February 2017

SCREENING LEVEL ASSESSMENT

Pilot Study - Hovercraft Implementation in Nunavut

Submitted to:
Agnico Eagle Mines Limited

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REPORT

EXECUTIVE SUMMARY

Agnico Eagle is proposing to purchase and transport 2 hovercraft units (3 tonnes in weight, each) to the Meadowbank site in the third quarter of the 2017 summer sealift season. The hovercraft is proposed to be used to transport personnel and light cargo on the approved Amaruq Exploration Access Road and on the approved winter roads to the Amaruq property on a year-round basis. The intent is to perform a one-year pilot project starting in the summer of 2017 continuing through until late 2018, with an aim to validate hovercraft operational performance, demonstrate their viability for search and rescue activities in the area around the Amaruq Property and Meadowbank. The low ground pressure generated by hovercraft operation creates a lesser impact to the terrestrial and aquatic environments than conventional, wheel- or track-based equipment, and noise levels are roughly equivalent to the operation of two snowmobiles. Compared with alternatives assessed (e.g., building all-season roads, increased use of helicopters), Agnico Eagle feels that the implementation of the hovercraft technology is the best overall alternative for exploration from an environmental and economic perspective.

Agnico Eagle's proposal for using 2 additional vehicles (hovercrafts) on the approved winter roads, trails or the Amaruq Exploration Access Road is a small deviation from these previously screened and approved activities. Nevertheless, given this activity is new in Nunavut, Agnico Eagle has conducted a screening assessment which identified Valued Components of the atmospheric, aquatic, terrestrial and human environments for assessment to determine potential Project interactions. All potential interactions between the Project and Valued Components were assessed through a pathway analysis and identified as having no linkage, a secondary linkage or a primary linkage based on the magnitude of an effect or link to an effect after mitigation measures are applied. Where a potential pathway has no effect on a Valued Component following mitigation, the pathway is assessed as "no linkage". Pathways with negligible effects post-mitigation are assessed as "secondary". "Primary" pathways are those that have the potential to result in a measurable change to measurement indicators that could contribute to residual effects on a Valued Component.

Given the limited scope of the hovercraft pilot project, a number of potential pathways were assessed as having no linkage (i.e., no effect on the Valued Component). There were no links between low ground pressure generated by hovercraft operation and ground vibrations levels, or changes in soil compaction and vegetation quantity. Therefore associated direct loss and fragmentation of wildlife habitat and effects on traditional plant harvesting are not expected as a result of the Project. Given that the Project does not require new ground disturbance or access, no effects to archaeological resources or traditional travel routes are anticipated. The Project will not generate new employment or drive population change, or alter associated socio-economic conditions in communities.

Through environmental design features and routing considerations the implementation of mitigation, other potential pathways were assessed as having a secondary (i.e., negligible) effect on a number of Valued Components. The atmospheric assessment determined that changes in air quality as a result of operation on winter road routes during summer months would be negligible, as mineral soils are not expected to be meaningfully exposed by operation, and dust generation will be minimal. Acoustically, the Project is expected to generate a negligible level of underwater noise on over-water portions of winter road routes during the summer, relative to propeller-driven vessels.

None of the identified aquatics pathways are anticipated to have a measurable change resulting in residual effects to hydrology, water and sediment quality, the abundance and distribution of fish, or fish habitat. Any effects will be limited to negligible, localized effects to habitat quality (e.g., noise, sedimentation). The potential

for Project-related spills will be minimized by not carrying fuel on hovercraft and implementation of spill response plans resulting in a highly localized, and dust deposition effects will be minimal, resulting in negligible potential effects on soil, vegetation and wildlife habitat quality. Adaptive management, including speed limit reductions, temporary road closures, and implementation of the Meadowbank Wildlife Protection and Response Plan are expected to minimize the potential for wildlife mortality associated with Project operation to a negligible level.

All secondary pathways identified for the human environment pertain to Traditional Land Use activities. Project operations at portages on winter road routes during summer months has the potential to create incidental and highly localized disturbances to traditional fishing activities, but is not expected to affect traditional fishing opportunities in the region overall, or in preferred fishing locations around Baker Lake. Similarly, the Project's potential operational effects on wildlife population and behavior, and on nesting birds at portages are not expected to have a measureable residual effect on opportunities to participate in associated traditional activities, particularly in preferred harvesting locations nearer to Baker Lake.

Primary pathways of effect were determined to be those with the potential for beyond-negligible residual effects following the implementation of mitigation. Residual Project effects include:

- the generation of dust, combustion emissions and noise emissions from hovercraft operation;
- sensory disturbances to wildlife potentially altering movement and behaviour;
- potential for the disturbance of ground bird nests at waterbody portages during summer months; and
- potential impacts to worker and public safety associated with the introduction of a new type of traffic on approved roads (adverse effect) and the potential for the use of hovercraft as an all-weather emergency response vehicle (positive effect).

Key mitigations aimed at offsetting primary pathways include dust control measures on roads, regular maintenance for vehicles and equipment, use of emission-compliant engine technology, imposition of speed controls and travel routes, and adherence to existing environmental and operational management plans in place for the Amaruq Exploration Site and Amaruq Exploration Access Road. During the pilot study, monitoring data will be collected to assist in assessing the potential dust, combustion emissions, noise emissions, disturbance to wildlife and worker safety for future hovercraft evaluations.

While the magnitude of a primary pathway is measureable, residual effects assessment considers the geographic extent, duration, frequency and reversibility of the effect, along with mitigation, when determining the significance of the effect. Environmental effects from the use of hovercraft will occur over the short-term pilot study period, reversing at the end of operations, and are anticipated to be of low to moderate magnitude. With the implementation of mitigation, and based on the residual effects criteria of primary pathways, the potential environmental effects of the Project are assessed as not significant. The assessment of worker and public safety is discussed in terms of the potential for associated pathways to occur, and does not attempt to quantitatively predict likelihood or assign significance.

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ᐊᓲᑦᑯᑦ ᓂᐅᕕᐳᒪᔪᑦ ᐊᒻᒪᓗ ᐊᒡᔭᖅᑕᐅᑎᓪᓗᒋᑦ ᒪᕿᕐᓂᒃ ᒪᓂᕋᐅᑉ ᖁᓕᑦᑎᐊᖕᒐᓂᑦ ᖃᖓᑕᓲᓂᒃ (3 ᑕᓐᓂᒃ ᐅᖁᒪᐃᓐᓂᖃᖅᑐᑦ, ᐊᑐᓂ) ᐊᐳᖅᑎᓈᖅᑐᒧᑦ ᐊᐅᔭᐅᓕᖅᐸᑦ 2017-ᒥᑦ. ᖃᖓᑕᓲᖅ ᐊᑐᖅᑕᐅᓇᔭᖅᑐᖅ ᐊᒡᔭᖅᑐᐃᓗᓂ ᐱᓕᕆᔨᓂᒃ ᐊᒻᒪᓗ ᐅᖁᒪᐃᖕᒋᑦᑐᓂᒃ ᐱᖁᑎᓂᒃ ᓈᒻᒪᒋᔭᐅᓯᒪᔪᒧᑦ ᐊᒪᕈᖅ-ᒥᑦ ᕿᓂᖅᓴᐃᕝᕕᖕᒥᑦ ᐊᑉᖁᑎᒧᑦ ᐊᒻᒪᓗ ᓈᒻᒪᒋᔭᐅᓯᒪᔪᒧᑦ ᐅᑭᐅᒃᑯᑦ ᐊᑉᖁᑎᓄᑦ ᐊᒪᕈᖅ-ᒎᖕᒐᐅᔪᒧᑦ ᐅᑭᐅᓗᒃᑖᒃᑰᖕᒐᔫᒃᑯᑦ. ᐊᑕᐅᓯᖅ ᐅᑭᐅᒥᑦ ᐆᒃᑐᖅᑕᐅᔪᒪᔪᖅ ᐱᒋᐊᕐᓗᓂ ᐊᐅᔭᐅᓕᖅᐸᑦ 2017 ᑲᔪᓯᓗᓂ 2018 ᓄᖑᓕᖅᐸᑦ, ᑐᕌᒐᖃᕐᓗᑎᒃ ᓇᓗᓇᐃᖅᓯᓂᕐᒧᑦ ᖃᖓᑕᓲᖅ ᐊᑐᖅᑕᐅᔪᖕᓇᕐᓂᖕᒐᓄᑦ, ᐊᓯᐅᓯᒪᔪᖅᓯᐅᕈᑎᒋᓗᒍ ᐊᒪᕈᖅ ᐊᒻᒪᓗ ᐊᐳᖅᑎᓈᖅᑑᑉ ᖃᓂᑕᖕᒐᓂᑦ. ᓄᓇᒧᑦ ᖃᓂᑦᑐᒥᑦ ᐊᐅᓛᕐᓂᖕᒐᓂᑦ ᐱᔪᖅ ᖃᖓᑕᓲᒥᑦ ᐊᒃᑐᖅᓯᙱᓐᓂᖅᓴᐅᖃᑦᑕᖅᑐᖅ ᓄᓇᒥᑦ ᐊᒻᒪᓗ ᐃᒪᕐᒥᐅᑕᓂᒃ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᓂᐅᖕᒐᓂᑦ, ᐊᒃᓴᓗᐊᓕᖕᓂᑦ ᓄᓇᒃᑰᕈᑎᓂᒃ, ᐊᒻᒪᓗ ᓂᐱᖃᕐᓂᖕᒐ ᐊᔾᔨᒋᔭᖕᒐ ᒪᕿᒃ ᓯᑭᑑᒃ ᐊᐅᓛᖅᑎᓪᓗᒋᑐᑦ. ᐊᓯᖕᒋᑦ ᑕᐅᑐᖕᒑᖅᓱᒋᑦ ᖃᐅᔨᓴᖅᑕᐅᔪᓂᑦ (ᓲᕐᓗ ᐅᑭᐅᓗᒃᑖᖅ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓂᒃ ᐊᑉᖁᓯᐅᖅᑎᓪᓗᒋᑦ, ᐊᑐᖅᑕᐅᓂᖅᓴᐅᓕᕐᓂᖕᒋᑦ ᖁᓕᒥᑰᓖᑦ), ᐊᓲᑦᑯᑦ ᐃᒃᐱᒍᓱᒃᑐᑦ ᐊᑐᖅᑕᐅᓂᖕᒐ ᖃᖓᑕᓲᖅ ᐱᐅᓛᖑᔪᖅ ᑕᒪᐃᓐᓅᖕᒐᔫᒃᑯᑦ ᐊᓯᐊᒎᖕᒑᖅ ᕿᓂᖅᓴᐃᓂᕐᒧᑦ ᐊᕙᑎ ᐊᒻᒪᓗ ᐱᕈᖅᐸᓪᓕᐊᑎᑦᑎᓂᖅ ᑕᐅᑐᒃᓱᒋᑦ.

ᐊᓲᑦᑯᑦ ᑐᒃᓯᕋᐅᑎᖕᒐᑦ ᒪᕐᕈᒃᑲᓐᓃᖕᓂᒃ ᖃᖓᑕᓲᓂᒃ ᐊᑐᕈᒪᐸᓪᓗᒋᑦ ᓈᒻᒋᔭᐅᔪᓂᑦ ᐅᑭᐅᒃᑯᑦ ᐊᑉᖁᑎᓂᑦ, ᐅᕙᓘᓐᓃᑦ ᐊᒪᕈᖅ ᕿᓂᖅᓴᐃᕝᕕᖕᒥᑦ ᐊᑉᖁᑎᐊᓂᑦ ᒥᑭᑦᑑᔪᖅ ᐊᔾᔨᐅᖕᒋᓐᓂᖅ ᕿᒥᕐᕈᔭᐅᓚᐅᖅᑐᓂᑦ ᐊᒻᒪᓗ ᓈᒻᒪᒋᔭᐅᔪᓂᒃ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓂᑦ. ᑭᓯᐊᓂ, ᑖᒻᓇ ᓄᑖᖑᑎᓪᓗᒍ ᓄᓇᕗᒻᒥᑦ, ᐊᓲᑦᑯᑦ ᕿᒥᕈᓂᖃᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᐃᐸᓪᓗᑎᒃ ᖃᐅᔾᔾᔪᑎᒋᐸᓪᓗᓗ ᐃᒃᐱᒋᓂᖃᕝᕕᐅᔪᑦ ᐃᓚᒋᔭᐅᔪᑦ ᓯᓚᒥᑦ, ᐃᒪᕐᒥᐅᑕᓂᒃ, ᓄᓇᒥᐅᑕᓂᒃ ᐊᒻᒪᓗ ᐃᓄᖕᓄᑦ ᐊᕙᑎᒋᔭᐅᔪᓂᑦ ᖃᐅᔾᔨᓂᕐᒧᑦ ᐱᓕᕆᐊᕐᒥᑦ ᐊᒃᑑᑎᖃᑎᙱᓐᓂᖃᕈᓐᓇᕐᓂᙱᓐᓄᑦ. ᐊᒃᑑᑎᖃᑎᙱᓐᓂᖃᕈᓐᓇᕐᓂᓗᒃᑖᙱᑦ ᐱᓕᕆᐊᑉ ᐊᒻᒪᓗ ᐃᒃᐱᒋᓂᖃᕝᕕᐅᔪᑦ ᐃᓚᒋᔭᐅᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᑉᖁᑎᒋᔭᐅᔪᒥᒃ ᖃᐅᔨᓴᐃᓂᒃᑯᑦ ᐊᒻᒪᓗ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᖅ ᐊᒃᑐᐊᓂᖃᙱᓐᓂᙱᓐᓄᑦ, ᑐᒡᓕᐊᓂᑦ ᐊᒃᑐᐊᓂᖃᕐᓂᖅ ᐅᕙᓗᓐᓃᑦ ᐊᒃᑐᐊᓂᖃᓗᐊᖅᑐᖅ ᐊᑐᖅᓗᓂ ᐊᖕᒋᓂᕆᔭᖕᒐ ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᐅᔫᑉ ᐅᕙᓗᓐᓃᑦ ᐊᒃᑐᐊᓂᖃᖅᑑᑉ ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᕐᒧᑦ ᐊᖕᒋᓗᐊᖕᒋᒋᐊᖅᑎᑦᑎᓂᖅᖄᖅᑎᓪᓗᒍ. ᐊᑉᖁᑎᒋᔭᐅᔪᖕᓇᖅᑐᖅ ᐊᒃᑐᖅᓯᓂᖃᖕᒋᑦᑎᓪᓗᒍ ᐃᒃᐱᒋᓂᖃᕝᕕᐅᔪᓄᑦ ᐃᓚᒋᔭᐅᔪᓂᒃ ᐊᖕᒋᓗᐊᖕᒋᒋᐊᖅᑎᑦᑎᓂᖅᖄᖅᑎᓪᓗᒍ, ᐊᑉᖁᑎᒋᔭᐅᔪᖅ ᖃᐅᔨᔭᐅᔪᖅ "ᐊᒃᑐᐊᓂᖃᙱᓐᓂᖕᒐᓄᑦ". ᐊᑉᖁᑎᒋᔭᐅᔪᑦ ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᖅᑕᖃᑦᑎᐊᖕᒋᑦᑐᑦ ᐊᖕᒋᓗᐊᖕᒋᒋᐊᖅᑎᑦᑎᓂᖃᕐᓂᐅᑉ ᓯᕗᓂᐊᒍᑦ ᖃᐅᔨᔭᐅᔪᑦ "ᑐᒡᓕᐅᓂᖕᒋᓐᓄᑦ". "ᐱᓗᐊᖅᑐᑦ" ᐊᑉᖁᑎᒋᔭᐅᔪᑦ ᐊᓯᐊᖑᖅᑎᑦᑎᓂᖃᕈᓐᓇᖅᑑᔪᑦ ᐆᒃᑐᕋᐃᓂᕐᒧᑦ ᓇᓗᓇᐃᒃᑯᑕᓄᑦ ᐃᑲᔪᐃᓂᖃᕈᓐᓇᖅᑐᑦ ᕿᒪᒃᑎᑦᑐᓄᑦ ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᕐᓄᑦ ᐃᒃᐱᒋᓂᖃᕝᕕᐅᔪᓄᑦ ᐃᓚᒋᔭᐅᔪᓄᑦ.

ᑭᓪᓕᖃᕐᓂᖕᒐᓄᑦ ᖃᖓᑕᓲᓕᕆᓂᕐᒧᑦ ᐆᒃᑐᕋᐃᓂᖅ, ᖃᑉᓯᐊᕐᔪᐃᑦ ᐊᑉᖁᑎᒋᔭᐅᔪᖕᓇᖅᑐᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ ᐊᒃᑐᐊᓂᖃᙱᓐᓂᖕᒋᓐᓄᑦ (ᓲᕐᓗ, ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᖃᙱᑦᑐᑦ ᐃᒃᐱᒋᓂᖃᕝᕕᐅᔪᓄᑦ ᐃᓚᒋᔭᐅᔪᓄᑦ). ᐊᒃᑐᐊᓂᖅᑕᖃᓚᐅᙱᑦᑐᖅ ᓄᓇᒧᑦ ᖃᓂᑦᑐᒥᑦ ᐊᐅᓛᕐᓂᖕᒐᓂᑦ ᐱᔪᓂᒃ ᖃᖓᑕᓲᖅ ᐊᐅᓛᕐᓂᖕᒐᓄᑦ ᐊᒻᒪᓗ ᓄᓇᒥᑦ ᓴᔪᕋᓛᒃᑐᓂᒃ, ᐅᕙᓗᓐᓃᑦ ᐊᓯᐊᖑᕐᓂᐅᔪᑦ ᑲᑎᓯᒪᓂᖕᒐᑕ ᐃᑉᔪᐃᑦ ᐊᒻᒪᓗ ᐱᕈᖅᑐᐃᑦ ᖃᐸᐅᓂᖕᒋᓐᓂᒃ. ᑕᐃᒪᓐᓇᒧᑦ ᓂᕆᐅᒋᔭᐅᙱᑦᑐᑦ ᐱᓕᕆᐊᖅ ᐱᔾᔪᑎᒋᐸᓪᓗᒍ ᐊᓯᐅᔨᓂᐅᔪᑦ ᐊᒻᒪᓗ ᓱᕋᐃᓃᑦ ᓂᕐᔪᑏᑦ ᐃᓂᖕᒋᓐᓂᒃ ᐊᒻᒪᓗ ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᐅᔪᑦ ᐱᕈᖅᑐᓄᑦ ᐃᓄᖕᓄᑦ ᐱᔭᐅᖃᑦᑕᖅᑐᓂᒃ. ᐱᓕᕆᐊᖅ ᓄᑖᒥᒃ ᓄᓇᒥᒃ ᐊᒃᑐᖅᓯᓂᖃᕐᓂᐊᖅᑎᓪᓗᒍ ᐅᕙᓗᓐᓃᑦ ᐊᑐᕐᓂᐊᕐᓗᓂ, ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᖃᕐᓂᐊᖅᑐᓇᔭᐅᙱᑦᑐᖅ ᐃᑦᑕᕐᓂᑕᖃᕐᕕᖕᓂᑦ ᐅᕙᓗᓐᓃᑦ ᐱᖅᑯᓯᕆᔭᐅᔪᒃᑯᑦ ᐊᑉᖁᑎᒋᔭᐅᔪᓂᒃ. ᐱᓕᕆᐊᖅ ᓄᑖᓂᒃ ᐱᓕᕆᔾᔭᖅᑎᑦᑎᓂᐊᙱᑦᑐᖅ ᐅᕙᓗᓐᓃᑦ ᐊᒥᖅᑰᓂᐅᔪᓂᒃ ᐊᓯᐊᖑᖅᑎᑦᑎᓗᓂ, ᐅᕙᓗᓐᓃᑦ ᐊᓯᐊᖑᖅᑎᑦᑎᓗᓂ ᐊᒃᑐᐊᓂᖃᖅᑐᓂᒃ ᐃᓄᐃᑦ-ᐱᕈᖅᐸᓪᓕᐊᓂᖕᒋᓐᓄᑦ ᖃᓄᐃᖕᒐᓂᐅᔪᓂᑦ ᓄᓇᓕᖕᓂᑦ.

ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐋᖅᑭᐅᒪᓂᖕᒋᑦᑎᒍᑦ ᐊᒻᒪᓗ ᐊᑉᖁᑎᒋᔭᐅᓂᐊᖅᑐᒥᒃ ᐃᓱᒪᒃᓴᖅᓯᐅᕆᓂᒃᑯᑦ ᐊᖕᒋᓗᐊᖕᒋᒋᐊᖅᑎᑦᑎᓂᕐᒥᒃ, ᐊᓯᖕᒋᓐᓂᑦ ᐊᑉᖁᑎᒋᔭᐅᔪᖕᓇᖅᑐᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ ᑐᒡᓕᐅᓂᖕᒋᓐᓄᑦ (ᓲᕐᓗ ᐅᔾᔨᕐᓇᙱᑦᑐᖅ) ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᖅ ᖃᐸᐅᓯᐊᕐᔪᖕᓄᑦ ᐃᒃᐱᒋᓂᖃᕝᕕᐅᔪᓄᑦ ᐃᓚᒋᔭᐅᔪᓄᑦ. ᓯᓚᒥᒃ ᖃᐅᔨᓴᐃᓂᖅ ᖃᐅᔨᓚᐅᖅᑐᑦ ᐊᓯᐊᖑᕐᓃᑦ ᓯᓚᒥᑦ ᐊᓂᖅᓵᖅᑐᖅᑕᐸᑕ ᖃᓄᐃᓐᓂᖕᒐᓂᒃ ᐊᐅᓚᖅᑎᑦᑎᓂᕐᒥᒃ ᐅᑭᐅᒃᑯᑦ ᐊᑉᖁᑎᓯᐅᔨᓂᒃ ᐊᐅᔭᐅᑎᓪᓗᒍ ᐅᔾᔨᕐᓇᖕᔭᙱᓐᓂᖕᒐᓄᑦ, ᓂᕆᐅᒋᔭᐅᙱᒻᒪᑕ ᓄᓇᐃᑦ ᐊᒃᑐᖅᑕᐅᓂᐊᕐᓂᖕᒋᓐᓄᑦ ᐊᐅᓚᖅᑎᑦᑎᓂᕐᒥᑦ ᐱᔪᓂᒃ, ᐊᒻᒪᓗ ᐳᔪᖃᑖᓕᐅᕐᓂᖅ ᒥᑭᔫᓂᐊᖅᓱᓂ. ᓂᐱᖃᕐᓂᕐᒧᑦ, ᐱᓕᕆᐊᖅ ᓂᕆᐅᒋᔭᐅᔪᖅ ᐅᔾᔨᕐᓇᙱᑦᑐᒥᒃ ᐃᒪᐅᑉ ᐃᓗᐊᓂᑦ ᓂᐱᖃᖅᑎᑦᑎᓂᐊᕐᓂᕐᒧᑦ ᓯᑯᒃᑯᑦ ᐅᑭᐅᒃᑯᑦ ᐊᑉᖁᑎᓯᐅᔪᓂᑦ ᐊᐅᔭᐅᑎᓪᓗᒍ, ᐸᐱᕈᖅᖃᖅᑐᓂᐅᖕᒐᓂᑦ ᐃᖕᒋᕋᔾᔪᑕᐅᖃᑦᑕᖅᑐᑦ ᐅᒥᐊᑦ.

