ᔫᓂ 4, 2021

ᑭᐅᕋᓐ ᑲᐠᑕᓚᐅ
ᐊᖓᔪᖅᑲᐅᑎᓄᑦ ᑐᑭᒧᐊᒃᑎᑦᑎᔨ
ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ
ᑐᕌᑏ 1360
ᐃᖃᓗᑦᑑᑦᑎᐊᖅ, ᓄᓇᕗᑦ
X0B 0C0

Re: ᑭᐅᔾᔪᑎ ᕿᒥᕐᕈᔨᓄᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᓂᑦ ᐹᕙᓐᓂᓐᑯᑦ ᓯᕗᓪᓕᖅᐹᒥᒃ ᓇᐃᓈᖅᓯᒪᔪᓂᒃ ᑎᑎᕋᖕᒋᓐᓂᒃ 2020–ᒥᑦ ᕿᓚᓗᒐᕐᓂᒃ ᖃᐅᔨᓴᕐᓂᐅᕙᒃᑐᓂᒃ

ᐃᓚᓐᓇᕆᔫᒃ ᒥᔅ ᑲᐠᑕᓚᐅ,

ᐹᕙᓐᓂᓐᑯᑦ ᓴᕕᒃᓴᕐᓂᐊᖅᑏᑦ ᑯᐊᐳᕇᓴᓐ (ᐹᕙᓐᓃᓐ) ᑐᓂᓯᕗᖅ ᐅᑯᓂᖓ (ᑎᑎᖅᑲᓄᑦ ᐃᓚᒋᔭᖅ) ᑭᐅᔾᔪᑎᓂᒃ ᑎᑎᖅᑲᓂᒃ ᐅᖃᐅᓯᐅᓯᒪᔪᓂᒃ ᐱᓕᕆᖃᑎᒋᔫᑦᑎᓐᓂᑦ ᐊᐃᕐᓕᓕ 8, 2021–ᒥᑦ ᐋᖅᑭᑦᑎᐊᖅᓯᒪᔪᓕᕆᓂᕐᒧᑦ ᑎᑎᖅᑲᖅ ᑕᐃᔭᐅᓪᓗᓂ "ᓯᕗᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᓇᐃᓈᖅᓯᒪᔪᖅ 2020–ᒥᑦ ᕿᓚᓗᒐᕐᓂᒃ ᖃᐅᔨᓴᕐᓂᐅᕙᒃᑐᖅ" (ᑖᓐᓇ ᐋᖅᑭᑦᑎᐊᖅᓯᒪᔪᓕᕆᓂᕐᒧᑦ ᑎᑎᖅᑲᖅ):

1. ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᖒ (QIA; Doc ID: 335352);
2. Hᐋᒪᓚᒃᑯᑦ ᒥᑦᑎᒪᑕᓕᖕᒥᑦ (Doc ID: 335355 & 335356);
3. ᐃᑲᔪᖅᑏᑦ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ (IHTO; Doc ID: 335354);
4. ᒐᕙᒪᑐᖃᒃᑯᑦ;
    a. ᐃᖃᓗᓕᕆᔨᒃᑯᑦ ᐃᒪᕐᒥᐅᑕᓕᕆᔨᒃᑯᓪᓗ ᑲᓇᑕᒥ (DFO; Doc ID: 335350)
    b. ᒥᕐᖑᐃᖅᓯᕐᕕᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ (PC; Doc ID: 335353)
5. ᐃᒪᕐᒥᐅᑕᓕᕆᔨᒃᑯᑦ ᐅᑭᐅᖅᑕᖅᑐᒥ (ON; Doc ID: 335351).

ᐹᕙᓐᓃᓐᑯᑦ ᖁᔭᓕᕗᑦ ᐱᓕᕆᖃᑎᒌᖕᒋᑕ ᐅᖃᐅᓯᕆᓯᒪᔭᖕᒋᓐᓂᒃ ᑭᐅᓯᒪᓂᖕᒋᓐᓂᒡᓗ ᑐᓴᕐᕕᒋᓯᒪᔭᐃᓐᓇᖕᒋᓐᓂᒃ.

ᓇᓗᓇᐃᖅᓯᒪᓚᐅᖅᑐᖅ ᐹᕙᓐᓃᓐᑯᑦ ᑎᑎᖅᑲᖕᒋᓐᓂᑦ ᐱᖃᓯᐅᔾᔨᓪᓗᓂ ᐋᖅᑭᑦᑎᐊᖅᓯᒪᔪᓕᕆᓂᕐᒧᑦ ᑎᑎᖅᑲᒧᑦ, ᐹᕙᓐᓃᓐᑯᑦ ᑐᓂᓯᓯᒪᕗᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᑲᑎᒪᔨᐊᓃᓄᑦ ᐱᓕᕆᖃᑎᖏᓐᓄᑦ ᐊᔾᔨᖏᓐᓂᒃ 2020–ᒥᑦ ᑕᕆᐅᒥᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ ᐅᓂᒃᑳᑦ ᑎᑭᓪᓗᒍ ᒪᐃ 13, 2021 ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᓐᓅᖅᑕᐅᓯᒪᓕᓪᓗᓂ 2020–ᒥᑦ ᐊᕐᕋᐅᒍᑕᓖᑦ ᐅᓂᒃᑳᓕᐊᕆᕙᒃᑕᖕᒋᓐᓂᑦ ᒪᐃ 6, 2021–ᒥᑦ. ᐅᖃᐅᓰᒃᓴᖃᑦᑐᑦ ᑐᓴᕐᕕᐅᔪᒪᕗᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᑲᑎᒪᔨᐊᓛᑦ ᐱᓕᕆᖃᑎᖒᓄᑦ ᐊᓯᖏᓐᓂᓪᓗ ᐱᓕᕆᖃᑎᕙᒃᑕᑦᑎᓐᓂᑦ ᐅᓂᒃᑳᓕᐊᕆᔭᐅᔪᒥᒃ ᐱᔪᒪᔪᑦ ᔫᓂ 24, 2021–ᒥ ᑐᖔᓂᓪᓘᓐᓃᑦ.

Baffinland

ᓄᓘᔮᖅᓂ ᐱᓕᕆᐊᖑᔪᖅ
ᑭᐅᒪᔾᔪᑏᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᓄᑦ ᐊᔪᕐᓇᖅᑐᓕᔪᓂ
ᑎᑎᖅᑲᒦᑦᑐᓂᒃ
ᔫᓂ 4, 2021

<u>ᑐᓴᕐᓱᐊᕐᓂᕐᒥᑦ ᑐᓴᒐᒃᓴᖅ</u>

ᑎᑎᖅᑲᐃᑦ ᖃᖄᓐᓂᐊᕈᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᑦ ᑭᐅᔾᔪᑏᓪᓗ ᐱᓕᕆᐊᖑᓂᖏᑦ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᓐᓂᑦ, ᒪᐃ 13, 2021−ᒥᑦ ᐹᕙᓚᓐᑯᑦ ᑲᑎᒪᖃᑎᖃᓚᐅᖅᐳᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᑲᑎᒋᐊᓛᓂᒃ ᐱᓕᕆᖃᑎᖏᓂᒃ ᐊᐱᖅᓱᕐᓇᕐᑯᓪᓗᒋᑦ ᐋᖅᑭᑦᑎᐊᖅᓯᒪᔪᓕᕆᓂᕐᒧᑦ ᑎᑎᖅᑲᒃᑯᑦ ᑎᑎᕋᖅᑕᐅᔪᓂᒃ ᑐᓂᔭᐅᔪᖃᓚᐅᖅᑎᓇᒋᑦ. ᑲᑎᒪᔾᔪᑎᕕᓃᑦ ᒪᐃ 13, 2021−ᒥᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᑲᑎᒪᔨᐊᓛᑦ ᑲᑎᒪᓚᐅᖅᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ ᐅᓂᒃᑳᕐᕕᐅᓪᓗᑎᒃ ᑕᑯᒃᓴᐃᑎᑕᐅᓚᐅᖅᑎᓪᓗᒋᑦ ᑎᑎᖅᑲᕐᑯᑏᑦ ᐊᑦᑕᑕᖅᑎᑕᐅᓯᒪᔪᑦ 2−ᒥᒃ ᑖᒃᑯᓄᖓ ᑎᑎᖅᑲᓄᑦ. ᖄᒃᑲᓐᓂᐊᕈᑦ, ᐹᕙᓚᓐᑯᑦ ᑲᑎᒪᑎᑦᑎᕐᖓᐅᑎᖏᓐᓂᒃ ᒥᑦᑎᒪᑕᓕᖕᒥᑦ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ ᒥᑦᑎᒪᑕᓕᖕᒥᓪᓗ Hᐋᒪᓚᒃᑯᖏᓐᓂᒃ ᐅᖃᖅᑎᕆᓚᐅᖅᑐᑦ ᐸᕐᓇᐅᑎᓄᑦ 2021−ᒥ ᐅᒥᐊᕐᔪᐊᖃᕐᓇᐅᓛᖅᑐᒥᒃ ᒪᐃ 28, 2021−ᒥᑦ, ᑭᖑᓂᐊᒍᑦ ᐹᕙᓚᓐᑯᑦ ᐅᖄᓚᕋᖅᑎᑦᑎᓚᐅᖅᐳᑦ ᒥᑦᑎᒪᑕᓕᖕᒥᐅᓂᒃ ᐅᖃᓪᓚᖁᑎᒃᑯᑦ ᔫᓂ 2, 2021−ᖑᑎᓪᓗᒍ.

