical resources, spiritually important sites and travel routes, due to disturbance to these sites or areas and changes in access to these sites or areas. ▪ Project activities have the potential to affect opportunities for participation in TLRU activities. ▪ The consideration of effects to marine resource harvesting in the TLRU assessment for the Expansion Project is based on consultation with the community of Chesterfield Inlet and concerns expressed regarding potential Project effects on marine resources, particularly related to marine shipping.

[a] Dana and Anderson (2014); Freeman (2011).

[b] Nuttall et al. (2005).

[c] NIRB (2013, 2007, n.d.); Cumberland (2005b).

[d] Tagalik (2012).

VC = valued component; FEIS = Final Environmental Impact Statement; EIS = Environmental Impact Statement; NIRB = Nunavut Impact Review Board, TLRU: Traditional Land and Resource Use

7.1.2 Spatial and Temporal Boundaries

7.1.2.1 Spatial Boundaries

7.1.2.1.1 Heritage Resources

The Expansion Project considers the same spatial boundary as the Approved Project, with consideration to expansion of the Whale Tail Pit, IVR Pit, haul road widening, and additional quarry/borrow locations. The LSA for heritage resources is defined as the area that encloses the haul road and the Expansion and Approved footprint (FEIS Addendum Volume 3, Figure 3.2-5). For the haul road, the LSA includes an area extending 25 m on either side of the road center line (a 50 m wide corridor), as well as proposed borrow locations on esker numbers 1 to 7 adjacent to the haul road, and new quarries located at KM 2.5, KM 8, KM 26.5 (expansion), KM 34.9 (expansion), KM 40.4, and KM 53. For the Whale Tail Pit area, the LSA includes the footprint for the various Project facilities where Project activities will occur.

Given the site-specific and stationary nature of heritage resources, this is the maximum area where direct and indirect Project effects to heritage resources could reasonably occur. There are no expected direct effects to heritage resources outside the LSA. As a result, an RSA for heritage resources has not been defined, and all discussion will remain at the LSA scale.

7.1.2.1.2 Traditional Land and Resource Use/Inuit Qaujimajatuqangit

The spatial boundaries considered for the Expansion Project TLRU assessment are consistent with those defined in the Approved Project (FEIS Volume 7, Section 7.1.3), and considers the terrestrial study areas to evaluate potential effects of the Project on land-based activities (i.e., wildlife harvesting and plant harvesting), and the freshwater study areas to discuss effects of the Project on water-based activities (i.e., fishing). The heritage resources and noise and vibration study areas are considered to evaluate potential effects on the use of culturally important sites.

The TLRU impact assessment for the Expansion Project also considers potential effects on traditional marine resource harvesting related to marine resource availability, which is associated with the marine environment VCs (i.e. marine fish, marine mammals and marine birds). Therefore, the spatial boundaries for the TLRU assessment of continued opportunities for traditional marine resource harvesting considers the study areas used for the marine environment, which encompass the Approved Project shipping corridor in the channel of Chesterfield Inlet, Hudson Bay, and Hudson Strait (Volume 3, Appendix 3-A, Section 3.A-2).

7.1.2.1.3 Socio-Economics

The spatial boundaries for the socio-economic effects assessment are delineated as either local or regional and are consistent with the Approved Project. The LSA consists of the Kivalliq region, and the RSA is the territory of Nunavut. Further details are provided in Volume 7, Appendix 7-B.

7.1.2.2 Temporal Boundaries

For the Approved Project, the temporal boundary for assessment of potential effects on the human environment, for construction, operations, and closure of the Project was about a three to four-year LOM, with operations running from 2019 through 2022 and closure culminating in 2029 (Section 3.3).

The Expansion Project activities are to be initiated upon receipt of Project approvals. Construction activities are proposed from 2019 to 2020, operations from 2020 to 2025, and closure from 2026 to 2051, followed by post-closure from 2051.

Potential direct effects to heritage resources are associated primarily with the construction and operations phase during ground altering activities and the removal of soil, vegetation, and bedrock. Direct effects could potentially occur during the closure phase in the event activities extend beyond the existing footprint. Heritage resources are non-renewable and can be permanently damaged or destroyed during these activities.

Further details on socio-economics are provided in Volume 7, Appendix 7-B.

7.2 Heritage Resources

A summary of the key changes to the assessment of the heritage resources component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 7.2-0.

Table 7.2-0: Heritage Resources: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
7.2.1 Incorporation of IQ	Review of • Inuit Qaujimajatuqangit Baseline Report 2015 (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c); • Public Information Meeting Summary Report (NIRB 2015a); • Proposed All-weather Exploration Road from the Meadowbank Mine to the Amaruq Site, Baseline Traditional Knowledge Report (Agnico Eagle 2014a); and • Meadowbank Gold Baseline Traditional Knowledge Report (Cumberland 2005a).	Additional sources of IQ and Project concerns reviewed for the Expansion Project are listed below: • Whale Tail Pit Open House-Chesterfield Inlet-October 24, 2016 • Whale Tail Pit Open House-Naujaat, October 2016 • Meadowbank AWAR Community Safety Meeting Minutes December 14, 2016. Community Hall Baker Lake • Whale Tail Pit Open House-Baker Lake, October 25, 2016 • Whale Tail Pit Open House-Coral Harbor, October, 2016 • Whale Tail Pit Open House-Whale Cove, October 2016 • Baker Lake HTO Meeting Q1-February 10, 2017 • Meeting with Coral Harbour HTO, July 5, 2017 • Public Meeting – Chesterfield Inlet: July 5, 2017 • Baker Lake HTO Meeting Q3, September 2017 • Pre-Hearing Conference Decision concerning the Whale Tail Pit Project and an Application for a New Type “A” Water License proposed by Agnico Eagle Mines Limited. • Nunavut Impact Review Board’s Hearing Regarding the Review of Agnico Eagle Mines Limited’s Whale Tail Pit Project Proposal. Hearing held at Baker Lake, Nunavut. • In Pit Disposal Community Minutes-Baker Lake March 6, 2018 • Baker Lake Water Quality Improvement Project, Power Potential and Shipping Community Consultation, May 23, 2018 • July 10-13 Community Consultation Notes. July 10-13, 2018, Baker Lake and Chesterfield Inlet, Nunavut
7.2.2 Existing Environment and Baseline Information	• 2013, 2014, 2015 Heritage Resources Baseline Studies	• 2016, 2017, and 2018 Field Studies
7.2.3 Potential Project-related Effects Assessment	Three secondary pathways were identified; no primary pathways were identified	No new primary pathways identified
7.2.4 Residual Impact Classification	Potential residual effects to heritage resources are not considered significant after mitigation measures are applied	Unchanged

Section of FEIS	Approved Project	Expansion Project
7.2.5 Cumulative Effects Assessment	Potential cumulative effects to heritage resources are not considered significant after mitigation measures applied	Unchanged
7.2.6 Uncertainty	Future proposed changes to the Project footprint, if contemplated, or other ancillary activities will be assessed relative to the heritage resources VC through desktop review and field studies (where warranted) by a qualified archaeologist.	Unchanged
7.2.7 Mitigation and Monitoring	Archaeological Management Plan	Refer to Volume 8, Appendix 8-E.8 for an updated Archaeology Management Plan

7.2.1 Incorporation of Inuit Qaujimajatuqangit

Additional IQ and concerns related to Heritage Resources were provided by community members since the FEIS submission in 2016 for the Approved Project. This assessment considers community consultation notes form Agnico Eagle (2016g, 2016h, 2017c), NIRB and NWB (2017), and NIRB (2017), as well as during community consultation with Baker Lake and Chesterfield Inlet for the Expansion Project (Agnico Eagle 2018a). The following Project comments and concerns related to Heritage Resources are summarized below.

Several Baker Lake community members described how they used to visit the Approved and Expansion Project area, and travelled to Gjoa Haven during the summer or by snowmobile in the winter, using one of several travel routes (Agnico Eagle 2018a). They explained that several different communities have used the Approved and Expansion Project area, including families from Kugaaruk and Gjoa Haven in the Kitikmeot region, and there would be archaeological sites, including graves and artifacts in the Project area:

> *a group hunted around there, so they will come, there are graves, it's part of people coming down from Gjoa Haven…People go up there and come down, family to see. They get there with snowmobile takes 2 or 3 days depending on weather, but not summer – although still do spring (Agnico Eagle 2018a p.32)*

Several concerns were raised by Baker Lake, Chesterfield Inlet, and Naujaat community members about disturbances to archaeological and historic sites, including to artifacts, graves, inukshuks and camp sites, and whether any archaeological studies had been completed to identify sites in the Approved Project area (Agnico Eagle 2016g, 2016h, 2017c, 2018a; NIRB and NWB 2017; NIRB 2017). Concerns were also raised about existing archaeological sites that were identified during studies conducted for the Approved Project, including historic sites along the haul road, and the grave site near Whale Tail Pit area (Agnico Eagle 2017c; NIRB and NWB 2017; NIRB 2017). The importance of consulting with different communities who have used the area in the past was emphasized (Agnico Eagle 2018a). For example, Baker Lake community members stated that it was important to consider "*what is there for our ancestors*", and potential effects to traditional or archaeological sites from three other communities from the Kitikmeot region that have used the Project area, since their ancestors are also buried there (Agnico Eagle 2018a).

The concerns as they pertain to the Expansion Project have been incorporated in Sections 7.2.2.2, 7.2.3, and 7.2.7 of the FEIS Addendum.

7.2.1.1 Existing Environment and Baseline Information

The Expansion Project does not change IQ integration from the Approved Project. Additional assessments in 2016, 2017, and 2018 (Tischer 2017, 2018a, nd) involved participation by community members and Elder site visits.

Inuit Qaujimajatuqangit information helped focus and prioritize data collection methods and inform heritage resource baseline data. Through community meetings and engagement, culturally special places, locations of known or potential archaeological sites, as well as grave sites were identified in the LSA and broader region.

7.2.1.2 Valued Component Selection

Selection of VCs is the same as the Approved Project and were reiterated in more recent community consultations (Agnico Eagle 2016g, 2016h, 2017c, 2018a; NIRB and NWB 2017; NIRB 2017).

7.2.1.3 Impact Assessment

The Expansion Project considers the same potential effects as the Approved Project. Additional assessments in 2016, 2017 and 2018 (Tischer 2017, 2018a, nd) involved participation by community members and Elder site visits.

The impact assessment for heritage resources focused on the presence of archaeological sites, their distance from the proposed Expansion Project footprint, and the predicted level of impact. Heritage resource value or significance was considered when determining Expansion Project effects and mitigation measures. Both scientific and IQ perspectives were considered in the assessment.

7.2.1.4 Mitigation and Monitoring

Mitigation and monitoring measures for the Expansion Project included in this Addendum will be the same as the Approved Project. As indicated in Agnico Eagle's Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1), project design and construction will incorporate avoidance where possible to protect heritage resources. Where this is not possible, mitigation of archaeological sites directly affected by the Expansion Project will take place prior to construction. Mitigation measures required to reduce impacts to archaeological sites will be determined in consultation with the Nunavut Department of Culture and Heritage, and with the community of Baker Lake (specifically elders and the HTO Members).

Agnico Eagle is committed to incorporating any new mitigation measures in the applicable management plan.

7.2.2 Existing Environment and Baseline Information

Heritage resource baseline studies related to the Meadowbank Mine have been ongoing since 1999 (Webster 2004; Prager 2006; Tischer 2007, 2010, 2012). Baseline studies specifically related to the Approved Project area were carried out over four years (Tischer 2013, 2014, 2015, 2016).