ᖃᐅᔨᓴᐅᔪᓂᑦ ᐃᒪᕐᒥᑦ ᐊᑉᖁᑎᒋᔭᐅᔪᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐊᓯᐊᖑᕐᓂᖅᓴᕐᓂᐊᕐᓂᖕᒐᓄᑦ ᕿᒪᒃᑎᑦᑐᓄᑦ ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᐅᔪᑦ ᐃᒪᓕᓇᓂᕐᒧᑦ, ᐃᒪᕐᒥᑦ ᐊᒻᒪᓗ ᐊᓗᐊᓃᑦᑐᑦ ᖃᓄᐃᓐᓂᖕᒋᓐᓄᑦ, ᐱᑕᖃᐅᕐᓂᖕᒋᑦ ᐊᒻᒪᓗ ᐊᕙᒻᒧᖃᑦᑕᕐᓂᖕᒋᑦ ᐃᖃᓗᐃᑦ, ᐅᕙᓗᓐᓃᑦ ᐃᖃᓗᐃᑦ ᐃᓂᖕᒋᓐᓂᑦ. ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᖃᖅᐸᑦ ᐅᔾᔨᕐᓇᖕᔭᙱᑦᑐᖅ, ᖃᓂᑦᑑᓕᓗᓂ ᖃᓄᐃᖕᒐᓕᖅᑎᑦᑎᓂᐅᔪᑦ ᐃᓂᐅᔪᑦ ᖃᓄᐃᓐᓂᖕᒋᓐᓂᒃ (ᓲᕐᓗ

ᓂᐱᖃᕐᓂᖅ, ᑕᓯᐅᑉ ᐊᓗᐊᓄᐊᖅᑐᑦ). ᑯᕕᓂᖃᑐᐃᓐᓇᓇᐊᓕᒃ ᐱᓕᕆᐊᕐᒥᑦ ᐱᔪᓂᒃ ᒥᑭᓛᒃᑰᖓᓂᐊᖅᑐᖅ ᐅᓯᖃᑦᑕᙱᓪᓗᓂ ᐅᖅᓱᐊᓘᖏᑦ ᖃᖓᑕᓃᒥᑦ ᐊᒻᒪᓗ ᐊᑐᓕᖅᑎᑦᑎᓗᓂ ᑯᕕᔪᖃᖅᐸᑦ ᐅᐸᓗᐊᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᓂᒃ ᐱᔪᓂᒃ ᖃᓂᑦᑐᒥᑦ, ᐊᒻᒪᓗ ᐳᔪᖃᑖᕐᒥᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᔪᑦ ᐊᖏᓗᐊᔾᔮᙱᑦᑐᖅ, ᐅᔾᔨᕐᓇᙱᑦᑐᒥᒃ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᑐᐃᓐᓇᓇᐊᓕᒃ ᐃᑉᔪᒥᑦ, ᐱᕈᖅᑐᓂᒃ ᐊᒻᒪᓗ ᓂᕐᔪᑏᑦ ᐃᓂᒋᔭᖏᑦᑕ ᖃᓄᐃᓐᓂᖓᓂᒃ. ᐊᑐᖅᑕᐅᑎᑦᑎᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᖅ, ᐃᓚᐅᑉᐅᓂ ᓇᑭᖅᓴᕐᓂᕐᒧᑦ ᑭᒡᓕᐅᔪᓂᒃ ᒥᒃᓵᒋᐊᖅᑎᑦᑎᓃᑦ, ᐊᑦᕐᑯᑏᑦ ᐅᒃᑯᐊᖅᑕᐅᓚᐅᐱᓚᖃᑦᑕᕐᓗᑎᒃ, ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᑎᓪᓗᒍ ᐊᐳᖅᑎᓐᓈᖅᑐᒥᑦ ᓂᕐᔪᑎᓂᒃ ᒥᐊᓂᖅᓯᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐅᐸᓗᐊᓂᕐᒧᑦ ᐸᕐᓇᐅᑎ ᓂᓇᐅᒋᔭᐅᔪᑦ ᒥᒃᓵᒋᐊᖅᑎᑦᑎᓂᐊᕐᓂᖓᓄᑦ ᓂᕐᔪᑎᓂᒃ ᑐᕐᑯᕌᖓᕐᓂᖕᒋᓐᓄᑦ ᐱᔾᔪᑎᒋᐸᓗᒍ ᐱᓕᕆᐊᖅ ᐊᐅᓛᕐᓂᖓᓄᑦ ᐅᔾᔨᕐᓇᙱᑦᑐᒦᖓᓗᓂ.

ᑐᒡᓕᓇᔭᐅᔪᑦ ᐊᑉᕐᑯᑎᒋᔭᐅᔪᓗᒃᑖᑦ ᖃᐅᔨᔭᐅᔪᑦ ᐃᓄᖕᓄᑦ ᐊᕙᑎᒋᔭᐅᔪᒧᑦ ᐱᔾᔪᑎᖃᖅᑐᑦ ᐱᖅᑯᓯᓇᔭᐅᔪᒃᑯᑦ ᓄᓇᒥᒃ ᐊᑐᕐᓂᕐᒧᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓄᑦ. ᐱᓕᕆᐊᕐᒥᑦ ᐊᐅᓛᖅᑎᑦᑎᓂᑦ ᐃᒪᕐᒦᑦᑐᓂᑦ ᐅᑭᐅᒃᑯᑦ ᐊᑉᕐᑯᑎᒋᔭᐅᔪᓂᑦ ᐊᐅᔭᐅᑎᓪᓗᒍ ᓴᖅᑭᑦᑎᑐᐃᓐᓇᓇᐊᖃᖅᑐᑦ ᖃᑯᑎᒃᑯᑦ ᐊᒻᒪᓗ ᖃᓂᑦᑐᒦᖓᔪᒃᑯᑦ ᐃᔪᐃᓵᓇᓂᕐᓂᒃ ᐱᖅᑯᓯᓇᔭᐅᔪᒃᑯᑦ ᐃᖃᓗᒃᓯᐅᕐᓂᕐᒧᑦ, ᑭᓯᐊᓂ ᓂᓇᐅᒋᔭᐅᙱᑦᑐᖅ ᐊᒃᑐᖅᓯᓂᖃᕐᓂᐊᕐᓂᖓᓄᑦ ᐱᖅᑯᓯᓇᔭᐅᔪᒃᑯᑦ ᐃᖃᓗᒃᓯᐅᕈᖓᕐᓂᐅᔪᒥᒃ ᑖᒪᓂ, ᐅᕝᕙᓘᓐᓂᑦ ᐃᖃᓗᒃᓯᐅᕐᕕᐅᔪᒪᓂᖅᓴᐅᔪᓂᑦ ᖃᒪᓂᑦᑐᐊᑉ ᖃᓂᖓᓂᑦ. ᐊᔾᔨᖓᑦᑕᐅᖅ, ᐱᓕᕆᐊᑉ ᐊᐅᓛᖅᑎᑦᑎᓂᖓᓄᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᔪᕐᓇᖅᑐᑦ ᓂᕐᔪᑎᓄᑦ ᐊᒻᒪᓗ ᐃᓕᖅᑯᓯᖓᓐᓄᑦ, ᐊᒻᒪᓗ ᐅᐸᓗᖃᕐᕕᐅᔪᓄᑦ ᑎᖕᒥᐊᓄᑦ ᐃᒪᐅᓂᕐᑏᑦᑐᓂᒃ ᓂᓇᐅᒋᔭᐅᙱᑦᑐᑦ ᕿᒪᒃᑎᑦᑐᓂᒃ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᔪᓄᑦ ᐱᖅᑯᓯᓇᔭᐅᔪᒃᑯᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓄᑦ, ᐱᓗᐊᖅᑐᒥᑦ ᐃᓂᐅᔪᓄᑦ ᒪᖃᐃᕝᕕᐅᔪᒪᖃᑦᑕᖅᑐᓄᑦ ᖃᓂᓐᓂᖅᓴᐅᔪᓄᑦ ᖃᒪᓂᑦᑐᐊᕐᒧᑦ.

ᐊᑉᕐᑯᑎᒋᔭᐅᓗᐊᖅᑐᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᕐᒧᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ ᑕᐃᑉᑯᓄᙵ ᐅᔾᔨᕐᓇᕐᓂᖃᙱᓐᓂᐅᑉ ᐅᖓᑖᓂᑦᑐᓄᑦ ᕿᒪᒃᑎᑦᑐᓄᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᕐᒧᑦ ᐊᑐᓕᖅᑎᑕᐅᖅᑳᖅᑎᓪᓗᒍ ᐊᖏᓗᐊᖏᕆᐊᖅᑎᑦᑎᓂᖅ. ᕿᒪᒃᑎᑦᑐᑦ ᐱᓕᕆᐊᕐᒥᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᔪᓂᑦ ᐃᓚᐅᔪᑦ:

- ᐳᔪᖃᑖᓕᐅᕐᓂᖅ, ᐃᑯᐊᖅᑐᓂᑦ ᐊᓂᐊᔪᑦ ᐳᔪᕐᓗᐃᑦ ᐊᒻᒪᓗ ᓂᐱᖃᕐᓃᑦ ᖃᓚᑕᓃᖅ ᐊᐅᖅᑎᓪᓗᒍ;
- ᐃᒃᐱᒋᓴᕐᐃᓐᓂᖏᓐᓂᒃ ᐃᓗᐃᓵᓇᓃᑦ ᓂᕐᔪᑎᓄᑦ ᐊᓯᐊᖑᖅᑎᑦᑐᐃᓐᓇᓇᐊᓕᒃ ᐊᐅᓚᓐᓂᖏᓐᓂᒃ ᐊᒻᒪᓗ ᐃᓕᖅᑯᓯᖏᓐᓂᒃ;
- ᐃᓗᐃᓵᓇᓂᖃᑐᐃᓐᓇᓇᐊᖃᕐᓂᖓ ᓄᓇᒥᑦ ᑎᖕᒥᐊᑦ ᐅᐸᓗᖏᓐᓂᑦ ᐃᒪᐃᑦ ᖃᓂᑕᖏᓐᓂᑦ ᐊᐅᔭᐅᑎᓪᓗᒍ; ᐊᒻᒪᓗ
- ᐊᒃᑐᖅᓯᓂᖃᑐᐃᓐᓇᓇᐊᖃᕐᓂᖓ ᐱᓕᕆᔪᒧᑦ ᐊᒻᒪᓗ ᐃᓄᓗᒃᑖᑦ ᐊᑦᑕᓇᖅᑐᒦᖏᓐᓂᖏᓐᓂᒃ ᐱᔾᔪᑎᖃᖅᑐᓄᑦ ᓄᑖᒥᒃ ᐃᖏᕋᔾᔪᑎᒥᒃ ᓈᒻᒥᔭᐅᔪᓄᑦ ᐊᑉᕐᑯᑎᒃᑯᕐᓂᒃᑯᑦ (ᐊᖏᔪᒥᒃ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᖅ) ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᔪᓐᓇᕐᓂᖓ ᖃᓚᑕᓃᖅ ᐅᑭᐅᒃᑖᖅ ᑐᐊᕕᓇᖅᑐᓕᓇᓂᕐᒧᑦ ᐅᐸᓗᐊᔾᔪᑎᒋᓗᒍ (ᐱᐅᔪᖅ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᖅ).

ᐊᖏᕈᐊᖏᕆᐊᖅᑎᑦᑎᓃᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐋᖅᑭᒃᓯᓂᕐᒧᑦ ᐊᑉᕐᑯᑎᒋᔭᐅᓗᐊᖅᑐᓂᒃ ᐃᓚᐅᔪᑦ ᐳᔪᖃᑖᒥᒃ ᐊᐅᓚᑦᑎᓂᖅ ᐊᑉᕐᑯᑎᓂᑦ, ᐋᖅᑭᒃᓱᖅᑕᐅᖃᑦᑕᖅᑎᓪᓗᒋᑦ ᓄᓇᒃᑰᕈᑏᑦ ᐊᒻᒪᓗ ᐱᕐᑰᑦ, ᐊᑐᖅᑕᐅᓂᖓ ᐳᔪᕐᓗᐃᑦ ᐊᓂᐊᔪᓄᑦ ᒪᓕᖓᓂᕐᒧᑦ ᐃᑯᒪᓄᑦ, ᓇᑭᖅᓴᕐᓃᑦ ᐊᐅᓚᑕᐅᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ ᐃᖏᕋᔾᔭᒡᕕᐅᔪᑦ ᐊᑉᕐᑯᑏᑦ, ᐊᒻᒪᓗ ᒪᓕᒡᓗᒋᑦ ᑕᐃᒪᐅᔪᑦ ᐊᕙᑎᓕᓇᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐊᐅᓛᖅᑎᑦᑎᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᕐᒥᒃ ᐸᕐᓇᐅᑏᑦ ᑕᐃᒪᐅᑎᓪᓗᒋᑦ ᐊᒪᕈᖅ–ᒥᑦ ᕿᓂᖅᓴᐃᕝᕕᖕᒥᑦ ᐊᒻᒪᓗ ᐊᒪᕈᖅ–ᒥᑦ ᕿᓂᖅᓴᐃᕝᕕᖕᒥᑦ ᐊᑉᕐᑯᑎᒥᑦ. ᐆᒃᑐᕋᐃᓂᐅᑎᓪᓗᒍ, ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᕐᒧᑦ ᓈᓴᐅᑏᑦ/ᑎᑎᖅᑲᐃᑦ ᑲᑎᑕᓂᐊᖅᑐᑦ ᐃᑲᔫᑎᒋᓗᒋᑦ ᖃᐅᔨᓴᐃᓂᕐᒥᒃ ᐳᔪᖃᑖᖃᕐᓂᕐᒥᒃ, ᐃᑯᐊᖏᖅᑐᓂᒃ ᐊᓂᐊᔪᓂᑦ, ᓂᐱᖃᕐᓂᕐᒥᒃ, ᐃᓗᐃᓵᓇᓂᖅ ᓂᕐᔪᑎᓄᑦ ᐊᒻᒪᓗ ᐱᓕᕆᓃᑦ ᐊᑦᑕᓇᖅᑐᖃᙱᓐᓂᖏᓐᓄᑦ ᓯᕗᓂᒃᓴᒥᑦ ᖃᓚᑕᓂᒃ ᕿᒥᕐᕈᓂᐅᔪᓄᑦ.

ᐊᖏᓂᕆᔾᔭ ᐊᑉᕐᑯᑎᒋᔭᐅᓗᐊᖅᑑᑉ ᐆᒃᑐᕋᖅᑕᐅᔪᕐᓇᖅᑎᓪᓗᒍ, ᕿᒪᒃᑎᑦᑐᓄᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᑦ ᖃᐅᔨᓴᐃᓂᖅ ᐃᓱᒪᒋᔭᖃᖅᑐᖅ ᓄᓇᐅᑉ ᓇᒧᑦ ᑎᑭᐅᑎᓯᒪᓂᙱᓂᒃ, ᖃᓄᖅ ᐊᑯᓂᐅᑎᒋᓂᐊᕐᓂᖓ, ᖃᑯᑎᒃᑰᖓᓂᐊᕐᓂᖓ ᐊᒻᒪᓗ ᐅᑎᖅᑎᑦᑐᙵᕐᓂᖓ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᑉ, ᐃᓚᐅᑉᐅᓂ ᐊᖏᕈᐊᖏᕆᐊᖅᑎᑦᑎᓂᖅ, ᖃᐅᔨᓴᐃᑎᓪᓗᒋᑦ ᐊᖏᓂᕆᔾᔭᓕᑕ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᔫᑉ. ᐊᕙᑎᒥᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᑦ ᐊᑐᖅᑕᐅᓂᖓᓄᑦ ᖃᓚᑕᓃᑦ ᑕᐃᒪᐅᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᐊᑯᓂᐅᖏᑦᑐᒥᑦ ᐆᒃᑐᕋᐃᓂᐅᑎᓪᓗᒍ, ᐅᑎᖅᑎᑦᑐᓂ ᐃᓯᓕᑉᐸᑦ ᐊᐅᓛᖅᑎᑦᑎᓂᑦ, ᐊᒻᒪᓗ ᓂᕐᔪᑎᓄᑦ ᐊᑦᑎᒃᑐᒥᑦ ᕿᑎᐊᓅᖓᓂᐊᕐᓂᖏᓐᓄᑦ ᐊᖏᓂᕆᔾᔭᖓ. ᐊᖏᕈᐊᖏᕆᐊᖅᑎᑦᑎᓂᖅᑕᖃᖅᑎᓪᓗᒍ, ᐊᒻᒪᓗ ᐊᑐᖅᓱᓂ ᕿᒪᒃᑎᑦᑐᓄᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᔪᓂᒃ ᐊᑉᕐᑯᑎᒋᔭᐅᓗᐊᖅᑐᓂᑦ, ᐊᕙᑎᒥᒃ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᔪᕐᓇᖅᑐᑦ ᐱᓕᕆᐊᕐᒥᑦ ᐱᔪᓂᒃ ᖃᐅᔨᔭᐅᔪᑦ ᐅᔾᔨᕐᓇᔾᔮᙱᓐᓂᖏᓐᓄᑦ. ᖃᐅᔨᓴᐃᓂᖅ ᐱᓕᕆᔨᒥᒃ ᐊᒻᒪᓗ ᐃᓄᓗᒃᑖᓂᒃ ᐊᑦᑕᓇᖅᑐᖃᙱᓐᓂᕐᒧᑦ ᐅᖃᐅᓯᐅᔪᖅ ᐊᑉᕐᑯᑎᒋᔭᐅᓗᐊᖅᑐᖃᕐᓂᖏᓐᓂᖓᒍᑦ, ᐊᒻᒪᓗ ᐊᒥᓯᐃᖅᑕᖅᑐᒃᑯᑦ ᓇᓚᐅᑖᓇᓯᙱᑦᑐᑦ ᑕᐃᒪᐅᔪᕐᓇᕐᓂᖏᓐᓄᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐃᓕᓯᓂᕐᒧᑦ ᐊᖏᑎᒋᓂᐊᕐᓂᖏᓐᓄᑦ.

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ABBREVIATIONS, ACRONYMS AND UNITS

Agnico Eagle	Agnico Eagle Mines Limited
AEAR	Amaruq Exploration Access Road
ATV	All-Terrain Vehicle
AWAR	All Weather Access Road (Meadowbank)
dB	decibels
DFO	Fisheries and Oceans
ECCC	Environment and Climate Change Canada
ELC	Ecological Land Classification
Whale Tail FEIS	Whale Tail Pit Final Environmental Impact Statement
KIA	Kivalliq Inuit Association
km	kilometre
km/hr	kilometres per hour
INAC	Indigenous and Northern Affairs Canada
ISQG	Interim Sediment Quality Guidelines
NIRB	Nunavut Impact Review Board
NPC	Nunavut Planning Commission
NRCAN	Natural Resources Canada
NWB	Nunavut Water Board
PEL	Probable Effect Level
Pilot Study	Amaruq Hovercraft Pilot Study
psi	pounds per square inch
TC	Transport Canada
TLU	Traditional Land Use
VC	Valued Component

1.0 INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) proposes a one-year Pilot Study utilizing two air cushion vehicles, or hovercraft, to transport personnel and equipment on the Amaruq Exploration Access Road (AEAR) and approved winter-road routes, year-round initiating in summer 2017 and extending through to winter 2018. The purpose of the pilot study is to:

- Demonstrate that hovercraft technology can operate with minimal environmental impacts to the atmospheric, aquatic, and terrestrial environments by reducing ground pressure effects;
- Determine the functionality and safety of operating hovercraft in support of exploration activities on tundra and on lakes, 24 hours per day;
- Replace to the greatest extent possible the current use of helicopters to move personnel and equipment;
- Provide support for health, safety and environment departments; and
- Provide monitoring data collection.

A key outcome of the Pilot Study will be to determine the economic viability of hovercraft as an alternative mode of transportation. Should the Pilot Study prove successful for use in mining exploration, the use of hovercraft could also be beneficial to communities in Nunavut as a form of transportation in contexts beyond mining exploration (e.g., emergency response, logistics, shipping), as it is not dependent on built roads for operation.

This assessment does not discuss impacts of the development of the AEAR or approved winter roads themselves, or the use of these roads by other types of traffic. Construction, operations, closure, and post-closure phases related to development, operation, and final reclamation of the AEAR year-round and winter roads has been previously assessed in the Whale Tail Pit Final Environmental Impact Statement (Whale Tail FEIS) (Agnico Eagle 2016a).

1.1 Pilot Study Description

The 2 proposed hovercrafts would be used to transport equipment, supplies, and up to 25 personnel between the Meadowbank Mine and the Amaruq site for exploration activities. Hovercrafts will be operated in avoidance of topographical obstacles such as rock outcrops, boulder fields and steep slopes. In addition, hovercrafts will not be used to transport explosives or fuel during the pilot study.

The proposed vehicles are Russian-manufactured Arktika hovercraft. Agnico Eagle considered several technologies, including hoverbarge, pneumatic pipeline, barge, rail, and blimp. Agnico Eagle selected the Arktika hovercraft, in part, by the craft's ability to maintain itself above water, snow soil, packed ice bogs and tundra during year-round conditions.

The selected hovercraft can operate with a ground pressure of 1 pound per square inch (psi). This is low relative to other modes of transport used in exploration (e.g., All-Terrain Vehicles (ATVs) [2 psi], drilling rigs [3.8 psi], human foot traffic [8 psi]), enhancing the ability of the hovercraft to traverse soft terrain, and allowing for flotation. Noise generated by the hovercraft is similar to that created by the operation of two snowmobiles (i.e., ranging from about 70 dB to 120 dB). The proposed hovercraft is approximately the same dimensions as a 50 tonne haul truck, if slightly shorter, at 16.8 m long, 6.5 m wide, and 4.2 m high, and weigh 3 tonnes each.

In operation, the average speed of the hovercraft is anticipated to be 100 kilometres per hour (km/hr) on winter roads, decreasing to 50 km/hr during the summer. As per standard operating practices on Agnico Eagle exploration trails or winter roads, the hovercraft will operate with caution when caribou are within the vicinity, or when snowmobiles or foot traffic are observed adjacent to hovercraft trails. While on the AEAR or near the exploration camp, hovercraft will adhere to the road's speed limit of 50 km/hr, dropping to 30 km/hr where small to moderate aggregations of caribou are observed or as per the AEAR Management Plan (Agnico Eagle 2015a). As per standard operating practices, wildlife will be given the right of way. Assuming that hovercraft will potentially operate 24 hours a day between the Meadowbank Mine and the Amaruq Property, to be conservative in this assessment, there is the potential for around 10 to 15 trips to be made daily, per craft.

Hovercraft operation produces a large volume of air below the craft hull that is slightly above atmospheric pressure. The pressure difference between the higher-pressure air below the hull and lower pressure ambient air above it produces lift, which causes the hull to float above the running surface. For stability reasons, the air is blown through slots or holes around the outside of a disk- or oval-shaped platform, giving most hovercrafts a characteristic rounded-rectangle shape. Typically, this cushion is contained within a flexible "skirt", which allows the vehicle to travel over small obstacles and varied terrain without causing damage to either the craft, or the terrain.

1.2 Alternatives Assessment

Agnico Eagle evaluated alternatives to the use of hovercraft as follows:

- Continued use of the AEAR and winter roads to transport light cargo and passengers between Meadowbank and Amaruq, and continued use of helicopter to access drilling sites;
- Continue used of the AEAR and constructing a network of all-season trails for drilling; and
- Continued use of AEAR and helicopter use; no longer any use of winter roads or trails.

Under all scenarios, helicopter use will continue. However, the magnitude of helicopter use will decrease with the implementation of the Pilot Study. Table 1 summarizes the alternatives assessed in the evaluation of the Pilot Study with consideration and overview of the effects on exploration. Acquisition of 2 hovercrafts for the Pilot Study, in addition to being economical, is expected to be beneficial for logistics and will provide flexibility to transport people and materials as needed, while reducing the impact on the environment as compared to the alternatives of trail or road construction and higher hard-track-vehicle traffic use on winter roads. Apart from its use in regular transportation of personnel and equipment, a second hovercraft would be valuable in search and rescue operations during inclement weather, which may lead to the grounding of helicopters.

Table 1: Alternatives to Hovercraft Use

Assessment Alternative	Effect on Exploration
Continued use of AEAR, winter road, and helicopter	■ Seasonal scaled back pace; ■ Reduced exploration and drilling activities due to limited helicopter flexibility (day use only, weather, ground condition and pilot availability dependant); ■ Increased emergency response time; ■ Less flexible exploration planning due to uncertainty in helicopter availability; ■ Delay to advancement of exploration; and ■ Operational difficulty in meeting aggressive exploration timelines.
Continued use of the AEAR, helicopter use and development of a permanent network of all season trails near the exploration site	■ Improves year-round access; ■ Increased and reliable emergency response time to drill sites; ■ Higher construction and maintenance cost (including higher fuel costs); ■ Delay to advancement of exploration; ■ Operational difficulty in meeting aggressive exploration timelines; and ■ Increased environmental footprint
Use of AEAR and helicopter use; no longer any use of winter roads or trails	■ Seasonal scaled back pace; ■ Greatly reduced exploration activities in 2017/2018 prior to AEAR completion; ■ Reduced exploration and drilling activities due to limited helicopter flexibility (day use only, weather, ground condition and pilot availability dependant); ■ Reduced emergency response time and flexibility; ■ Less flexible exploration planning due to uncertainty in helicopter availability; ■ Delay to advancement of exploration; and ■ Operational difficulty in meeting aggressive exploration timelines.