<u>ᐱᓕᕆᐊᖑᕙᓪᓕᐊᓂᐊᖅᑐᑦ</u>

ᐱᓇᓱᐊᕈᓯᓂᒃ ᖃᐃᕙᓪᓕᐊᔪᓂᒃ, ᐱᓕᕆᖃᑎᒋᔫᕙᑦ ᐊᑐᐃᓐᓇᐅᒍᑎᒃ, ᐹᕙᓚᓐᑯᑦ ᑲᑎᖃᑎᖃᕈᒪᕚᑦ ᒥᑦᑎᒪᑕᓕᐅᑉ Hᐋᒪᓚᒃᑯᖏᓐᓂᑦ, ᒥᑦᑎᒪᑕᓕᖕᒥᐅᑦ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᖏᓐᓂᑦ, ᐃᒪᕐᓂᐅᑕᓕᕆᔨᕐᔪᐊᒃᑯᓂᑦ ᐊᒻᒪᓗ ᕿᑭᑦᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖅᑎᒌᒃᑯᓂᑦ ᑭᐅᔾᔪᑎᑦᑎᓂᒃ ᑐᓴᕐᑯᓪᓗᒋᑦ, ᐱᕙᖁᕈᒪᓂᑦᑎᓂᓪᓗ 2021−ᒥᑦ ᐅᒥᐊᕐᔪᐊᖃᕐᓇᐅᓛᖅᑐᒥᒃ. ᐱᓕᕆᖅᑎᕇᓚᐅᖅᑎᓪᓗᑕ ᑭᖑᓂᐊᒍᑦ, ᐹᕙᓚᓐᑯᑦ ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᓄᐊᖅᓯᕚᖅᑐᑦ 2021−ᒥᑦ ᐅᒥᐊᕐᔪᐊᖅᑕᖃᓚᐅᖅᑲᓂᖕᒪᓂᒃ, ᑎᑎᖅᑲᑦ ᐊᔾᔨᖏᑦ 2021-ᒥᑦ ᐋᕿᒋᐊᕐᕕᖃᐃᓐᓇᖅᑐᒥᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᑲᒪᔾᔪᑏᑦ ᐸᕐᓇᐅᑏᑦ. ᐸᕐᓇᐅᑏᑦ ᐃᓚᐅᑎᑦᑎᔪᑦ ᑲᑎᒪᓂᐅᖃᑦᑕᓚᐅᖅᑐᓂᒃ ᐊᒻᒪᓗ ᖃᐅᔨᔭᐅᔪᓂᒃ, ᖃᐅᔨᓴᒃᑲᓂᕐᓃᑦ ᐱᐊᓂᒃᑕᐅᓯᒪᔪᑦ ᐹᕙᓚᓐᑯᓐᓂᑦ ᐊᒃᑐᐊᓂᖏᓐᓂᑦ, ᐊᑖᖏᓗᒃᑖᖅᓯᒪᔪᑦ 2021-ᒥᑦ ᑕᕆᐅᒥᒃ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᓄᑦ ᐸᕐᓇᐅᑏᑦ, ᐊᒻᒪᓗ ᑎᑎᕋᖅᓯᒪᔪᑦ ᐊᒃᑐᐃᓗᐊᖅᓯᑦᑕᐃᓕᒪᓇᓱᒃᑎᓪᓗᑕ ᐋᕿᒋᐊᕐᕕᖃᐃᓐᓇᖅᑐᒥᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐊᑐᓕᖅᑎᑕᐅᓇᔭᖅᑐᑦ 2021−ᒥᑦ ᐅᒥᐊᕐᔪᐊᖃᕐᓇᐅᓂᐊᖅᑐᒥᑦ.

ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ ᐃᖅᑲᓇᐃᔭᖅᑎᖏᓪᓗᓐᓃᑦ ᐊᐱᖅᑯᑎᖃᕈᑎᒃ ᑖᔅᓱᒧᖓ, ᖃᐅᔨᒋᐊᕐᕕᒋᔭᓇᖅᑐᖅ ᐊᑎᓕᐅᖅᓯᒪᔪᖅ.

ᑎᑎᕋᖅᑐᖅ,

ᓘ ᑳᐃᒧᒪᓐ

ᖁᑦᑎᙵᓂᖅᓴᒥᒃ-ᑐᑭᒧᐊᒃᑎᑦᑎᔨ, ᑲᔪᓰᓐᓇᕈᓐᓇᖅᑐᒥᒃ ᐱᕙᓪᓕᐊᑎᑦᑎᔨ

cc. ᑯᐊᕆ ᐸᐅᑯ, ᓄᓇᕗᒻᒥ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ

ᓂᖅᓱᕐᓇᕐᓂᖓ, ᒪᐃᔭ ᔮᔅᓱᐊ ᐋᓇᐊᒃ, Hᐋᒪᓚᒃᑯᑦ ᒥᑦᑎᒪᑕᓕᖕᒥ
ᖃᐅᒪᔪᖅ ᐆᔪᑯᒃ, ᐃᑲᔪᖅᑏᑦ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᖏᑦ
ᐃᐅᕆᒃ ᐆᑦᑐᕙᒃ, ᒥᑦᑎᒪᑕᓕᖕᒋᒥ ᐊᖑᓇᓱᒃᑐᓕᕆᔨᒃᑯᑦ
ᔨᐅᕋᑦ ᐊᑕᓐHᐋᕝ, ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᒃ
ᑖᒧᔨ Hᐅᓖᑦ, ᐃᖃᓗᓕᕆᔨᒃᑯᑦ ᐃᒪᕐᒥᐅᑕᓕᕆᔨᒃᑯᓐᓗ ᑲᓇᑕᒥ
ᐊᓕᓴᓐ ᔅᑕᑐᑦ, ᒥᕐᖑᐃᖅᓯᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ
ᑯᕆᔅᑎᓐ ᕙᔅᑐᓪ, ᐃᒪᕐᒥᐅᑕᓕᕆᔨᒃᑯᑦ ᐅᑭᐅᖅᑕᖅᑐᒥ

ᑎᑎᖅᑲᓃᖃᑕᐅᔪᖅ 1 – ᐹᕙᓐᓛᓐᑯᑦ ᑭᐅᔾᔪᑎᖏᑦ ᐅᖃᐅᓯᐅᓯᒪᔪᓄᑦ

June 4, 2021

Karen Costello
Executive Director
Nunavut Impact Review Board
P.O. Box 1360
Cambridge Bay, NU
X0B 0C0

Re: Response to Reviewer Comments on Baffinland's Preliminary Summary of 2020 Narwhal Monitoring Program

Dear Ms. Costello,

Baffinland Iron Mines Corporation (Baffinland) provides the following submission (Attachment 1) in response to written comments received by the following Parties on the April 8 2021 Technical Memo entitled "Preliminary Summary of 2020 Narwhal Monitoring Program" (the Technical Memo):

1. Qikiqtani Inuit Association (QIA; Doc ID: 335352);
2. Hamlet of Pond Inlet (Doc ID: 335355 & 335356);
3. Ikajutit Hunters and Trappers Organization (IHTO; Doc ID: 335354);
4. Government of Canada;
    a. Department of Fisheries and Oceans Canada (DFO; Doc ID: 335350)
    b. Parks Canada (PC; Doc ID: 335353)
5. Oceans North (ON; Doc ID: 335351).

Baffinland thanks these Parties for the comments provided and has endeavoured to meaningfully respond to all feedback received.

As was outlined in Baffinland's covering letter that accompanied the Technical Memo, Baffinland has provided members of the Marine Environmental Working Group (MEWG) copies of all its 2020 Draft Marine Monitoring Program Reports as of May 13, 2021 and has submitted to the Nunavut Impact Review Board (NIRB) its 2020 Annual Monitoring Report as of May 6, 2021. Comments are expected back from the MEWG and other interested Parties on these Reports on or before June 24, 2021.