Subsequent work has been completed since the submission of the Approved Project, which includes field assessments in 2016, 2017, and 2018 (Tischer 2017, 2018a, nd). These included participation by community members, as well as Elder site visits.

7.2.2.1 Methods

The methods for the Expansion Project remain the same as the Approved Project. A summary of methods is provided in the Approved Project (FEIS Volume 7, Section 7.2.2.1).

7.2.2.2 Results

Between 2013 and 2015, one archaeological overview and three archaeological inventory studies of the Approved Project were undertaken by Nunami-Stantec.

As a result of baseline studies (Tischer 2013, 2015, 2016), a total of 19 archaeological sites were identified within or adjacent to the LSA. Refer to the Approved Project (FEIS Volume 7, Section 7.2.2.1). These archaeological sites suggest a long history of land use in the region by Inuit peoples. This is consistent with information provided by Baker Lake community members during the field studies and IQ engagement meetings. Eight archaeological sites were identified during assessment of the haul road, nine during assessment of borrow sources, and two during assessment of the Whale Tail Pit area.

In summary, the types of heritage resources documented in baseline studies include:

- one marker site consisting of two stone uprights demarcating a crossing at the narrows of the Meadowbank River;
- three cache sites (two single and one multiple) located on prominent landforms overlooking the Meadowbank River;
- three hunting blind sites (also located on prominent landforms) consisting of large cobbles forming a low wall in the shape of an arc (n=2), or a circular pattern (n=1);
- 11 campsites consisting of a combination of stone tent rings, hearths, stone uprights, cairns, possible inuksuit, caches, wooden artifacts, and lithic scatters; and
- one burial cairn/campsite consisting of a grave, tent rings, and a wood and metal artifact scatter.

Three sites have been interpreted as prehistoric and contain either lithic artifact scatters from stone tool production or obviously old stone features that exhibit lichen and sod development. Eight sites were identified as potentially historic or prehistoric because they contained stone features, but no artifacts to assist with an age estimate. Eight sites were identified as historic based on the presence of more recent wood and metal artifacts, square tent outlines indicating use of canvas tents, or obviously recent stone features with little lichen or sod development.

Since the Approved Project, additional archaeological field studies have been carried out and are summarized below and in Table 7.2-1. These recent assessments addressed community concerns regarding whether archaeological studies will be completed to identify sites in the Approved and Expansion Project area (Agnico Eagle 2016g, 2016h, 2017c, 2018a; NIRB and NWB 2017; NIRB 2017). Given the confidential nature of archaeological sites, their locations are not provided in this document (e.g., on figures). Site maps and shapefiles have been provided to the GN and Agnico Eagle to assist with ongoing project planning purposes.

- Permit 2016-020A (Tischer 2017): Archaeological field investigations included supplemental assessment of planned esker borrow sources, new road routings, proposed quarry locations adjacent to the haul road route, additional assessment within the Whale Tail Pit area, and archaeological excavation at three previously recorded sites that could not be avoided by the Project (Tischer 2017). Results of the assessment identified two new archaeological sites in proposed quarry locations (LhLa-11 and LiLb-4), one identified while accessing the study area and well away from the haul road (LhLa-12), and one along the shore of Whale Tail Lake (LiLc-3).

- Permit 2017-07A (Tischer 2018a): Field assessments were conducted at a proposed communication tower along the haul road and at two proposed boat launch locations. One archaeological site was identified near the communication tower (LhLa-13).
- Permit 2018 (Tischer nd): Field studies examined one expanded borrow source along the haul road (Quarry 26), as well as the Tank Farm at Baker Lake. The final report is still being compiled and analyzed; however, the results and potential resource values were validated with elders during site visits.

Table 7.2-1: Heritage Resources Recorded within or Adjacent to Local Study Area since the Approved Project FEIS Submission

Project Component	Site	Site Type	Site Type Class	Description	Perceived Significance Value	Relationship to Project
Haul Road Quarry (15+800)	LhLa-11	Campsite	Indigenous historic Prehistoric	Ten features, including tent rings, caches, stones markers, as well as two stone tool, historic metal objects. two hearths and wooden artifacts	High	Avoided – proposed quarry location will not be developed
Haul Road	LhLa-12	Campsite	Indigenous historic	Four tent rings, three hearths, various historic materials	High	Avoided- approx. 1 km from haul road
Haul Road Quarry (53+650)	LiLb-4	Campsite	Prehistoric	At least 25 stone features including a variety of tent rings, hearths, cairns, and marker rocks. Several scatters of lithic debitage (tool making debris) and stone tools were observed	High	Avoided – proposed quarry location will not be developed
Whale Tail Lake	LiLc-3	Campsite	Indigenous historic	Single stone arc (disturbed tent ring) and historic item	Low-moderate	Within flooded zone of lake
Haul Road (Communication Tower Km 18)	LhLa-13	Campsite	Prehistoric	Multiple stone features (tent ring, caches)	High	Avoided

7.2.3 Potential Project-related Effects Assessment

Potential pathways through which the Expansion Project could affect heritage resources are presented in Volume 3, Appendix 3-C, Table 3-C-8. Consistent with the Approved Project, there are no primary pathways anticipated for heritage resources.

The following pathways considered for the Expansion Project are the same as those assessed for the Approved Project and are anticipated to be secondary in relation to heritage resources and were carried through to the effects assessment:

- Construction activities that involve ground disturbance have the potential to impact archaeological sites by disturbing cultural deposits and features, damaging artifacts, hindering or increasing access to archaeological deposits, and destroying contextual information that is essential for interpreting site function and age.

- Operational activities that involve ground disturbance have the potential to impact archaeological sites by disturbing cultural deposits and features, damaging artifacts, hindering or increasing access to archaeological deposits, and destroying contextual information that is essential for interpreting site function and age.
- Closure activities that involve ground disturbance have the potential to impact archaeological sites by disturbing cultural deposits and features, damaging artifacts, hindering or increasing access to archaeological deposits, and destroying contextual information that is essential for interpreting site function and age.

Four sites (LhLa-4, -5, -6, and -7) are located within the haul road or borrow source boundaries and potential Expansion Project effects are adverse. LhLa-5, which consists of two marker rocks, was evaluated as having limited scientific interpretive value. Recording and documentation is considered sufficient mitigation of this site. The remaining three heritage sites (Table 7.2-2) have been considered in Expansion Project planning, and appropriate mitigation measures will be applied as outlined in the Archaeology Management Plan (Volume 8, Appendix 8-E.8).

Table 7.2-2: Heritage Resources within the Local Study Area Proposed for Mitigation

Site	Site Type	Description	Perceived Interpretive Value	Relationship to Project	Mitigation Measure
LhLa-4	Campsite	Multiple features, including two tent rings, two hearths, and wooden artifacts	High	Within haul road ROW (km 18.3)	Systematic Data Recovery
LhLa-6	Campsite	A tent ring, likely of considerable age based on lichen growth; a scatter of lithic artifacts was observed 15 m south of the ring	High	Within Esker #2A	Systematic Data Recovery
LhLa-7	Blind	Low, north facing hunting blind	Moderate	Within Esker #2A	Systematic Data Recovery

ROW = right of way.

The three archaeological sites recorded within the haul road LSA in the Approved Project were mitigated in 2016 and involved Elder visits (Tischer 2017). This addressed the concerns raised by communities regarding existing archaeological sites documented along the haul road (Agnico Eagle 2017c; NIRB and NWB 2017; NIRB 2017).

Newly recorded sites LhLa-11, LhLa-12, LhLa-13, and LiLb-4 will be avoided by haul road activities (Tischer 2018a). Site LiLc-3 within the flooded zone of Whale Tail Lake was mitigated through site documentation, excavation/shovel testing, and artifact collection. The assessments that identified these new sites addressed community concerns regarding whether archaeological studies will be completed to identify sites in the Approved and Expansion Project area (Agnico Eagle 2016g, 2016h, 2017c, 2018a; NIRB and NWB 2017; NIRB 2017).

Grave site LiLc-2, which is an ongoing concern identified by community members during IQ (Agnico Eagle 2017c; NIRB and NWB 2017; NIRB 2017), is not in an area of proposed development and will continue to be avoided by Expansion Project activities.

With the implementation of appropriate mitigation measures, it is anticipated that there will be no or minimal Expansion Project effects to archaeological sites.

7.2.4 Residual Impact Classification

Consistent with the Approved Project, pathways for heritage resources have been assessed as secondary and are not classified.

7.2.5 Cumulative Effects Assessment

Consistent with the Approved Project, pathways for heritage resources have been assessed as secondary and are not assessed further. Further, heritage resource components are localized to the Project and will not interact with other disturbances regionally.

7.2.6 Uncertainty

Consistent with the uncertainty identified for the Approved Project, the following uncertainties apply to the Expansion Project. Future proposed changes to the Expansion Project footprint, if contemplated, or other ancillary activities will be assessed relative to the heritage resources VC through desktop review and field studies (where warranted) by a qualified archaeologist. Any data gaps will be addressed prior to ground disturbance activities by a qualified archaeologist. Agnico Eagle is committed to providing ongoing consultation with the community of Baker Lake (specifically Elders and the HTO Members) and to provide opportunities for participation in heritage resource surveys and mitigation measures. These activities will address uncertainty with respect to potential Project effects to the heritage resources VC.

7.2.7 Monitoring and Follow-up

The same approach as in the Approved Project will be followed for the Expansion Project, as outlined in the updated Archaeology Management Plan (Volume 8, Appendix 8-E.8). Agnico Eagle commits to conducting additional archaeological assessments for any previously unassessed Approved and Expansion Project footprint in archaeological sensitive areas, including quarries proposed for the haul road expansion. Should any archaeological sites be identified in proposed quarries, they will not be developed. This commitment for additional assessment addresses concerns raised by community members regarding whether archaeological studies will be completed to identify sites in the Approved Project area (Agnico Eagle 2016g, 2016h, 2017c, 2018a; NIRB and NWB 2017; NIRB 2017).

Agnico Eagle is committed to providing an education program for mine staff and contractors that will provide general awareness training for the proponent and contractors that includes general guidelines for the appropriate response to the inadvertent discovery of known or suspected archaeological sites. This will aid in limiting direct and indirect effects to the heritage resources VC during construction, operations, and closure of the Expansion Project.

Implementation of appropriate mitigation measures that are acceptable to the regulators, such as site avoidance or further investigation at archaeological sites that cannot be avoided, will reduce or eliminate impacts to archaeological sites as a result of the Expansion Project.

7.3 Traditional Land and Resource Use / Inuit Qaujimajatuqangit

A summary of the key changes to the assessment of the TLRU/IQ component for the Expansion Project compared to the FEIS developed for the Approved Project is provided in Table 7.3-0.