1.3 Consultation Summary

Consultation related to the Pilot Study has been ongoing since summer of 2016. Table 2 provides a summary of consultation activities to date.

Table 2: Summary of Pilot Study Consultation Activities

Date	Activity Type	Summary of Activity and Outcome
June 6, 2016	Community Meeting	■ Rankin Inlet Community Meeting to introduce the proposed Pilot Study
June 7, 2016	Community Meeting	■ Baker Lake Community Meeting to introduce the proposed Pilot Study
September 9, 2016	Regulator Communication	■ Agnico sent letters to the KIA, NWB, INAC, DFO, ECCC, NRCAN, TC to explain briefly the proposed project and request advice on regulatory requirement
September 13, 2016	Regulator Communication	■ Agnico Eagle sent an email to DFO to indicate that hovercraft would not be used to tow any other craft or objects. All passengers and/or cargo will be onboard the hovercraft unit
September 14, 2016	Regulator Communication	■ A DFO comment letter requested Angico Eagle provide: ■ a map of the intended route of the hovercraft to identify which waterbodies will be impacted; ■ a list of mitigation measures to ensure the bed and banks of waterbodies will be protected; and ■ a list of mitigation measures to ensure the avoidance of potential mortality fish and fish egg mortality resulting from noise during hovercraft operation on open water
September – October, 2016	Regulator Communications	■ Responses to Agnico Eagle's September 9, 2016 letter: ■ No comments provided by the KIA or INAC Project ■ Environment and Climate Change Canada identified no specific regulatory requirements for Hovercraft ■ NRCAN noted that they have no specific regulatory requirements for hovercraft, but requested information regarding the use of hovercraft for the transportation of explosives. Agnico Eagle advised there were no plans to use hovercraft to transport explosives ■ TC noted that hovercraft need to be inspected, certified and registered by TC ■ NWB identified no specific regulatory requirements for Hovercraft, but suggested that Agnico Eagle may need to update some of its environmental management plans to incorporate the use of the hovercraft, such as emergency response, spill prevention and clean up
November 2016	Community Meeting	■ Community meeting conducted in Baker Lake to provide more detail on the proposed Pilot Study
November 29, 2016	Regulator Communication	■ Agnico Eagle provided responses to the DFO letter dated September 14, 2016
December 2016	Regulator Communication	■ Agnico Eagle submitted an Exploration Modification Report to the NPC
December 23, 2016	Regulator Communication	■ The NPC provided a conformity decision regarding the proposed Pilot Study, noting the requirement for a NIRB Screening Assessment under Section 12.4.3 of the Nunavut Agreement based on a significant modification to the existing previous conformity determinations, NIRB decisions, and NWB licences

1.4 Valued Component Selection and Preliminary Interaction Screening

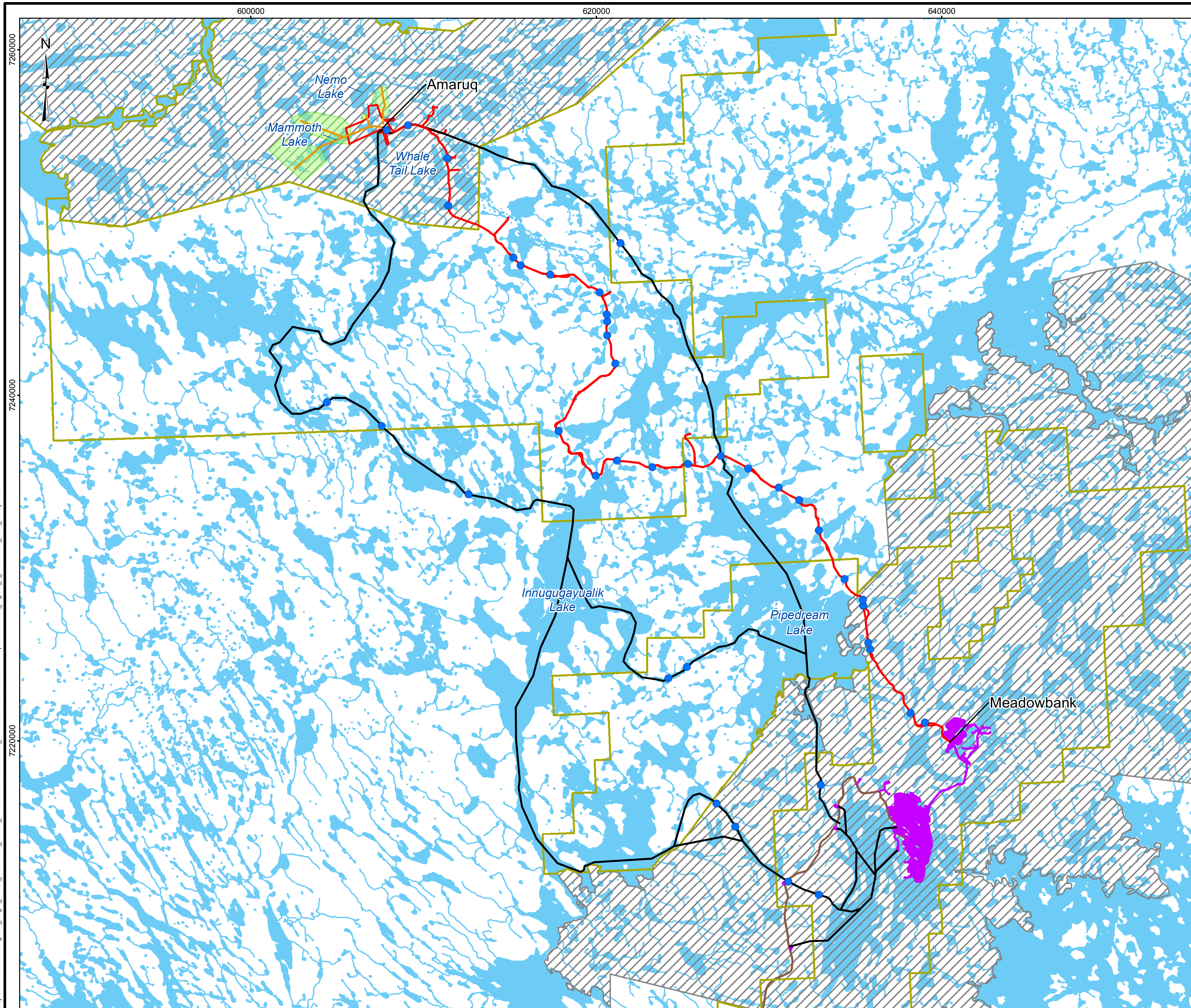
Valued Components (VCs) were selected to assess Pilot Study effects on the atmospheric, aquatic, terrestrial, and human environments. Based on recently reviewed projects, commonly assessed VCs for the atmospheric and biophysical environments have been selected to represent the components of each respective environment. The socio-economic VCs have been selected to focus on those that have some link to the narrow scope of the Pilot Study. A summary of VCs and their indicators is provided in Table 3.

Table 3: Valued Components and Measurement Indicators

Valued Component	Measurement Indicators
Air Quality and Climate	Road dust emissions
	Combustion emissions
Noise and Vibration	Atmospheric noise levels
	Underwater noise levels
	Ground vibration levels
Hydrology	Bank and/or shoreline erosion
Water and Sediment Quality	Physicochemical water quality constituents (e.g., turbidity, suspended solids, metals)
	Sediment quality constituents (e.g., grain size, metals)
Aquatic Biota	Fish abundance and distribution
	Fish habitat
Soil and Vegetation	Soil compaction
	Soil and vegetation quality
Wildlife	Wildlife survival and reproduction - caribou, muskox, predatory mammals, raptors, water birds, upland birds and small mammals
	Wildlife habitat quality - caribou, muskox, predatory mammals, raptors, water birds, upland birds and small mammals
Traditional Land Use	Fishing
	Hunting, trapping and bird and egg harvesting
	Plant harvesting
	Travel routes and culturally important areas
Socio-Economic Conditions	Employment, economic development, population, services and infrastructure
Community Wellness	Risks to worker and public safety Improved emergency response capabilities
Archaeology	Archaeological resources

1.5 Temporal and Spatial Boundaries

As noted above, the Pilot Study would operate on the AEAR year-round, on approved winter roads from the Meadowbank Mine to the Amaruq property, and on the Amaruq property. The AEAR links the Meadowbank Mine to the Amaruq Exploration Area, approximately 65 km to the northwest. Approved winter roads will be used by hovercraft to access other areas of Agnico Eagle's property, including drilling areas and locations not otherwise accessible by ground travel year-round (Figure 1). Spatial boundaries for the VC-specific effects assessment have been identified based on this assumption, and are detailed below. The temporal boundary for this screening assessment is the operation of hovercrafts from summer 2017 until late 2018.



LEGEND

- WATERCOURSE CROSSING
- INUIT OWNED LAND
- AGNICO EAGLE PROPERTY
- DRILLING AREA 2017
- COMMERCIAL LEASE KVCL314C01
- MEADOWBANK INFRASTRUCTURE
- WATERBODY
- WATERCOURSE
- APPROVED AMARUQ EXPLORATION ACCESS ROAD
- APPROVED WINTER ROAD
- MEADOWBANK MINE ALL WEATHER ACCESS ROAD
- DRILLING AREA ACCESS

REFERENCE

1. MEADOWBANK INFRASTRUCTURE AND PROPOSED WHALE TAIL HAUL ROAD ALIGNMENT OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. INUIT OWNED LANDS OBTAINED FROM THE NUNAVUT-TUNNGAVIK INC.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

5000 0 5000

METRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

HOVERCRAFT PILOT STUDY

Golder Associates

PROJECT		1666855	FILE No.	
DESIGN	JO	04 Mar. 2015	SCALE AS SHOWN	REV. 0
GIS	CDB	18 Apr. 2016		
CHECK	JO	09 Feb. 2017	**FIGURE 1**	
REVIEW	LY	09 Feb. 2017		

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1666855\02_PRODUCTION\1100\MXD\Report\1666855_Figure_1_Hovercraft_Pilot_Study.mxd

1.5.1 Atmospheric Environment

The noise study area is defined as a 5 km buffer centred on the AEAR and the approved winter roads, and is intended to encompass all Pilot Study effects to atmospheric noise and underwater noise.

1.5.2 Aquatic Environment

The Pilot Study will occur within the Meadowbank River, Quoich River, and Thelon River watersheds. The study area for Hydrology, Water and Sediment Quality, and Aquatic Biota is the 200 m corridor of the AEAR and approved winter road alignments (Figure 1). The entirety of each watershed along the road alignment is not included in the study area as winter road routes have already received approval. The study area is anticipated to be large enough to capture the residual effects on adjacent aquatic areas due to the narrow scope of the Pilot Study.

1.5.3 Terrestrial Environment

The terrestrial study area encompassing soils, vegetation, and wildlife was defined as a 50 km buffer centred on the AEAR and incorporates the approved winter roads. This study area is a similar size to those established along other mine roads (e.g., Meadowbank All-weather Access Road [AWAR]), and is intended to encompass all Pilot Study effects to soil, vegetation, and wildlife from operations on the AEAR and approved winter roads.

1.5.4 Human Environment

When assessing the Pilot Study's effects on Traditional Land Use (TLU) activities, the TLU assessment focuses on activity occurring in the study areas identified for the affected aquatic or terrestrial resources. When assessing effects on traditional fishing, the TLU assessment is completed within the spatial boundary identified for aquatic biota. Similarly, the TLU assessment considered the terrestrial spatial boundary when determining effects on traditional plant and animal harvesting. The worker and public safety study area is the AEAR and approved winter roads traversed by the hovercrafts.

2.0 EXISTING ENVIRONMENT

The description of the existing environment in which the Pilot Study will occur draws on material presented in existing literature sources, and data obtained as a part of the baseline studies completed in the Amaruq Exploration Area (Agnico Eagle 2016a). Additional baseline field data collection was not conducted for the Pilot Study; during the pilot study, additional field data will be collected to evaluate the predictions and inform future use of the hovercrafts.

Data obtained from baseline studies completed in the Amaruq Exploration Area has been drawn upon to supplement other data sources referenced in the existing environment summary of this screening assessment. However, given the ongoing review status of the Whale Tail FEIS, its results and conclusions have not been considered in this screening assessment.

2.1 Atmospheric Environment

2.1.1 Air Quality and Climate

Existing air quality and climate conditions in the atmospheric study area correspond to those presented in baseline study reports completed in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 4; Agnico Eagle 2015f). The climate in the study area, as recorded at Baker Lake over the long-term, is characterized by long, cold winters followed by short, cool summers. Winds are predominantly from the northwest and are highest in winter, lowest in summer. Annual precipitation is low, with most occurring as rain in late summer and fall. Air quality in the region is generally good, though there can be episodic reductions coincident with springtime Arctic Haze events, or when boreal forest fire smoke is transported to the region in summer.

Existing air quality conditions includes natural emissions from low-level wind-blown dust and compounds that have been transported long distances and from other jurisdictions in southern latitudes. It includes mining activities that are comprised of the following sources:

- road traffic to support personnel movement including buses and trucks and other light vehicles;
- excavation and haulage of ore and overburden (e.g., associated with the bulk sample);
- Amaruq exploration activities including terrestrial vehicle, boat and foot access to the various exploration areas; and
- air-based access to exploration areas including the use of helicopters.

2.1.2 Noise and Vibration

The Pilot Study will operate on the AEAR and on approved winter-roads in the Amaruq Exploration Area. Existing sources of atmospheric noise in the study area include:

- natural sources such as wind, rain, birds, insects, and other wildlife, as well as wave-action in close proximity to lakes and other water bodies;
- existing vehicular traffic on the AEAR and approved winter-roads;
- existing vehicular traffic on the Meadowbank AWAR;

- heavy-equipment, blasting, and back-up alarms from existing Meadowbank mining activities in the southern part of the study area;
- Amaruq exploration camp activities such as drill rigs and vehicles in the northern part of the study area; and
- helicopter and other aircraft associated with Meadowbank mining and Amaruq exploration activities.

Since 2009, existing atmospheric noise levels have been measured annually in the vicinity of the Meadowbank Mine (Agnico Eagle 2010, 2011, 2012, 2013a, 2014a, 2015b). These annual measurements provide an understanding of existing atmospheric noise levels in the southern part of the study area. In 2015, existing atmospheric noise levels were measured along the AEAR and in the vicinity of the Amaruq exploration camp. These 2015 measurements provide an understanding of existing atmospheric noise levels in the central and northern parts of the study area.

Atmospheric noise levels are usually presented using the energy equivalent sound level (L_{eq}) parameter, which represents the average noise level over a specified time period. Annual noise measurements recorded during baseline studies for the Meadowbank Mine have focused on daytime noise levels ($L_{eq,day}$) measured from 7 am to 11 pm and nighttime noise levels ($L_{eq,night}$) measured from 11 pm to 7 am (Agnico Eagle 2010, 2011, 2012, 2013a, 2014a, 2015b). The measurements completed for baseline studies conducted in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 4) focused on $L_{eq,day}$ noise levels for a daytime period defined as 7 am to 10 pm and $L_{eq,night}$ noise levels for a nighttime period defined as 10 pm to 7 am (Whale Tail FEIS, Volume 4).

Atmospheric noise levels are usually reported in A-weighted decibels referenced to a standard pressure level of 20 micropascals (dBA re 20 µPa). The dBA unit is used to account for the frequency sensitivity of the human auditory system. Table 4 presents existing atmospheric noise levels measured at locations across the study area. For the five locations used for annual Meadowbank noise monitoring, the range of L_{eq} values presented reflects the annual variability.

Table 4: Existing Atmospheric Noise Levels

Location	Location Description	Observed Noise Sources	Existing Atmospheric Noise Level [dBA re 20 µPa]		Reference
			Daytime [$L_{eq,day}$]	Nighttime [$L_{eq,night}$]	
R1	used for annual noise monitoring of Meadowbank Mine; 400 m from Meadowbank AWAR in the southern part of study area	helicopters; blasting; truck traffic; back-up alarms; birds	41 to 59	36 to 54	(Agnico Eagle 2010, 2011, 2012, 2013, 2014a)
R1	surrogate for R1 during 2014 monitoring of Meadowbank Mine; 400 m from Meadowbank AWAR in the southern part of the study area	truck traffic; birds; helicopters; road maintenance work	43	46	(Agnico Eagle 2015b)
R2	used for annual noise monitoring of Meadowbank Mine; 1.4 km from Meadowbank airstrip	Helicopters, aircraft; back-up alarms; construction activity; wind; blasting; birds; insects	40 to 52	37 to 41	(Agnico Eagle 2010, 2011, 2012, 2013, 2014a, 2015b)
R3	used for annual noise monitoring of Meadowbank Mine; 1.8 km from Meadowbank east dike	Helicopters, aircraft; heavy equipment; wind; rain; blasting; birds; insects	32 to 42	39 to 43	(Agnico Eagle 2010, 2011, 2012, 2014a, 2015b)
R4	used for annual noise monitoring of Meadowbank Mine; 1.5 km from Meadowbank Vault Pit	Helicopters, aircraft; heavy equipment; wind; rain; wildlife	35 to 44	33 to 40	(Agnico Eagle 2010, 2011, 2012, 2014a, 2015b)
R5	used for annual noise monitoring of Meadowbank Mine; within Meadowbank camp; 300 m from Meadowbank AWAR in the southern part of the study area	helicopters and aircraft; heavy equipment; wind; rain; waves along lakeshore; birds; wildlife	42 to 62	43 to 57	(Agnico Eagle 2010, 2011, 2012, 2013, 2014a, 2015b)
R6	used in 2015 for measurements to support baseline studies (Agnico Eagle 2016a); 750 m from Meadowbank Vault Pit; 1.5 km from AEAR in the southern part of the study area	helicopters; Vault Pit operations; wind	39	41	(Agnico Eagle 2016a, Vol. 4)
R7	used in 2015 for measurements to support baseline studies (Agnico Eagle 2016a); 1.5 km from AEAR in the central part of the study area	helicopters; wind; waves	29[(a)]	29[(a)]	(Agnico Eagle 2016a, Vol. 4)
R8	used in 2015 for measurements to support baseline studies (Agnico Eagle 2016a); 1.5 km from Amaruq exploration camp	helicopters; wind; drill rigs and vehicles at the exploration camp	30	31	(Agnico Eagle 2016a, Vol. 4)
R9	used in 2015 for measurements to support baseline studies (Agnico Eagle 2016a); 1.5 km from Amaruq exploration camp	helicopters; wind; drill rigs and vehicles at the exploration camp	31	31	(Agnico Eagle 2016a, Vol. 4)

At the time the measurements for R1 were taken in August 2015, there was very little vehicular traffic on the adjacent segment of the AEAR. Vehicular traffic to support Amaruq exploration activities has increased substantially on this segment of the AEAR since August 2015. There is now regular transport truck, fuel truck, and pickup truck traffic on this segment of the road; this increased traffic likely elevates existing noise levels at R7 above those reported in Table 4. Notwithstanding, the R7 data presented in Table 5 provide an understanding of existing atmospheric noise levels in parts of the study area that are relatively free from anthropogenic noise sources.

Underwater noise levels from natural sources are highly site-specific (e.g., loud in whitewater areas and quieter in calm areas). Although rare and unreported in TK workshops, for the purposes of this assessment sporadic boat traffic was assumed to periodically occur in some areas of the study area (e.g., Agnico Eagle conducts core receiving water environmental monitoring in Pipedream and Innugugayualik Lakes). Likewise, sporadic snowmobile and truck traffic over ice-covered water is likely to occur in some areas of the study area during the winter. Motor boats and snowmobiles are expected to be the loudest existing sources of underwater noise in the study area.

Underwater noise levels are usually presented using either the source level (SL) parameter, which represents the peak noise level from a given source normalized to an observation distance of 1 m, or the sound exposure level (L_E) parameter, which represents the total sound energy observed during a single operation by a given noise source (e.g., a snowmobile driving past a fixed point). The SL parameter characterizes a noise source in an environmentally-independent manner – i.e., the SL of a given noise source is unchanged when the source is deployed in different environments. In contrast, the L_E parameter characterizes a noise source in an environmentally-dependent manner – i.e., the observed L_E of a given noise source can change depending on propagation conditions between the source and point of observation.

Underwater noise levels – expressed using both the SL and L_E parameters – are usually reported in unweighted decibels referenced to a standard pressure level of 1 µPa (dBZ re 1 µPa). However, publically-available research studies of underwater noise levels from motor boats (Erbe 2001) and from snowmobiles (Roof and Fleming 2001) were used to characterize underwater noise levels in parts of the study area where these types of sources operate. Table 5 summarizes underwater noise levels associated with motor boats and snowmobiles.

Table 5: Existing Underwater Noise Levels

Source	Existing Underwater Noise Level [dBZ re 1 µPa]		Reference
	Source Level	Sound Exposure Level[a]	
Motor boat[b]	159 @ 10 km/h; 161 @ 60 km/h	--[c]	(Erbe 2001)
Snowmobile	--[c]	131 to 132 @ 4 m; 122 to 124 @ 24 m	(Roof and Fleming 2001)

[a] Observation snow depth: 0.3 m; Observation ice thickness: 0.9 m; Observation water depth: 0.9 m; Observation depth in water: 0.5 m.

[b] 150 horsepower outboard engine.

[c] This noise level parameter was not reported in the associated reference.

2.2 Aquatic Environment

2.2.1 Hydrology

Hydrology baseline conditions were characterized based on a review of the following sources:

- Baseline studies of the geomorphological, hydrologic, hydraulic, and navigation conditions for waterbodies and watercourses crossed by the AEAR, and near the Amaruq terminal of the AEAR and approved winter roads (Agnico Eagle 2016a, Volume 6, Appendixes 6-C and 6-D).
- Public spatial data: imagery (Google Inc. 2016) and 1:50,000 scale watercourse and waterbody data (Government of Canada 2016) were reviewed to derive road crossing locations and estimate navigation potential of the approved winter roads.
- Transport Canada (2014): Transport Canada's list of navigable waterbodies and watercourses was reviewed to determine the potential for navigation.

The AEAR and approved winter roads are located in the Meadowbank River, Quoich River, and Thelon River watersheds which comprise an extensive network of lakes, ponds, and interconnecting streams. The AEAR crosses 28 watercourses, including 3 rivers, and 25 smaller watercourses. Watercourse crossings and waterbodies are shown in Figure 1.

Approved winter roads cross 38 waterbodies, four of which are named (i.e., Pipedream Lake, Nutipilik Lake, Uiguklik Lake and Whale Tail Lake (Agnico Eagle 2016a), and include 12 watercourse crossings. Near the Amaruq terminal of the AEAR and approved winter roads, lake shorelines exhibit a consistent terrain type related to shorelines that have developed in morainal material. These morainal shorelines were observed at all visited lakes. 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 streambed materials exhibit the same characteristics as shorelines. 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 study area typically peak in late-May to mid-June from snowmelt, and rapidly decline in July; low discharges prevail until frozen conditions in October to November, with a secondary peak in September from rainfall events. Watercourses in the study area are frozen over the winter with shallow watercourses frozen to the bed.

2.2.2 Water and Sediment Quality

The study area (Section 1.5) is the 200 m corridor along the AEAR year-round and winter road alignments. Data used to describe existing conditions for water and sediment quality were selected from existing datasets collected within the region and to support the baseline studies completed in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 6, Appendix 6-G).

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 water quality guidelines for the protection of freshwater aquatic life (CCME 1999), Canadian drinking water quality guidelines (Health Canada 2014), and the trigger and threshold values developed for the Meadowbank CREMP (Azimuth 2015b). 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 vales.

Sediment data were screened against the CCME interim sediment quality guidelines (ISQGs) and probable effect level (PEL) concentrations (CCME 2002), and the Meadowbank CREMP triggers and thresholds (Azimuth 2015b)

Data were compared to guidelines for the protection of aquatic life guidelines (CCME 1999), drinking water guidelines (Health Canada 2014) and benchmarks developed for the Meadowbank Mine (Azimuth 2015b) as a means to evaluate the quality of water and sediment and determine the suitability of the water and sediment for aquatic life, including fish, waterfowl, and water as a drinking water source.

Results

This section provides a high-level summary of the water and sediment quality results; for more details please see the 2014 CREMP (Azimuth 2015a), the 2014-2015 report of baseline conditions in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 6, Appendix 6-G), and the 2016 baseline report (Azimuth 2017).