Consultation Update

In addition to the written comment and response process facilitated by the NIRB, on May 13, 2021 Baffinland met with the MEWG to provide an opportunity for members to ask questions regarding the

Technical Memo in advance of their written submissions. A copy of the draft minutes from the May 13 2021 MEWG Meeting and the relevant presentation materials that were provided have been submitted to the NIRB under separate cover. Additionally, Baffinland held an initial meeting with representatives from the Mittimatalik Hunter and Trappers Organization (MHTO) and the Hamlet of Pond Inlet to discuss plans for the 2021 shipping season on May 28, 2021, followed by a Baffinland hosted radio show for Pond Inlet residents with a question and answer period on June 2, 2021.

Next Steps

In the coming weeks, pending the Parties availability, it is Baffinland's intention to meet with the Hamlet of Pond Inlet, the MHTO, DFO and QIA to discuss our responses to their comments, as well as our plans for the 2021 shipping season. Following completion of these engagement sessions, Baffinland will submit to the NIRB before the start of the 2021 shipping season, a copy of our 2021 Adaptive Management Response Plan (the Plan). The Plan will include a summary of engagement and outcomes, additional investigation completed by Baffinland as relevant, an overview of our 2021 marine monitoring program plans, and a listing of our mitigation and adaptive management measures to be implemented for the 2021 shipping season.

Should the NIRB Board or Staff members have any questions regarding this submission, please do not hesitate to contact the undersigned.

Sincerely,

Lou Kamermans
Senior-Director, Sustainable Development

cc. Cory Barker, Nunavut Impact Review Board
His Worship, Mayor Joshua Arreak, Hamlet of Pond Inlet
Qaumayuq Oyukuluk, Ikajutit Hunter and Trappers Organization
Eric Oottoovak, Mittimatalik Hunter and Trappers Organization
Jared Ottenhof, Qikiqtani Inuit Association
Thomas Hoggarth, Fisheries and Oceans Canada
Allison Stoddart, Parks Canada
Kristin Westdal, Oceans North

Attachment 1 – Baffinland Responses to Comments

Attachment 1

Baffinland Responses to Comments

Table 1: Response to Comments

Cmt. #	ID #	Reviewer's Detailed Comment	Reviewer's Question/Recommendations	Baffinland's Response
			PC	
1	PC-1a	BIM has pointed to the impacts of ice breaking as the potential causal factor from the project for low Narwhal numbers in the project area. Parks Canada would like to note that it is possible that the low numbers of Narwhal is a cumulative effect from the overall volume of project shipping, including both open water shipping and ice breaking. *Reference: Section 1, PDF pp.1-2. "Identification and implementation of precautionary Project-based operational mitigations for shoulder season shipping…"* *"Based on a preliminary review, potential causal factors of the 2020 decreases narwhal abundance in Eclipse Sound include" acoustic disturbance from icebreaking, pile driving and increased killer whale presence."*	It may be useful for Baffinland to identify other operational mitigations beyond the shoulder season (i.e., during peak shipping, during identified narwhal calving, or at assumed peak local narwhal abundance).	BIM has identified several potential factors that may have contributed to the lower observed number of narwhal in Eclipse in 2020. This included heavier ice conditions (and a delayed break-up period), increased levels of icebreaking, increased killer whale presence, and the introduction of a new anthropogenic activity in the Regional Study Area (RSA) that generated high energy impulsive noise over an extended time period overlapping with the in-migration of narwhal in the RSA (i.e., impact pile driving program at Pond Inlet). These factors may have acted independently, or in a cumulative / additive manner, to result in the observed decrease. Based on currently available data, it is not possible to determine whether one of these factors alone was the source of the decline, whether the combined influence of one or more of these factors was responsible, whether another unknown factor was the cause, or whether the observed change was natural in occurrence. What is known is that each of the four potential contributing factors identified in the memo were either unique in 2020 (i.e., pile driving), or were more prominent in 2020 than in 2019, a year in which narwhal numbers in the RSA were shown to be stable (relative to previous survey years) and when no evidence of displacement was recorded. Other possible causal factors suggested in the memo included direct or indirect effects of climate change on narwhal including, but not limited to, associated changes in predator/prey dynamics and subsequent effects on narwhal fitness or energy reserves prior to their arrival on the summer grounds Alternatively, the lower number of narwhal observed in Eclipse Sound in 2020 may simply reflect natural exchange between the two summering areas, as was previously suggested by DFO (Doniol-Valcroze et al., 2015) when discussing possible reasons why the 2013 survey results for Admiralty Inlet (~35,000 narwhal) and Eclipse Sound (~10,000 narwhal) differed substantially from the 2004 survey results for the same stocks (18,000 for Admiralty Inlet in 2010 and 20,000 for Eclipse Sound). Both the 2004 and 2013 surveys occurred prior to the start of Baffinland iron ore shipping operations. Open-water shipping was not identified as a likely contributing factor to the observed decline in 2020 for several reasons. Firstly, open-water shipping levels were slightly lower in 2020 compared to 2019. As stated above, this was a year in which narwhal numbers in the RSA were shown to be stable (relative to previous survey years) and no evidence of displacement was recorded. Therefore, it is considered unlikely that open-water shipping in 2020 would suddenly trigger a high severity response in narwhal (such as a large-scale displacement from the RSA) when shipping levels were in fact slightly reduced that year. Secondly, the type of behavioural responses observed in narwhal to date from open-water shipping suggests that this is not the cause of the observed decrease in 2020. Behavioural responses to shipping have been limited to temporary and localized disturbance effects at close range to vessels (up to 5 km distance). These effects, when present, last for a short duration with animals quickly returning to their pre-response behaviour following exposure. These are considered to be low to moderate severity responses that are not thought to result in any significant biological consequences on reproduction or survival, and hence on the stock or population. In comparison, narwhal responses to killer whales in the RSA consist of rapid dispersal to shallow water nearshore areas, freeze behaviour and suspension of vocal activity, with effects persisting for periods well beyond the exposure event. This would be considered a high severity response with potential significant biological consequence. To date, no similar anti-predator response has been demonstrated by narwhal to shipping as part of Baffinland's monitoring programs. As a result, there is presently little uncertainty in how narwhal respond to vessel traffic and vessel noise during the open-water shipping period. For all of these reasons, Baffinland is of the view that there would be little to no utility in identifying other operational mitigations beyond the shoulder season. Doniol-Valcroze, T, Gosselin, J.F., Pike, D., Lawson, J., Asselin, N., Hedges, K., and S. Ferguson. 2015. Abundance estimates of narwhal stocks in the Canadian High Arctic in 2013. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/060. v + 36 p.