Table 7.3-0: Traditional Land and Resource Use / Inuit Qaujimajatuqangit: Approved Project vs Expansion Project Comparison

Section of FEIS	Approved Project	Expansion Project
7.3.1 Existing Environment and Baseline Information	Review of: • Inuit Qaujimajatuqangit Baseline Report 2015 (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c)	Review of: • Technical meetings (May 2017) and the Final Hearing (September 2017) for the Approved Project, and during subsequent consultation meetings for the Approved Project. • Agnico Eagle. 2018. Agnico Eagle Mines: Whale Tail Amendment. July 10-13 Community Consultation Notes. • Consultation Record documents and notes (2016-2018) associated with meetings shown in Volume 2, Appendix 2-D. Marine Resource Use: • Freeman. 1976. The Inuit Land Use and Occupancy Project. • Riewe. 1992. The Nunavut Atlas. • AREVA. 2011b. Kiggavik Project Environmental Impact Statement Tier 3 Technical Appendix 3B: Inuit Qaujimajatuqangit Documentation. December 2011. • Nanuk Enterprises. 2011. Appendix 9.3-A Results of the Inuit Qaujimajatuqangit interviews and focus groups held in Rankin Inlet, Chesterfield Inlet and Whale Cove. Meliadine FEIS-Volume 9 Socio-Economic Environment. • Burt and Hickes. 2012. Appendix 9.3-C Meliadine Gold Project Traditional Knowledge, Marine Approaches to Rankin Inlet Report. Meliadine FEIS-Volume 9 Socio-Economic Environment. • Nunami Stantec. 2010. Agnico Eagle Mines Limited Meadowbank Project. 2010 Inuit Qaujimajatuqangit Workshop. Final Report. • Kivalliq Inuit Association (KivIA) Land Administration 2018. Land Management Application. • GN. 2005. Inuit Qaujimajatuqangit of Climate Change in Nunavut, a Sample of Inuit Experiences of Climate Change in Nunavut Baker Lake and Arviat, Nunavut.
7.3.2 Potential Project-related Effects Assessment	Four primary pathways were identified.	The same four primary pathways are assessed, plus one additional primary pathway was identified: • Project activities may affect continued opportunities for traditional marine resource harvesting.
7.3.3 Residual Impact Classification	Residual effects predicted for traditional wildlife harvesting, traditional fishing, traditional plant harvesting and use of culturally important sites. Residual impacts are classified as being not significant.	Existing residual effects remain unchanged for traditional wildlife harvesting, traditional fishing and traditional plant harvesting. No residual effects are expected for use of culturally important sites and for marine resource harvesting. Residual impacts are classified as being not significant.
7.3.4 Cumulative Effects Assessment	No cumulative effects were predicted for traditional fishing, plant harvesting and culturally important sites because planned developments are all located outside of the RSA. Cumulative effects to traditional wildlife harvesting due to changes in the availability of caribou and opportunities to harvest them may occur.	These conclusions remain unchanged. In addition, cumulative effects to traditional marine resource harvesting because of changes in marine resource availability and opportunities to harvest them may occur.

Section of FEIS	Approved Project	Expansion Project
7.3.5 Uncertainty	There is inherent uncertainty in assessing the significance of some traditional land use effects, Uncertainty was addressed by applying a conservative estimate of effects in the residual impact classification and in the determination of significance; by incorporating both publicly available information from the literature and directly from community members; and from using past experience in similar areas including the experiences at Meadowbank Mine.	Unchanged
7.3.6 Monitoring and Follow-up	• Ongoing consultation with community members • Opportunities for participation in the development and implementation of mitigation measures and monitoring programs, as per the NIRB Guidelines requirements (NIRB 2004), and the terms and conditions of the Meadowbank Project Certificate No.004 (NIRB 2006).	Unchanged, as per the terms and conditions for the Project Certificate No. 008 (T&C #54).

This assessment will address the VC of TLRU as a component of traditional ways of life consistent with the approach used in the Approved Project (FEIS Volume 7, Section 7.3). Inuit Qaujimajatuqangit shared concerns raised by Baker Lake and Chesterfield Inlet community members and representatives since the Approved Project FEIS was submitted in 2016, have also been incorporated in the TLRU assessment.

7.3.1 Existing Environment and Baseline Information

The IQ baseline report describes in detail baseline information on TLRU (Approved Project FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Concerns, recommendations, or requests for mitigation related to TLRU and IQ that were raised during consultation meetings, TK workshops, or group discussions between 2014 and 2016 for the Amaruq Exploration Access Road and for the Approved Project are provided in the Approved Project (FEIS Volume 7, Section 7.3.1).

The IQ baseline report for the Approved Project (FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c) is considered relevant to the Expansion Project. It describes both contemporary and TK, activities and land use, community wellbeing, and local understanding of wildlife, fish, vegetation, climate and weather, and cultural sites. Baseline information gathered for the TLRU assessment for the Expansion Project has strengthened the Approved Project TLRU and IQ and also includes TK of marine resources, and marine resource harvesting.

Additional IQ, including TLRU baseline information, and Project-related concerns and issues were provided by Baker Lake and Chesterfield Inlet community members and representatives (i.e., HTO and KivIA) since the Approved Project FEIS submission (Agnico Eagle 2016c) through community consultation, including NIRB and NWB (2017), NIRB (2017), and Agnico Eagle (2018a). Concerns have been raised and comments provided by community members about the Approved Project and the continuation of mining, which are also relevant to the Expansion Project and carried forward in this assessment. A summary of relevant Expansion Project concerns and where they are addressed in this FEIS Addendum is provided in Volume 2, Appendix 2-D.

The results of the IQ baseline report is presented in the Approved Project (FEIS Volume 7, Appendix 7-A; Agnico Eagle 2016c). Additional IQ, including TLRU baseline information is presented in FEIS Addendum Appendix 7-A; as well as in discipline sections of Volumes 4, 5, 6, and 7 of the FEIS Addendum.

7.3.2 Potential Project-related Effects Assessment

A pathway analysis was conducted to identify linkages between the Expansion Project and TLRU and are summarized in Volume 3, Appendix 3-C, Table 3-C-9.

The assessment of Expansion Project effects on continued opportunities for TLRU considers the effects of VCs as described in the following sections:

- Wildlife and Wildlife Habitat (Section 5.5) - traditional wildlife harvesting;
- Fish and Fish Habitat (Section 6.5) - traditional fishing;
- Vegetation (Section 5.4) - traditional plant harvesting;
- Marine Resources (Volume 3, Appendix 3-A) – marine resource harvesting; and
- Heritage Resources (Section 7.2) and Noise and Vibration (Section 4.4) – use of culturally important sites.

In addition to the pathways identified for the Approved Project, pathways potentially leading to effects on TLRU for the Expansion Project also include indirect effects related to marine resources and marine resource harvesting. Indirect effects are related to changes in the availability of marine resources, including marine fish, marine mammals and marine birds for harvesting, and are therefore related to changes in the abundance and distribution and quality of marine resources. Expansion Project activities considered in the pathway analysis related to effects on marine resources were limited to those directly associated with marine shipping, which will occur during construction, operations, and closure phases of the Project.

As with the Approved Project, no linkage was identified between Expansion Project activities and changes in access to TLRU areas. The Approved and Expansion Project area was not identified as a preferred use area for traditional activities, and was predominantly used as a travel corridor by people in the past, and used opportunistically for harvesting and other activities. Although use of the Approved and Expansion Project area may increase in the future because access has been facilitated by the AWAR, it is expected to be limited, with preferred areas identified closer to the community and within 50 km of the AWAR (Agnico Eagle 2015c, 2016f), which do not interact with the Expansion Project. For people using the Expansion Project area for traditional activities, or as a travel corridor, access is not expected to change because of Expansion Project activities. The haul road will be closed to the public, with controlled access, only available for Agnico Eagle staff and contractors. The ATV and snowmobile trails that intersect with the haul road will be maintained with the installation of safe crossing areas, including signage for operations vehicles to ensure safety for land users. Agnico Eagle will continue to consult and work with the HTO and KivIA to identify trails or safe crossing locations that intersect with the haul road to ensure that safe crossing structures are installed where feasible.

7.3.2.1 Primary Pathways Effects Analysis

Table 7.3-1 provides a summary of the primary pathways that require further effects analysis. The primary pathways assessed for the Expansion Project and associated indicators are consistent with those assessed for the Approved Project FEIS, with the addition of a new primary pathway and associated indicator for traditional marine resource harvesting. For additional information related to mitigation measures refer to pathway tables provided in Volume 3, Appendix 3-C, Table 3-C-9.

Table 7.3-1: Primary Pathways and Measurement Indicators

Primary Pathway	Associated Indicators
■ Project activities may affect continued opportunities for traditional wildlife harvesting	■ disturbance to preferred traditional wildlife harvesting areas ■ changes in the availability of traditionally harvested wildlife resources (caribou, furbearers, birds) ■ social and economic factors affecting participation in traditional land use activities
■ Project activities may affect continued opportunities for traditional fishing	■ disturbance to preferred traditional fishing areas ■ changes in the availability of traditionally fished resources ■ social and economic factors affecting participation in traditional land and resource use activities
■ Project activities may affect continued opportunities for traditional plant harvesting	■ disturbance to preferred traditional plant harvesting areas ■ changes in the availability of traditionally harvested plant resources ■ social and economic factors affecting participation in traditional land resource use activities
■ Project activities may affect continued opportunities for the use of culturally important sites	■ disturbance to preferred use or culturally important areas ■ changes in the availability of traditionally important cultural and historic sites or features ■ social and economic factors affecting participation in traditional land resource use activities
■ Project activities may affect continued opportunities for traditional marine resource harvesting	■ changes in the availability of traditionally harvested marine resources (marine fish, marine mammals and marine birds)

7.3.2.1.1 Continued Opportunities for Traditional Wildlife Harvesting

Continued opportunities for traditional wildlife harvesting (hunting and trapping) considers potential effects of the Expansion Project on wildlife and wildlife habitat that may result in changes in the availability of wildlife resources for harvesting purposes, and changes in traditional land use patterns. Inuit Qaujimajatuqangit values and concerns are also considered in assessing potential effects on traditional wildlife harvesting. Potential Expansion Project effects on terrestrial wildlife and birds were analyzed and results are provided in the Volume 3, Appendix 3-C, Table 3-C-3. The wildlife primary pathways assessed for the Expansion Project are consistent with those assessed for the Approved Project (Addendum Volume 5, Section 5.5.3.1). Pathways were determined to have no linkage or considered secondary for predatory mammals and muskox and were not carried though the effects assessment (Appendix 3-C, Table 3-C-3). Therefore, potential effects to continued opportunities for traditional wildlife harvesting considers effects on harvesting of caribou and waterbirds (waterfowl and geese) were carried forward, and effects to furbearers were not carried forward in the analysis.

The wildlife assessment for the FEIS Addendum determined that the conclusions for the Expansion Project are consistent with the Approved Project, with low and localized effects to waterbird populations (Addendum Volume 5, Section 5.5.4.1). Waterfowl and geese are expected to continue to be regionally available for harvesting, including in preferred harvesting areas near Baker Lake. The effects of direct wildlife habitat loss on caribou from the Expansion Project are similarly low in the LSA and RSA (Addendum Volume 5, Section 5.5.4.1). The residual effects of indirect habitat loss on caribou from sensory disturbance and barriers to migration for the Expansion Project are consistent with the Approved Project (Addendum Volume 5 Section 5.5.4.1). Therefore, measurable changes in the availability of caribou for harvesting in certain areas are anticipated at the regional level due to changes in caribou movement patterns and distribution because of the Expansion Project.

Concerns continue to be expressed by community members regarding the effects of the mine and haul road, including noise and dust on caribou movement and migration patterns. Mitigation to address the effects of sensory disturbance to wildlife is described in the Addendum Volume 5, Section 5.5.3.3, and includes implementation of the Noise Monitoring and Abatement Plan (Volume 8, Appendix 8-E.7), the Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1), the Air Quality and Dustfall Monitoring Plan (Volume 8, Appendix 8-E.1), and the TEMP (Volume 8, Appendix 8-E.9). The same mitigation applied to the Approved Project to minimize barriers to migration will also be used for the Expansion Project, which are outlined in the Whale Tail Pit Haul Road Management Plan (Volume 8, Appendix 8-C.1) and TEMP (Volume 8, Appendix 8-E.9).