Water Quality

Concentrations of all constituents were less than the guidelines for protection of aquatic life and drinking water with the exception of one field pH value from Pipedream Lake during open-water conditions (Table 6). Constituents that were non-detectable included:

- Conventional constituents: total suspended solids;
- Major ions: bromide and cyanide;
- Nutrients: nitrite and ortho-phosphate; and
- Metals: antimony, beryllium, bismuth, boron, lithium, selenium, silver, thallium, vanadium, zinc, and zirconium.

Water quality in these lakes was characteristic of headwater lakes in the Arctic: circum-neutral (field pH of 6.4 to 7.8), low productivity (total phosphorus of <0.002 to 0.0072 mg-P/L); soft (hardness of 5.4 to 10 mg $CaCO_3$/L), low alkalinity (5.1 to 8.9 mg $CaCO_3$/L), low TDS (11 to 20 mg/L), low turbidity (0.12 to 1.5 NTU) and low metals.

There were a small number of constituents with concentrations that exceeded the Meadowbank trigger values (i.e., conductivity, hardness, alkalinity, TDS, TSS, DOC, alkalinity, silicate, total phosphorus, and total aluminum, chromium, and tin). Exceedances were observed in all sample groups except under-ice samples from Inuggugayualik Lake. The Meadowbank triggers are intended as early warning levels only. The threshold level for TSS was exceeded in one sample from the Haul Lake roads (Lake C41).

Sediment Quality

Concentrations of sediment quality constituents were generally similar between lakes with concentrations less than the ISQG and PEL guidelines for lead, mercury, and zinc in all samples (Table 7). Sedimentation rates in lakes within the study area are low, with most sedimentation due to runoff from the watershed and deposition through dust (Azimuth 2016). Previous studies have also demonstrated natural spatial heterogeneity in sediment quality in lakes (Azimuth 2016).

Particle size was analyzed from grab samples. The particle size distribution was predominantly silt/clay, and characteristic of depositional areas in lakes from this region (Azimuth 2015a). Baseline data summarized in this section represent data collected specifically in depositional areas, in areas dominated by silt and clay, and within water depths of 6 to 10 m. Sediment grain size tends to be finer in deeper water and courser in shallower water (Agnico Eagle 2014b; Dominion Diamond 2014).

Metals and organic carbon were analyzed from both the core and grab sample types. As described in previous reports (Azimuth 2015a; Table 7), concentrations of constituents were similar between the core and bulk grab sample types.

Concentrations of arsenic and copper exceeded the ISQG in most samples, and concentrations of chromium exceeded the ISQG in all samples (Table 7 and Table 8). Concentrations of arsenic and chromium exceeded the PEL in most samples, but concentrations of copper were less than the PEL and trigger level in all samples. Concentrations of arsenic exceeded the trigger level in about a quarter of the samples. Concentrations of chromium exceeded the trigger level in less than 25% of the samples from Inuggugayualik Lake but in most to all of the samples from Pipedream Lake.

Table 6: Water Quality Summary for the Study Area

Constituent	Unit	AEAR Lakes, Open-water				Inuggugayualik Lake, Open-water				Inuggugayualik Lake, Under-ice				Pipedream Lake, Open-water				Pipedream Lake, Under-ice			
		2015				2015-2016				2016				2015-2016				2016			
		Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max
Field Measured																					
pH	-	14	6.8	7.0	7.4	12	6.6	7.1	7.8	2	7.2	-	7.2	11	**6.4**(C, D, T, R)	7.2	7.7	2	6.6	-	7.0
Specific conductivity	µS/cm	15	14	21	**25**(T)	12	6	13	**157**(T)	2	14	-	17	11	15	18	**37**(T)	2	23	-	**29**(T)
Temperature	°C	15	2.5	9.6	10.9	12	2.4	11.1	13.7	2	0.3	-	0.3	11	3.0	9.9	10.6	2	0.1	-	0.5
Dissolved oxygen	mg/L	15	10.7	12.5	15.0	12	9.9	10.2	13.2	2	16.1	-	17.1	9	10.6	11.6	13.0	0	-	-	-
Conventional Parameters																					
pH	-	15	6.8	7.0	7.1	12	6.7	6.8	6.9	2	6.8	-	6.8	11	6.9	7.0	7.1	2	7.0	-	7.0
Specific conductivity	µS/cm	15	17	23	**25**(T)	12	15	16	17	2	20	-	21	11	21	22	23	2	**24**(T)	-	**25**(T)
Hardness, as $CaCO_3$	mg/L	15	6.8	**9.4**(T)	**10**(T)	12	5.4	5.7	5.9	2	7.2	-	7.4	11	8.3	**8.8**(T)	**9.1**(T)	2	**9.5**(T)	-	**9.6**(T)
Total alkalinity, as $CaCO_3$	mg/L	15	5.1	7.5	**8.9**(T)	12	4.6	5	5.7	2	6.2	-	6.5	11	6.9	7.6	8.2	2	7.5	-	7.8
Total dissolved solids	mg/L	15	13	17	**20**(T)	12	11	14	17	2	15	-	16	11	12	17	**18**(T)	2	18	-	18
Total suspended solids	mg/L	15	<1.0	<1.0	**9**(T,R)	12	<1.0	<1.0	1	2	<1.0	-	<1.0	11	<1.0	<1.0	<1.0	2	<1.0	-	<1.0
Total organic carbon	mg/L	15	1.4	2	2.7	12	1.5	1.9	2.1	2	2	-	2.1	11	1.3	1.5	1.8	2	1.7	-	1.7
Dissolved organic carbon	mg/L	15	1.3	1.9	**2.8**(T)	12	1.5	1.7	2.1	2	2.1	-	2.3	11	1.3	1.5	1.9	2	1.5	-	1.7
Turbidity	NTU	15	0.21	0.35	1.5	12	0.28	0.32	0.4	2	0.14	-	0.16	11	0.19	0.22	0.26	2	0.12	-	0.13
Alkalinity - bicarbonate	mg/L	15	5.1	7.5	**8.9**(T)	12	4.6	5.0	5.7	2	6.2	-	6.5	11	6.9	7.6	8.2	2	7.5	-	7.8
Major Ions																					
Chloride	mg/L	15	0.47	0.57	0.67	12	0.7	0.74	0.77	2	0.95	-	0.97	11	0.58	0.59	0.62	2	0.65	-	0.68
Fluoride	mg/L	15	0.034	0.046	0.073	12	0.056	0.059	0.064	2	0.073	-	0.073	11	0.035	0.037	0.039	2	0.041	-	0.042
Sulphate	mg/L	15	1.4	1.6	4	12	0.8	0.86	0.9	2	1.1	-	1.2	11	1.5	1.6	1.7	2	1.8	-	1.8
Bromide	mg/L	15	<0.05	<0.05	<0.05	12	<0.05	<0.05	<0.05	2	<0.05	-	<0.05	11	<0.05	<0.05	<0.05	2	<0.05	-	<0.05
Calcium	mg/L	15	1.5	2.3	2.9	12	1.1	1.1	1.2	2	1.4	-	1.5	11	2.1	2.2	2.3	2	2.4	-	2.4
Magnesium	mg/L	15	0.74	0.8	1.1	12	0.66	0.69	0.72	2	0.88	-	0.9	11	0.75	0.77	0.81	2	0.83	-	0.85
Potassium	mg/L	15	0.26	0.34	0.38	12	0.35	0.38	0.41	2	0.47	-	0.48	11	0.3	0.33	0.35	2	0.37	-	0.38
Sodium	mg/L	15	0.4	0.51	0.57	12	0.53	0.56	0.6	2	0.68	-	0.7	11	0.47	0.5	0.52	2	0.51	-	0.52
Nutrients and Biological Indicators																					
Nitrate	mg-N/L	15	<0.005	<0.005	0.024	12	<0.005	<0.005	<0.005	2	<0.005	-	<0.005	11	<0.005	<0.005	<0.005	2	<0.005	-	<0.005
Nitrite	mg-N/L	15	<0.001	<0.001	<0.001	12	<0.001	<0.001	<0.001	2	<0.001	-	<0.001	11	<0.001	<0.001	<0.001	2	<0.001	-	<0.001
Total ammonia	mg-N/L	15	<0.005	<0.005	0.0053	12	<0.005	<0.005	<0.005	2	0.016	-	0.019	11	<0.005	<0.005	<0.005	2	0.012	-	0.012
Total Kjeldahl nitrogen	mg-N/L	15	0.085	0.15	0.27	12	<0.05	0.12	0.15	2	0.15	-	0.15	11	<0.05	0.098	0.17	2	0.1	-	0.11
Total phosphorus	mg-P/L	15	<0.002	0.0022	**0.0072**(T, R)	12	<0.002	<0.002	**0.0058**(R)	2	<0.002	-	0.0021	11	<0.002	<0.002	0.0023	2	<0.002	-	<0.002
Chlorophyll *a*	µg/L	15	0.21	0.56	2.3	12	0.26	0.38	0.49	2	0.24	-	0.26	11	0.25	0.38	0.49	2	0.27	-	0.33
Ortho phosphate (as p)	mg-P/L	15	<0.001	<0.001	<0.001	12	<0.001	<0.001	<0.001	2	<0.001	-	<0.001	11	<0.001	<0.001	<0.001	2	<0.001	-	<0.001
Phosphorus (p)-total diss.	mg-P/L	15	<0.002	0.0022	0.0031	12	<0.002	<0.002	0.0021	2	<0.002	-	<0.002	11	<0.002	<0.002	<0.002	2	<0.002	-	<0.002
Silicate (as sio2)	mg/L	15	<0.5	0.64	**1.4**(T)	12	<0.5	<0.5	<0.5	2	<0.5	-	<0.5	11	<0.5	<0.5	<0.5	2	<0.5	-	<0.5
Cyanide																					
Total cyanide	mg/L	15	<0.001	<0.001	<0.001	12	<0.001	<0.001	<0.001	2	<0.001	-	<0.001	11	<0.001	<0.001	<0.001	2	<0.001	-	<0.001

Table 6: Water Quality Summary for the Study Area

Constituent	Unit	AEAR Lakes, Open-water				Inuggugayualik Lake, Open-water				Inuggugayualik Lake, Under-ice				Pipedream Lake, Open-water				Pipedream Lake, Under-ice			
		2015				2015-2016				2016				2015-2016				2016			
		Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max
Free cyanide	mg/L	15	<0.001	<0.001	<0.001	12	<0.001	<0.001	<0.001	2	<0.001	-	<0.001	11	<0.001	<0.001	<0.001	2	<0.001	-	<0.001
Total Metals																					
Aluminum	mg/L	15	0.0042	0.0099	**0.065$^{(T)}$**	12	0.0079	0.01	0.012	2	<0.003	-	0.0039	11	0.0046	0.005	0.047	2	<0.003	-	<0.003
Antimony	mg/L	15	<0.0001	<0.0001	<0.0001	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001
Arsenic	mg/L	15	0.00013	0.00018	0.00042	12	<0.0001	0.0001	0.00012	2	0.00011	-	0.00012	11	0.00013	0.00016	0.00024	2	0.00017	-	0.00018
Barium	mg/L	15	0.0018	0.0032	0.0059	12	0.0017	0.0019	0.0021	2	0.0021	-	0.0023	11	0.0018	0.002	0.0025	2	0.002	-	0.0021
Beryllium	mg/L	15	<0.00002	<0.00002	<0.00002	12	<0.00002	<0.00002	<0.00002	2	<0.00002	-	<0.00002	11	<0.00002	<0.00002	<0.00002	2	<0.00002	-	<0.00002
Bismuth	mg/L	15	<0.00005	<0.00005	<0.00005	12	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005
Boron	mg/L	15	<0.01	<0.01	<0.01	12	<0.01	<0.01	<0.01	2	<0.01	-	<0.01	11	<0.01	<0.01	<0.01	2	<0.01	-	<0.01
Cadmium	mg/L	15	<0.000005	<0.000005	0.0000093	12	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005	11	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005
Chromium	mg/L	15	<0.0001	0.0001	**0.00079$^{(T)}$**	12	<0.0001	<0.0001	0.0002	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0004	2	<0.0001	-	<0.0001
Cobalt	mg/L	15	<0.0001	<0.0001	0.00013	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001
Copper	mg/L	15	<0.0005	0.0007	0.0011	12	<0.0005	<0.0005	0.00069	2	<0.0005	-	0.00051	11	<0.0005	0.0005	0.0016	2	<0.0005	-	0.0006
Iron	mg/L	14	0.012	0.036	0.16	12	0.015	0.02	0.029	2	<0.01	-	<0.01	11	<0.01	<0.01	0.081	2	<0.01	-	<0.01
Lead	mg/L	15	<0.00005	<0.00005	0.00037	12	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	0.00049	2	<0.00005	-	<0.00005
Lithium	mg/L	15	<0.001	<0.001	<0.001	12	<0.001	<0.001	<0.001	2	<0.001	-	<0.001	11	<0.001	<0.001	<0.001	2	<0.001	-	<0.001
Manganese	mg/L	15	0.00031	0.0017	0.017	12	0.002	0.0026	0.0066	2	0.00056	-	0.00059	11	0.0013	0.0016	0.0025	2	0.00055	-	0.00058
Mercury	mg/L	15	<0.000005	<0.000005	0.000008	12	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005	11	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005
Molybdenum	mg/L	15	<0.00005	<0.00005	0.000078	12	<0.00005	<0.00005	0.000075	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	0.000085	2	<0.00005	-	0.000053
Nickel	mg/L	15	<0.0005	0.00051	0.0046	12	<0.0005	<0.0005	0.00053	2	<0.0005	-	0.0065	11	0.00055	0.00065	0.01	2	0.00055	-	0.00059
Selenium	mg/L	15	<0.00005	<0.00005	<0.00005	12	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005
Silicon	mg/L	15	0.14	0.35	0.72	12	0.12	0.14	0.18	2	0.13	-	0.14	11	0.12	0.13	0.19	2	0.12	-	0.12
Silver	mg/L	15	<0.00001	<0.00001	<0.00001	12	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001	11	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001
Strontium	mg/L	15	0.0072	0.012	0.015	12	0.0061	0.0064	0.0068	2	0.008	-	0.0084	11	0.0088	0.0092	0.0095	2	0.0099	-	0.011
Sulfur	mg/L	15	0.54	0.6	1.4	12	<0.5	<0.5	<0.5	2	<0.5	-	<0.5	11	0.56	0.62	0.65	2	0.59	-	0.64
Thallium	mg/L	15	<0.00001	<0.00001	<0.00001	12	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001	11	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001
Tin	mg/L	15	<0.0001	<0.0001	**0.00027$^{(T)}$**	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001
Titanium	mg/L	15	<0.0003	<0.0003	0.0013	12	<0.0003	<0.0003	<0.0003	2	<0.0003	-	<0.0003	11	<0.0003	<0.0003	0.0015	2	<0.0003	-	<0.0003
Uranium	mg/L	15	0.00002	0.000036	0.00006	12	0.000042	0.000048	0.000054	2	0.000044	-	0.000047	11	0.000021	0.000023	0.000037	2	0.000021	-	0.000022
Vanadium	mg/L	15	<0.0005	<0.0005	<0.0005	12	<0.0005	<0.0005	<0.0005	2	<0.0005	-	<0.0005	11	<0.0005	<0.0005	<0.0005	2	<0.0005	-	<0.0005
Zinc	mg/L	15	<0.003	<0.003	<0.003	12	<0.003	<0.003	<0.003	2	<0.003	-	<0.003	11	<0.003	<0.003	<0.003	2	<0.003	-	<0.003
Zirconium	mg/L	15	<0.0003	<0.0003	<0.0003	12	<0.0003	<0.0003	<0.0003	2	<0.0003	-	<0.0003	11	<0.0003	<0.0003	<0.0003	2	<0.0003	-	<0.0003
Dissolved Metals																					
Aluminum	mg/L	15	0.0013	0.0038	0.0086	12	0.0018	0.003	0.013	2	0.0014	-	0.002	11	0.0018	0.0021	0.0036	2	<0.001	-	<0.001
Antimony	mg/L	15	<0.0001	<0.0001	<0.0001	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001
Arsenic	mg/L	15	0.00011	0.00014	0.00034	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	0.00013	0.00014	0.00017	2	0.00014	-	0.00015
Barium	mg/L	15	0.0017	0.0031	0.0048	12	0.0016	0.0019	0.002	2	0.0021	-	0.0022	11	0.0019	0.002	0.0021	2	0.002	-	0.002

Table 6: Water Quality Summary for the Study Area

Constituent	Unit	AEAR Lakes, Open-water				Inuggugayualik Lake, Open-water				Inuggugayualik Lake, Under-ice				Pipedream Lake, Open-water				Pipedream Lake, Under-ice			
		2015				2015-2016				2016				2015-2016				2016			
		Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max	Count	Min	Median	Max
Beryllium	mg/L	15	<0.00002	<0.00002	<0.00002	12	<0.00002	<0.00002	<0.00002	2	<0.00002	-	<0.00002	11	<0.00002	<0.00002	<0.00002	2	<0.00002	-	<0.00002
Bismuth	mg/L	15	<0.00005	<0.00005	<0.00005	12	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005
Boron	mg/L	15	<0.01	<0.01	<0.01	12	<0.01	<0.01	<0.01	2	<0.01	-	<0.01	11	<0.01	<0.01	<0.01	2	<0.01	-	<0.01
Cadmium	mg/L	15	<0.000005	<0.000005	0.0000067	12	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005	11	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005
Chromium	mg/L	15	<0.0001	<0.0001	0.00014	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001
Cobalt	mg/L	15	<0.0001	<0.0001	0.0001	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001
Copper	mg/L	15	0.00037	0.00061	0.0008	12	0.00029	0.00032	0.00033	2	0.00035	-	0.00036	11	0.00038	0.0004	0.00048	2	0.00036	-	0.00038
Iron	mg/L	15	<0.01	0.014	0.072	12	<0.01	<0.01	<0.01	2	<0.01	-	<0.01	11	<0.01	<0.01	<0.01	2	<0.01	-	<0.01
Lead	mg/L	13	<0.00005	<0.00005	0.000098	12	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005
Lithium	mg/L	15	<0.001	<0.001	<0.001	12	<0.001	<0.001	<0.001	2	<0.001	-	<0.001	11	<0.001	<0.001	<0.001	2	<0.001	-	<0.001
Manganese	mg/L	15	<0.0001	0.0012	0.015	12	0.00016	0.00043	0.0034	2	0.0002	-	0.00024	11	0.00018	0.00061	0.0015	2	<0.0001	-	<0.0001
Mercury	mg/L	15	<0.000005	<0.000005	0.000005	12	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005	11	<0.000005	<0.000005	<0.000005	2	<0.000005	-	<0.000005
Molybdenum	mg/L	15	<0.00005	<0.00005	0.0001	12	<0.00005	<0.00005	0.0002	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	0.000051	2	<0.00005	-	<0.00005
Nickel	mg/L	15	<0.0005	<0.0005	0.0033	12	<0.0005	<0.0005	<0.0005	2	<0.0005	-	<0.0005	11	<0.0005	0.00059	0.00091	2	<0.0005	-	<0.0005
Phosphorus	mg/L	15	<0.05	<0.05	<0.05	12	<0.05	<0.05	<0.05	2	<0.05	-	<0.05	11	<0.05	<0.05	<0.05	2	<0.05	-	<0.05
Selenium	mg/L	15	<0.00005	<0.00005	<0.00005	12	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005	11	<0.00005	<0.00005	<0.00005	2	<0.00005	-	<0.00005
Silicon	mg/L	15	0.14	0.31	0.61	12	0.1	0.12	0.14	2	0.12	-	0.13	11	0.1	0.12	0.14	2	0.11	-	0.11
Silver	mg/L	15	<0.00001	<0.00001	<0.00001	12	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001	11	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001
Strontium	mg/L	15	0.007	0.011	0.015	12	0.006	0.0063	0.0066	2	0.0077	-	0.0082	11	0.0086	0.009	0.0095	2	0.0096	-	0.0099
Sulfur	mg/L	15	0.52	0.58	1.4	12	<0.5	<0.5	<0.5	2	<0.5	-	<0.5	11	0.55	0.57	0.62	2	0.6	-	0.62
Thallium	mg/L	15	<0.00001	<0.00001	<0.00001	12	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001	11	<0.00001	<0.00001	<0.00001	2	<0.00001	-	<0.00001
Tin	mg/L	15	<0.0001	<0.0001	<0.0001	12	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001	11	<0.0001	<0.0001	<0.0001	2	<0.0001	-	<0.0001
Titanium	mg/L	15	<0.0003	<0.0003	0.00034	12	<0.0003	<0.0003	<0.0003	2	<0.0003	-	<0.0003	11	<0.0003	<0.0003	<0.0003	2	<0.0003	-	<0.0003
Uranium	mg/L	15	0.000017	0.000026	0.000051	12	0.000032	0.000041	0.000044	2	0.000039	-	0.00004	11	0.000016	0.000019	0.000022	2	0.000016	-	0.000018
Vanadium	mg/L	15	<0.0005	<0.0005	<0.0005	12	<0.0005	<0.0005	<0.0005	2	<0.0005	-	<0.0005	11	<0.0005	<0.0005	<0.0005	2	<0.0005	-	<0.0005
Zinc	mg/L	15	<0.001	<0.001	<0.001	12	<0.001	<0.001	<0.001	2	<0.001	-	<0.001	11	<0.001	<0.001	0.0012	2	<0.001	-	<0.001
Zirconium	mg/L	15	<0.0003	<0.0003	<0.0003	12	<0.0003	<0.0003	<0.0003	2	<0.0003	-	<0.0003	11	<0.0003	<0.0003	<0.0003	2	<0.0003	-	<0.0003

Bolded concentrations are higher than relevant water quality guidelines.

(C) = concentration higher than the relevant chronic aquatic life guideline or beyond the recommended pH, DO or total alkalinity concentration range.

(D) = concentration higher than the relevant drinking water guideline or beyond the recommended pH or DO concentration range.

(T) = concentration higher than the relevant trigger Meadowbank or beyond the recommended pH or DO concentration range.

(R) = concentration higher than the relevant threshold or beyond the recommended pH or DO concentration range.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

- = no guideline or data.