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2	PC-1b	*Same as above.*	Parks Canada also suggests that work towards further developing the existing Early Warning Indicator (EWI), as well as at least one other EWI, be prioritized to help understand the cumulative and causal factor(s) related to this current observed decrease in narwhal abundance as well as the overall trend in narwhal condition and abundance and health of the marine ecosystem in Eclipse Sound and Milne Inlet.	Baffinland conducts a number of marine mammal monitoring programs that, collectively, enable the effective monitoring of Project effects on marine mammals in the RSA. For example, the marine mammal aerial survey program has clearly demonstrated that it is effective in detecting a large-scale displacement, as described in the 2021 April technical memorandum. Baffinland will continue to engage with the Marine Environmental Working Group (MEWG) with regards to the development and refinement of EWIs. On March 22, 2021 Baffinland released the most current version of the Marine Monitoring Plan's TARP's and Action Toolkits as part of its responses to Post-Hearing Questions related to Phase 2 (Appendix 12, Attachment 1A). The MMP TARP's include a number of indicators and thresholds related to narwhal that would achieve the same objective as EWI's. Through the MEWG, Parks Canada and other interested parties will continue to have input on the development and refinement of EWI's, and Baffinland looks forward to receiving substantive submissions to that effect.
3	PC-2	Reference: Section 1, PDF p.2. *"Golder recommends additional Project-related monitoring be undertaken by Baffinland; in particular aerial based surveys in 2021 to obtain an abundance estimate for the Eclipse Sound summer stock, as well as instrumentation of narwhal with satellite tags during early season ice conditions to fill data gaps associated with narwhal interactions with icebreaking."*	Has the Qikiqtaaluk Wildlife Board's recent guidance regarding direct handling of wildlife by researchers (e.g., for tagging) and the unknown impacts of COVID-19 on terrestrial and marine mammals been considered in monitoring plans?	None of Baffinland's proposed 2021 marine mammal monitoring programs involve direct interaction with marine mammals or any handling of marine wildlife, so the referenced guidelines are not applicable and there is no potential for human to marine mammal COVID-19 transmission in this case. The proposed tagging study for implementation in 2022 does not involve live-capture of narwhal, but rather relies on remote application of the tags on to the animals with the tags remaining on the animal for only a limited duration (on the order of days to weeks). This type of satellite tracking approach is a relatively non-invasive method to gather extensive high-resolution behavioural data sets regarding narwhal responses to vessels and other anthropogenic sources.
4	PC-3a	Reference. Section 1, p.2; Section 4.1, p.19; Section 5.1, p.51. *Same as above.*	Have alternative non-invasive research methods such as land-based theodolite tracking to monitor fine scale behavioural impacts (dive time, reorientation rates, swim speed, etc.) around shipping been considered? This type of work could potentially be added to the existing Bruce Head monitoring site. These types of methods may also capture more individual variation in behavioural responses to shipping (e.g., capturing mother-calf pairs, groups, individuals, etc.).	Yes, Baffinland gave consideration to various research methods, but did not select theodolite tracking for the following reasons. Theodolite systems are fairly limited in their ability to monitor fine-scale movements of toothed whales that typically travel in large clusters or groups, and that dive for extended periods such as narwhal. Theodolite tracking is generally more effective for larger baleen whales which spend a larger proportion of time at the surface and move slowly and in a predictable manner. Theodolite tracking of narwhal was performed by LGL during previous years' monitoring efforts at Bruce Head (i.e., prior to 2017). During these years, tracking of narwhal was generally limited to the area within a few hundred meters of the Bruce Head shore, and surveys were typically short in duration as individuals or groups were often quickly 'lost' as they dove to even shallow depths. The use of Unmanned Aerial Vehicle (UAV) or drone surveys at Bruce Head has been adopted since 2019 as an alternative, non-invasive approach to recording fine-scale behavioural responses of narwhal to shipping. Through the use of UAVs to monitor narwhal behaviour, high-resolution video and positional data may be obtained simultaneously, allowing the data analyst to review the event in greater detail than would be provided through theodolite tracking alone. UAV surveys also provide an opportunity for monitoring narwhal in closer proximity to the shipping lane rather than simply in the nearshore Behavioral Study Area (BSA). UAV surveys were first implemented at Bruce Head in 2019 and will continue to be implemented during future monitoring years.

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5	PC-3b	*Same as above.*	Are there plans for more directed behavioural studies other than satellite tagging?	Yes, Baffinland plans on and has executed alternative behavioural studies other than satellite tagging. Baffinland monitors behavioural response of narwhal to shipping using a multiple lines of evidence approach. Since the start of shipping operations, this has included many different study designs that have allowed for direct evaluation of narwhal responses to shipping in their natural environment. Aside from tagging, this has included ship-based behavioural monitoring, shore-based behavioural monitoring, UAV-based behavioural monitoring, acoustic-based behavioural monitoring and aerial survey programs. There are limited further options available for in-field behavioural studies on this species, and none that are capable of yielding as useful information as that obtained via satellite tagging (which offers continuous three-dimensional tracking of animals across extended ranges and time periods which can then be overlaid with detailed vessel movements and ice conditions). The currently proposed tagging study (for implementation in 2022) does not involve live-capture of narwhal, but rather relies on remote application of the tags on to the animals with the tags remaining on the animal for only a limited duration (on the order of days to weeks). This type of satellite tracking approach is a relatively non-invasive method to gather extensive high-resolution behavioural data sets regarding narwhal responses to vessels and other anthropogenic sources. As an advisory member of the Project, we encourage Parks Canada to identify a suitable data-equivalent behavioural study design that could be adopted as an alternative to tagging should they be aware of one, through the regular MEWG process.
6	PC-4a	Reference: Section 4.1., PDF p.4. *"The objective of Leg 2 surveys were to obtain abundance and density estimates of marine mammals in the RSA during the open-water season including an annual abundance estimate for the Eclipse Sound and Admiralty Inlet narwhal summer stocks."*	Was the leg 2 survey done at assumed peak local abundance before migration back to overwintering areas?	The Leg 2 survey was completed during the month of August. Historical tagging data indicate that narwhal belonging to the Eclipse Sound and Admiralty Inlet summer stocks start their fall outmigration in mid to late September (Dietz et al. 2001, Heide-Jørgensen et al. 2002, Heide-Jørgensen et al. 2003, and Dietz et al. 2008). This is consistent with available IQ that indicated the out-migration of narwhal from the Eclipse Sound summering grounds occurs primarily between September and November. "In August and September, narwhal will be found in the Milne Inlet area of Eclipse Sound; this is where calving activities occur. In October and November, narwhal will migrate back out to Baffin Bay through Eclipse Sound and Pond Inlet to overwinter" (p. 159 of JPCS 2017 / TSD #03) "There is some narwhal hunting in Milne Inlet at this time of year (the group indicated the movement of narwhal on the map). By October the narwhal are moving out of the area." (p. 153 of JPCS 2017 / TSD #03) "During the fall in September, October narwhal migrate southward before the ice forms, when the weather is getting colder during the fall they migrate through here, in September, October" (p. 5 of NWMB 2016). Baffinland acknowledges some degree of narwhal movement between Eclipse Sound and Admiralty Inlet is possible during August (DFO 2020). This is why Baffinland revised its aerial survey design to include surveying both summer stock areas (Eclipse Sound and Admiralty Inlet) during the Leg 2 aerial surveys (this has occurred since 2019). The low coefficients of variation (CVs) obtained for the 2019 and 2020 narwhal aerial surveys suggest that these surveys are being conducted during peak local abundance periods as the low CVs are primarily a result of most animals being clustered in their preferred summering areas in the RSA during the photographic surveys (Milne Inlet, Koluktoo Bay and Tremblay Sound), rather than in Eclipse Sound and Navy Board Inlet where narwhal groups are more spread out and the survey data is primarily collected via visual observer methods (conventional distance sampling) rather than via photographic surveys. Dietz, R., Heide-Jørgensen, M.P., Richard, P.R., and Acquarone, M. 2001. Summer and fall movements of narwhals (Monodon monoceros) from northeastern Baffin Island towards northern Davis Strait. Arctic. 54: 244-261. Dietz, R., Heide-Jørgensen, M.P., Richard, P.R., Orr, J., Laidre, K., and Schmidt, H.C. 2008. Movements of narwhals (Monodon monoceros) from Admiralty Inlet monitored by satellite telemetry. Polar Biol. 31: 1295-1306.

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				DFO. 2020. Information related to the delineation of the Eclipse Sound and Admiralty Inlet narwhal stocks. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2020/048. Heide-Jørgensen, M.P., R. Dietz, K.L. Laidre and P. Richard. 2002. Autumn movements, home ranges and winter density of narwhal (Monodon monoceros) tagged in Tremblay Sound, Baffin Island. Polar Biol. 25:331–341. Heide-Jørgensen, M.P., Dietz, R., Laidre, K., Richard, P., Orr, J., and Schmidt, H.C. 2003. The migratory behaviour of narwhals (Monodon monoceros). Can. J. Zool. 81: 1298-1305. Jason Prno Consulting Services Ltd (JPCS). 2017. Technical Supporting Document (TSD) No. 03: Results of Community Workshops Conducted for Baffinland Iron Mines Corporation's – Phase 2 Proposal. Report submitted to Baffinland Iron Mines Corporation. January 2017. Nunavut Wildlife Management Board (NWMB). 2016. Qikiqtarjuaq Narwhal IQ Interview Report. Prepared by Sheila Oolayou, Inuit Qaujimajatuqngit Coordinator for the NWMB. 10 November 2016.
7	PC-4b	*Same as above.*	Did BIM consult with communities on when Narwhal stop moving before they migrate back to wintering grounds?	Community members are regularly consulted on all aspects of the monitoring programs, as part of annual planning and follow-up meetings for the monitoring programs and as part of regular community engagement, notably with the MHTO, including in 2020. Inuit have provided the following documented observations respecting narwhal fall migration, which Baffinland has taken into account in selecting timing for aerial surveys: "In August and September, narwhal will be found in the Milne Inlet area of Eclipse Sound; this is where calving activities occur. In October and November, narwhal will migrate back out to Baffin Bay through Eclipse Sound and Pond Inlet to overwinter" (p. 159 of JPCS 2017 / TSD #03) "There is some narwhal hunting in Milne Inlet at this time of year (the group indicated the movement of narwhal on the map). By October the narwhal are moving out of the area." (p. 153 of JPCS 2017 / TSD #03) "During the fall in September, October narwhal migrate southward before the ice forms, when the weather is getting colder during the fall they migrate through here, in September, October" (p. 5 of NWMB 2016). These Inuit observations are consistent with available scientific studies that suggest narwhal start their fall migration in mid to late September (Dietz et al. 2001, Heide-Jørgensen et al. 2002, Heide-Jørgensen et al. 2003, and Dietz et al. 2008). Dietz, R., M.P. Heide-Jørgensen, P. Richard and M. Acquarone. 2001. Summer and fall movements of narwhals (Monodon monoceros) from Northeastern Baffin Island towards Northern Davis Strait. Arctic 54:244-261. Dietz, R., M.P. Heide-Jørgensen, P. Richard, J. Orr, K. Laidre and H.S. Schmidt. 2008. Movements of narwhals (Monodon monoceros) from Admiralty Inlet monitored by satellite telemetry. Polar Biology. 31: 1295-1306. Heide-Jørgensen, M.P., R. Dietz, K.L. Laidre and P. Richard. 2002. Autumn movements, home ranges, and winter density of narwhals (Monodon monoceros) tagged in Tremblay Sound, Baffin Island. Polar Biology. 25: 331-341. Heide-Jørgensen, M.P., K.L. Laidre, Ø. Wiig, M.V. Jensen, L. Dueck, L.D. Maiers, H.C. Schmidt, and R.C. Hobbs. 2003. From Greenland to Canada in ten days: Tracks of bowhead whales, Balaena mysticetus, across Baffin Bay. Arctic 56(1): 21-31. Jason Prno Consulting Services Ltd (JPCS). 2017. Technical Supporting Document (TSD) No. 03: Results of Community Workshops Conducted for Baffinland Iron Mines Corporation's – Phase 2 Proposal. Report submitted to Baffinland Iron Mines Corporation. January 2017.