No new preferred caribou harvesting locations were identified in the literature review for the Expansion Project, but Baker Lake hunters indicated that they continue to benefit from using the AWAR to access caribou harvesting areas (NIRB 2017). The Expansion Project does not overlap with preferred harvesting areas located near the community or the AWAR. The Expansion Project is expected to have similar impacts as the Approved Project on traditional harvesting patterns from a socio-economic perspective; some people may experience an increase in harvesting opportunities because of the benefits of wage employment and increased access along the AWAR, while others may experience a decrease in harvesting opportunities because of a lack of time and resources. Rotational employment will facilitate participation in hunting activities for employees during their time off so that traditional activities can be balanced with wage employment.

The conclusions from the Approved Project remain the same for the Expansion Project (Approved Project FEIS Volume 7, Section 7.3.2). Although changes in caribou movement patterns and distribution in the terrestrial RSA are anticipated for the Expansion Project, the vast majority of caribou range is undisturbed and a reduction in caribou survival is not expected, therefore caribou will still be available in preferred harvesting locations close to Baker Lake and in areas north of the community that are accessed by the AWAR. Continued opportunities for traditional harvesting of wildlife may decrease for some traditional land users due to the Expansion Project, based on potential changes in wildlife availability, combined with barriers to participation in traditional hunting activities for some land users however the effect is anticipated to be limited (Section 7.3.3.1).

7.3.2.1.2 Continued Opportunities for Traditional Fishing

Continued opportunities for traditional fishing considers potential effects of the Expansion Project on fish and fish habitat that may result in changes in the availability of fish resources for fishing purposes, and changes in traditional land use patterns. Inuit Qaujimajatuqangit values and concerns are also considered in assessing potential effects on traditional fishing. Potential Project effects on fish and fish habitat were analyzed and results are provided in Volume 3, Appendix 3-C, Table 3-C-7. New primary pathways were assessed for the Expansion Project that required effects analysis (Addendum Volume 6, Section 6.5.4).

The Expansion Project is expected to affect fish and fish habitat primarily as a result from direct habitat losses which will have a measurable effect on Arctic Char, Lake Trout, Burbot, and Round Whitefish (Addendum Volume 6, Section 6.5.5). Concerns were expressed by community members about the dewatering and fish-out process for the Expansion Project in general, including the potential for fish injury and mortality. Small waterbodies and ponds with large-bodied fish species within the footprint of the IVR Pit and WRSF, as well as Lake A53 (IVR Attenuation Pond) will require DFO approved fish-outs during the open-water seasons of 2020 to 2022 prior to dewatering (Addendum Volume 6, Section 6.5.4.2.2). The direct mortality from the fish-out is expected to result in measurable effects to the abundance and distribution of fish species at the regional scale. Therefore, measurable changes in the availability of fish for harvesting in certain areas are anticipated at the regional level due to direct and indirect effects of the Expansion Project.

Concerns were raised by community members about potential adverse effects of water quality on fish populations, including contamination from contact water, and water quality at closure, and the effects of dust on fish populations. Residual effects to fish and fish habitat are also predicted through changes in hydrology and water quality (Addendum Volume 6, Section 6.5.5). Consistent with the Approved Project, the air quality assessment for the Expansion Project concluded that the effects of the Expansion Project on air quality are limited in spatial extent and temporal extent and the effects of dust deposition and acidifying air emissions is predicted to have a negligible effect on water quality, and thus a negligible effect on aquatic ecosystems (i.e., fish) (Addendum Volume 6, Section 6.2.3.1 and 6.2.4.2).

During consultation for the Expansion Project, preferred fishing sites were identified close to Baker Lake, and include Airplane Lake, Baker Lake and Prince River, but it was noted that fish caught further away from town taste better than fish caught close to town (Agnico Eagle 2018a). The Expansion Project does not overlap with preferred fishing sites located near the community. Some land users may experience an increase in fishing opportunities because of the Expansion Project and the benefits of wage employment, while others may experience a decrease in fishing opportunities because of a lack of time and resources. Participation in fishing activities will be facilitated by rotational employment for employees during their time off.

The conclusions from the Approved Project remain the same for the Expansion Project (Approved Project FEIS Volume 7, Section 7.3.2). Changes in the availability Arctic Char, Lake Trout, Burbot and Round Whitefish are expected for some land users within the RSA, however these species are expected to remain locally and regionally abundant, and still available for fishing in preferred fishing locations.

7.3.2.1.3 Continued Opportunities for Traditional Plant Harvesting

Continued opportunities for traditional plant harvesting considers potential effects of the Expansion Project on vegetation that may result in changes in the availability of vegetation resources for harvesting purposes, and changes in traditional land use patterns. Inuit Qaujimajatuqangit values and concerns are also considered in assessing potential effects on traditional plant harvesting. Potential Expansion Project effects on vegetation were analyzed and results are provided in Volume 3, Appendix 3-C, Table 3-C-2. The vegetation primary pathways assessed for the Expansion Project are consistent with those assessed for the Approved Project (Addendum Volume 5, Section 5.4.3.1).

The physical loss of vegetation populations and communities as a result of the Expansion Project will remain during the life of the mine (Addendum Volume 5, Section 5.4.4). After mitigation measurements are applied (FEIS Volume 3, Appendix 3-C, Table 3.C-2), disturbance to the Approved and Expansion Project footprint is predicted to result in the loss of 1,188 ha, of which 828 ha are limited to vegetation communities and 360 ha to water (Addendum Volume 5, Section 5.4.4). Consistent with the Approved Project, although high-quality caribou habitat (i.e., graminoid and lichen dominated ELC units) will be affected by the Expansion Project, these vegetation communities will remain well represented across the LSA and RSA. Reclamation activities and natural re-vegetation of disturbed areas during the closure phase will improve vegetation communities, and revegetated areas of the Expansion Project footprint are expected to be productive and function as wildlife habitat (Addendum Volume 5, Section 5.4.3.1.1 and 5.4.4).

The effects of dust on vegetation and caribou foraging habitat continues to be raised as a key concern among community members. Dust will be generated as a result of construction activities and operations, and it has the potential to affect vegetation quality, particularly to the vegetation adjacent to the haul road. Results of the air quality assessment indicate that rates of atmospheric deposition are below relevant dustfall standards within 500 m from the haul road (Addendum Volume 4, Section 4.3.3.1). Mitigation measures to address the effects of dust are provided in the Air Quality and Dustfall Monitoring Plan (Volume 8, Appendix 8-E.1). The conclusions from the Approved Project remain the same for the Expansion Project (Approved Project FEIS Volume 7, Section 7.3.2). Traditional use of the Expansion Project area is limited for plant harvesting, and traditional use plants are associated with a range of plant community types that are locally and regionally abundant will continue to be available for harvesting.

7.3.2.1.4 Continued Opportunities for the use of Culturally Important Sites

Continued opportunities for the use of culturally important sites considers potential effects of the Expansion Project on heritage resources (archaeological and sacred sites) and the potential effects of the Expansion Project on the acoustic environment that may result in disturbance to culturally important sites, and changes in traditional land use. The IQ values and concerns are also considered in assessing potential effects on the use of culturally important sites, including cabins, camp sites, caching sites, grave sites, spiritual sites, and travel routes. Potential Expansion Project effects on heritage resources and noise and vibration were analyzed and the results are provided in Volume 3, Appendix 3-C. No additional primary pathways for noise and vibration were identified for the Expansion Project (Addendum Volume 4, Section 4.4.3). The key predictions of the Noise and Vibration Impact Assessment remain consistent with the Approved Project (Addendum Volume 4, Section 4.4.4). Noise levels will either decay to below existing ambient noise levels or be compliant with AER Directive 038 Criteria at the noise LSA boundary during construction and operations, with the exception of blasting, which will comply with NPC-119 (Addendum Volume 4, Section 4.4.4). Therefore, community members from Baker Lake or the Kitikmeot region who occasionally travel through the Approved and Expansion Project area to access preferred harvesting areas or culturally important sites outside the noise and vibration LSA (e.g., Back River or near Baker Lake) may experience noise effects, but noise is expected to be temporary and will decrease as people travel away.

No primary pathways were identified for heritage resources for the Expansion Project; with the implementation of appropriate mitigation measures, there were no residual effects to heritage resources (Addendum Volume 7, Section 7.2.4). Four archaeological sites are located within the haul road or borrow source boundaries, one was mitigated through recording and documentation, and the other three were mitigated through systematic data recovery/excavation measures outlined in the Archaeology Management Plan (Volume 8, Appendix 8-E.8). Four newly recorded archaeological sites will be avoided by haul road/quarry activities, and one site located within the flooded zone of Whale Tail Lake was mitigated through site documentation, excavation/shovel testing and artifact collection (Section 7.2.3). The same mitigation applied for the Approved Project and outlined in the Archaeology Management Plan (Volume 8, Appendix 8-E.8) will be implemented prior to construction for the Expansion Project, which will minimize effects to existing cultural sites. In addition, Agnico Eagle will continue to consult with land users to identify important trails that potentially intersect the Approved and Expansion Project footprint, including the expanded haul road, and will install all-terrain vehicle or snowmobile crossing areas to notify vehicles along the haul road.

Given that no new cultural sites were identified in the literature review for the Expansion Project and additional heritage resource sites recorded in the LSA will be mitigated, no residual effects are anticipated for the use of culturally important sites.

7.3.2.1.5 Continued Opportunities for Marine Resource Harvesting

Continued opportunities for traditional marine resource harvesting considers potential effects of the Expansion Project on marine resources that may result in changes in the availability of marine resources for harvesting. Potential Project effects on marine fish, marine mammals and marine birds were analyzed and results are provided in Volume 3, Appendix 3-A, Table 3-C-9. Project activities considered in the pathway analysis for marine resources were limited to those directly associated with marine shipping, which will occur during all phases of the Project (construction, operations, and closure).

Primary pathways that are likely to result in residual effects for marine resources were identified for marine fish, marine mammals, and marine birds because of the Approved Project (FEIS Volume 3, Section 3.A-8; Agnico Eagle 2016c). The potential residual impacts of the Approved Project FEIS include the following (Volume 3, Appendix 3-A):

- Loss or alteration of fish habitat due to an accidental spill, as well as potential fish mortality or health risk due to exposure to an accidental fuel spill.
- Loss or alteration of marine mammal habitat due to an accidental spill, potential marine mammal mortality or health risk due to an accidental spill, potential mortality / injury due to vessel collisions, and potential changes in behavior due to underwater noise from vessel operations.
- Loss or alteration of marine bird habitat due to an accidental spill, potential marine bird mortality or health risk due to an accidental spill, potential mortality or injury due to collisions with ships due to sensory disturbance from ship lighting, and behavioural changes due to sensory disturbance (in-air noise and lighting).

The marine resources assessment predicted that with the implementation of mitigation, the Approved Project would not result in any significant impacts on marine fish productivity, or the structure and function of self-sustaining and ecologically effective marine wildlife populations relative to natural factors (Volume 3 Appendix 3-A, Table 3-A-1).

Pathways associated with the Expansion Project were consistent with the Approved Project, because the shipping route, shipping volumes, volume of fuel being transported, lightering activities, and anchorage locations will remain consistent (Volume 3, Appendix 3-A, Table 3.A-1). Community concerns were raised related to the effects of shipping, including ship traffic and potential spills on marine fish, marine mammals and marine birds. Mitigation measures outlined in the Approved Project will be carried forward through the Expansion Project, and no detectable environmental changes or residuals effects to marine resources are anticipated because of the Expansion Project (Volume 3, Appendix 3, Table 3-A-4). Mitigation will include the implementation of the Shipping Management Plan (Volume 8, Appendix 8-D.6), Oil Pollution Emergency Plan, Spill Contingency Plan (Volume 8, Appendix 8-D.5), and Emergency Response Plan (Volume 8, Appendix 8-D.3). The Expansion Project will continue to implement a marine mammal and seabird observer program onboard Project vessels similar to the on-going program related to the Approved Project (Volume 3, Appendix 3-A, Table 3.A-4).