Table 7: Sediment Quality Summary for the Study Area

Constituent	Unit (Dry Weight)	Inuggugayualik Lake, Sediment Core 2008, 2009, 2012, and 2014				Inuggugayualik Lake, Sediment Grab 2008 to 2016				Pipedream Lake, Sediment Core 2012 and 2014				Pipedream Lake, Sediment Grab 2009 to 2016			
		Count	Minimum	Median	Maximum	Count	Minimum	Median	Maximum	Count	Minimum	Median	Maximum	Count	Minimum	Median	Maximum
Particle Size																	
Gravel	%	-	-	-	-	37	<DL	<DL	0.88	-	-	-	-	36	<DL	<0.1	<0.1
Clay	%	-	-	-	-	37	4.86	19	31	-	-	-	-	36	6.05	15.75	33
Sand	%	-	-	-	-	37	1.12	3.42	17.6	-	-	-	-	36	5.31	10.8	20.5
Silt	%	-	-	-	-	37	52.5	75.9	90.1	-	-	-	-	36	46	73.9	81.4
Carbon Content																	
Total organic carbon	%	40	2.68	4.56	6.81	37	0.59	4	4.94	10	2	2.51	5.77	36	0.72	2.475	5.05
Total Metals																	
Aluminum	µg/g	39	15,800	21,900	27,400	37	13,300	20,900	25,800	10	19,500	20,550	23,400	36	15,100	19,300	27,400
Antimony	µg/g	40	<DL	<DL	0.3	37	<0.1	0.16	0.23	10	0.22	0.26	0.38	36	<0.01	0.235	0.3
Arsenic	µg/g	40	<5	**26**(I, P)	**354**(I,P,T)	37	**5.7**(I)	**34.1**(I, P)	**228**(I, P,T)	10	**11.6**(I)	**36.7**(I, P)	**138**(I, P,T)	36	**7.5**(I)	**25.8**(I, P)	**208**(I, P,T)
Barium	µg/g	40	31.9	117	273	37	81.7	116	147	10	78.6	87.6	104	36	60.6	89.1	138
Beryllium	µg/g	40	<1	1.385	1.62	37	0.85	1.29	1.64	10	0.94	1.005	1.21	36	0.7	0.94	1.24
Bismuth	µg/g	10	<0.2	1.205	1.38	33	<0.02	1.14	1.58	10	0.82	0.94	1.09	33	<0.02	0.84	1.17
Cadmium	µg/g	40	<DL	<DL	**1.5**(I)	37	<0.5	0.155	0.298	10	0.11	0.195	0.33	36	<0.5	0.13	**0.63**(I)
Calcium	µg/g	10	1,400	2,045	22,200	33	1,330	1,810	2,280	10	1,740	2,010	2,770	33	1,660	2,090	2,660
Chromium	µg/g	40	**50.8**(I)	**95.1**(I,P)	**125**(I,P,T)	37	**65.9**(I)	**104**(I,P)	**120**(I,P,T)	10	**124**(I,P,T)	**133.5**(I,P,T)	**152**(I,P,T)	36	**97.2**(I,P)	**128.5**(I,P,T)	**160**(I,P,T)
Cobalt	µg/g	40	9.2	13.8	47.2	37	9.01	12.4	18.1	10	11	18	21.6	36	8.25	12.25	25
Copper	µg/g	40	30.1	**47.9**(I)	**63**(I)	37	28.7	**44.7**(I)	**55.2**(I)	10	**45.8**(I)	**48.9**(I)	**59.4**(I)	36	33.2	**44.7**(I)	**66.9**(I)
Iron	µg/g	10	29,400	44,750	132,000	33	24,200	64,700	162,000	10	28,200	40,350	64,500	33	19,700	38,800	65,300
Lead	µg/g	40	<DL	<DL	15.5	37	<DL	12.2	15.7	10	14.1	15.1	16.8	36	<DL	13.6	17
Lithium	µg/g	10	19.8	27.95	33.8	33	15.7	28.2	34.7	10	25.6	27.75	29.9	33	22.5	28.2	49.3
Magnesium	µg/g	10	7,470	9,930	18,700	33	5,820	9,100	11,100	10	9,830	10,450	11,500	33	8,150	10,500	13,400
Manganese	µg/g	10	364	783	3,050	33	291	1,000	3,910	10	301	1,435	2,170	33	216	542	4,660
Mercury	µg/g	40	0.0143	0.03955	0.0644	37	0.0066	0.0242	0.0425	10	0.0091	0.01135	0.0664	36	0.0058	0.01085	0.0235
Molybdenum	µg/g	40	<DL	4.95	19.6	37	<4	4.59	13.7	10	2.09	3.01	4.93	36	<4	2.77	10.3
Nickel	µg/g	40	37.4	74.35	131	37	49.8	72.8	90.9	10	79.6	89.95	109	36	58.9	80.6	192
Phosphorus	µg/g	25	518	1,150	4,240	33	551	1,290	3,430	10	410	555	997	33	318	508	1,720
Potassium	µg/g	10	740	3,500	3,850	33	2,060	3,270	4,150	10	2,570	2,820	3,140	33	1,890	2,670	4,620
Selenium	µg/g	40	<DL	<DL	0.76	37	<DL	0.57	0.8	10	0.29	0.42	0.58	36	<2.2	0.345	0.52
Silver	µg/g	40	<DL	<DL	0.21	37	<DL	0.15	0.23	10	<0.1	<0.1	0.28	36	<DL	<0.1	0.25
Sodium	µg/g	10	100	150	200	33	<100	150	343	10	<100	115	170	33	<DL	<100	282
Strontium	µg/g	10	18.6	24.45	75.6	33	16.1	23	29.6	10	19	22.35	24.9	33	17.4	22.2	25.7
Thallium	µg/g	40	<1	<1	0.255	37	<DL	0.192	0.258	10	0.175	0.192	0.215	36	<1	0.17	0.297
Tin	µg/g	40	<DL	<DL	3.4	37	<DL	<DL	<DL	10	<2	2.35	8	36	<DL	<2	<2
Titanium	µg/g	10	499	694	2,610	33	358	544	681	10	468	530	581	33	394	530	938

Table 7: Sediment Quality Summary for the Study Area

Constituent	Unit (Dry Weight)	Inuggugayualik Lake, Sediment Core				Inuggugayualik Lake, Sediment Grab				Pipedream Lake, Sediment Core				Pipedream Lake, Sediment Grab			
		2008, 2009, 2012, and 2014				2008 to 2016				2012 and 2014				2009 to 2016			
		Count	Minimum	Median	Maximum	Count	Minimum	Median	Maximum	Count	Minimum	Median	Maximum	Count	Minimum	Median	Maximum
Uranium	µg/g	10	0.689	15.6	22.3	33	9.69	15.4	18.3	10	7.73	8.86	10.9	33	5.82	8.22	12.5
Vanadium	µg/g	40	18.8	35.35	111	37	21.4	34.8	41.5	10	34.6	36	40.5	36	25.3	35.45	45.9
Zinc	µg/g	40	58.4	81.65	102	37	60	83.3	100	10	77.8	80.6	89.9	36	57.5	77.5	101

<DL = less than the analytical detection limit which has varied over time

Bolded values are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

(T) = value higher than the Trigger.

(DL>I) = analytical detection limit was higher than the Interim Sediment Quality Guideline.

(DL>P) = analytical detection limit was higher than the Probable Effects Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

\- = no guideline or data.

PAHs analyzed in 2008 to 2011 from Inuggugayualik and 2009 to 2011 from Pipedream Lake; not going to show PAHs

Table 8: Percent of Sediment Samples Above Guidelines

Constituent	Lake	Sample Type	Percent of Samples Above Guideline			
			ISQG	PEL	Trigger	Threshold
Arsenic	Inuggugayualik Lake	Core	98	63	15	-
		Grab	97	70	22	-
	Pipedream Lake	Core	100	80	10	-
		Grab	100	58	8	-
Chromium	Inuggugayualik Lake	Core	100	58	15	-
		Grab	100	84	14	-
	Pipedream Lake	Core	100	100	100	-
		Grab	100	100	86	-
Copper	Inuggugayualik Lake	Core	98	-	-	-
		Grab	84	-	-	-
	Pipedream Lake	Core	100	-	-	-
		Grab	86	-	-	-

2.2.3 Aquatic Biota

This section provides a summary of baseline data results drawn from baseline studies completed in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 6, Appendix 6-J and Appendix 6-K). The study area is the 200 m corridor along the AEAR year-round and winter road alignments. Baseline data used to describe existing conditions for fish and fish habitat were selected from existing datasets collected along the proposed AEAR alignment as well as lakes in the Meadowbank watershed.

Of the 40 watercourses surveyed, 8 were determined to be high quality habitat for fishery species throughout the open water season. These watercourses were deemed important for specific life stages of fish (e.g., spawning or rearing habitat) and/or provided potential migration routes between larger water bodies. Species captured during these ground surveys were Arctic Char (*Salvenillus alpinus*), Arctic Grayling (*Thymallus arcticus*), Burbot (*Lota lota*), Ninespine Stickleback (*Pungitius pungitius*), and Slimy Sculpin (*Cottus cognatus*), with Slimy Sculpin being the most commonly captured species. Fish were captured at 7 of the 8 sites assessed from the ground. The 32 watercourses not inventoried in detail were either poorly defined drainages or small, ephemeral channels that likely only provide habitat for forage fish species on an intermittent basis.

Of the 13 waterbodies assessed from the air, 7 were along shorelines of larger lakes (i.e., greater than 150 m wide) and 6 were of portions of smaller lakes and ponds. Potential for fish at the waterbody crossings was high for all large lakes, moderate and/or seasonal for 4 small lakes/ponds, and low for 2 isolated, shallow ponds. Nearby lakes sampled for fish in the Meadowbank watershed contained Arctic Char, Burbot, Lake Trout (*Salvelinus namaycush*), Ninespine Stickleback, Round Whitefish (*Prosopium cylindraceum*), and Slimy Sculpin.

Results from the water crossings assessment indicate that most watercourses (80%) consist of low quality fish habitat and likely provide seasonal fish use at most; whereas most of the waterbodies (85%) provide moderate to high quality fish habitat and the potential for overwintering where depths are sufficient.

2.3 Terrestrial Environment

2.3.1 Soil and Vegetation

Baseline soil and vegetation data has been summarized here based on baseline studies conducted in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 5, Section 5.4.2.2 and Appendixes 5-A and 5-C). The presence of continuous permafrost in the study area suggests that soils in the region are predominantly of the Cryosolic Order. Soils of the Cryosolic order are considered the dominant soils in the Arctic regions of Canada (Tarnocai and Bockheim 2011). These soils are formed in either mineral or organic materials that have permafrost either within 1 m of the surface or within 2 m, if the active layer of the soil has been strongly cryoturbated (SCWG 1998).

Vegetation in the study area is predominated by lichen/rock complexes and heath upland Ecological Land Classification (ELCs) units. There is little disturbance in the study area with the exception of the Meadowbank Mine. Lakes are the most common ELC units; Lichen/Rock complex and Heath Upland. Most of the Lichen/Rock complex patches are located in the southwestern portion of the study area whereas the Heath Upland patches are mostly localized in the east portion of the study area.

The Wet Graminoid and Sand ELC units are less common ELC units in the study area. Patches of these ELC units are localized in the southeast portion of the study area 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. Patches of the Sand ELC unit are scattered in the study area. The most common and widespread vascular plants were Northern Labrador Tea (*Rhododendron tomentosum*), and Mountain Cranberry (*Vaccinium vitiidaea*). The majority of areas surveyed had a low species diversity of vascular plants (less than 10 species).

Inuit Qaujimajatuqangit has highlighted concern about the sensitivity of caribou and muskox to losses of vegetation and changes in vegetation habitat quality and dust deposition. Elders also expressed concerns regarding the capacity of vegetation to regenerate following mining and exploration activities (Cumberland 2005a).

2.3.2 Wildlife

Baseline information about wildlife has been summarized from the following sources:

- Environmental monitoring information collected at the Meadowbank Mine (Gebauer and Boulanger 2007; Gebauer et al. 2008 to 2015); and
- Baseline field studies completed at the Amaruq Exploration Area during 2014 and 2015 (Agnico Eagle 2016a, Volume 5, Appendix 5-C).

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. The Ahiak and Lorillard herds are considered the most likely to interact with hovercraft. Based on collaring and monitoring, caribou were most commonly recorded crossing the AEAR during the spring season.

In previous baseline studies, Elders have stated that there are no caribou calving grounds identified near the study area (Agnico Eagle 2016a, Volume 7, Appendix 7-A), and according to Nagy et al. (2011), the nearest calving ground to the Pilot Study is over 100 km away. No collard caribou have approached the AEAR during calving season.

While mortalities of caribou as a result of Meadowbank Mine operations have been low, there have been 11 documented caribou mortalities on the AWAR between 2007 and 2015 (Agnico Eagle 2016a, Volume 5, Appendix 5-C); not all of which can be directly attributed to the road. In 2013, all five of the caribou mortalities were the result of a single vehicular incident along the AWAR because of human error. This accident led to adaptive management to increase safety awareness amongst Mine staff. Other 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, a quicker response time, and road closures during key caribou migration periods. Details of all wildlife mortalities can be found in the annual wildlife monitoring reports for the Meadowbank Mine (Gebauer et al. 2008 to 2015).

Monitoring of caribou population status, distribution, seasonal movements, traditional use, and hunting pressures have been ongoing since 1999 (Cumberland 2005b; Gebauer et al. 2008 to 2015, Agnico Eagle 2016a, Volume 5, Appendix 5-C).

Muskox

Current muskox populations in Canada are stable to increasing, representing a rebound from overhunting in the early 1900s (Ferguson and Gauthier 1992). This information is consistent with the IQ findings, which indicated that muskox are becoming more common in the study area (Agnico Eagle 2014c).

During baseline studies at and near the Amaruq Exploration Area, 30 muskox were observed, and muskox scat and bones were identified (Agnico Eagle 2016a, Volume 5, Appendix 5-C). Muskox are observed in most years in the study area, typically in small groups. They are non-migratory and present throughout the year. Data collected during the Meadowbank Mine baseline studies and monitoring suggest that a relatively stable population of 500 to 1,000 muskox with herd sizes of up to 80 animals reside near the site (Cumberland 2005a).

Predatory Mammals

Predatory mammals are highly mobile and occupy the top or near-top terrestrial trophic layer. In the study area, this group is represented by three VC species; Arctic wolf, grizzly bear, and wolverine. Grizzly bears and wolverine are species of special concern in Canada (COSEWIC 2017). These terrestrial carnivores occur at low densities in the landscape relative to their prey species (McLoughlin et al. 2004). As a result of this low density, predatory mammals were rarely observed during baseline studies for Meadowbank Mine (Cumberland 2005a) and in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 5, Appendix 5-C). Outside of the breeding season, predatory mammal VCs use a wide range of land types within large territories (Naughton 2012).

2.3.2.1 Raptors

Of the 10 raptor species known to breed in the Kivalliq, 5 species are expected to occur within the study area, including: short-eared owl, snowy owl, rough-legged hawk, peregrine falcon, and gryfalcon. Of these species, peregrine falcon and short-eared owl are listed as special concern in Canada (COSEWIC 2017). Elders have noted that there are more raptors in the vicinity of the study area as compared with 20 years ago; however, owls are believed to be less common (Agnico Eagle 2014c). Cliff nesting raptors include peregrine falcons and gyrfalcons. Cliff nest locations in the study area are known and monitored.

2.3.2.2 Water Birds

Water birds encompass waterfowl (ducks, geese, and swans) and loons. There are few water birds in the area, as confirmed during baseline studies and monitoring for the Meadowbank Mine (Cumberland 2005a, Gebauer et al. 2013), and during baseline studies in the Amaruq Exploration Area (Agnico Eagle 2016a, Volume 5, Appendix 5-C). Canada goose, snow goose, long-tailed duck and the four loon species (yellow billed, red-throated, pacific and common) were found to be the most abundant water bird species. None of the water birds occurring within the study area are listed federally (COSEWIC 2017).

2.3.2.3 Upland Breeding Birds

Various upland breeding bird species, including horned lark, American pipit, white-crowned sparrow, savannah sparrow, lapland longspur, snow bunting, semi-palmated sandpiper, and American golden-plover are present seasonally while willow ptarmigan and rock ptarmigan are present year round within the study area. None of the upland birds occurring within the study area are listed federally (COSEWIC 2017) but the red-necked phalarope that is listed as a species of special concern (COSEWIC 2017) but has not been observed in the study area. Elders consider upland birds to be less common than they were in the past (Agnico Eagle 2014c).

2.3.2.4 Small Mammals

In the Arctic, small mammals are a significant food resource for a variety of predatory mammals and birds. Several species, including Arctic hare, Arctic ground squirrel, and northern collared lemming, were observed during 2014 studies. None of the small mammals within the study area are considered species at risk (COSEWIC 2017).

2.4 Human Environment

While work-related accidents and injuries, and associated use of health services at the Meadowbank Mine are tracked (Agnico Eagle 2016a, Volume 7, Appendix 7-B), specific data relating to work on roads is not disaggregated, and so is not available for summary here. Pathways analysis did not determine a linkage between the Pilot Study and archaeological resources or socio-economic conditions in communities, so no summary of baseline conditions for either VC is provided here. The description of the existing human environment is, therefore, focused on TLU.

2.4.1 Traditional Land Use

2.4.1.1 Travel

The study area was used by Baker Lake community members in the past primarily as a travel corridor between Baker Lake and the Back River to access TLU sites, including for fishing, caribou and wolf hunting, and white fox trapping during the trade era (1915 to 1956). Today, hunting and fishing activities are largely practiced opportunistically in the study area, as people travel through the region to other important TLU sites. In the past, caribou were hunted at harvesting sites known as crossing places, where large numbers of caribou encounter rivers and lakes during their migration and are therefore targeted at these locations during hunts. Several crossing places were identified by Elders during consultation for the AEAR in 2014 that overlap with the study area.

2.4.1.2 Hunting, Trapping and Bird Harvesting

The area most frequently used to hunt caribou during the 1970s was identified as within 10 km of Baker Lake and decreasing further north, with low use in the Meadowbank Mine area (between 1 to 32% of hunters reported use of the area) (IDS 1978). In 2008 Baker Lake hunters reported that they no longer travel as far as they once did to hunt caribou, preferring to stay within approximately 60 to 65 km of the community because of caribou availability there (Areva 2011). However, hunters have been known to travel up to 300 km northwest of town to hunt, potentially using the study area (Kendrick and Manseau 2008). Caribou harvesting areas are variable from year to year, since areas targeted for hunting are dependent on caribou movements, and their migration patterns change in different areas and from year to year (Cumberland 2005c; Areva 2011; Agnico Eagle 2014c, 2015c). Specific harvesting sites in the study area are unknown, with hunters indicating variability in preferred hunting locations, ranging from convenient locations close to Baker Lake, to more remote locations.

No specific harvesting areas for muskox were identified in the study area. Moose are harvested opportunistically, when they are observed during other land use activities (Agnico Eagle 2014c). Fox trapping is still practiced among Baker Lake community members; however, specific locations have not been identified relative to the study area (Cumberland 2005c; Agnico Eagle 2014c). Baker Lake community members indicated during interviews conducted in the 1990s that wolves, wolverines and grizzly bears were not specifically targeted and were hunted irregularly, often taken incidentally during caribou hunting or fox trapping trips (Cumberland 2005c).

Waterfowl provide an important alternate food source for the local people, especially during spring break-up when large numbers of birds are migrating northward through the area (Agnico Eagle 2014c; Cumberland 2005c; Mannik 1998). Snow goose, Canada goose, and greater-white fronted goose are the most commonly harvested species, followed by Northern pintails, long-tailed ducks, and tundra swans (Agnico Eagle 2014c). Goose harvesting was not a preferred activity by Baker Lake community members during the 1970s, and goose and waterfowl harvesting primarily occurred near Baker Lake and southwest of the community (Freeman 1976; IDS 1978). Due to their wide distribution, ptarmigan could be harvested anywhere, either close to the community or in outlying areas where they could be taken incidentally while out hunting for caribou or fishing (IDS 1978).

2.4.1.3 Fishing

Fish provide an important secondary source of food after caribou to Baker Lake community members, and fishing is a year round activity that occurs in lakes and rivers throughout the Kivalliq region (Agnico Eagle 2014c; IDS 1978; NIRB 2015). Most fishing sites were relatively close to Baker Lake during the 1970s and 1980s, including the mouth of the Thelon and Kazan Rivers, and Tehek Lake. Outlying areas were used by hunters and trappers who fished for food and bait (IDS 1978, Riewe 1992). Several Baker Lake Elders noted that they or other community members used the study area for fishing with their families when they were younger when they travelled through the region (Local Inuit Field Assistant, 2015b, pers. comm. July 2015; Local Inuit Field Assistant, 2015c, pers. comm. July 18, 2015). Good fishing sites identified near the study area that were used in the past include Nutipilik Lake, Qugiilik Lake, Tahinajuk Lake, Hiatuuq Lake, Kivgajulik Lake, Haninajuq Lake, Uiguklik Lake, and Tasirjuaraajuk Lake (Agnico Eagle 2014c, 2015c). Many of these lakes overlap with the road routes that will be used during the Pilot Study. Today, while fishing occurs opportunistically in the study area while people are travelling to other important TLU sites, no specific sites of use have been identified (Cumberland 2005c; Agnico Eagle 2014c).

2.4.1.4 Plant Harvesting

Traditional plant gathering was extensive in the past, and occurred in the study area while families travelled and camped in the region. A variety of traditional plants were used for fuel used for fires, bedding, food, and medicine (Mannik 1998; Cumberland 2005c; Bennet and Rowley 2004). Results of a survey conducted in 2006 (Statistics Canada 2011) showed that 87% of Inuit adults in Baker Lake reported gathering wild plants in the previous 12 months. Specific plant gathering sites relative to the Amaruq Property have not, however, been identified.

2.4.1.5 Culturally Important Areas

The caching of meat and fish was important to the people living inland in the past, with caching areas situated along the Back River, and in the area between the Meadowbank Mine and the Back River (Agnico Eagle 2014c; Mannik 1998). Preferred caching sites were located adjacent to lakes in the region, and potential caches or tent rings were identified near Tahinajuk and Nutipilik Lakes near the Amaruq Property (Agnico Eagle 2014c). During the 2014 and 2015 archaeological field program for the development of the AEAR, 3 cache sites were identified in the study area (Stantec 2016). The specific locations of these sites are considered confidential.

In the past, travelling and camping activities were centered on accessibility to caribou (Agnico Eagle 2014c). Some of the most important traditional camping sites were situated along major rivers near water caribou crossings (Bernauer 2015a; Mannik 1998; Areva 2011; Stewart et al. 2004). One camping area was identified north of Nutipilik Lake, and one camping area was identified south of Uiguklik Lake. Neither overlap with the road route alignments traversed by Pilot Study hovercraft (Agnico Eagle 2014c; Agnico Eagle 2015c). The esker to the northeast of the AEAR was also identified as a potential area where old campsites might be located (Agnico Eagle 2014c; Agnico Eagle 2015c). Evidence of eleven campsites were identified during the 2014 and 2015 archaeological field program for the AEAR, in the form of tent rings and other stone features, wooden artifacts and hearths (Stantec 2016).

Several potential gravesites were identified by Elders during consultation for the Meadowbank mine and the AEAR, primarily south of the mine, and to the west of the AEAR and Amaruq Exploration Area (Cumberland 2005c, Agnico Eagle 2014c, Agnico Eagle 2015c; Stantec 2016; Figure 3-2). A total of 18 cultural sites were identified during the 2014 and 2015 archaeological field programs for the AEAR and in the Amaruq Exploration Area, including, marker rocks (1), cache sites (3), hunting blinds (3), campsites (10) and a campsite/grave (Stantec 2016). The specific locations of these cultural sites are considered confidential; however, Elders and other Baker Lake community members consider all cultural sites to be spiritually important and requested that they be preserved for the transfer of knowledge to younger generations (Agnico Eagle 2014c, 2015c).

3.0 PATHWAYS ANALYSIS

Pathway analysis is a screening step that identifies and assesses the linkages between the Pilot Study, and the correspondent potential residual effects to that valued components. This screening step is largely a qualitative assessment, and focuses the effects analysis on pathways that require a more comprehensive assessment of residual effects on VCs.

Pathways are determined to be primary, secondary, or as having no linkage. Each potential pathway is assessed and described as follows:

- No linkage – Analysis of the potential pathway reveals that there is no effect to the measurement indicator, or the pathway is removed by environmental design features or mitigation such that the Pilot Study would not be expected to result in a measurable change to the measurement indicator.
- Secondary – Pathway could result in a measurable minor change to measurement indicators, but would have a negligible residual effect on a VC relative to the Baseline Case or guideline.
- Primary – Pathway is 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.

Pathways assessed are presented in Appendix 1. No linkage and secondary pathways are not assessed further using residual effects analysis criteria, because environmental design features or mitigation will remove or limit the pathway to a negligible residual effect.

3.1 No Linkage Pathways

3.1.1 Atmospheric Environment

Ground pressure from Pilot Study hovercraft (i.e., 1 psi) is lower than other modes of transportation created by land users. The Pilot Study is not expected to increase ground vibration levels. The pathway between the Pilot Study and increased ground vibration levels is, therefore, assessed as having no linkage.

3.1.2 Aquatic Environment

There are no “no linkage” pathways for the aquatic environment. All potential Pilot Study effects were determined to result in a measurable change to aquatic measurement indicators, and so have been assessed further below.

3.1.3 Terrestrial Environment

Hovercraft operations on over-land portions of approved winter roads in the summer months will not lead to increased soil compaction or damage to vegetation or wildlife habitat because all Pilot Study travel will occur on approved road alignments. Soil compaction and damage to vegetation on the AEAR as a result of the Pilot Study is not anticipated given that the road will already be disturbed and compacted by construction activities associated with the AEAR. Hovercraft have a ground pressure of 1 psi which creates a lesser impact to the terrestrial environments than conventional, wheel- or track-based equipment. During winter months, soil and vegetation will be covered by snow. Further, the use of hovercrafts will not require new landscape disturbance. The pathways between the Pilot Study and changes in soil compaction and vegetation quantity, and the direct loss and fragmentation of wildlife habitat are, therefore, assessed as having no linkage.

3.1.4 Human Environment

Hovercraft operations are not expected to influence socio-economic conditions in communities (i.e., employment, business opportunities, population, service provision and infrastructure). The Pilot Study will not generate employment, instead drawing from the existing Amaruq exploration workforce. As a result, no employment-driven population change in Kivalliq communities, or associated changes to community demographics and public service provision, is anticipated. The Pilot Study will not result in additional procurement or economic development activities for Kivalliq communities as hovercraft will be obtained from outside Nunavut, and will require minimal upkeep supplies (e.g., fuel) sourced from existing suppliers. The pathway between the Pilot Study and socio-economic conditions in communities is, therefore, assessed as having no linkage.