Cmt. #	ID #	Reviewer's Detailed Comment	Reviewer's Question/Recommendations	Baffinland's Response
8	PC-5	Reference: Section 3.2, PDF p.7. "This suggests the calf presence (calving success) at Bruce Head is still occurring at a rate that is consistent with pre-shipping conditions…"	How is calf success defined? This is normally associated with a measure of calf survival which doesn't seem to be the case here, but rather more of a binary calf presence.	Calving success includes a component of calf birthing and calf survival. As indicated, the April 2021 technical memorandum presents a preliminary summary of 2020 narwhal monitoring results. It reported a measure of calf birthing in a similar proportion to past years which indicates that a measure of calving success for this year is being achieved. The survival of the 2020 calves will be assess in 2021 through the continual monitoring of the Early Warning Indicator (EWI). The EWI monitors for changes in the proportion of calves and yearlings across years. The inclusion of yearlings in the EWI provides a measure of calf survival. Detailed reporting on the EWI (proportion of calves and yearlings) results are presented in the 2020 Bruce Head Shore-based Monitoring Program Report (Golder 2021). Golder. 2021. Draft 2020 Bruce Head Shore-based Monitoring Program. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-269-R-RevB-33000. 12 May 2021.
9	PC-6	The last Marine Monitoring Plan that Parks Canada has reviewed is from 2019. As a result, Parks Canada has not reviewed the draft version referred to here. Reference: Section 5.1, PDF p.30. *"The draft Marine Monitoring Plan (Baffinland 2021)…"*		The draft Marine Monitoring Plan (MMP) referenced in the Preliminary Summary of 2020 Narwhal Monitoring Programs refers to the MMP TARP and Mitigation Toolkit, submitted with Baffinland's response to Post-Hearing Questions regarding the Phase 2 Proposal (Appendix 12, Attachment 1A).
10	PC-7	Parks Canada supports Baffinland's commitment to integration of Inuit Qaujimajatuqangit noted in section 5.2 of the report and suggests that this must be prioritized when interpreting the results of this report and when developing mitigations. Reference: Section 5.2		Baffinland reconfirms its commitment to IQ consideration and integration and will continue to work with QIA, the Hamlet of Pond Inlet and the MHTO on this topic.
11	PC-8	Of the five mitigation options presented in section 5.4.1 of the Preliminary Summary of Narwhal Monitoring Programs, only options 1 and 5 appear to provide enhanced mitigation beyond what is already committed to in the "Summary of Baffinland Commitments for the Phase 2 Expansion Project [current to April 1, 2021; DRAFT]", which provides commitments related to icebreaking that will begin in the 2021 shipping season. These include commitments to spring (DFO 3.4.4 NEW (1)) and fall transit restrictions (DFO 3.4.4 NEW (2) and (3)). Reference: Section 5.4	As part of an adaptive management strategy for enhanced mitigation Parks Canada would like to see mitigation options that are more robust than those already committed to.	Parks Canada's interpretation of the enhanced mitigation measures listed in Section 5.4.1 is incorrect. Options 2, 3 and 4 would see no icebreaking in 9/10ths or greater ice concentrations (Option 2) or conditional icebreaking in 9/10ths or greater ice concentrations based on observed narwhal presence/absence (Options 3 and 4). Present and future commitments, should Phase 2 be approved, allow for shipping in 9/10ths of greater ice concentrations as long as the ice concentration can be confirmed by ice charts, satellite imagery, or other vessel based surveillance technology. Moving forward with the enhanced mitigation outlined under Option 2 for 2021 represents a relatively precautionary approach towards adaptive management compared to the alternative use of Options 3 or 4. Furthermore, Option 1 is not significantly more precautionary than Option 2, as the average difference in days between the dates that 9/10ths (July 27th) and 6/10ths (July 30th) ice concentrations are no longer present along the shipping route is 3 days, compared to the 8 days that typically elapses between break up (July 19th) and when Baffinland would be able to ship, on average, under Option 2 (July 27th). For a greater understanding of historical ice contraction dates please see Appendix 1. Additionally, Baffinland would encourage Parks Canada as an advisory member of the MEWG to suggest "more robust" mitigation options with a corresponding biological rationale and consideration of feasibility for implementing if they have the expertise to do so.

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			QIA	
12	QIA-1a	We cannot review this thoroughly without methodological details, particularly as they relate to aerial survey design and analysis. QIA therefore had P. Richard review the 2019 aerial survey report methods, as they were presumably the same. There is an arithmetic error in the 2019 survey report, which casts some doubt on the accuracy of other calculations. Table 2 sums the Eclipse Sound and Admiralty Inlet 2019 surveys incorrectly (38,771 rather than the correct sum of 38,677). Also, the CVs of the sum of the two areas in 2019 and 2020 are identical, which is surprising given that the CVs of the single area estimates are different in both years They could be the results of typos or rounding errors. Accurate population estimates are required for trend analysis. Reference: Memo Introduction, p.1, general.		There was an error in the reported combined stock abundance in the 2019 aerial survey report. The reported value of 38,771 for the combined Eclipse and Admiralty stock will be corrected to 38,677 in the Final 2020 aerial survey monitoring report., which will be issued following receipt of the MEWGs June 24 2021 comments on the report. The source of the error stems from a corrected value for 'survey effort' for the 2019 Admiralty Inlet survey which resulted in a revised abundance estimate for the Admiralty Inlet stock. This revised abundance estimate was not carried over to the combined stock value in the 2019 aerial survey report. All statistical tests using the corrected value of 38,677 have been re-run and this did not change the statistical significance of any of the comparisons. The reported CV values for the combined Eclipse Sound and Admiralty Inlet stocks were accurate for the 2019 and 2020 reported values in the April 2021 technical memorandum. However, when using the corrected abundance estimate for the combined stock in 2019, the CV for the combined 2019 abundance estimate should be corrected to 0.11.
13	QIA-1b	Based on the 2019 survey report, and assuming methodological and reporting similarities for the 2020 survey, it is unclear how the availability correction factor was applied. Golder uses an availability correction of 3.16 but the source they quote (Watt et al. 2015a) is not the correct reference. It does not give any such correction factor. Another Watt et al. 2015 report does give 3.18 as a correction factor (Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (Monodon monoceros) in the Canadian High Arctic. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/044. v + 13 p.). The 0-2m narwhal surface time used to derive the correction factor was 31.6%, perhaps explaining the error above-mentioned. Reference: Memo Introduction, p.1, general		We confirm methodological and reporting similarities between the 2019 and 2020 survey reports, and acknowledge that the reference originally cited is the incorrect Watt et al. (2015) publication and should be the other Watt et al. (2015) publication referenced below. However, the availability correction factor stated in the report (3.16) is correct for narwhal observed in late August. On p.4 of Watt et al. (2015), it is stated: "In late August, narwhals (n = 24) spent an average of 31.6 ± 0.86 % of their time in the 0-2 m bin". The correction factor is derived from this value by using the following equation: 1/31.6*100 = 3.16. The correction factor of 3.18 (1/31.4*100) is used for surveys conducted in mid-August, or earlier. This is outlined in Table 2 of the 2019 and 2020 Marine Mammal Aerial Survey Reports (Golder 2020,2021). Golder. 2020. 2019 Marine Mammal Aerial Survey. Final Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-191-R-Rev0-22000. 5 August 2020. Golder. 2021. Draft 2020 Marine Mammal Aerial Survey. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-270-R-RevB-39000. 22 April 2021. Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (Monodon monoceros) in the Canadian High Arctic. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/044. v + 13 p.
14	QIA-1c	The 2019 survey report's Table 16 gives corrected abundances from photographic surveys with all CVs equal to 0.04. Reference: Memo Introduction, p.1, general	Is that correct or is it an unedited copy and paste [referencing all survey CVs being equal to 0.04]? It is unlikely that the CVs of the estimates are identical in all surveys. It would be informative to see more significant decimals on these values to judge whether they are correct.	The reported CVs are correct. The CV values for Table 16 to multiple decimal places are: 0.04199, 0.04471, 0.03692, 0.03794, 0.03798, 0.03701, and 0.04255, respectively. The CVs in the report are presented in the same format (two decimal places) that is typically presented in the reporting of marine mammal aerial survey abundance estimates, including previous DFO aerial survey publications. Adding addition decimal points in the reporting would not provide any additional benefit with respect to technical verification of the survey results.