Considering these results, marine resources will continue to be available for harvesting locally and regionally, and no residual effects are anticipated because of the Expansion Project on continued opportunities for traditional marine resource harvesting.

7.3.3 Residual Impact Classification

The residual impact classification is used to describe the residual effects on TLRU from incremental changes to measurement indicators due to the Project.

The Expansion Project's residual incremental effects on traditional wildlife harvesting, traditional fishing, and traditional plant harvesting are considered to be a combination of effects on the direct disturbance to preferred TLRU areas, the availability of resources, and IQ values related to TLRU (Table 7.3-2).

Table 7.3-2: Residual Impacts Classification and Determination of Significance on Traditional Land and Resource Use

Effects Pathways	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Likelihood	Significance for Assessment Endpoint	Consequence of Proposed Change: Determining Significance
Project activities may affect continued opportunities for traditional wildlife harvesting	Negative	Low to Moderate	Local to Regional	Short-term to Medium-term	Isolated to Continuous	Reversible	Likely	Not Significant	No change
Project activities may affect continued opportunities for traditional fishing	Negative	Low to Moderate	Local to Regional	Short-term to Permanent	Infrequent to Continuous	Reversible to Irreversible	Likely	Not Significant	No change
Project activities may affect continued opportunities for traditional plant harvesting	Negative	Low	Local	Medium-term to Long-term	Continuous	Reversible	Likely	Not Significant	No change

Note: For further information on consequence of proposed change: determining significance for the Expansion Project refer to Table 3.4-2.

7.3.3.1 Traditional Wildlife Harvesting

The conclusions in the wildlife assessment for the Expansion Project remain consistent for the Approved Project (Addendum Volume 5, Section 5.5.4.1), which predicted that Project effects would be low in magnitude and local in scale for waterbirds, and ranging from low to moderate in magnitude, and extending to the regional scale for caribou. However, incremental effects from the Expansion Project are not expected to have a significant adverse effect on the existing self-sustaining and ecologically effective wildlife populations.

Considering these results, socio-economic factors described in Section 7.3.2.1.1 and that the Expansion Project does not overlap with preferred harvesting areas, the residual effects of the Expansion Project on continued opportunities for traditional wildlife harvesting are consistent with the Approved Project, and expected to range from low (waterfowl and geese) to moderate (caribou) in magnitude, extending to regional in scale for caribou. The community's ability to continue to practice subsistence activities, and to hunt and rely on caribou as a primary food source will not be significantly affected.

7.3.3.2 Traditional Fishing

The conclusions in the fish and fish assessment for the Expansion Project remain consistent for the Approved Project (Addendum Volume 6, Section 6.5.5), which predicted that Expansion Project effects would range from low to moderate in magnitude, local to regional in scale, with most effects being reversible. Expansion Project effects are not expected to have a significant adverse effect on fish and fish and habitat; although Expansion Project-related effects are expected to be measurable at the population level for Arctic Char, Lake Trout, Burbot, and Round Whitefish, the likelihood of any risk to the ongoing productivity of the fishery (or ongoing support for the productivity of the fishery) in the RSA are low (Addendum Volume 6, Section 6.5.7). The resilience of the regional fishery will be maintained through the implementation of environmental design features and mitigation for the Expansion Project.

Considering these results, the socio-economic factors described in Section 7.3.2.1.2, and that the Expansion Project does not overlap with preferred fishing locations, the residual effects of the Expansion Project on continued opportunities for traditional fishing are consistent with the Approved Project, and expected to range from low to moderate in magnitude and local to regional in scale. Most residual effects are predicted to be reversible following closure. The community's ability to continue to practice traditional fishing will not be significantly affected.

7.3.3.3 Traditional Plant Harvesting

The conclusions in the vegetation assessment for the Approved Project remain consistent for the Expansion Project (Addendum Section 5.4.4, Table 5.4-4), which were predicted to be low in magnitude and local in scale. Considering these results, socio-economic factors, and that the Expansion Project does not overlap with preferred plant harvesting locations, the residual effects of the Expansion Project on traditional plant harvesting are consistent with the Approved Project and expected to be low in magnitude, local in geographic extent and reversible. The community's ability to continue to gather traditional plants will not be significantly affected.

7.3.4 Cumulative Effects Assessment

Residual effects to TLRU were predicted to be confined to the LSAs for plant harvesting and use of culturally important sites, and to the fish and fish habitat assessment area for fishing. The database of reasonably foreseeable future developments (Volume 3, Appendix 3-D) indicates that there are some planned developments within the Kivalliq region that have the potential to interact with the potential effects of the Project on traditional land use. It is not anticipated that these developments will result in any changes in the availability of traditional resources for fishing, plant harvesting or culturally important sites, as they are all located outside of the RSA for vegetation and heritage resources, and the assessment area used for fish and fish habitat. There were no changes to the cumulative effects assessments for vegetation, fish and fish habitat and heritage resources; therefore the conclusions for the Expansion Project remain consistent with the Approved Project.

Residual effects to traditional wildlife harvesting, specifically caribou, are predicted to extend to the RSA and beyond. The wildlife and wildlife assessment predicted that the cumulative effects of the Project in combination with the other developments present in the RSA may lead to localized cumulative effects for birds, raptors, predatory mammals, and muskox (Volume 5, Section 5.5.4.2). Therefore, localised cumulative effects may occur for traditional wildlife harvesting due to changes in the availability of furbearers, waterfowl, and geese. There are eight potential future developments within the range of either one or all three of the caribou herds occurring in the Kivalliq region (Volume 3, Appendix 3-D, Figure 3-D-4), herds that Baker Lake harvesters, their families, and other community members rely on as a key part of their diet. The wildlife and wildlife habitat assessment predicted that cumulative effects to caribou as a result of these projects would be a concern should most or all of them proceed within a similar timeframe (Volume 5, Section 5.5.4.2). Therefore, cumulative effects to traditional wildlife harvesting due to changes in the availability of caribou and opportunities to harvest them may occur. Additional cumulative effects analysis for caribou indicated that the changes associated with the Expansion Project will have a negligible influence on caribou and will be the same as for the Approved Project (Addendum Volume 5, Section 5.5.4.2). The wildlife and wildlife assessment determined that the Expansion Project would not change the conclusions about cumulative effects on wildlife for the Approved Project. Therefore, the same conclusions for cumulative effects on traditional wildlife harvesting apply for the Expansion Project.

The marine resources assessment determined that the assessment of Expansion Project activities yielded no changes to the conclusions of the cumulative effects assessment made in the Approved Project FEIS (Volume 3, Appendix 3-A, Table 3.A-5). Cumulative effects to marine resources were considered in all assessment pathways for the Approved Project and were predicted to range from low to high in magnitude when considering the effects of a minor or major fuel spill, however these effects were predicted to be isolated in frequency and unlikely to occur (Volume 3, Appendix 3-A, Table 3.A-5). Other cumulative effects (e.g., mortality and injury risk due to vessel collision, change in behaviour due to underwater noise and change in behaviour due to in-air noise and vessel lighting) ranged from low to moderate in magnitude, unlikely to likely to occur, and reversible. The cumulative effects of the Approved Project and therefore the Expansion Project in combination with other developments are not expected to result in significant impacts on marine fisheries productivity, or the structure and function of self-sustaining and ecologically effective marine wildlife populations relative to natural factors occurring over the same period of time and space. Given this, cumulative changes in marine resource availability and opportunities for harvesting are possible, although effects related to an accidental fuel spill are unlikely.

The associated access roads that are required to support these developments may result in increased access to traditional land use areas for local community members, which may offset the cumulative effects of changes in the availability of caribou for harvesting. Additional roads as supporting infrastructure to proposed projects would improve access and change land use in the Kivalliq region, creating increased opportunities for traditional land use activities. However, increased access may also lead to increased wildlife harvesting and competition among hunters, and could potentially lead to decreased availability of caribou. The same conclusions apply for the Expansion Project.

There is limited information available on traditional use of the Back River area; however, the Nunavut Atlas (Riewe 1992) indicates that Inuit from Gjoa Haven and Cambridge Bay used to hunt and fish along the lower and middle

Back River, and around Garry Lakes, Armark Lake, McAlpine Lake, and Franklin Lake (Riewe 1992). Information provided in Rescan (2012) for the Back River Project indicates that the Back River area was not a preferred use area for Kitikmeot communities. Based on known areas of traditional use of Baker Lake residents, it is not expected that opportunities for traditional activities would be impacted in the Kitikmeot region. The potential for cumulative effects because of the Expansion Project extending into the Kitikmeot region, particularly the Back River area, is unlikely. The majority of effects of the Expansion Project are expected to be local to regional in scale, with no detectible effects on the Back River in the Kitikmeot region, and the Kitikmeot region itself. The Expansion Project is expected to have a moderate effect on caribou in the Kivalliq region by creating barriers to movement during migration, and many of these caribou travel through the Kitikmeot region; however, the impacts to the herd are not expected to extend past the zone of influence for caribou. Socio-economic effects (e.g., employment, education, and training) are concentrated in the Kivalliq region.

7.3.5 Uncertainty

Consistent with the uncertainty identified for the Approved Project, the following uncertainties apply to the Expansion Project:

- The potential effects on traditional land use incorporates the assessment results of other VCs (i.e., wildlife and wildlife habitat, vegetation, fish and fish habitat, heritage resources, noise and vibration and marine resources). Therefore any limits in residual impact classification and determination of significance in those assessments are applied in the assessment on TLRU.
- There are no established thresholds or standards for most measurement indicators on TLRU. Although it may be possible to set thresholds for purposes of an EA, it often cannot be demonstrated that there is any consensus on a specific threshold value where an effect on traditional land use occurs or what such a threshold means in terms of significance of an effect.
- The effects on traditional land use may not lend themselves to the assignment of criteria or determination of significance except in terms of potential, thus introducing a larger element of uncertainty. There generally is the expectation that an effect brought forward for assessment will in fact occur, at least to some degree. However, it is difficult to predict, for example, whether some effects will be positive, negative or both, and in what ways.
- The reliance on previously written literature to inform the IQ baseline and assessment may result in limitations if it doesn’t reflect the most current information available. Therefore gaps in data may result in an under representation of effects on TLRU.
- The potential effects of climate change on TLRU use activities remains unclear, and therefore it is challenging to incorporate these uncertainties into the prediction of long-term effects.

Uncertainty was addressed in the assessment by applying a conservative estimate of effects in the residual impact classification and in the determination of significance. Uncertainty was also addressed by incorporating publicly available information from the literature for both Baker Lake and Chesterfield Inlet communities, and directly from Elders and land users, where available, and from using past experience in similar areas including the experiences at Meadowbank Mine and other Agnico Eagle regional operations. Uncertainty will be further minimized through Agnico Eagle’s commitment to providing ongoing consultation with different stakeholders and community members from Baker Lake and Chesterfield Inlet to address their concerns, and through opportunities for participation in the development and implementation of mitigation measures, and in the ongoing monitoring and adaptive management of culturally and traditionally important resources. Uncertainty is further mitigated through compliance with the existing terms and conditions of the Approved Project authorizations, certificate and licenses.