Hovercraft operations will occur on the AEAR and approved winter roads, for which archaeological assessments have been carried out. Archaeological concerns on these roads, and on portages where roads intersect with waterbodies, were mitigated by avoidance or systematic data recovery as part of the assessment and approval process. No new ground disturbance is expected as a result of the Pilot Study, removing the potential for chance finds of buried archaeological resources. The pathway between the Pilot Study and archaeological resources is, therefore, assessed as having no linkage.

The negligible effects (i.e., secondary pathways) of hovercraft operation on aquatic or terrestrial resources are not expected to alter the ability of people to carry out TLU activities. The assessment of the Pilot Study's effects on the aquatic environment did not find any primary pathways resulting in more than a negligible effect on water quality or aquatic biota. The pathway between the Pilot Study and the availability of resources for Traditional fishing opportunities is, therefore, assessed as having no linkage. Similarly, the negligible effect of hovercraft operation on vegetation is not expected to alter the availability of vegetation for traditional harvesting, and the pathway between the Pilot Study and this activity is assessed as having no linkage. Finally, the operation of hovercraft does not represent new ground disturbance or access restrictions to those travelling in the region. The pathway between the Pilot Study and traditional travel routes and culturally important areas is, therefore, assessed as having no linkage.

3.2 Secondary Pathways

3.2.1 Atmospheric Environment

Mineral soils are not expected to be exposed in meaningful quantities along the over-land portions of the winter roads in the summer, therefore there will be very few small particles available for entrainment by the wind created by the hovercraft. Dust emissions are not be expected to result from operating hovercraft during winter months on the over-land or, over-water portions of the approved winter roads. The occasional passage of hovercraft along these sections of the approved winter roads will not materially change air quality, and the pathways between the Pilot Study and changes in air quality from operation on winter roads are assessed as secondary.

Peer-reviewed scientific research has shown that hovercraft are *"…considerably quieter underwater than conventional [i.e., propeller-driven] vessels of comparable sizes"* (Blackwell and Greene 2005). As such, hovercraft will have a negligible effect on underwater noise levels relative to the existing environment and the pathway between the Pilot Study and changes in underwater noise levels is assessed as secondary.

3.2.2 Aquatic Environment

Pathways potentially leading to effects on the aquatic environment VCs (hydrology, surface water and sediment quality, and aquatic biota) for the Pilot Study include direct and indirect effects.

Hovercraft operations on approved winter roads during open water conditions could potentially result in bank and/or shoreline erosion. Through the use of mitigations, including regular inspection of banks and shorelines during open water conditions, use of best management practices and adaptive management (e.g., slowing down in more sensitive areas; alternating travel path to avoid sensitive areas) will be deployed where needed to limit disturbance to shorelines and riparian areas, and any related effects. Hovercraft operations are anticipated to result in negligible changes in bank or shoreline erosion and the pathway was assessed as secondary.

Leaks or spills from the hovercraft (at the storage facility or while in use along the roads) can affect water and sediment quality, and aquatic biota. Based on Agnico Eagle's experience with the Meadowbank Mine, accidental spills (e.g., fuel) have occurred, but most of the spill volumes have been small, and clean-up has occurred with only minor effects to the environment (Agnico Eagle 2015d). Between 2011 and 2015, 63 reportable spills were reported to the GN spill hot line. In 2015, there were 4 spills greater than 900 L at the Meadowbank Mine. In 2015 spill training was provided to employees. All spills are managed appropriately on site in accordance with the AEAR Spill Contingency Plan (Agnico Eagle 2016b) and there was no off site impact to watercourses due to spills in 2015. In NIRB's 2011 annual report (NIRB 2011), it was noted that the Meadowbank Mine was kept in an impressively clean state with no apparent spills on location. In the event of an accident, the Spill Contingency Plan (Agnico Eagle 2016b) will be followed with appropriate clean-up and monitoring. Hovercraft will be outfitted with spill kits appropriate for diesel fuel. It is anticipated the Amaruq exploration division will continue to manage spills in the same manner. Based on operational experience, the pathway was assessed as secondary.

Operation of hovercraft on the roads can result in disturbance and sediment releases, which in turn can effect water and sediment quality and aquatic biota. Through regular inspection of road surface (check for ponding, erosion, dust), best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armoring of banks), where needed, and monitoring, effects are anticipated to be negligible and thus the pathway was assessed as secondary.

Operation of hovercraft on the roads can result in the generation of dust, which in turn can effect water and sediment quality and aquatic biota. Generation and deposition of dust from use of hovercraft will be a discontinuous activity with relatively low to negligible generation of dust (low as compared to dust generated from blasting and crushing activities at the mine) and as based on the air quality predictions (Section 4.1.1). Best management practices will be used to minimize generation of dust and monitoring of water quality will be conducted to confirm impacts to water quality with adaptive management. Effects are anticipated to be negligible and thus the pathway was assessed as secondary.

Operation of hovercraft on the roads can generate acidifying air emissions, which in turn can effect water and sediment quality and aquatic biota. Acidifying air emissions from use of two hovercraft are predicted to be low (refer to Section 4.1.1 for further description of air quality effects). Best management practices will be used to manage and limit air emissions and monitoring, with adaptive management, will be conducted to confirm effects. Effects to water and sediment quality and aquatic biota are anticipated to be negligible and thus the pathway was assessed as secondary.

There is the potential for physical disturbance/mixing of the water column (and into the sediments) from the use of hovercraft over open-water. Any grains disturbed will settle out after cessation of disturbance and effects could be more pronounced and last longer in areas of smaller-grained as compared to larger grained substrates; however smaller-grained substrates tend to be found in areas of deeper water, and physical mixing of water is expected to be minimal due to the low ground pressure from the hovercrafts (i.e., 1 psi). There is the potential for disturbance of the substrate composition in shallow waterbodies during the open water season, any effects are expected to be minor and localized to crossing locations; thus the pathway was assessed as secondary.

Of the pathways, noise and vibration from hovercraft use has the greatest potential for effects on aquatic biota, specifically for fish species with sensitive hearing (e.g., whitefish species [Mann et al. 2009]) or species occupying or migrating through shallow water crossings during the open water season. Underwater noise levels produced by hovercraft (approximately 130 dB; Roof and Fleming 2001) are not expected to cause any permanent or temporary hearing loss, however the masking of natural noises is more likely. Underwater noise is expected to be less than that generated from motorized boats, and similar to typical ice-road traffic. Vibration from the hovercraft may have the potential to cause ice cracking, which can generate underwater noises louder than 125 dB (Mann et al. 2009); however, the short duration of the noise and the periodic nature of this disturbance is unlikely to measurably change the behavior and distribution of fish; thus the pathway was assessed as secondary.

Agnico Eagle prohibits fishing by any employees near exploration or mine sites or while using approved winter roads and the AEAR, and the same rules will apply for the operation of a hovercraft. Therefore the potential does not exist for increased access to waterbodies to affect the abundance and distribution of fish species through increased harvesting pressure by employees. Agnico Eagle will deploy proven mitigation features such that there are no impacts to fisheries. Increased access to waterbodies by use of hovercrafts for the purposes of exploration in the region will not result in effects to aquatic biota; thus the pathway was assessed as secondary.

Through the use of environmental design features and mitigation (summarized in Appendix 1), all of the identified aquatic pathways were classified as secondary, with any effects being negligible in magnitude and local in geographic extent. None of the identified pathways are anticipated to have a beyond-negligible measurable change to hydrology, water and sediment quality, the abundance and distribution of fish, or fish habitat. Any effects will be limited to minor, localized effects to habitat quality (e.g., noise, sedimentation).

3.2.3 Terrestrial Environment

Hovercraft operations on approved winter roads and the AEAR could potentially result in changes to soil, vegetation and wildlife habitat quality associated with accidental spills. Effects to wildlife habitat quality due to exposure to spills is anticipated to be negligible relative to existing conditions for ungulates, water birds, upland birds and small mammals. For the Pilot Study, hovercrafts will not be used for the transport of fuel and the only fuels and oils on board will be required for operation. Any potential spill resulting from hovercraft operation would be of a small volume and localized. Spill response supplies will be available on each hovercraft. In the event of a spill, contaminated soils will be collected and treated at the Meadowbank Mine, or shipped off-site for treatment and disposal in line with the Spill Contingency Plan (Agnico Eagle 2015e; 2016b). The pathways between hovercraft-related spills and changes to soil, vegetation and wildlife habitat quality are, therefore, assessed as secondary.

Hovercraft operation on the AEAR could result in dust deposition on exposed soils and vegetation, in turn changing wildlife habitat quality. Limiting the amount of traffic, enforcing speed limits on the AEAR, watering as needed and regular maintenance of hovercrafts will aid in reducing dust emissions. Hovercraft traffic on winter roads is not expected to result in significant dust generation, even at higher operational speeds (Section 4.1.1), given that these winter roads are not graveled. The Air Quality and Dustfall Monitoring Plan (Agnico Eagle 2013b) will be expanded to include monitoring of the effects of hovercrafts on dust deposition in 2017 and 2018. There have been no observed changes in soil/plant metal concentrations from current operations (see the Wildlife Screening Level Risk Assessment [Cumberland 2006]) that examined impacts of dust) in the Amaruq Exploration Area. A 2013 report for Diavik Diamond Mine found that lichen cover decreased while vascular plant species richness increased in response to dust deposition (Golder 2014). It is unlikely that there will be permanent changes in vegetation community composition due to the short duration of the Pi Study. Mitigation presented in the Amaruq Exploration Access Road Management Plan (Agnico Eagle 2015a) will be applied to the Pilot Study. Dust will occur from the hovercrafts but will be similar to existing levels at Meadowbank Mine and that caused by other approved modes of transport. The risk from dust ingestion to wildlife posed by the Pilot Study is expected to be negligible. The pathways between hovercraft-related dust and changes to the soil, vegetation and wildlife VCs are, therefore, assessed as secondary.

Hovercraft operations on the AEAR and approved winter roads year-round could potentially result in injury or mortality to wildlife. No caribou or muskox have been killed at the Meadowbank Mine as a result of mining activity and none are expected in the Amaruq Exploration Area. Caribou have been killed due to collisions on the AWAR, but adaptive management (e.g., closure of the AWAR during peak migration) has reduced the hazard from vehicle collisions. The same approach will be applied to the Pilot Study operation on the approved AEAR and winter roads. Wolverine and wolf mortality has occurred at the Meadowbank Mine and on the AWAR, but not with a frequency affecting populations. Mitigation included in the Amaruq Exploration Access Road Management Plan (Agnico Eagle 2015a), Wildlife Protection and Response Plan (Agnico Eagle 2013c) will be applied to hovercrafts along the AEAR and winter roads, with the exception of the speed limit on winter roads. It is anticipated that birds will avoid moving vehicles and no mortalities from vehicle collisions have been reported (i.e., no linkage). Given adaptive management practices and the negligible and infrequent potential effect for caribou, muskox, and small and predatory mammal mortality, the pathway between the Pilot Study and vehicular mortality of these species is assessed as secondary.

3.2.4 Human Environment

During the summer, disruption to fishing activities at waterbody portages along approved winter road alignments as a result of operation of the hovercrafts is possible. Disruptions will be isolated and sporadic, but will occur over one year of operations. Given the remote location of the Amaruq Exploration Area, the low-frequency (i.e., opportunistic) fishing of waterbodies, and the prevalence of fishing opportunities throughout the region and near Baker Lake, these disturbances are expected to result in negligible changes to traditional fishing opportunities. The pathway between the Pilot Study and changes to traditional fishing opportunities is assessed as secondary.

The AEAR will not be open to public access limiting new access to the area. While there may be some local disturbance along the winter road route due to hovercraft operations, it is not anticipated to affect overall regional availability of caribou and muskox for harvesting. A “no hunting, trapping, harvesting or fishing” policy will be enforced for employees and contractors, and hunting will be prohibited within 1 km of the AEAR; however, in the similar context of the AWAR to the south, while gates on the road prohibit hunting caribou harvesting continues around the existing road from Baker Lake to the Meadowbank Mine, despite mine traffic. Harvesting opportunities closer to Baker Lake will not be materially impacted by the Pilot Study. Measurable residual changes to wildlife mortality or habitat are not anticipated, and the effect of incremental, hovercraft-related sensory disturbances on wildlife movement is expected to result in a negligible change in the availability of wildlife for hunting and trapping. The pathway between the Pilot Study and the availability of wildlife for traditional harvesting is, therefore, assessed as secondary.

The Pilot Study's potential effect on nesting water and ground birds is temporary and highly localized to portages along the approved winter road routes during the summer months. This disturbance to nesting birds could have an effect on traditional bird and egg harvesting at these isolated locations. Given the temporary, periodic and highly localized nature of this effect relative to the availability of other bird and egg harvesting areas closer to Baker Lake, the Pilot Study's potential effect on these traditional activities is anticipated to be negligible. The pathway between the Pilot Study and continued traditional harvesting of water and ground birds and eggs is assessed as secondary.

3.3 Primary Pathways

A summary of primary pathways is provided in Table 9, and further assessment of the effects of primary pathways is provided in Section 4.0 Environmental Screening. No primary pathways were identified for the following VCs: hydrology; water quality; aquatic biota; soil and vegetation; socio-economics; archaeology; and TLU.

Table 9: Primary Pathways of Effect

VC	Pilot Study Activity	Effects Pathways	Environmental Design Features and Mitigation
Air quality and climate	Operation the approved winter roads and the AEAR, year-round, 2017-2018	Operation could result in increased dust deposition onto immediately adjacent land and into nearby water-bodies Increased combustion emissions during operations could lead to changes in local air quality	■ Implement dust control measures, as needed ■ Adherence to the Meadowbank Air Quality and Dustfall Monitoring Plan (Agnico Eagle 2013b) ■ Watering of roads and enforcing speed limits to suppress dust production ■ Equipment and vehicles will comply with relevant non-road emission criteria at the time of purchase ■ Regular maintenance for equipment and vehicles
Noise and vibration	Operation on approved winter roads and the AEAR, year-round, 2017-2018	Noise emissions from operation of hovercraft can increase atmospheric noise levels	■ Regular maintenance for equipment and vehicles ■ Enforcement of speed limits
Wildlife (caribou, muskox, upland birds)	Operation on approved winter roads and the AEAR, year-round, 2017-2018	Operations leading to sensory disturbance can change the amount of different quality habitats, and alter wildlife movement, migration and behaviour	■ Regular maintenance for equipment and vehicles ■ Speed reductions in effect when caribou are in the vicinity of the Pilot Study routes ■ Adherence to the Meadowbank Air Quality and Dustfall Monitoring Plan (Agnico Eagle 2013b) and the AEAR Management Plan (Agnico Eagle 2015a)
Wildlife (water birds and upland birds)	Operation on approved winter roads, summer months	Operations on approved winter roads portages in summer months leading to the disturbance or destruction of bird nests	
Community wellness	Operation on approved winter roads and the AEAR, year-round, 2017-2018	Operations activities could pose risk to worker and public safety for users of the AEAR and winter roads The Pilot Study could improve emergency response near the exploration site, in areas adjacent to winter roads and the AEAR during periods of inclement weather	■ Enforcement of speed limits as described in Section 1.1, and safe driving practices for all hovercraft traffic ■ Zero-tolerance policy towards operating hovercraft traffic under the influence of alcohol and intoxicating drugs ■ Prohibition of hunting within 1 km of the AEAR and approved winter roads ■ Signage in English and Inuktitut advising drivers of speed limits and road conditions ■ Adherence to the AEAR Management Plan (Agnico Eagle 2015a) ■ Hovercraft operation training for approved operators ■ Limited (10 to 15) frequency of daily hovercraft trips

4.0 ENVIRONMENTAL SCREENING OF PRIMARY PATHWAYS

The Screening Assessment identifies potential effects, determines residual effects following mitigation, and assigns significance. Pilot Study effects are described through the following criteria:

Direction: Direction indicates whether the effect is negative (i.e., less favourable), positive (i.e., an improvement), or neutral (i.e., no change). The focus of an environmental assessment is to predict if the Pilot Study is likely to cause a significant adverse effect on the environment or cause public concern. Neutral and positive effects are not assessed for significance.

Magnitude: Magnitude is a measure of the intensity of an effect to the measurement indicator, or the degree of change caused by the Pilot Study relative to baseline conditions or a guideline value. Magnitude is often classified as negligible, low, moderate, or high. The number and definitions of scales of magnitude are specific to VCs.

Geographic Extent: Geographic (spatial) extent refers to the area or range of the effect, and is different from the spatial boundary (i.e., effects study area) for the effects assessment. The study area for the effects analysis represents the maximum area used for the assessment and is related to the spatial distribution and movement of VCs

Duration: Duration is VC-specific and is defined as the amount of time from the beginning of an effect to when the effect on a VC is reversed, and is typically expressed relative to the length of the Pilot Study. Duration has two components: the amount of time between the start and end of the study, plus the time required for the effect to be reversed. By definition, residual effects that are short-term, medium-term, or long-term in duration are reversible.

Reversibility: After hovercraft operation is suspended, the Pilot Study will either no longer influence a VC within a defined amount of time (i.e., is reversible) or will continue to have effects on a VC (i.e., is irreversible). Permanent impacts are considered irreversible.

Frequency: Frequency refers to how often an effect will occur and is expressed as isolated (confined to a discrete period), periodic (occurs intermittently, but repeatedly over the assessment period), or continuous (occurs continuously over the assessment period). Frequency is explained more fully by identifying when the effect occurs (e.g., once at the beginning of the Pilot Study).

Likelihood: Likelihood is the probability of an effect occurring and is described in parallel with uncertainty.

4.1 Atmospheric Environment

4.1.1 Air Quality and Climate

Hovercraft-related air emissions have the potential to deposit to local terrestrial, aquatic, and marine 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. This assessment includes quantification and a screening assessment of the potential effects these emissions. Additional hovercraft operational activities were evaluated regarding whether the activity would or could result in measureable or significant effects on the atmospheric environment. These additional activities included the following:

- operation on over-land portions of approved winter roads, summer months, 2017-2018;
- operation on over-land portions of approved winter roads, winter months, 2017-2018;
- operation on over-water portions of approved winter roads, summer months, 2017-2018; and
- operation on over-water portions of approved winter roads, winter months, 2017-2018.

In each of these additional cases or operational scenarios, it was determined that for a screening level assessment, the evaluation of the hovercraft operation on the AEAR, year round through the 2017-2018 study period would represent an appropriately conservative surrogate activity. In other words, the results of the assessment of the Pilot Study would represent a worst-case scenario for air quality. Assessing the other, modestly different pathways as described above, would be redundant. Dust generation on non-gravel roads (i.e., approved winter roads) would be minimal when compared to that generated on the graveled AEAR.

- **Operation could result in increased dust deposition onto immediately adjacent land and into nearby waterbodies**

This screening-level air quality assessment has been conducted semi-quantitatively. The emission estimates are based on hovercraft fleet information available at the time of writing, but the effects assessment is based on professional judgement.

A preliminary assessment of emissions typical of a mine-related fleet of vehicles that includes a mix of haul trucks, maintenance vehicles, personnel transport vehicles (e.g., buses) and light vehicles results in an aggregate emission rate of approximately 5,200 grams of dust per vehicle kilometer traveled.

An estimate has also been made of the emissions, including road dust from hovercraft operation. The estimate is based on the available information at the time of writing. Hovercraft road dust emissions have been estimated at 921 grams per vehicle kilometer traveled. The estimate was derived assuming that the hovercraft would be operating on a gravel road (i.e., the AEAR) under summertime conditions.

The assumption has been made that the hovercraft will operate up to 24 hours per day, seven days per week at 50 km/hr on the AEAR. The 24/7 assumption is conservative because in reality, there will be down-time associated with maintenance, fueling, passenger and cargo loading and unloading, and other activities that will reduce the operating time. Operating at 50 km/hr on the AEAR in summer conditions is conservative because it is likely to produce more dust than operating at higher speeds on approved winter roads or over water.

There are a number of important observations regarding the context of this emissions estimate. Specifically, this emission estimate increase does not consider that the hovercraft emissions will displace other vehicles' emissions. It is reasonable to assume that bus and helicopter emissions will actually be reduced commensurately with hovercraft use. It is also important to consider that hovercraft will not actually make contact with the road surface, thus the potential for regeneration of dust particles from hovercraft use is eliminated. The passage of conventional vehicles is accompanied by the tires of those vehicles additionally pulverizing the road surface, which leads to “new dust”. Hovercraft will not create new dust in any meaningful quantity, so as the use of hovercraft increases, we propose that road maintenance activities and the need for supplemental dust suppression will be reduced. This considered, it is a reasonable to conclude that the changes in road dust emissions associated with the Pilot Study are low.

- **Increased combustion emissions during operations could lead to changes in local air quality**

Combustion-based emissions of specific potential concern for this assessment are oxides of nitrogen (NO_X) and particulate matter (PM). Greenhouse gases (GHGs) are also considered. To put the hovercraft emissions into an appropriate context, it is reasonable to compare a single hovercraft with its two 460 horsepower (hp) engines (920 hp per hovercraft) to a single, typical mining haul truck with a horsepower rating of approximately 1,500 hp. The operation of the two hovercrafts would be similar to 1.33 typical, mid-sized mining haul trucks.

GHG emissions are also expected as a direct result of diesel fuel combustion in the hovercraft engines. GHG emissions have been calculated assuming that the maximum fuel-burn rate will be 62 litres per hour per hovercraft. When it is conservatively estimate that the hovercraft may operate 24-hours per day, 7 days per week, the total estimated GHG emissions are 1,635 tonnes per year.

Climate change is a global issue caused by emissions of GHG. The contribution of the Pilot Study, and total GHG emissions from Nunavut (less than 0.5 million metric tonnes per year), are negligible compared to the magnitude of global GHG emissions (approximately 45,000 million metric tonnes per year).

The direction of the effects will be negative and the magnitude will be low. The geographic extent of the effects will be local and they will short-term and quickly reversible. The effects are expected during operation, continuously and the likelihood of effects is certain.

4.1.2 Noise and Vibration

- **Operations could generate noise emissions, increasing atmospheric noise levels.**

The following methodology was used to assess potential residual effects of the Pilot Study on atmospheric noise levels:

- atmospheric noise emissions from hovercraft were estimated using vendor-supplied data sheets and information from peer-reviewed scientific literature (Blackwell and Greene 2005);
- a computer noise model was developed to simulate hovercraft travelling along generic segments of the AEAR and approved winter roads (ISO 1996);
- the computer model was used to predict atmospheric noise levels from the Pilot Study at receptors comparable to locations where existing atmospheric noise levels had been previously measured;
- atmospheric noise level predictions for the Pilot Study were compared to existing atmospheric noise levels to characterize the magnitude of the potential residual effect; and
- other residual effects criteria (e.g., direction, geographic extent, duration) were characterized based on professional judgment and experience.

When modelling atmospheric noise levels the relevant parameter for characterizing a given noise source is the sound power level (PWL), which represents the total sound power radiated by the source. The PWL is an environmentally-independent noise parameter. Source PWL levels are usually reported in unweighted decibels referenced to a standard power level of 1 picowatt (dBZ re 1 pW) and/or A-weighted decibels referenced to a standard power level of 1 picowatt (dBA re 1 pW).

PWL values cannot be measured directly. Instead, PWL values are usually calculated based on sound pressure level (SPL) parameter values, which are either measured in the field or specified by equipment vendors. A data sheet supplied by the hovercraft vendor indicates that the SPL of the hovercraft, while underway, ranges from 110 to 120 dBZ re 20 µPa at locations immediately adjacent to the hovercraft. Based on this information, and given the physical dimensions of the hovercraft, the total PWL is expected to be between 133 and 143 dBZ re 1 pW for each hovercraft. For the sake of conservatism, the computer noise modelling and subsequent assessment of potential residual effects to atmospheric noise levels has made use of the higher PWL estimate: 143 dBZ re 1 pW.

Available information on hovercraft does not indicate how the hovercraft sound power is distributed across the audible frequency band. Because spectral data is required to support the atmospheric noise modelling, reference spectra from peer-reviewed scientific literature was used to establish an appropriate spectral shape for the hovercraft noise emissions (Blackwell and Greene 2005). Hovercraft spectral emissions data are presented in Table 10 as PWL in both dBZ re 1 pW and dBA re 1 pW. The A-weighted PWL (i.e., dBA re 1 pW) values have been scaled to reflect the frequency sensitivity of the human auditory system.