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15	QIA-1d	It would also be useful to get an appendix of the detailed visual transect and photographic survey data from both 2019 and 2020 surveys, including transect maps with overlaid sightings to assess the results. Reference: Memo Introduction, p.1, general		The survey effort (km) and sightings for each survey are presented in the 2019 and 2020 Marine Mammal Aerial Survey Reports for Leg 1 and Leg 2 surveys (Golder 2020, 2021). Appendix B in both reports provide the daily flights, including transect maps overlaid with sightings. The 2020 Report was circulated to the members of the MEWG on May 13, 2021. Note that the purpose of releasing expedited preliminary 2020 survey results to the MEWG was to allow for adequate time for consultation and adaptive management planning prior to the 2021 field season, and as this was a preliminary summary additional details planned for release as part of regular reporting were not included. Golder. 2020. 2019 Marine Mammal Aerial Survey. Final Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-191-R-Rev0-22000. 5 August 2020. Golder. 2021. Draft 2020 Marine Mammal Aerial Survey. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-270-R-RevB-39000. 22 April 2021.
16	QIA-1e	The output of the mark-recapture distance sampling (MRDS) analyses should be provided in another appendix. Reference: Memo Introduction, p.1, general		The mark-recapture distance sampling models along with the AIC values are presented in Appendix D of the 2020 Marine Mammal Aerial Survey Report (Golder 2021) which was circulated to the members of the MEWG on May 13, 2021. Note that the purpose of releasing expedited preliminary 2020 survey results to the MEWG was to allow for adequate time for consultation and adaptive management planning prior to the 2021 field season, and as this was a preliminary summary additional details planned for release as part of regular reporting were not included. Now that the 2020 draft Marine Mammal Aerial Survey Report has been provided to the MEWG, there is no need to include this as an appendix to the memo. Golder. 2021. Draft 2020 Marine Mammal Aerial Survey. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-270-R-RevB-39000. 22 April 2021.
17	QIA-2	Re: "Despite the limited information to reliably attribute the primary causal factors..." This is a failure of the monitoring program. If monitoring cannot reliably identify causal factors (and the role of Project activities specifically), it's not effective and potential Project-related effects are not being effectively identified. Project-related effects that aren't being identified won't be mitigated. Reference: Section 1, PDF p.1 [Introduction]		Baffinland disagrees with this suggestion. Baffinland has clearly demonstrated that its monitoring programs are capable and, in fact, highly effective at detecting impacts on narwhal, including detection of potential effects of non-Project effects (i.e., pile driving noise). It is unreasonable to assume that Baffinland is responsible for monitoring and detection of all external non-Project stressors on narwhal, particularly when details on these stressors are poorly understood and when Baffinland not has no direct influence or responsibility for the monitoring of other projects, including the application of mitigation strategies. QIA's comment does, however, highlight the need for all parties of the MEWG to share any information available to them to help understand all of the various factors (whether related to the Project or not) that could affect narwhal. Baffinland has shared the information derived from its robust monitoring program that detected changes to narwhal distribution during 2020 in order to inform its own activities going forward, but also to support other proponents in the area (such as the Pond Inlet Small Craft Harbour Project) in considering modifications to their own activities to limit potential effects on narwhal in the 2021 season. It is also suggested that government can and should carry out more general monitoring in the RSA in order to provide further data to help understand narwhal distribution in future years. In the absence of full scientific certainty regarding causal factors, Baffinland has applied a precautionary approach as applied to its own activities that could be a potential contributing factor, and has proposed to apply enhanced mitigations during the 2021 shipping season. The determination of causal factors requires long-term monitoring, and the effects of the Project in conjunction with other anthropogenic and natural effects must be studied during a longer temporal scope (not a single season). Our forward-looking approach for combining behavioural analysis with acoustic and abundance surveys will allow us to study larger data sets and effects directly related to the Project. Baffinland is not in the position to, nor is it responsible for investigating the effects of external anthropogenic sources not related to the Project, however, is willing to collaborate and contribute to regional monitoring initiatives for cumulative assessment.

Cmt. #	ID #	Reviewer's Detailed Comment	Reviewer's Question/Recommendations	Baffinland's Response
18	QIA-3	Reference: Section 1. PDF p.1 [Introduction]	What does "precautionary Project-based operational measures for shoulder season shipping" mean? What measures?	Despite the lack of certainty that Project-related activities contributed to the 2020 decline, Baffinland has committed to applying additional mitigations to its operations during the 2021 shipping season. In doing so, Baffinland is taking a precautionary approach to minimize any potential Project-related effects that could contribute to impacts on narwhal. For additional information of the degree of precaution in Baffinland's planned 2021 mitigations, please see Baffinland's response to PC-8. Given the information derived from Baffinland's 2020 monitoring program that supports the view that pile driving likely contributed to the 2020 decline as well, it is Baffinland's hope that a precautionary approach is also taken towards the construction of the Small Craft Harbour during the 2021 season to limit the potential for cumulative effects.
19	QIA-4	RE: "unmitigated cumulative activities". Reference: Section 1, p. 2 [Introduction]	What did Baffinland's cumulative effects assessment (CEA) include here, and how will that guide adaptive management?	The Pond Inlet Small Craft Harbour Project (the Project) was submitted to NIRB and NPC in May 2017, and given it was not a reasonably foreseeable project at the time the CEA for the Mary River Project and ERP was prepared, the Project was not required to be considered in Baffinland's CEA. Based on submissions by the proponent to NIRB and NPC respecting the Pond Inlet Small Craft Harbour, construction was originally anticipated to be completed within two years from the start of construction in summer 2018, and concluding in fall 2019. The screening was circulated by NIRB for public comment and government parties, including PC, CIRNAC, TC, ECCC, DFO and GN, provided comments and no concerns were raised at that time respecting potential for cumulative effects of the marine infrastructure project with Mary River Project shipping (it does not appear QIA elected to submit any comments on the screening). The NIRB Screening Report for the Project explicitly acknowledges the Mary River Project is an active project in the area and generally notes that "the potential for cumulative impacts to terrestrial wildlife and habitat, fish and fish habitat, marine mammals, migratory birds, water quality, soil quality and ground stability, air quality, cultural and archaeological resources, and traditional wildlife harvesting pursuits from the proposed marine infrastructure and quarry activities, and other projects occurring in the region has been identified and considered in the development of the NIRB's recommendations. Terms and conditions recommended for each of these projects are expected to reduce any residual impacts, and as such would limit or reduce the potential for cumulative effects to occur." As for QIA's question respecting adaptive management in relation to cumulative effects from various projects occurring within the RSA, in accordance with Section 7.8 of the NIRB Guidelines for the Mary River Project, "if any impact is identified and verified beyond the Proponents sole responsibility or capacity, the Proponent shall make best efforts to identify other responsible parties in order to mitigate the impact collectively". Given that Baffinland's robust monitoring program has identified that pile driving to support the Pond Inlet Small Craft Harbour likely contributed to the changes to narwhal distribution observed in 2020, Baffinland anticipates that the MEWG presents an opportunity to collaboratively and quantitatively evaluate the cumulative impacts of these activities on marine mammal VECs, and to develop appropriate mitigation measures for managing identified residual effects, as well as develop suitable monitoring programs for verification of impact predictions and the functionality of the introduced mitigation measures. Also see response to DFO-2.
20	QIA-5	The preliminary review identified three causal factors - acoustic disturbance from 2020 icebreaking, acoustic disturbance from impact pile driving for small craft harbour (SCH) construction, and increased killer whale presence. Reference: Section 1, PDF p.2 [Introduction]	What about open-water shipping? Why is not considered a potential causal factor? Similarly, what about the volume of vessel traffic?	See response to PC-1a.