7.3.6 Monitoring and Follow-up

Agnico Eagle is committed to providing ongoing consultation and active engagement with community members and representatives of stakeholder groups, to provide opportunities for participation in the development and implementation of mitigation measures, and in monitoring programs, as per Project Certificate No. 008, T&C #54.

Baker Lake and Chesterfield Inlet community members continue to express concerns related to traditional land use and resources during consultation for the Approved and Expansion Project, which are described in Volume 2, Appendix 2-D. The corresponding FEIS Addendum reference to mitigation measures, management plans, and monitoring programs that address these concerns are listed in the table. Agnico Eagle anticipates on-going questions and concerns will be brought forward by community members and representatives of stakeholder groups and will continue to be discussed, addressed and mitigated through future meetings, annual reports, and IIBA implementation throughout the LOM. Refer to Volume 8, Table 8.2-1 for a summary of all Plans.

7.4 Socio-Economics Assessment Update Summary

The assessment of the Expansion Project's socio-economic effects presents up-to-date baseline data, and is reflective of the Expansion Project-specific economic elements and schedule. The Expansion Project extends operational economic inputs, including employment, for five years beyond the Approved Project. With a larger workforce requirement, the Expansion Project is expected to draw more heavily on the Kivalliq labour force outside of Baker Lake, particularly that present in Rankin Inlet. Conversely, much of the capital spending associated with the Approved Project will cover off costs otherwise incurred by the Expansion Project. Operational procurement for the Expansion Project is expected to be greater than that of the Approved Project, both in annual and, to a larger extent, cumulative spending. Given these points, the socio-economic impact assessment of the Expansion Project is largely a new analysis in addition to that presented in the Approved Project FEIS. The full socio-economic assessment update is provided in Volume 7, Appendix 7-B. The results of the update are summarized below.

The study area for the socio-economic assessment is, as in the case of the Approved Project, focused on Kivalliq and its communities. The primary socio-economic pathways assessed in the Approved Project are applicable to the assessment of the Expansion Project. Further, based on feedback during the review of the Approved Project, three additional pathways of effect have been assessed as primary based on the potential for the Expansion Project to result in speculative migration between Kivalliq communities, and the associated additional demand for and pressure on housing, infrastructure, and services.

The temporal boundary for the socio-economic assessment is pushed beyond 2021 (i.e., the end of mining at the Approved Project) to 2025 to reflect that the Expansion Project adds four years to the life of mining at the Whale Tail development. The Expansion Project begins operation in 2020, ramping up to full operation in 2021. At this time the Approved Project workforce will be integrated into the Expansion Project. The Expansion Project will make use of existing infrastructure associated with the Meadowbank Mine and the Approved Project while requiring limited additional disturbance to the landscape. Table 7.4-1 presents the schedule of Kivalliq's active and approved mining operations during the life of the Expansion Project, from a labour force perspective.

Table 7.4-1: Labour Force Transition Assumptions in the Socio-Economic Effects Assessment

Project	2018	2019	2020	2021	2022	2023	2024	2025	2026
Meadowbank Mine		*	Meadowbank mill and camp will continue to operate						
Meliadine Mine									
Approved Project		*							
Expansion Project			*						

Construction   Operations Ramp-Up   Operations   Operations Ramp-Down

* = labour force will be transferring to mine operations during this year.

Note: This table presents the assumptions used in the socio-economic assessment as related to the transition of Agnico Eagle's operational labour between the Company's Kivalliq operations. It is not reflective of the timing of capital or operational expenditures, or other economic elements of the Expansion Project.

7.4.1 Economics and Employment

The purpose of the FEIS Addendum is to evaluate the changes to the Approved Project FEIS predictions as a result of the Expansion Project. Given that the Expansion Project will operate after the Approved Project, its economic value is less effectively described in terms of additive effects over and above the Approved Project. Rather, the Expansion Project represents the continuation of inputs to economic parameters into years beyond the end of mining of the Approved Project. As a result, the assessment of economic impacts is focused on the additional years of economic benefit associated with Expansion Project operations.

The economic effects of the Expansion Project are substantial, and are expected to be of significant benefit to the territory. Annual GDP contributions are expected to be equivalent to around 5% to 6% of current territorial GDP (i.e., $100 to $120 million). Average annual procurement in the territory is expected to amount to over $270 million. Revenues paid to the territory in the form of taxes are anticipated to amount to over $40 million, or a fifth of the territory's own-source budgeted revenue. Further revenues will be paid to the KivIA (royalties) and the NTI pursuant to the agreements negotiated with each body in relation to the Expansion Project.

The Expansion Project is expected to generate 99 new direct average annual employment opportunities[4] for Nunavummiut extra to those created by the Approved Project, representing a doubling of new employment positions at Whale Tail over the Approved Project scenario. However, the primary employment benefit of the Expansion Project is the extension of nearly 500 direct employment opportunities and associated incomes for Nunavummiut until 2025. The Expansion Project's addition of four years of economic benefits to Nunavut has been assessed as significant (i.e., a significant benefit). Table 7.4-2 provides a summary of the Expansion Project's economic impacts within Nunavut.

[4] Average annual employment is reported for the purpose of the FEIS to avoid overstating or understating the employment benefit of the Project. Total operational employment fluctuates to a small degree with varying activities on-site. As a result, there may be temporary peak periods of activity wherein total employment is greater than what is presented here. These peaks are anticipated to be limited in frequency and duration, and not require substantially more workers than the average annual.

Table 7.4-2: Summary of Expansion Project Economic Impacts on Nunavut ($ Million)

Economic Parameter		2020	2021	2022	2023	2024	2025
GDP (Direct, Indirect, Induced)		$120.2	$117.9	$117.9	$116.6	$105.2	$52.7
Procurement	Baker Lake	$70.5					
	Rest of Nunavut	$200.7					
	Total Nunavut	$271.2					
Territorial Taxes		$41.5					
KivIA IIBA Royalties		Further revenues will be paid to the KivIA (royalties) and the NTI pursuant to the agreements negotiated with each body in relation to the Expansion Project					
NTI Payments							
Employment Positions (Direct, Indirect, Induced)		667	683	686	682	626	411
Labour Income (Direct, Indirect, Induced)		$95.7	$95.0	$94.2	$93.6	$87.0	$43.8
Support for Education and Training		Continuation of scholarships, on-the-job training, and other contributions to educational programming					

7.4.2 Individual and Community Wellness

The Expansion Project will continue to have positive effects in communities, in terms of household incomes and associated access to nutritious food, recreation, education, and resources with which to conduct traditional activities. Similarly, the Expansion Project will continue support for community programming and educational initiatives, as well as IIBAs royalties and commitments. Health and safety training over the operational life of the Expansion Project is also expected to continue to be of benefit to communities. The positive contribution of the Approved Project to communities will be continued by the Expansion Project for an additional four years, and at a similar magnitude. The continuation of these benefits for four years beyond the Approved Project is assessed as significant (i.e., a significant benefit).

The Expansion Project is expected to continue to contribute to the social maladies assessed in the Approved Project FEIS impacting family and community health and cohesion. The possibility of accidents and emergencies will persist over the longer period of operations. Social maladies such as substance abuse, sexual misconduct, family violence, and crime associated with the challenges of rotational work, poor spending choices, rising inequalities between 'haves" and have nots" and changes in traditional values will also persist. Social maladies do not disappear with the closure of a project, instead persisting into the future indefinitely without being addressed. Agnico Eagle will continue their approach to these issues noted in the Approved Project FEIS. There is, however, great uncertainty regarding individual responses to increased incomes, the ability or willingness of those affected to take up related programming, and the way in which families and communities will respond to changes in income distribution. As a result, increased incomes from the Expansion Project have the potential to have deleterious effect on families, communities and on community cohesion. The continued contribution of the Expansion Project to accidents, emergencies and social maladies is assessed as significant.

7.4.3 Population

Roughly 80% (931 workers) of the Expansion Project's workforce requirement is expected to be met by the existing Approved Project's workforce. Of the remaining labour demand of the Expansion Project (around 235 workers), 58% (136 workers) are expected to be drawn from outside of Nunavut. This outside workforce would not be expected to relocate to Kivalliq with their families for employment, instead being housed at the on-site camp for two weeks at a time. The remaining 99 workers would be drawn from Kivalliq communities where fly-in, fly-out arrangements are already available, removing the need to relocate to access Expansion Project employment. As a result, the direct labour requirement of the Expansion Project is not expected to induce a meaningful scale of intra-regional migration within Kivalliq. The combined labour demand of the Expansion Project and the Meliadine Mine will be met in a similar manner, using a combination of workers from the south and, to a lesser extent, other parts of Nunavut. Given the above, the direct labour requirement scenario created by the Expansion Project and the Meliadine Mine is not expected to induce a meaningful scale of in-migration to the Kivalliq region.

There is, however, the possibility for speculative migration between Kivalliq communities in response to the Expansion Project. Individuals may choose to relocate in hopes of obtaining work without having secured an offer of employment from Agnico Eagle. It is also possible that some new hires may prefer to live in Baker Lake or Rankin Inlet, rather than other Kivalliq communities with fewer amenities. In 2010 when the Meadowbank Mine opened, and in the year preceding, population change in Baker Lake was slightly elevated, but in line with regional and territorial levels. If past population change in Baker Lake in the year following the opening of the Meadowbank Mine is indicative of the potential for speculative migration, the data suggests that speculative migration in hopes of seeking employment with the Expansion Project could yield a small change in population.

7.4.4 Housing, Services and Infrastructure

It is not possible to say with any certainty if speculative migration will occur, or to what extent, and so the effect is identified only in terms of potential to occur. Speculative in-migration of any scale can exacerbate pressure on already constrained housing and infrastructure conditions, and service provision. If even a small number of people move to Baker Lake and Rankin Inlet in hopes of securing employment at the Expansion Project or being closer to amenities, the already pressured housing, infrastructure and service situation in each community could be exacerbated.

It is unlikely that those moving would be able to access subsidized housing given wait lists in communities. Further, the development of market housing in Kivalliq is highly constrained, and would almost certainly not be an option for speculative migrants. As a result, those who move to Baker Lake and Rankin Inlet seeking work would instead likely stay with people they know in each community, in turn contributing to crowding. While most utility infrastructure in Baker Lake have the capacity to support additional demand, most other services and infrastructure in the hamlet and Rankin Inlet need repair, or replacement. Should even a small number of job seekers relocate to either community with their families, their demand for childcare, healthcare services, waste disposal, and other services and infrastructure currently under pressure would likely require action and management by governments.

In advance of construction and operations, Agnico Eagle will clearly communicate labour force requirements to community liaisons, and will work with communities and local governments to provide clear information regarding the recruitment process for Expansion Project employment opportunities. Through this engagement, Agnico Eagle hopes to limit the potential for speculative migration in hopes of securing employment. It is, however, recognized that the decisions of individuals in terms of movement between communities are outside the control of the developer, and some may still choose to relocate. In a context where housing, services, and infrastructure are already stretched to near, or in some cases, beyond capacity, even a small population increase can have an adverse effect the requires management. As a result, population-based pressure on housing, services, and infrastructure associated with the Expansion Project has been assessed as potentially significant.