Table 10: Pilot Study Hovercraft Atmospheric Noise Emissions

Source Parameter	**Octave Band Frequency**									**Total**
	31.5 Hz	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	
Hovercraft PWL [dBZ re 1 pW]	133	131	141	133	134	132	128	125	118	143
Hovercraft PWL [dBA re 1 pW]	93	104	124	124	130	132	129	126	116	136

The hovercraft noise emissions data from Table 4 were used as inputs to a computer model of atmospheric noise developed in accordance with the International Organization for Standardization (ISO) noise propagation standard 9613-2 (ISO 1996). In addition to the hovercraft emissions data, the computer model of atmospheric noise incorporated the following assumptions about environmental conditions and hovercraft operations:

- hard, acoustically-reflective ground throughout the study area – this is a conservative assumption since hard ground tends to enhance atmospheric noise propagation;
- wind blowing from source to receptors 100% of the time – this is a conservative assumption since downwind conditions tend to enhance atmospheric noise propagation;
- hovercraft will travel at relatively low speeds (i.e., 50 km/hr) in the southern parts of the study area (i.e., around the Meadowbank mine and along southern parts of the AEAR) where existing traffic and equipment activity levels are high;
- where deemed safe, hovercraft will travel at relatively high speeds (i.e., up to 100 km/hr) in the central and northern parts of the study area (e.g., approved winter-roads) where existing traffic and equipment activity levels are low;
- in southern parts of the study area (i.e., around Meadowbank Mine) there may be up to eight one-way hovercraft passes of a given location within a single 24-hour period; and
- in central and northern parts of the study area (i.e., along remote stretches of the AEAR and approved winter-roads) there may be up to three one-way hovercraft passes of a location within a 24-hour period.

The computer model was used to predict atmospheric noise levels from the Pilot Study at receptors comparable to locations where existing atmospheric noise levels had been previously measured. In particular, the computer model was used to predict atmospheric noise levels from the Pilot Study at:

- RA – a receptor located 400 m from a hovercraft travel path in the southern part of the study area;
  - Pilot Study receptor RA is comparable to the receptor locations R1 and R1* used to measure existing atmospheric noise levels (see Table 4);
- RB – a receptor located 1.5 km from a hovercraft travel path in the central part of the study area;
  - Pilot Study receptor RB is comparable to the receptor location R7 used to measure existing atmospheric noise levels (see Table 4);
- RC – a receptor located 1.5 km from the Meadowbank mine in the southern part of the study area;
  - Pilot Study receptor RC is comparable to the receptor location R4 used to measure existing atmospheric noise levels (see Table 4); and
- RD – a receptor located 1.5 km from the Amaruq exploration camp in the northern part of the study area;
  - Pilot Study receptor RD is comparable to the receptor locations R8 and R9 used to measure existing atmospheric noise levels (see Table 4).

Atmospheric noise level predictions for the Pilot Study were compared to existing atmospheric noise levels to characterize the magnitude of the potential residual effect at each receptor location (RA, RB, RC, and RD). Four potential magnitude classifications were considered:

- negligible – predicted atmospheric noise levels from the Pilot Study are within the range of existing noise levels;
- low – predicted atmospheric noise levels from the Pilot Study are no more than 3 dBA re 20 µPa above existing atmospheric noise levels;
- moderate – predicted atmospheric noise levels from the Pilot Study are no more than 10 dBA re 20 µPa above existing atmospheric noise levels; and
- high – predicted atmospheric noise levels from the Pilot Study are more than 10 dBA re 20 µPa above existing atmospheric noise levels.

For each receptor location (RA, RB, RC, and RD), Table 11 presents a comparison of predicted atmospheric noise levels from the Pilot Study and existing atmospheric noise levels at comparable locations. For each receptor location, Table 11 also presents a classification of the residual effect magnitude, based on the classification system described above.

Table 11: Pilot Study Atmospheric Noise Levels and Magnitude Classification

Receptor	Predicted Pilot Study Atmospheric Noise Level [dBA re 20 μPa]		Existing Atmospheric Noise Level [dBA re 20 μPa]		Magnitude Classification
	Daytime [$L_{eq,day}$]	Nighttime [$L_{eq,night}$]	Daytime [$L_{eq,day}$]	Nighttime [$L_{eq,night}$]	
RA	55	55	41 to 59	36 to 54	low
RB	38	38	29[a]	29[a]	moderate
RC	39	39	35 to 44	33 to 40	negligible
RD	32	32	30 to 31	31	low

[a] As discussed in relation to Table 4, these existing noise levels do not reflect the current level of vehicular traffic on the corresponding segment of the AEAR. In particular, the existing atmospheric noise levels for this location are likely higher than those presented in Table 4. As such, classifying residual effect magnitude by comparing predicted Pilot Study noise levels to these underestimates of existing noise levels is conservative.

The results presented in Table 11 indicate that the magnitude of the residual effect from the Pilot Study to atmospheric noise levels can be classified as negligible at one receptor location, low at two receptor locations, and moderate at one receptor location. Considering all receptors collectively, the highest magnitude residual effect can be considered moderate for the study area as a whole. The Pilot Study's residual effect on atmospheric noise levels is local, short-term duration, periodic and certain, and is completely reversible.

4.2 Terrestrial Environment

- **Operations leading to sensory disturbance (noise, movement, lights and smells) can change the amount of different quality habitats, and alter wildlife movement, migration and behavior**

Indirect habitat loss due to sensory disturbance (e.g., noise and movement) will extend beyond the roads travelled by the Pilot Study and will have negative effects at the regional level. Noise from hovercraft operation will be similar to noise created by 50 tonne haul trucks, but the speed of travel is anticipated to be greater on winter roads. Further, the Pilot Study will introduce traffic on the winter road routes during summer months. The speed limit will be reduced to 50 km/hr on winter roads when caribou are migrating through the area and closed during periods of peak migration. The speed limit on the AEAR may be lowered to 30 km/hr when small to moderate aggregations of caribou (i.e., approximately 50 animals) are observed. 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 2014c, Kendrick and Manseau 2008). However, indirect changes to preferred habitat from the hovercraft operation have the potential to affect the population size and distribution of caribou and muskox through altered movement and avoidance behaviour, as caribou and muskox have been shown to avoid mines and roads.

The impact of indirect habitat loss from sensory disturbance to caribou, muskox and upland birds is considered moderate as it is assumed that some degradation of habitat quality or reduced wildlife activity will occur. Given that noise created by hovercraft operation is anticipated to be similar to that caused by the haul trucks, sensory disturbance from the Pilot Study is expected to be similar to or less than that of haul trucks. Impacts from sensory disturbance will be localized to the terrestrial study area, and continuous throughout the life of the Pilot Study, reversing in the short-term when noise and activity are no longer present post-2018.

Considering other developments and activity that may lead to cumulative effects, caribou encountering the hovercraft may also be exposed to the Amaruq Site, 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, leading to the possibility of cumulative sensory disturbance to caribou extending beyond the terrestrial study area. Caribou calving grounds are respected among the Inuit and the calving period is considered a critical and sacred time when caribou should be left alone. However, as the vast majority of the caribou range is undisturbed and the Pilot Study area does not overlap with any known calving grounds, the magnitude of the effect is no greater than the incremental impact of hovercraft operation.

- **Operations on portages of approved winter road alignments in summer months leading to the disturbance or destruction of bird nests**

Operation of hovercraft on portages of approved winter road alignments in the summer months may lead to the disturbance and destruction of nests. Environment Canada will be consulted and mitigation will be considered to prevent birds from nesting along the portages. Hovercraft will follow a single route along the winter roads used. This is likely to deter birds from nesting on the travel path. 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 nesting is confined to the portages of the approved winter roads, it is local in geographic extent. The Pilot Study is currently planned to occur during a single nesting season in an environment with low nest density. The frequency of this effect is expected to be isolated to these nests. The effect of any nests that are destroyed during operation is reversible as these effects are anticipated to have only a short-term effect on the regional population. Regionally, the flooding of habitat from the construction of dykes in support of the development of the Amaruq property will lead to the destruction of nesting habitat but not nests assuming that other developments follow the typical practice of removing upland bird habitat only outside of the nesting season.

4.3 Human Environment

- **Operations activities could pose risk to worker and public safety for users of the AEAR and winter roads**

The first practical design for hovercraft derived from British technology developed in the 1950s to 1960s. Hovercraft are now used throughout the world as specialized transports in disaster relief, coastguard, military and survey applications, as well as for sport or passenger service. While hovercraft have been used successfully throughout other parts of the arctic, this technology has not yet been applied in Nunavut.

The Pilot Study represents a new type of traffic on the AEAR and approved winter roads, and will operate on winter road alignments during the summer months. Hovercraft operation thus has the potential to influence worker and public safety for road users. Road safety measures outlined in the AEAR Management Plan (Agnico Eagle 2015a) will be applied to all AEAR traffic, including hovercraft. Safety measures outlined in the AEAR Wildlife Protection and Response Plan (Agnico Eagle 2013c), Spill Contingency Plan (Agnico Eagle 2016b), and Emergency Response and Spill Contingency Plan (Agnico Eagle 2015e) will also be applied to the operation of hovercraft on the AEAR with an aim to mitigate the risk of accidents and emergencies. The following measures will be implemented for the Pilot Study on the AEAR:

- Maximum speed limits of 50 km/h;

- Use of seat belts by all drivers and passengers is mandatory;
- Driving under the influence of alcohol or intoxicating drugs is prohibited;
- Wildlife has right-of-way on the road, and no harassment of wildlife is allowed;
- Hunters must avoid shooting across the road and should not discharge a firearm within 1 km of the road;
- Hunting is not allowed within 1 km of Meadowbank mining areas or the Amaruq Exploration Site;
- Vehicles are not to park on the travel surface of the road but pull off the road at a safe location such as passing pullouts to prevent accidents; and
- Signs will be posted in English and Inuktitut advising drivers of the posted speed limit, of approaching bridges, of approaching curves, and/or areas of lower visibility (blind hills or obstructed curves).

As a privately operated road, responsibility for "policing" will not fall under the RCMP. Responsibility for all operating and maintenance activity on the road will rest solely with Agnico Eagle. Agnico Eagle will operate with a Transport Canada Air Cushion Vehicle Safety Certificate (Transport Canada 2010) and with all appropriate licences required for air cushioned vehicle (hovercraft) operation. Hovercraft will be maintained to international good practice standards. All Agnico Eagle employees and its contractors who will use the road will be required to take road safety training before being allowed to venture out on the road. Hovercraft-specific training will be developed and implemented for approval to operate hovercraft. Further, Agnico Eagle will concentrate on maintaining awareness among Agnico Eagle employees and contractors on the safe use of the road.

Agnico Eagle will use its road supervisor and site security to monitor what is occurring on the road, and will monitor speed limit infractions by direct observation of drivers seen to be driving too fast. Agnico Eagle will also rely on radio contact with all company and contractor vehicles on the road to monitor unsafe conditions or activity. Agnico Eagle does not have any special policing powers and cannot issue tickets or use other methods to address unsafe operation. Agnico Eagle can record unsafe practices, warn the person causing the infraction, and in severe or repeated cases of violation, remove all privileges for future access to the road by an offending driver.

The road safety measures noted for the AEAR will apply to the operation of hovercraft on approved winter roads and trails, with the exception of operational speed limits. Hovercraft are expected to operate at speeds of up to 100 km/hr on winter roads, slowing to 50 km/hr when caribou are in the vicinity of winter routes, roads, or when snowmobile or foot traffic is observed adjacent to road alignments.

While the road safety measures identified above are expected to limit the potential of the Pilot Study to interact with worker and public safety, there remains potential risks associated with accidents. Despite best efforts on the part of Agnico Eagle to mitigate risks to public health and safety as related to accidents or emergencies, by their very nature, accidents may still occur. Attempting to assess the magnitude of a risk of accidents is problematic. Should neither occur, there will be no associated effect. However, it can also not be assumed that either or both *will* occur definitely, or to what extent. For these reasons, residual effects criteria have not been assessed for accidents and emergencies.

- **The Pilot Study could improve emergency response in areas adjacent to winter roads and the AEAR during periods of inclement weather**

A recent feasibility study (Dickins et al., 2008) concluded that there are no fundamental technical limitations or operational constraints to the use of appropriate hovercraft as a year-round patrol vessel in the Canadian Arctic, but did note that further investigation into their operational utility is required. By design, the Pilot Study has an aim to do just this, determining the feasibility of hovercraft for, among other tasks, emergency response activities. The all-weather capabilities of hovercraft make them valuable for emergency response activities, particularly those required during periods of inclement weather that would otherwise ground helicopters used to respond to emergencies. This is of specific benefit in the context of remote exploration activities such as those at the northern terminus of the AEAR, or along winter road routes. As with accidents, this assessment does not attempt to determine with reasonable certainty the probability of emergencies occurring or the requirement for hovercraft to be deployed in response. This is, however, a potential benefit of the Pilot Study. As a benefit, no mitigation measures have been identified.

4.4 Summary of Residual Effects

A summary of residual effects is presented in Table 12.

Table 12: Summary of Residual Pilot Study Effects

VC	Primary Pathway	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Likelihood	Significance
Air quality and climate	Operation could result in increased dust deposition onto immediately adjacent land and into nearby water-bodies	Negative	Low	Local	Short-Term	Continuous	Reversible	Certain	Not Significant
	Increased combustion emissions during operations could lead to changes in local air quality	Negative	Low	Local	Short-Term	Continuous	Reversible	Certain	Not Significant
Noise and vibration	Noise emissions from operation of hovercraft can increase atmospheric noise levels	Negative	Moderate	Local	Short-Term	Periodic	Reversible	Certain	Not Significant
Wildlife (caribou, muskox, upland birds)	Operations leading to sensory disturbance can change the amount of different quality habitats, and alter wildlife movement, migration and behaviour	Negative	Moderate	Regional	Short-Term	Continuous	Reversible	Highly Likely	Not significant
Wildlife (water birds and upland birds)	Operations on portages of approved winter road alignments in summer months leading to the disturbance of destruction of bird nests	Negative	Low	Local	Short-Term	Isolated	Reversible	Likely	Not significant
Community wellness	Operations activities could pose risk to worker and public safety for users of the AEAR and winter roads	n/a							
	The Pilot Study could improve emergency response near the exploration site, in areas adjacent to winter roads and the AEAR during periods of inclement weather								

n/a = not applicable

Report Signature Page

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5.0 REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2010. Meadowbank Gold Project 2009 Annual Report. Appendix F8: Report on 2009 Noise Monitoring – Meadowbank Gold Project, Nunavut. February 2010.

Agnico Eagle. 2011. Meadowbank Gold Project 2010 Annual Report. Appendix L: Report on 2010 Noise Monitoring. March 2011.

Agnico Eagle. 2012. Meadowbank Gold Project 2011 Annual Report. Appendix J: Noise Monitoring. February 2012.

Agnico Eagle. 2013a. Meadowbank Gold Project 2012 Annual Report. Appendix G11: Noise Monitoring Report. March 2013.

Agnico Eagle. 2013b. Meadowbank Gold Project. 2015 Air Quality and Dustfall Monitoring Plan. November 2013.

Agnico Eagle. 2013c. Wildlife Protection and Response Plan. Meadowbank Division. Version 3. November 2013.

Agnico Eagle. 2014a. Meadowbank Gold Project 2013 Annual Report. Appendix G15: Noise Monitoring Report. February 2014.

Agnico Eagle. 2014b. Final Environmental Impact Statement, Meliadine Gold Project; Volume 7, Freshwater Environment. April 2014.

Agnico Eagle. 2014c. Proposed All-weather Exploration Road from the Meadowbank Mine to the Amaruq Site. Baseline Traditional Knowledge Report, Version 2. December 2014.

Agnico Eagle. 2015a. Amaruq Exploration Access Road, Road Management Plan. Version 1. March 2015.

Agnico Eagle. 2015b. Meadowbank Gold Project 2014 Annual Report. Appendix G11: Noise Monitoring Report. March 2015.

Agnico Eagle. 2015c. Meeting Minutes for the fall 2015 consultation meeting for the All-weather Exploration Road and exploration area. September 2015.

Agnico Eagle. 2015d. Meadowbank Gold Project. 2014 Annual Report. 180 pp + 41 app.

Agnico Eagle. 2015e. Amaruq Exploration Access Road: Emergency Response and Spill Contingency Plan.

Agnico Eagle.2015f. Application for a Type B Licence to Construct the Amaruq Exploration Access Road – Main Application Document. Submitted to the Nunavut Water Board. March 2015.

Agnico Eagle. 2016a. Whale Tail Pit Project Meadowbank Division. Submitted to Nunavut Impact Review Board and Nunavut Water Board. June 2016.

Agnico Eagle. 2016b. Amaruq Exploration Access Road: Spill Contingency Plan.

AREVA. 2011. Kiggavik Project Environmental Impact Statement – Technical Appendix 9A Socio-Economic Baseline. Available at: ftp://ftp.nirb.ca/02-REVIEWS/ACTIVE%20REVIEWS/09MN003-AREVA%20KIGGAVIK/2-REVIEW/09-FINAL%20EIS/03-FEIS/03-TECH%20APPENDICES-Teir%203/. Accessed September 21, 2015.

Azimuth (Azimuth Consulting Group Partnership). 2015a. Core Receiving Environment Monitoring Program (CREMP) 2014, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico-Eagle Mines Ltd., Baker Lake, NU. March, 2015.

Azimuth. 2015b. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico-Eagle Mines Ltd., Baker Lake, NU. November, 2015.

Azimuth. 2017. Whale Tail Pit Core Receiving Environment Monitoring Program (CREMP) 2016 Baseline Studies, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico-Eagle Mines Ltd., Baker Lake, NU. March, 2017.

Azimuth. 2016. Core Receiving Environment Monitoring Program (CREMP) 2015, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico-Eagle Mines Ltd., Baker Lake, NU. March, 2016.

Bennett, J., and S. Rowley. 2004 (Compiled and Edited). Uqalurait: An Oral History of Nunavut. Montréal and Kingston: McGill's-Queen's University Press.

Bernauer, W. 2015a. Inuit Qaujimajatuqangit of Caribou Habitat, Workshop Report.

Blackwell, S.B. and Greene, C.R. 2005. Underwater and in-air sounds from small hovercraft. J. Acoust. Soc. Am. 118(6). December 2005.

CCME (Canadian Council of Ministers of the Environment). 1999 (with updates to 2016). Canadian Environmental Quality Guidelines for the Protection of Aquatic Life – Summary Table. Available at: http://st-ts.ccme.ca/. Accessed: December 2016.

CCME. 2002. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life – Summary Table Update 2002.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2016. Wildlife Species Search. Available at: www.cosewic.gc.ca. Accessed: January 2016.

Cumberland (Cumberland Resources Ltd.). 2005a. Meadowbank Gold Project Baseline Terrestrial Ecosystem report.

Cumberland. 2005b. Meadowbank Gold Project. Terrestrial Ecosystem Impact Assessment. October 2005.

Cumberland). 2005c. Meadowbank Gold Project, Baseline Traditional Knowledge Report 2005. Final Report. October 2005.

Cumberland. 2006. Meadowbank Gold Project Terrestrial Ecosystem Management Report. Cumberland Resources Ltd. Vancouver, British Columbia.

Dickins, D. F., Cox, M., and Thorleifson, J. 2008. Arctic Patrol Hovercraft: An Initial Feasibility Study. Paper No. ICETECH08-115-R0.

Dominion Diamond Corporation. 2014. Developer's Assessment Report for the Jay Project; Section 9, Fish and Fish Habitat. October 2014.

Erbe, C. 2001. Underwater noise of whale-watching boats and potential effects on killer whales (Orcinus orca), based on an acoustic impact model. Report for Fisheries & Oceans Canada. April 2001.

Ferguson, M.A.D., and L. Gauthier. 1992. Status and trends of Rangifer tarandus and Ovibos moschatus populations in Canada. Rangifer 12 (3), 1992.

Freeman, M. M.R. (General Editor). 1976. Inuit Land Use and Occupancy Project, Volume 1. INA Publication No. QS 8054-001-EE-A1. Thorn Press Limited.

Gebauer, M.B. and J. Boulanger. 2007. Meadowbank Mine: 2006 Wildlife Monitoring Summary report. Can be found in Agnico Eagle 2006 Annual Report.

Gebauer, M.B., C. Lee, J. Boulanger, J. Shaw and Goodings Environmental Inc. 2008. Meadowbank Mine: 2007 Wildlife Monitoring Summary report. Can be found in AEM 2007 Annual Report.

Gebauer, M.B., C. Lee, J. Boulanger and J. Shaw. 2009. Meadowbank Mine: 2008 Wildlife Monitoring Summary Report. Can be found in Agnico Eagle 2008 Annual Report.

Gebauer, M., C. Lee, I. Laing, and J. Shaw. 2010. Meadowbank Mine: 2009 Wildlife Monitoring Summary Report. Can be found in Agnico Eagle 2009 Annual Report.

Gebauer, M., C. Lee, J. Shaw, and I. Laing. 2011. Meadowbank Mine: 2010 Wildlife Monitoring Summary Report. Can be found in Agnico Eagle 2010 Annual Report.

Gebauer, M., A. Crampton, C. Lee, J. Boulanger, J. Shaw, and I. Laing. 2012. Meadowbank Mine: 2011 Wildlife Monitoring Summary Report. Can be found in Agnico Eagle 2011 Annual Report.

Gebauer, M., A. Crampton, M. Huntley, J. Boulanger, J. Shaw, and I. Laing. 2013. Meadowbank Mine: 2012 Wildlife Monitoring Summary Report. Can be found in Agnico Eagle 2012 Annual Report.

Gebauer, M., A. Crampton, J. Shaw, and I. Laing. 2014. Meadowbank Mine: 2013 Wildlife Monitoring Summary Report. Can be found in Agnico Eagle 2013 Annual Report.

Gebauer, M., A. Crampton, J. Shaw, and I. Laing. 2015. Meadowbank Mine: 2014 Wildlife Monitoring Summary Report. Prepared for Agnico Eagle Mines Ltd.

Golder (Golder Associates Ltd.). 2014. 2013 Comprehensive Vegetation and Lichen Monitoring Program. Prepared for Diavik Diamond Mines Inc. March 2014.

Google Inc. 2016. Used under Licence. Imagery Date: 2016.

Government of Canada. 2016. Lakes and Rivers and Canada - CanVec – Hydro Features.

Health Canada. 2014. Guidelines for Canadian Drinking Water. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water. Ottawa, ON, Canada.

IDS (Interdisciplinary Systems Ltd.). 1978. Effects of Exploration and Development in the Baker Lake Area. Volume 1 – Study Report. Winnipeg, MB.

ISO (International Organization for Standardization). 1996. ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. December 1996.

Kendrick, A., and M. Manseau. 2008. Representing Traditional Knowledge: Resource Management and Inuit Knowledge of Barren-Ground Caribou. Society and Natural Resources 21: 404-418. Available at: http://nricaribou.cc.umanitoba.ca/LandscapeEcology/wp-content/uploads/inuit_knowledge/literature_and_papers/Kendrick_Manseau_2008.pdf. Accessed October 9, 2015.

Local Inuit Field Assistant. 2015b. Baker Lake, NU. Conversations in the field. June 28-29, July 2015.

Local Inuit Field Assistant. 2015c. Baker Lake, NU. Conversations in the field. July 18, 2015.

Mann, D., P. Cott, and B. Horne. 2009. Under-ice noise generated from diamond exploration in a Canadian sub-arctic lake and potential impacts on fishes. Journal of the Acoustical Society of America. Volume 126, p.2215-2222.

Mannik, H. (volume editor). 1998. Inuit Nunamiut: Inland Inuit. Altona, Manitoba: Friesen Corporation.

McLoughlin, P.D., L.R. Walton, H.D Cluff, P.C. Paquet, M.A. Ramsay. 2004. Hierarchical habitat selection by tundra Wolves. Journal of Mammalogy 85(3): 576-580.

Nagy, J.A., D.L. Johnson, N.C. Larter, M.W. Campbell, A.E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (Rangifer tarandus L.) in arctic and subarctic Canada. Ecological Applications, 21(6), pp.2334-2348.

Naughton, D. 2012. The Natural History of Canadian Mammals. Canadian Museum of Nature and University of Toronto press. Toronto, ON. 783 pp.

NIRB (Nunavut Impact Review Board). 2011. 2010-2011 Annual Monitoring Report for the Meadowbank Gold Project (NIRB File No. 03MN107).