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21	QIA-6	Reference: Section 1, PDF p.2 [Introduction]	How can drones assess body conditions? Why not hunter observations?	The use of drones allows for recordable visual evidence that can be referenced and replicated annually as part of the shore-based narwhal monitoring program. Drones can be used for detailed aerial photogrammetry, in which high resolution photographs are analyzed during the post-processing stage in order to evaluate body condition of free-ranging narwhal. This tool offers a non-invasive approach to quantitatively track the condition of narwhal over time, potentially allowing for mitigation before decreased body condition results in mortality. There are numerous examples in the literature in which aerial photogrammetry has been used very successfully as a tool to evaluate the body condition of marine mammals (Perryman and Lynn 2002; Miller et al. 2012; Durban et al. 2016; Christiansen et al. 2016,2018; Fearnback et al. 2018; and Fearnbach et al. 2020). This is also an accessible tool that can be used to consult with community members in future - photographs are sharable and Inuit may choose to share further observations based on their own knowledge as related to the contents of the photographs. Baffinland believes hunter observations are equally valuable in reporting on narwhal and plans to have further discussions with the MHTO around the potential for a community based monitoring program to be run in 2021. Christiansen, F., Dujon, A. M., Sprogis, K. R., Arnould, J. P. Y., & Bejder, L. (2016). Noninvasive unmanned aerial vehicle provides estimates of the energetic cost of reproduction in humpback whales. Ecosphere. 7(10). Christiansen, F., F. Vivier, C. Charlton, R. Ward, A. Amerson, S. Burnell and L. Bejder. 2018. Maternal body size and condition determine calf growth rates in southern right whales. Marine Ecology Progress Series. 592: 267–281. Durban, J. W., Moore, M. M., Chiang, G., Hickmott, L. S., Bocconcelli, A., Howes, G., … Leroi, D. J. (2016). Photogrammetry of blue whales with an unmanned hexacopter. Marine Mammal Science. 32: 1510–1515. Fearnback, H., J.W.Durban, L.G. Barrett-Lennard, D.K. Ellifrit and K.C. Balcolm. 2020. Evaluating the power of photogrammetry for monitoring killer whale body condition. Marine Mammal Science. 36: 359-364. Fearnbach, H., Durban, J. W., Ellifrit, D. K., & Balcomb, K. C. (2018). Using aerial photogrammetry to detect changes in body condition in endangered Southern Resident killer whales. Endangered Species Research. 35: 175–180. Miller, C. A., Best, P. B., Perryman, W. L., Baumgartner, M. F., & Moore, M. J. (2012). Body shape changes associated with reproductive status, nutritive condition and growth in right whales Eubalaena glacialis and E. australis. Marine Ecology Progress Series. 459: 135–156. Perryman, W. L., & Lynn, M. S. (2002). Evaluation of nutritive condition and reproductive status of migrating gray whales (Eschrichtius robustus) based on analysis of photogrammetric data. Journal of Cetacean Research and Management. 4: 155–164.
22	QIA-7	Reference: Section 1, PDF p.2 [Introduction]	Were larger vessels used on average in 2020 compared to previous years?	Yes, the average vessel (cargo size) in 2020 increased to 75,792 mt compared to an average of 71,756 mt in period of 2015 - 2019. The increase was due primarily to the usage of larger, newly chartered panamax bulk carriers in 2021 (Admiral Shmidt and Vitus Bering).

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23	QIA-8a	During early (leg 1) surveys, prior to start of icebreaking, very few narwhal had progressed into Milne Inlet "due to a large consolidated ice field present in western Eclipse Sound which appears to impede southbound access". Large numbers of narwhal, including "many" mother/calf pairs, were present in the RSA, as "narwhal were largely concentrated within this ice field amongst several prominent ice leads when icebreaking began". Starting the shipping and icebreaking season under this scenario, when large numbers of narwhals are present in limited open-water habitat, is particularly worrisome. Project Term and Condition 120 stipulates that when a vessel is in the vicinity of marine mammals, "[w]ildlife will be given right of way. Furthermore, "[w]hen marine mammals appear to be trapped or disturbed by vessel movements, the vessel will implement appropriate measures to mitigate disturbance, including stoppage of movement until wildlife have moved away from the immediate area". Narwhal were clearly present early in the season, before icebreaking started but while SCH construction was occurring. The integration of Inuit observations of narwhal presence before and during SCH construction should be prioritized. Reference: Section 3.1 Marine Mammal Aerial Survey Program, pp.3-4.		As was previously committed to QIA through the MEWG, during 2019 Baffinland attempted to capture noise from the MSV Botnica transiting through various ice concentrations to assess the accuracy of noise modelling completed for the Project and to understand the sound levels and durations of exposure events associated with icebreaking transits at the start of the shipping season. Due to ice conditions, this was not accomplished in 2019, and accordingly, based on recommendations made by the MEWG the program was run again in 2020. The Captain of the MSV Botnica was provided coordinates for the acoustic recorders and instructed to travel over these, to ensure success of the monitoring program. Under normal operating circumstances (i.e. without the acoustic monitoring program underway), vessel captains would seek the path of least resistance to avoid transiting through heavier ice concentration and would in turn avoid narwhals who may also be congregating in leads that overlap with the Project shipping route. For clarity, no reports of ship strikes of narwhal were observed as a result of shipping during the spring shoulder season, and the proportion of immatures observed during 2020 appeared consistent from previous years despite shoulder season shipping activities.
24	QIA-8b	Preventing disturbance to mother/calf pairs in narrow leads should be a top priority for mitigation/adaptive management measures. Appropriate thresholds for adaptive management are needed, which should include the cessation of shipping and/or delays in starting the shipping season as required. Reference: Section 3.1 Marine Mammal Aerial Survey Program, pp.3-4.		Baffinland is committed to delaying the start of the 2021 shipping season until there is a continuous path of 8/10th's or less ice (inversely, Baffinland has committed not to ship through 9/10ths of greater concentrations of ice). The biological value in this is that it significantly reduces the potential for Baffinland to ship through ice leads where narwhal, including narwhal in mother/calf pairs are present. This mitigation will be applied in addition to the already conservative application of 24-hour transit restrictions that serve to substantially minimize the time and extent that narwhal are potentially being disturbed during their migratory period and the start of the shipping season. For clarity, the proportion of immatures (calves and yearlings) observed during 2020 appeared consistent from previous years despite shoulder season shipping activities.
25	QIA-8c	Combined ES-AI abundance was similar to previous years (2013 and 2019). Narwhal either went elsewhere (east Baffin?) or weren't picked up by the surveys (and for the latter, we need additional info such as clumping factors, shoreline survey coverage, etc.). Reference: Section 3.1 Marine Mammal Aerial Survey Program, pp.3-4.	If combined ES-AI estimate was similar to previous years, how could there have been "potential displacement of EC stock to AI"?	If a potential displacement of the Eclipse Sound stock to Admiralty Inlet had occurred, it would be expected that the combined Eclipse Sound–Admiralty Inlet estimate would remain similar between years. This is indeed the case, as reported in the April 2021 technical memorandum. When comparing abundance estimates between years it is important to remember that these reported values remain estimates and that they should not be considered absolute values. The variability that exists in the calculation of these estimates is represented in the 95% confidence intervals (CIs) that are reported alongside these abundance estimates. Comparing the range of values provided by the 95% CIs is a more representative indicator of changes in regional abundance than comparing only the mean abundance estimate values.