7.4.5 Conclusion

The significance of the Expansion Project's residual effects is expected to be consistent with those predicted for the Approved Project (i.e., all significant). The assessment of the Expansion Project finds both significant economic benefits, and potentially significant adverse social, housing, infrastructure, and service impacts in communities. The Expansion Project's continuation of economic benefits, including fiscal contributions to government, territorial procurement, and employment and incomes will be positive and impactful to communities. Consistent with the approved project, the Expansion Project has the potential, however, to contribute to social issues linked by communities to mining and associated incomes, such as substance abuse, family violence, and crime. While the Expansion Project is not expected to spur meaningful migration to the territory or Kivalliq and its communities through direct workforce demands, the potential for speculative migration of jobseekers remains. Any level of in-migration in a context where housing, services, and infrastructure are already taxed can place significant strain on government and authorities with a mandate to ensure the provision and condition of these aspects of communities. While the response to community-level changes in demand for housing, schools, healthcare, and policing is under the purview of local, territorial, and federal authorities with a mandate to ensure that services are provided to communities, Agnico Eagle will continue to work with communities and governments to monitor and adaptively respond to adverse effects as they materialize, and to ensure a maximum level of local benefit capture to communities. The Whale Tail IIBA will continue to be a mechanism that ensures the people of Kivalliq benefit from the Expansion Project. The IIBA is available publicly on-line at the following website http://aemnunavut.ca/wp-content/uploads/2017/06/Whale-Tail-IIBA2017-06-15-.pdf

8.0 MITIGATION, MONITORING, AND MANAGEMENT PLANS

8.1 Introduction

Following direction from NIRB on December 10, 2018, where appropriate, Agnico Eagle has amended the various mitigation, monitoring, and management plans (Plans) in support of the NIRB reconsideration of the Project Certificate No. 008 to include the Expansion Project. For the purposes NIRB reconsideration and review process updated Plans are provided in Appendices 8-A through 8-F.

The FEIS Addendum constitutes additional information as it relates to the Expansion Project. The updated plan are submitted to extend already approved activities to the Approved Project. As such, many of the Plans are “operational” plans in place for the Approved Project. By title, Agnico Eagle has indicated that plans submitted in support of the NIRB reconsideration process for the Expansion Project, version control includes (_NIRB). These plans are living documents which will evolve as the approved and expanded project proceeds and will be updated to reflect changes in operation, technology, and direction or requests made by the NIRB and/or NWB and subsequent approvals for the project.

The review of Plans is an iterative process throughout the environmental assessment phase and permitting stage for the Project. Figure 8.1-1 provides an overview of the key touch points for review of the Plans, including the following:

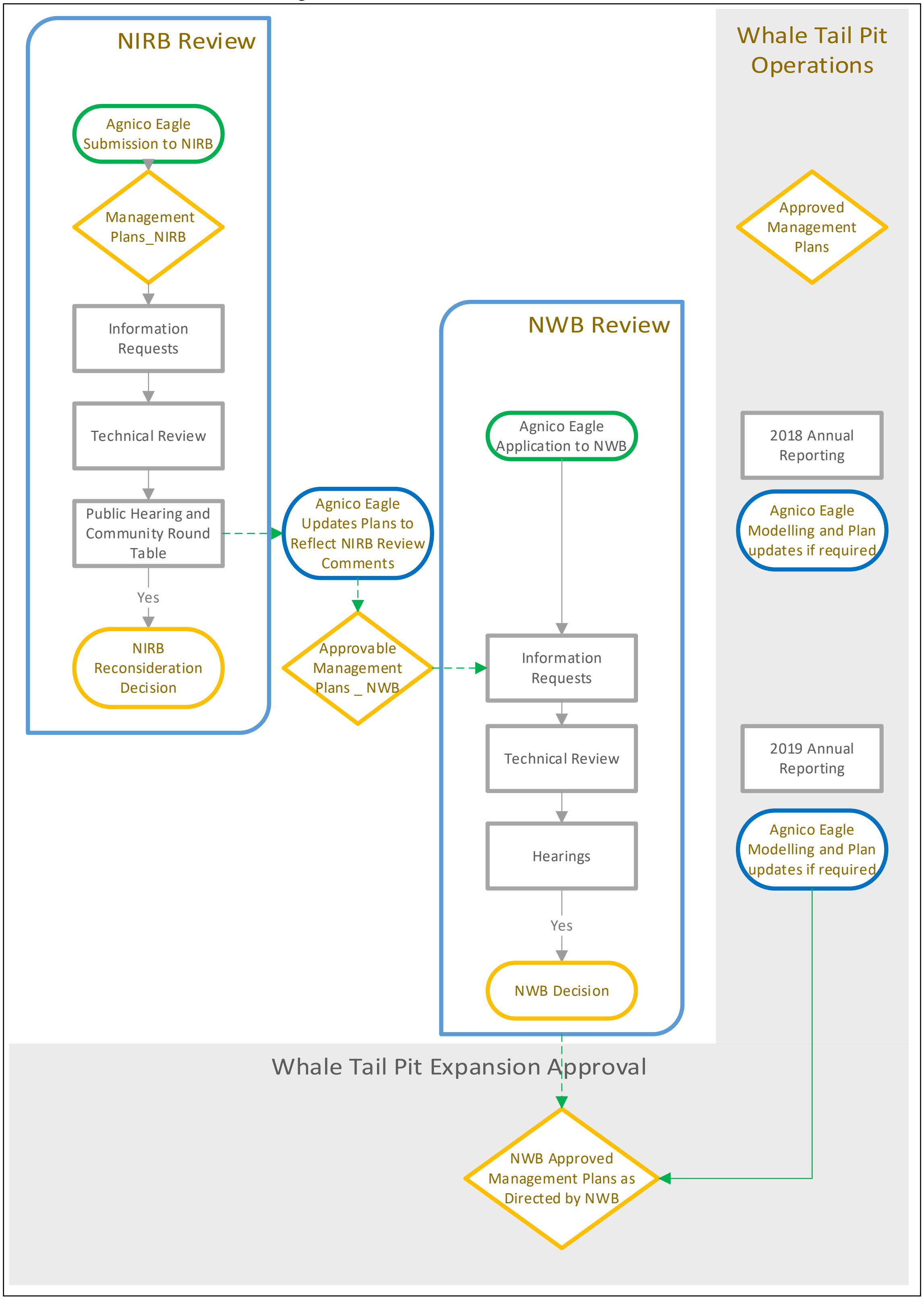
1) Conceptual Management Plans submission to NIRB: _NIRB addendums have been included in this submission to support EA;

2) Approvable Management Plans to NWB: To be provided in response to NWB Information Requests and NIRB review comments/ recommendations. Plans will integrate where possible, additional works and updated modelling results completed by Agnico Eagle, responses, commitments and directions resulting from the NIRB process. In addition, plans will be developed as addenda, in concordance with NWB guidelines and existing terms and conditions where applicable; and

3) Final Approved Plans: To be provided following NWB issuance of Type A Water Licence. Plans will integrate where possible, additional works completed by Agnico Eagle, responses, commitments, and directions resulting from the NWB process.

Once approved, Agnico Eagle will implement the plans as directed by the NWB in accordance with the Type A Water Licence.

Figure 8.1-1: Technical Review and Management Plan Process



8.2 Management Plans Submitted to Assist NIRB in the Review Process

Following direction from NIRB on December 10, 2018, Agnico Eagle has updated management and monitoring plans to support the Whale Tail Pit Expansion FEIS Addendum NIRB review process (_NIRB) based on the following criteria:

- ✓ Plans that are referenced in the Whale Tail Pit Expansion FEIS Addendum to support management and mitigation decisions. These are plans that have been revised due to approved or expansion project related changes.
- ✓ Plans that are reference in NIRB Project Certificate No. 008 (i.e., plans that were submitted by Agnico Eagle to NIRB to comply with NIRB PC No. 008).

Agnico Eagle has defined three categories of Plans formatted for review of the Expansion Project as follows:

1) **New Plans**: wherein comprehensive updating or new plans developed to address the Expansion Project activities;

2) **Updated Plan:** Plans submitted based on NIRB direction. Where historical information previously assessed and approved (as required) under the Type A Water Licence are in place for the Approved Project. These Approved Plans are submitted for ease of regulatory review. Updates were completed to account for Expansion Project activities; and

3) **No Change**: Plans not submitted in support of the environmental assessment given the information contained therein relates primarily to regulatory requirements of the Type A Water Licence or other authorizations.

For complete list of plans and additional information, please refer to Table 8.2-1.

Table 8.2-1: List of Monitoring, Mitigation, and Management Plans (as of 18 December 2018)

FEIS Addendum Mitigation/Monitoring Plan Document Title to Support the Review by NIRB	Project Certificate	Water Licence Approved Plan		Format	Rationale	FEIS Addendum Appendix Reference
	No. 008	2AM-MEA1526	2AM-WTP1826			
APPENDIX 8-A: Mine Infrastructure						
Whale Tail Pit – Waste Rock Management Plan_ Version 5_NIRB November 2018	Version 2 May 2018		Version 1 January 2017	Updated Plan	▪ Agnico Eagle updated the Whale Tail Pit – Waste Rock Management Plan to address Project Certificate No. 008, T&C #7 ▪ Version 4 is currently reviewed by the NWB. Approval is expected prior to operations of the Whale Tail Pit. V4 includes comments received from CIRNAC on V3. V3 was submitted for approval to NWB as per licence condition in September.	8-A.1
Meadowbank Tailings Storage Facility Management Plan for Whale Tail Pit_ Version 2_NIRB December 2018	Version 1 January 2017	Version 1 January 2017		Updated Plan	▪ Tailings associated with this expansion will be deposited in the Meadowbank Tailings Storage Facility regulated under 2AM-MEA1526 ▪ Agnico Eagle updated the Meadowbank Tailings Storage Facility Management Plan (June 2018) to reflect changes to the North Cell internal structures ▪ Agnico Eagle has updated the current version to account for Expansion Project activities.	8-A.2
Thermal Monitoring Plan_Version 2_NIRB November 2018	Version 1 August 2018			Updated Plan	▪ Agnico Eagle developed a Thermal Monitoring Plan in May 2018 to address Project Certificate No. 008, T&C #10 and #14	8-A.3
Whale Tail Pit - Water Quality Monitoring and Management Plan for Dike Construction Dewatering_ Version 2_NIRB December 2018	Version 1 January 2017		Version 1 January 2017	Updated Plan	▪ Agnico Eagle amended the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering Plan in January 2017, to address dewatering activities required for operations of the Whale Tail Pit ▪ Agnico Eagle updated the current version to account for Expansion Project activities as IVR Dikes will be constructed and Lake A53 will be dewatered.	8-A.4
Dewatering Dikes OMS Manual		Version 6 March 2017	Version 6 March 2017	No change		
Tailings Storage Facility OMS Manual		Version 7 March 2017		No change		

FEIS Addendum Mitigation/Monitoring Plan Document Title to Support the Review by NIRB				Format	Rationale	FEIS Addendum Appendix Reference
	Project Certificate	Water Licence Approved Plan				
	No. 008	2AM-MEA1526	2AM-WTP1826			
APPENDIX 8-B: Water, Domestic Waste and Operational Infrastructure						
Whale Tail Pit - Landfill and Waste Management Plan_ Version 2_NIRB December 2018	Version 1 January 2017		Version 1 January 2017	Updated Plan		8-B.1
Whale Tail Pit - Water Management Plan_ Version 4_NIRB November 2018	Version 2 September 2018		Version 1 January 2017	Updated Plan	▪ Agnico Eagle has submitted an addendum to the approved January 2017 (version 1) Whale Tail Pit – Water Management Plan which includes specific water management strategies for the Expansion Project to address Project Certificate No. 008, T&C #18 ▪ Version 3 is currently reviewed by the NWB. Approval is expected prior to operations of the Whale Tail Pit. V3 includes comments received from CIRNAC on V2. V2 was submitted for approval to NWB as per licence condition in September.	8-B.2
Whale Tail Pit - Water Quality and Flow Monitoring Plan_ Version 6_NIRB November 2018	Version 3 May 2018		Version 5 October 2018	Updated Plan	▪ Agnico Eagle has submitted an updated plan to the approved Whale Tail Pit – Water Quality and Flow Monitoring plan which includes specific water monitoring strategies for the Expansion Project to address Project Certificate No. 008, T&C #6, #17 and #18 where applicable	8-B.3
Whale Tail Pit - Landfarm Design and Management Plan_ Version 1_NIRB October 2018				New Plan		8-B.4
Whale Tail Pit - Incinerator and Composter Waste Management Plan_ Version 1_NIRB October 2018				New Plan		8.B-5
Amaruq Gold Wastewater Treatment System Operation and Maintenance Plan_ Version 1 December 2015				No change		