NIRB. 2015. Public Information Meeting Summary Report, September 9-11, 2015. October 2015. Created for the NIRB's Monitoring of Agnico Eagle Mines Ltd.'s Meadowbank Gold Mine Site (NIRB File No. 03MN107). Available at: http://ftp.nirb.ca/03-MONITORING/03MN107-MEADOWBANK GOLD MINE/07-COMMUNITY CONSULTATIONS/2015/06-REPORT/151008-03MN107-Public Information Meeting Summary Report-OT2E.pdf. Accessed January 19 2016.

Riewe, R. (Editor). 1992. Nunavut Atlas. Canadian Circumpolar Institute and the Tungavik Federation of Nunavut. Edmonton, Alberta: Art Design Printing Inc.

Roof, C. J. and Fleming, G.G. 2001. Hovercraft Underwater Noise Measurements in Alaska. Letter Report for the United States Postal Service. April 2001.

SCWG (Soil Classification Working Group). 1998. The Canadian System of Soil Classification. Agriculture and Agri-Food Canada Publication 1646 (Revised). 187 pp.

Stantec (Stantec Consulting Ltd.). 2016. Archaeological Baseline Report. Agnico Eagle Mines: Meadowbank Division-Whale Tail Pit and Haul Road.

Statistics Canada. 2011. 2006 Profile of Aboriginal Children, Youth and Adults – Baker Lake. Available at: http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/89-635/P4.cfm?Lang=eng&age=3&ident_id=1&B1=0&geocode1=083&geocode2=000. Accessed September 17, 2015.

Stewart, A.M., D. Keith, and J.Scotti. 2004. Caribou Crossings and Cultural Meanings: Placing Traditional Knowledge and Archaeology in Context in an Inuit Landscape. Journal of Archaeological Method and Theory. 11(2): 183-211. Available at: http://www.jstor.org/stable/20164814. Accessed October 14, 2015.

Tarnocai, C. and J.G. Bockheim. 2011. Cryosolic soils of Canada: Genesis, distribution, and classification. Can J Soil Sci 91:749-762.

Transport Canada. 2010. Division 6 – Vehicle Certification. Marine Safety. Air Cushion Vehicle Safety Certificate. Archived content available at: http://data.tc.gc.ca/archive/eng/marinesafety/tp-tp5579-division-6-1426.htm. Accessed January 2017.

Transport Canada. 2014. List of Scheduled Waters. Available online at: http://laws-lois.justice.gc.ca/eng/acts/n-22/FullText.html#h-27

APPENDIX 1

Pathways Analysis

Appendix 1: Pathways Analysis for the Hovercraft Pilot Study

Valued Components	Pilot Study Activity	Potential Effects Pathways	Environmental Design Features and Mitigation	Pathway Assessment	Rationale
Atmospheric Environment					
Air Quality	Operation on the Amaruq Exploration Access Road, year round, 2017-2018	Increased dust and combustion emissions could change the amount of dust deposited onto immediately adjacent land and into nearby water-bodies and could lead to changes in local air quality	Implement dust control measures, if needed; Equipment and vehicles will comply with relevant non-road emission criteria at the time of purchase; Regular maintenance will be implemented for equipment and vehicles. Adherence to the Meadowbank Air Quality and Dustfall Monitoring Plan (Agnico Eagle 2013b) Watering of roads and enforcing speed limits to suppress dust production. Note that hovercraft will be exempt from the 50 km/hr speed limit in areas where it has been deemed appropriate to have a higher speed limit. Hovercraft speed could be up to 100 km/hr.	Primary	Pilot Study-related air emissions have the potential to deposit to local terrestrial, aquatic, and marine ecosystems. Atmospheric deposition of fugitive dust therefore has 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. An increase in combustion related emissions has the potential to change air quality locally.
	Operation on over-land portions of approved winter roads, summer months, 2017-2018	A modest increase in emissions could lead to small changes in local air quality		Secondary	Mineral soils are not expected to be exposed in meaningful quantities along the "portage" or over-land portions of the winter roads in the summer, therefor there will be very few small particles available for entrainment by the wind created by the hovercraft. The occasional passage of hovercraft along these sections of the approved winter roads will not materially change air quality.
	Operation on over-land portions of approved winter roads, winter months, and over-water portions of approved winter roads, summer and winter months 2017-2018	A modest increase in emissions could lead to small changes in local air quality		Secondary	Dust emissions are not be expected to result from operating hovercraft during winter months on the over-land or over-water portions of the approved winter roads. The occasional passage of hovercraft along these sections of the approved winter roads will not materially change air quality.
Noise and Vibration	Operation on the Amaruq Exploration Access Road and approved winter roads, year round, 2017-2018	Noise emissions from operation of hovercraft can increase atmospheric noise levels	Best management practices for controlling equipment noise emissions, including mufflers on all engines; Regular maintenance on all equipment; Adherence to the Meadowbank Noise Monitoring and Abatement Plan	Primary	See Section 4.1.1
	Operation on over-water portions of approved winter roads, summer and winter months, 2017-2018	Noise emissions from operation of hovercraft can increase underwater noise levels when the hovercraft travel over water	Best management practices for controlling equipment noise emissions, including mufflers on all engines; Regular maintenance on all equipment; Adherence to the Meadowbank Noise Monitoring and Abatement Plan	Secondary	Peer-reviewed scientific research has shown that hovercraft are *"…considerably quieter underwater than conventional [i.e., propeller-driven] vessels of comparable sizes"* (Blackwell and Greene 2005). As such, hovercraft will have a negligible residual effect on underwater noise levels relative to the existing environment.
	Operation on over-land portions of approved winter roads, summer and winter months, 2017-2019	Ground pressure from operation of hovercraft could result in ground vibrations	Based on equipment specifications, the hovercraft is expected to operate with a ground pressure of only 1 psi.	No Linkage	Ground pressure from hovercraft (i.e., 1 psi) is lower than other modes of transportation created by land users. The Pilot Study is not expected to increase ground vibration levels. The pathway between the Pilot Study and increased ground vibration levels is, therefore, assessed as having no linkage.
Aquatic Environment					
Hydrology, Water and Sediment Quality, and Aquatic Biota	Operation on over-water portions of approved winter roads, summer months, 2017-2018	Bank and/or shoreline erosion from operation on water during open water conditions	Best management practices for erosion and sediment controls, and adaptive measures (e.g., slowing down in more sensitive areas; alternating travel path to avoid sensitive areas; local armouring in entry or exit points, if deemed necessary)	Secondary	Wakes generated by hovercrafts are minimal and are anticipated to results in negligible shoreline erosion.
Water and Sediment Quality	Operation on the Amaruq Exploration Access Road, year round, 2017-2018	Storage of hovercraft	Appropriately designed storage pads or sheds at least 30 m from the highwater mark of any waterbody Storage areas designed to minimize footprint and disturbance to the tundra Secondary containment to capture any possible leaks from the hovercraft Regular inspections for leaks	Secondary	Leaks or spills from the hovercraft can affect water and sediment quality, and aquatic biota. Storage of hovercraft at approved locations with secondary containment will minimize potential effects to water and sediment quality. Regular inspections will be conducted with spills or leaks managed as per the management plan.

Appendix 1: Pathways Analysis for the Hovercraft Pilot Study

Valued Components	Pilot Study Activity	Potential Effects Pathways	Environmental Design Features and Mitigation	Pathway Assessment	Rationale
Water and Sediment Quality Aquatic Biota	Operation on the Amaruq Exploration Access Road, and approved winter roads, year round, 2017-2018	Spills and leaks from equipment (including during re-fueling) or accidents	No planned direct releases to water Training and provision of spill kits to manage accidental spills or releases to water Equipment will be re-fueled, serviced, and washed away from stream crossings Fuel, lubricants, hydraulic fluids, etc. will be stored at least 30 m away from the high-water mark of any waterbody Soils from any petroleum spills will be collected and treated on-site. If not possible, the contaminated soils will be shipped off-site for treatment and disposal An emergency response and spill contingency plan will be developed and implemented	Secondary	Based on Agnico Eagle's experience with the Meadowbank, accidental spills (e.g., fuel) have occurred, but most of the spill volumes have been small, and clean-up has occurred with only minor effects to the environment. Between 2011 and 2015 , 63 reportable spills were reported to the GN spill hot line. In 2015 there were 4 spills greater than 900 L at Meadowbank. In 2015 spill training was provided to employees. All spills are managed appropriately on site in accordance with Agnico Eagle's Spill Contingency Plan and there was no off site impact to any watercourses as a result of spills in 2015. In NIRB's 2011 annual report, it was noted that Meadowbank was kept in an impressively clean state with no apparent spills on location. It is anticipated the Meadowbank will continue to manage spills in the same manner and only minor impacts are predicted.
	Operation on the Amaruq Exploration Access Road year-round, and over-land portions of approved winter roads during summer months, 2017-2018	Sediment releases from surface disturbance during use of hovercraft	Regular inspection of road surface (check for ponding, erosion, dust) Best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armouring of banks), where needed to limit disturbance to waterbodies.	Secondary	Through the use of best management practices and monitoring, effects to water and sediment quality are expected to be minor; however, a water quality monitoring will be conducted to observe conditions. No measurable effects to aquatic biota are expected.
	Operation on the Amaruq Exploration Access Road, and approved winter roads, year round, 2017-2018	Generation and deposition of dust from operation of hovercraft	Implement dust control measures, if needed; Equipment and vehicles will comply with relevant non-road emission criteria at the time of purchase; Regular maintenance will be implemented for equipment and vehicles. Adherence to the Air Quality Dustfall Monitoring Plan. Watering of roads and enforcing speed limits to suppress dust production. Inspection and maintenance of disturbed areas along the streambanks with stabilization and re-vegetation, where required.	Secondary	Generation and deposition of dust from use of hovercraft will be a discontinuous activity with relatively low to negligible generation of dust (low as compared to dust generated from blasting and crushing activities at the mine) and as based on the air quality predictions. Best management practices will be used to minimize generation of dust and monitoring of water quality will be conducted to confirm impacts to water quality with adaptive management.
	Operation on the Amaruq Exploration Access Road, and approved winter roads, year round, 2017-2018	Generation and deposition of acidifying air emissions from operation of hovercraft	Hovercraft will be equipped with industry-standard emission control systems and will comply with relevant non-road emission criteria at the time of purchase. Exhaust emissions will be managed through regular and routine maintenance of vehicles. SO2 emissions from non-road vehicles and stationary equipment will be reduced through the use of low emission diesel fuel. Adherence to existing air quality monitoring plan to detect changes in air quality Adherence to water quality monitoring and adaptive management in the CREMP to detect changes in water quality	Secondary	Generation of acidifying air emissions from use of hovercraft is predicted to be a small. Best management practices will be used to manage and limit air emissions and monitoring, with adaptive management, will be conducted to confirm effects.
	Operation on the Amaruq Exploration Access Road and over-water portions of approved winter roads, year round, 2017-2018	Surface disturbance of water (sediment suspension) from operation of hovercraft over water	Stabilization of lakeshore and streams at the winter road and AEAR crossings	Secondary	Potential to affect/disturb small grained sediments through vibration disturbance; grains will settle out after cessation of disturbance. Effect be more pronounced and last longer with smaller grained as compared to larger grained substrates. No vertical mixing of water is anticipated. Although there is the potential for alteration to fish habitat (substrate composition) in shallow waterbodies during the open water season, any effects to aquatic biota are expected to be minor and localized to crossing locations.

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Aquatic Biota	Operation on the Amaruq Exploration Access Road and over-water portions of approved winter roads, year round, 2017-2018	Surface disturbance of water (noise and vibration)	The road alignment does not pass over sensitive aquatic habitat Underwater noise is less than from motorized boats, and similar to typical ice-road traffic Duration of noise events is low	Secondary	Potential exists to affect fish behavior and distribution due to increased noise levels, especially for fish species with sensitive hearing structures (e.g., whitefish species). Noise levels produced by hovercraft are not expected to cause any permanent or temporary hearing loss, however the masking of natural noises is more likely. Vibration has the potential to cause ice cracking, which create noises well above background; however, the short duration of the noise and low frequency of this disturbance is unlikely to measurably change the behaviour and distribution of fish.
	Operation on the Amaruq Exploration Access Road and over-water portions of approved winter roads, year round, 2017-2018	Increased access to waterbodies can increase fishing pressure on fish species	Winter road alignments used during the open water season will be accessible by hovercraft only. Hovercraft will not be used for recreational access for fishing. Hovercraft use in the winter will not result in additional ice road access beyond what has been previously approved.	Secondary	Although the potential exists for increased access to waterbodies to affect the local fishery through increased harvesting pressure, Agnico Eagle will deploy proven mitigation features such that there are no impacts to fishery species. Agnico Eagle prohibits fishing by any employees near mine sites or access roads, and the same rules will apply for the operation of a hovercraft.
Terrestrial Environment					
Soil and Vegetation	Operation on over-land portions of approved winter roads, 2017-2018	Vehicle travel leading to the changes in soil compaction, vegetation quantity and the direct loss and fragmentation of wildlife habitat	No new soil or vegetation clearing is required. All travel will be done on approved road alignments. In winter, soil and vegetation will be covered by snow. AEAR will already be compacted and disturbed, and hovercraft operations is not expected to result in additional effects.	No-linkage	In the absence of new disturbance and clearing, and based on the Pilot Study design, no additional compaction of soil, changes to vegetation, or associated impacts to wildlife habitat are anticipated.
	Operation on over-land portions of approved winter roads, 2017-2018	Operation over land may lead to mechanical breakdowns and chemical spills which can affect soil and vegetation	All spills resulting from the Pilot Study will be immediately reported, cleaned up and/or isolated from the receiving environment. Hovercraft will carry spill response kits. Hovercraft will be regularly maintained and inspected to reduce oil leakage. Operators will be trained in refueling procedures. Hazardous materials and fuel will be stored according to regulatory requirements. Detailed spill prevention and response procedures is provided in the Emergency Response and Spill Contingency Plan (Agnico Eagle 2015e) and the Amaruq Exploration Access Road Management Plan (Agnico Eagle 2015a).	Secondary	Hovercraft operations on approved winter roads and the AEAR could potentially result in changes to soil, vegetation and wildlife habitat quality associated with accidental spills. Effects to wildlife habitat quality due to exposure to spills is anticipated to be negligible relative to existing conditions for ungulates, water birds, upland birds and small mammals.
	Operation on the Amaruq Exploration Access Road, year round, 2017-2018	Operations on AEAR may increase the amount of dust deposition on soil and vegetation which can affect wildlife habitat quality	Watering of roads and enforcing speed limits to suppress dust production. Regular maintenance will be implemented for hovercraft. Enforcing speed limits and limiting access to Amaruq Exploration Access Road for public (less traffic) will assist in reducing dust. Adherence to the Air Quality and Dustfall Monitoring Plan (Agnico Eagle 2013b). Detailed mitigation is provided in the Amaruq Exploration Access Road Management Plan (Agnico Eagle 2015a).	Secondary	There have been no observed changes in soil/plant metal concentrations from current operations (see the Wildlife Screening Level Risk Assessment) that examined impacts of dust) in the Amaruq Exploration Area. A 2013 report for Diavik Diamond Mine found that lichen cover decreased while vascular plant species richness increased in response to dust deposition. It is unlikely that there will be permanent changes in vegetation community composition due to the short duration of the Pilot Study. Dust will occur from the Pilot Study but will be similar to existing levels at Meadowbank Mine and caused by other approved modes of transport.

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Wildlife (caribou, muskox, predatory mammals, raptors, water birds, upland birds and small mammals)	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2018	Increased speeds of vehicle travel and increased braking distances may cause injury or mortality to individual animals which can affect population sizes	Wildlife will have the right-of way. Hovercraft will stay within the existing Amaruq Exploration Access Road or winter road. Maximum speed limits of 50 km/hr on Amaruq Exploration Access Road and 100 km/hr on winter roads (50 km/hr when caribou are in the Amaruq Exploration Area) will be enforced in all seasons. All employees will be provided with wildlife environmental awareness training. The presence of wildlife will be monitored and communicated to site personnel and drivers through the wildlife reporting system. Road closures will occur in periods of peak migration. Personnel are instructed to report all mine related wildlife injuries and mortalities. Littering and feeding of wildlife will be prohibited. Continued monitoring of wildlife activity on site and travel routes and adaptive management of issues as they arise will continue to mitigate any effect to wildlife survival and reproduction. Detailed mitigation is included in the Amaruq Exploration Access Road Management Plan.	Secondary for caribou, muskox and small mammals and predatory mammals. No-linkage for birds	Given adaptive management practices potential effects to caribou, muskox, and small and predatory mammal mortality are considered negligible and infrequent
Wildlife (water birds, upland birds, raptors)	Operation on over-land portions of approved winter roads, summer months, 2017-2018	Operations on portages of approved winter roads in summer months leading to the disturbance or destruction of bird nests	Detailed mitigation for nesting birds is included in the Amaruq Exploration Access Road Management Plan (Agnico Eagle 2015a)	Primary for water birds and upland birds. No linkage for other birds that don't nest on ground.	Winter road alignment portages will be clearly delineated at the start of the Pilot Study. Hovercraft operation will likely be continual through the winter, spring and summer (i.e. during the migratory bird nesting season) on the approved winter road alignment, leading to disturbance that will likely deter birds from nesting on the alignment. Mitigation to reduce impacts to nesting birds will be discussed with Environment Canada. Despite mitigation, effects may persist during operation at portages
Wildlife (caribou, muskox, upland birds, raptors, predatory mammals, water birds and small mammals)	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2018	Operations leading to sensory disturbance (noise, movement, light, smells) can change the amount of different quality habitats, and alter wildlife movement, migration and behaviour	Maximum speed limits of 100 km/hr on the winter roads and 50 km/hr on the Amaruq Exploration Access Road will be enforced. When caribou are observed near the road or mine speed limits will be reduced to 50km/hr in the area. Travel will be restricted or stopped in periods of peak caribou migration. All employees will be provided with wildlife environmental awareness training. Employees will be notified when caribou, muskox and predatory mammals are observed in the Amaruq Exploration Area. Wildlife is always provided the right-of-way. Detailed mitigation is provided in the Noise Monitoring and Abatement Plan and the Amaruq Exploration Road Management Plan.	Primary	Sensory disturbances impacting movement, migration and behaviour have the potential to have beyond-negligible effects on wildlife.

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Human Environment					
Traditional Land Use	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2018	Hovercraft operation could disturb resources used in traditional fishing.	Employ mitigations identified for the aquatic environment.	No linkage	The assessment of Pilot Study effects on the aquatic environment did not find any primary pathways resulting in more than a negligible Pilot Study effect on water quality or aquatic biota. The pathway between the Pilot Study and the availability of resources for traditional fishing opportunities is, therefore, assessed as having no linkage.
	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2019	Operation could disturb resources used in traditional plant gathering.	Employ mitigations identified for soil and vegetation.	No linkage	The negligible Pilot Study effect on vegetation is not expected to alter the availability of vegetation for traditional harvesting, and the pathway between the Pilot Study and this linkage is assessed as having no linkage.
	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2018	Operation could require access restrictions impacting traditional travel routes, or create disturbances affecting culturally important areas.	The Pilot Study is designed to avoid the need for new ground disturbance and access restrictions.	No linkage	The Pilot Study does not represent new ground disturbance or access restrictions to those travelling in the region. The pathway between the Pilot Study and traditional travel routes and culturally important areas is, therefore, assessed as having no linkage.
	Operations on approved winter road, summer months, 2017-2018	Operation leading to disruption of fishing activities at portages	The Pilot Study is located in a remote location Infrequency of trips on winter roads	Secondary	Disruptions will be isolated and sporadic, but will occur over one year of hovercraft operations. Given the remote location of the Pilot Study, the low-frequency (i.e., opportunistic) fishing of waterbodies in the study area, and the prevalence of fishing opportunities throughout the region and close to Baker Lake, these disturbances are expected to result in negligible changes to traditional fishing opportunities
	Operation on approved winter road, summer months, 2017-2018	Operation leading to change in availability of caribou and muskox for harvesting	Employ mitigations identified for wildlife	Secondary	Harvesting opportunities closer to Baker Lake will not be materially impacted by hovercraft operations. Beyond-negligible changes to wildlife mortality or habitat are not anticipated, and the effect of incremental, hovercraft-related sensory disturbances on wildlife movement is expected to result in a negligible change in the availability of wildlife for hunting and trapping.
	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2018	Operations at portages leading to change in availability of ground and upland birds and eggs for harvesting	Employ mitigations identified for nesting birds		Given the temporary, periodic and highly localized nature of this effect relative to the availability of other bird and egg harvesting areas closer to Baker Lake, the Pilot Study's potential effect on these traditional activities is anticipated to be negligible.
Socio-Economic Conditions in Communities	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2018	Pilot Study employment demand and procurement could have knock-on effects to communities such as speculative migration and population change, and associated changes to service delivery or infrastructure.	Train members of the existing workforce on hovercraft operation, and maintain existing fuel suppliers.	No linkage	The Pilot Study will not generate employment, instead drawing from the existing Meadowbank workforce. As a result, no employment-driven population change in Kivalliq communities, or associated changes to community demographics and public service provision, is anticipated. The Pilot Study will not result in additional procurement or economic development activities for Kivalliq communities as hovercraft will be obtained from outside Nunavut, and will require minimal upkeep supplies (e.g., fuel) sourced from existing suppliers.

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Community Wellness	Operations on approved Amaruq Exploration Access Road and approved winter road, year round, 2017-2018	The Pilot Study represents a new type of traffic on the AEAR and approved winter roads, posing a risk to worker and public safety	Operate with a Transport Canada Air Cushion Vehicle Safety Certificate (Transport Canada 2010) and with all appropriate licences required for air cushioned vehicle (hovercraft) operation; Hovercraft-specific training will be developed and implemented for approval to operate hovercraft; Hovercraft will be maintained to international good practice standards; Maximum speed limits of 50 km/h on roads and 100km/h on winter routes and trails; Use of seat belts by all drivers and passengers is mandatory; Driving under the influence of alcohol or intoxicating drugs is prohibited; Wildlife has right-of-way on the road, and no harassment of wildlife is allowed; Hunters must avoid shooting across the road and should not discharge a firearm within 1 km of the road ; Hunting is not allowed within 1 km of Meadowbank mining areas or the Amaruq Exploration Site; Vehicles are not to park on the travel surface of the road but pull off the road at a safe location such as passing pullouts to prevent accidents; and Signs will be posted in English and Inuktitut advising drivers of the posted speed limit, of approaching bridges, of approaching curves, and/or areas of lower visibility (blind hills or obstructed curves) .	Primary	While the road safety measures identified above are expected to limit the potential of hovercraft to interact with worker and public safety, there remains potential risks associated with accidents and emergencies. Despite best efforts on the part of Agnico Eagle to mitigate risks to public health and safety as related to accidents or emergencies, by their very nature, accidents may still occur. Attempting to assess the magnitude of a risk of accidents and emergencies is problematic. Should neither occur, there will be no associated effect. However, it can also not be assumed that either or both *will* occur definitely, or to what extent.
		The Pilot Study could improve emergency response in areas adjacent to winter roads and the AEAR during periods of inclement weather		Primary	The all-weather capabilities of hovercraft make them valuable for emergency response activities, particularly those required during periods of inclement weather that would otherwise ground helicopters used to respond to emergencies. This is of specific benefit in the context of remote exploration activities such as those at the northern terminus of the AEAR, or along winter road routes. As with accidents, this assessment does not attempt to determine with reasonable certainty the probability of emergencies occurring or the requirement for hovercraft to be deployed in response. This is, however, a potential benefit of the Pilot Study. As a benefit, no mitigation measures have been identified.
Archaeology	Operation on the Amaruq Exploration Access Road, year round, 2017-2018	Hovercraft traffic could disturb stone features (e.g. inuksuit, hunting blinds, caches) located on ground surface within road corridor.	Archaeological assessments were previously carried out along road corridor in 2015 and 2016 by Nunami-Stantec in relation to haul road construction and borrow sources. Archaeological concerns were mitigated by avoidance or systematic data recovery.	No linkage	No new ground disturbance. No effects to archaeological sites anticipated.
	Operation on over-land portions of approved winter roads, year round, 2017-2018	Hovercraft could disturb stone features (e.g. inuksuit, hunting blinds, caches) located on ground surface at portages within road corridor.	Archaeological assessments were previously carried out along winter road corridor in 2014 by Nunami-Stantec. Archaeological concerns were mitigated by avoidance or systematic data recovery.	No linkage	No new ground disturbance. No effects to archaeological sites anticipated.

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