FEIS Addendum Mitigation/Monitoring Plan Document Title to Support the Review by NIRB				Format	Rationale	FEIS Addendum Appendix Reference
	Project Certificate	Water Licence Approved Plan				
	No. 008	2AM-MEA1526	2AM-WTP1826			
APPENDIX 8-C: Construction and Transportation Infrastructure						
Whale Tail Pit Haul Road Management Plan_ Version 2_NIRB December 2018	Version 1 August 2018		Version 1 August 2018	Updated Plan		8-C.1
Transportation Management Plan: All-weather Private Access Road_ Version 3 March 2014				No change	▪ No changes will be made to the AWAR due to the Project ▪ Agnico Eagle is requesting that the life of the AWAR and activities approved under this plan be extended for an additional LOM for operations and closure ▪ Plan a requirement of Project Certificate No. 004, T&C #32	
Air Traffic Management Plan_ October 2005				No change	▪ Agnico Eagle has met the requirements of Project Certificate No.004. There are no changes to the October 2005 Air Traffic Management Plan ▪ Plan a requirement of Project Certificate No. 004, T&C #33, and #61	
APPPENDIX 8-D: Materials Management and Emergency Response						
Meadowbank Division Ammonia Management Plan – Whale Tail Pit _Version 2_NIRB December 2018	Version WT_June 2016		Version WT_ June 2016	Updated Plan		8-D.1
Meadowbank & Whale Tail Bulk Fuel Storage Facility Environmental Performance Monitoring Plan_Version 4_NIRB December 2018	Version WT June 2016	Version WT June 2016	Version WT June 2016	Updated Plan		8-D.2
Whale Tail Pit - Emergency Response Plan_ Version 1_NIRB December 2018	Version WT_ June 2016		Version WT_ June 2016	Updated Plan		8-D.3

FEIS Addendum Mitigation/Monitoring Plan Document Title to Support the Review by NIRB	Project Certificate	Water Licence Approved Plan		Format	Rationale	FEIS Addendum Appendix Reference
	No. 008	2AM-MEA1526	2AM-WTP1826			
Hazardous Materials: Meadowbank Mine Site, Whale Tail Pit Site, Baker Lake Facilities Management Plan_ Version 4_NIRB December 2018	Version WT_ June 2016		Version WT_June 2016	Updated Plan		8-D.4
Spill Contingency Plan: Meadowbank Mine Site, All Weather Access Road, Whale Tail Pit Site_ Version 7_NIRB December 2018	Version WT_ June 2016		Version WT_ June 2016	Updated Plan		8-D.5
Shipping Management Plan_Version 3_NIRB December 2018	Version 2 April 2018			Updated Plan	▪ Agnico Eagle developed a Shipping Management Plan to support the Approved Project. This plan was updated in April 2018 to address Project Certificate No. 008, T&C #37 to #43 ▪ Includes: Marine Mammal Management and Monitoring Plan in Appendix B to address Project Certificate No. 008 T&C #40 to #42	8-D.6
Oil Pollution Emergency Plan				No change	▪ Plan is a requirement of Transport Canada. Not a requirement of Water Licence or Project Certificate.	
Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan (EPMP)		Version 3 June 2014		No change	▪ No changes are planned for the Baker Lake Bulk Fuel Storage Facility due to construction and operations of the Whale Tail expansion project site; therefore, the Plan has not been amended at this time	
APPENDIX 8-E: Environmental Protection and Monitoring Plans						
Air Quality and Dustfall Monitoring Plan_ Version 4_NIRB December 2018	Version 3 June 2018			Updated Plan	▪ Agnico Eagle updated the Air Quality and Dustfall Monitoring Plan (June 2018) to address Project Certificate No. 008, T&C #1 and #2	8-E.1
Greenhouse Gas Reduction Plan_Version 2_NIRB December 2018	Version 1 May 2018			Updated Plan	▪ Agnico Eagle submitted the Plan (May 2018) to address Project Certificate No. 008, T&C #3	8-E.2

FEIS Addendum Mitigation/Monitoring Plan Document Title to Support the Review by NIRB	Project Certificate	Water Licence Approved Plan		Format	Rationale	FEIS Addendum Appendix Reference
	No. 008	2AM-MEA1526	2AM-WTP1826			
Groundwater Monitoring Plan_ Version 3_NIRB November 2018	Version 1 May 2018		Version WT June 2016	Updated Plan	▪ Agnico Eagle updated the Groundwater Management Plan (June 2018) to address Project Certificate No. 008, T&C #15 and #16 ▪ An addendum to this plan is provided to address the underground component of the Expansion Project ▪ Version 2 is currently reviewed by the NWB. Approval is expected prior to operations of the Whale Tail Pit. V2 includes comments received from CIRNAC on V1. V1 was submitted for approval to NWB as per licence condition in October 2018. This is the same version that was submitted to NIRB in May 2018.	8-E.3
Conceptual Whale Tail Pit Expansion Offsetting Plan_ Version 1_NIRB November 2018				New Plan	▪ Agnico Eagle has submitted a Conceptual Whale Tail Pit Expansion Offsetting Plan to reflect the expansion activities and support the NIRB review of the project and support EA review required under Section 36 (Schedule II listing) of the *Fisheries Act* ▪ A final offsetting plan is a regulatory requirement of DFO ▪ Agnico Eagle will continue to work with the DFO and ECCC (regarding Schedule II) to finalize the Offsetting Plans	8-E.4
Operational ARD-ML Sampling and Testing Plan_ Version 4_NIRB November 2018	Version 2 June 2018		Version WT June 2016	Updated Plan	▪ Agnico Eagle updated the Operational ARD- ML Sampling and Testing Plan (June 2018) to address Project Certificate No. 008, T&C #8 ▪ An update to this plan to reflect Expansion Project activities is provided. ▪ Version 3 is currently reviewed by the NWB. Approval is expected prior to operations of the Whale Tail Pit. V3 includes comments received from CIRNAC on V2. V2 was submitted for approval to NWB as per licence condition in September 2018. This is the same version that was submitted to NIRB in May 2018.	8-E.5
Erosion Management Plan_Version 2_NIRB December 2018	Version 1_ June 2018			Updated Plan	▪ Agnico Eagle submitted the Plan (May 2018) to address Project Certificate No. 008, T&C #11	8-E.6
Noise Monitoring and Abatement Plan_ Version 4_NIRB December 2018	Version 3 June 2018			Updated Plan	▪ Agnico Eagle updated the Noise Monitoring and Abatement Plan (June 2018) to address Project Certificate No.008, T&C #5 and No.004 T&C #62	8-E.7

FEIS Addendum Mitigation/Monitoring Plan Document Title to Support the Review by NIRB	Project Certificate	Water Licence Approved Plan		Format	Rationale	FEIS Addendum Appendix Reference
	No. 008	2AM-MEA1526	2AM-WTP1826			
Archaeology Management Plan_ Version 2_NIRB September 2018	Version 1_June 2016			Updated Plan	▪ Project Certificate No. 008, T&C #55 and #56 and No. 004, T&C #69 and #70 ▪ Plan has been amended to include new Expansion Project activities	8-E.8
Terrestrial Ecosystem Management Plan (TEMP)_ Version 6_NIRB December 2018	Version 5 June 2018			Updated Plan	▪ Submitted in June 2018 to address Project Certificate No. 008, T&C #28 ▪ Addresses commitments made during the Whale Tail Pit Technical Meetings, Pre-hearing Conference and Community round-table ▪ Includes revisions based on June 2018 TAG meeting recommendations ▪ Includes Migratory Birds Protection Plan requirement of Project Certificate No. 008, T&C #34 ▪ Includes Invasive Species Mitigation in Section 3.4 of the TEMP	8-E.9
Migratory Birds Protection Plan	Version 5, June 2018			Updated Plan	▪ Refer to TEMP, Appendix F. ▪ Requirement of Project Certificate No. 008, T&C #34	8-E.9
Invasive Species Mitigation				New Plan	▪ Refer to TEMP Section 3.4 ▪ Requirement of Project Certificate No.008, T&C # 25	8-E.9
Core Receiving Environment Monitoring Program: 2015 Plan Update – Whale Tail Pit Addendum_Version December 2018_NIRB	Version WT June 2016		Version WT_ June 2016	Updated Plan	▪ Agnico Eagle has submitted an updated addendum to the Core Receiving Environment Monitoring Program to reflect Approved Project activities address Project Certificate No. 008, T&C #19 and #23 ▪ Appendix A Mercury Monitoring Studies v1 June 2018 was submitted to NWB as per Part B Item 15; the expansion does not change these approved monitoring studies	8-E.10
QA/QC Plan		Version 2 July 2014	Version 2 July 2014	No change	▪ No changes proposed to the current Plan to address Expansion activities ▪ No changes to the outlined procedures are anticipated as a result of construction and operations of the Project ▪ This plan refers to specific monitoring stations, parameters and criteria set out in the Type A Water Licence ▪ Project Certificate No. 004, T&C #23	

FEIS Addendum Mitigation/Monitoring Plan Document Title to Support the Review by NIRB	Project Certificate	Water Licence Approved Plan		Format	Rationale	FEIS Addendum Appendix Reference
	No. 008	2AM-MEA1526	2AM-WTP1826			
Habitat Compensation Monitoring Plan	Version 4 March 2016			No change	▪ No changes proposed to the current Plan to address Expansion activities ▪ Habitat Compensation Monitoring Plan is a regulatory requirement of DFO ▪ Agnico Eagle will continue to work with the DFO to finalize a revised Habitat Compensation Monitoring Plan	
Meteorological Monitoring Plan_ Version 1 May 2013				No change	▪ No changes proposed to the current Plan to address Expansion activities.	
Socio-economics Management and Monitoring Plan_ Version 2_NIRB December 2018	Version 1 June 2016			Updated plan	▪ Agnico Eagle provided a Socio-economics Management and Monitoring Plan for the Whale Tail Project in June 2016 ▪ Project Certificate No. 008, T&C #50-#53 and No. 004, T&C # 63-#65	8-E.11
Occupational Health and Safety Plan_ December 2018	October 2005			Updated plan	▪ Project Certificate No. 008, T&C #57 and #58	8-E.12
Aquatic Effects Management Program (AEMP)		Version 3 November 2015	Version 3 November 2015	No change	▪ No changes proposed to the current Plan to address Expansion activities. Plan provided to support NIRB review	8-E.13
APPENDIX 8-F: Closure and Reclamation						
Whale Tail Expansion Interim Closure and Reclamation Plan_Version 1_NIRB November 2018	Version WT June 2016		Version WT June 2016	Updated plan	▪ Project Certificate No. 008, T&C #12-#13	8-F.1

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All Appendices have been provided as stand-alone PDF files