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26	QIA-9	The use of a Z test to compare annual estimates may be inappropriate because the error distribution of these survey estimates is unlikely to be Normal (vs a non-parametric test such as Mann-Whitney or Kruskal-Wallis). Furthermore, enough surveys exist to be analyzing trends to the extent possible, rather than making single comparisons among a set of surveys. Golder (MEWG meeting) proposes to conduct the 2021 survey without observers (i.e., photo only). Reference: Section 3.1 Marine Mammal Aerial Survey Program, p.5	How will this change affect comparisons with earlier surveys and thereby trend analysis?	The T test and Z test are the recommended statistical analyses in Buckland et al. (2001) for comparisons between two distance sampling estimates. It is generally suggested that a log transformation should be considered before the test if the CV is much beyond 20 % (Laake 2006). In the current situation, we do not compare two values that have a CV beyond 20 % and therefore did not use a log transformation before the test. Had the Z test formula recommended by Laake (2006) been used, this would not have changed the statistical significance of the comparisons made between the combined narwhal abundance estimates for 2013/2019 or 2013/2020. The Mann-Whitney or Kruskal-Wallis tests mentioned above are not appropriate for comparisons between survey years since we only have one abundance estimate per year. Only the two most recent yearly datasets (2019 and 2020) have sufficiently low CVs to enable trend analysis. Additional years of data are required to enable this analysis (see Golder 2020, Appendix C – Power Analysis). During the 13 May 2021 MEWG meeting, Golder did not state that the 2021 marine mammal aerial surveys would be conducted without observers (i.e., photographic survey only). The 2021 marine mammal aerial survey methodology was not discussed during this specific MEWG meeting. Similar to previous survey years, the 2021 marine mammal aerial surveys will be conducted using a combination of visual line-transect sampling with high-resolution aerial photographic surveys in marine mammal high density areas. Only the 2021 ringed seal survey methodology was discussed during the May 2021 MEWG meeting. The ringed seal survey will be conducted without observers (infrared video and photography only) as this is the preferred methodology for ringed seal surveys and the method used by DFO for its previous ringed seal surveys (which will be used for interannual comparisons). Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., and L. Thomas.2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, Oxford, xv + 432 p. Golder. 2020. 2019 Marine Mammal Aerial Survey. Final Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-191-R-Rev0-22000. 5 August 2020. Laake, J.L. 2006. 'Distance Sampling' Google Group conversation. Subject heading: "Re: significance testing & calculating unweighted global or". 10 March 2006.
27	QIA-10	Re: observations of nursing providing evidence that females continued to carry out critical life functions in the presence of vessel traffic - continuing critical life functions does not mean that they, and the population as a whole, are not under severe stress, that the female can continue to do so over the longer term, or that the calf is getting the resources it needs. Reference: Section 3.2 Bruce Head Program, p.6		The assertion that females are under severe stress is inconsistent with currently available science. Based on the Southall et al. (2007) framework for severity responses, cessation of reproductive activities, including nursing, is categorized as a "moderate severity" response. As evidence through drone monitoring program exhibits females continuing to conduct reproductive activities, including nursing in the presence of vessel traffic, the notion that they are experiencing severe stress is inconsistent with best available science on the subject. Baffinland plans to continue to conduct monitoring studies in order to establish longer term analysis on reproductive activities and calf health. Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R., Jr., Kastak, D., Ketten, D. R., Miller, J. H., Nachtigall, P. E., Richardson, W. J., Thomas, J. A. and Tyack, P. L. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals. 33(4).
28	QIA-11	A > Sighting rates at Bruce Had were. ca half or less of all previous years. 50% decline in relative abundance being only "marginally significant" (p=0.058 for effect of year) suggests monitoring programs may not have sufficient power to detect biologically significant effects. Reference: Section 3.2 Bruce Head Program, p.6		While this particular finding may be only "marginally significant" statistically, it is still biologically informative. Of note, the relative abundance and distribution (RAD) data obtained through the 2020 Bruce Head Program supports the findings obtained through the 2020 aerial survey program in that there was a decrease in number of narwhal observed in the RSA throughout the open-water season. This finding suggests that data obtained through the Bruce Head Program are useful in predicting annual fluctuations in narwhal abundance throughout the RSA, particularly in the event that aerial surveys are not carried out in a given year going forward.

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29	QIA-12	Calf presence is not a measure of calving success. The proportion of calves in the sample has stayed similar but there are only half as many whales. This suggests either avoidance of preferred habitation the part of 50% of the females with calves or that those females did not produce calves and no longer needed to use this habitat. Reference: Section 3.2 Bruce Head Program, p.7	Did the proportion of females with calves in Admiralty Inlet Change? What monitoring data are available that can be mined for additional information?	The Early Warning Indicator (EWI) monitors changes in the proportion of juvenile narwhal (calves and yearlings) among years. The inclusion of yearlings provides an indicator of calving success. The full details reporting on the EWI are available in the Draft Bruce Head Shore-based Monitoring Program Report (Golder 2021) that was distributed to the MEWG on May 13 2021. Baffinland will continue to monitor this EWI from the Bruce Head Shore-based Monitoring Program in 2021. This will contribute to the evaluation of whether preferred habitat was avoided in 2020 and impacted calving success. If there is an indication that narwhal calving success off Bruce Head is impacted in 2021, changes in the proportion of calves in Admiralty Inlet can be assessed through the archived photographic data collected during the 2019–2021 marine mammal aerial surveys in Admiralty Inlet as part of a follow-up investigation. Photographs are continuously taken at 1,000 ft during visual observations. Photographs of areas where visual observers recorded narwhal can be examined to ascertain group composition and, through this process, provide a proportion of calves/yearlings in Admiralty Inlet. Golder. 2021. Draft 2020 Bruce Head Shore-based Monitoring Program. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-269-R-RevB-33000. 12 May 2021.
30	QIA-13	The closest observed nursing was 4.25 km from a vessel, meaning there is potentially a vessel disturbance swath over 8 km wide for nursing females. Reference: Section 3.2 Bruce Head Program, p.7		While 4.25 km from a vessel was the closest observation recorded, it does not indicate this is the closest nursing may have occurred. The survey in question (i.e., FF106) occurred when the focal group was 4.25 km away from the shipping lane and no data was available at closer distances (i.e., the survey was only 10 minutes in duration based on drone battery limitations). The current UAV-based focal follow program dataset is still being developed and making any inference based on such a limited dataset is not possible at this time. In 2020, a total of 84 narwhal focal follow surveys were successfully undertaken in the RSA (near Bruce Head and Koluktoo Bay) (representing 7.3 h of recorded behaviour). This included 16 focal follows when ships were present (representing 1.3 h of recorded behaviour) and 68 focal follows when ships were absent (representing 6.0 h of recorded behaviour). Only eight of the 16 focal follow surveys involving ship transits included calves or yearlings. Of these, nursing was observed during two surveys (FF104 and FF106). Nursing occurred 63% of the time for FF104 and 52% of the time for FF106. Additional drone monitoring is required to increase the sample size of focal follows conducted in the presence of vessel traffic in order to allow for a quantitative analysis of narwhal behaviour between shipping exposure and non-exposure periods, and to potentially identify a vessel disturbance range specific to nursing behaviour.
31	QIA-14	Re: "... the captain of the icebreaker was requested to travel a predetermined route directly over the underwater recording station...". Reference: Section 3m3 PAM during icebreaking operations, p.8	How does this work given committed mitigation which includes avoiding ice where possible? And does it align with the mitigation envisioned by Project Term and Condition 120? How representative were these transits in terms of ice conditions, vessel speed, etc.? Especially given that the Captain knew beforehand where the receiver was located.	See response to QIA-8a. Austin and Dofher (2021) provides details of the transits that were analysed, including the ice concentrations, vessel speeds, and compositions of the vessel convoys for each measured transit. We were able to measure sounds of the icebreaker transits in various ice conditions, and at various speeds as appropriate for the vessel at the time (the vessels transited at their safe operating speed for the conditions at the time). Austin, M.E. and T. Dofher. 2021. Underwater Acoustic Monitoring: Baffinland Iron Mines Shoulder Season Shipping 2019–2020. Document 02330, Version 1.0. Technical report by JASCO Applied Sciences for Golder Associates, Ltd.
32	QIA-15	"Although the MSV Botnica was shown to periodically generate high intensity sound while transiting through ice, findings suggest that these periods are brief and intermittent (i.e., on the order of minutes or less)." Parties require significantly more quantitative information here. Reference: Section 3.3 PAM during icebreaking Operation, p. 9		Detailed results from the acoustic measurements of the MSV Botnica in 2020 are provided in Austin and Dofher (2021). For example, Figure 6 in Austin and Dofher (2021) illustrates some of these intermittent spikes of noise. Similar figures are provided for each recorded transit in Appendix B of that report. Austin, M.E. and T. Dofher. 2021. Underwater Acoustic Monitoring: Baffinland Iron Mines Shoulder Season Shipping 2019–2020. Document 02330, Version 1.0. Technical report by JASCO Applied Sciences for Golder Associates, Ltd."

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33	QIA-16	Reference: Section 3.4 Discussion of Results, p.10	If Eclipse Sound/Admiralty Inlet combined numbers are statistically similar, what evidence is there to suggest that a portion of the Eclipse Sound stock were possibly displaced there? Wouldn't some animals then have had to be displaced elsewhere for estimated numbers to be similar?	The fact that the Eclipse Sound/Admiralty Inlet combined abundance estimate was similar is evidence that a portion of the Eclipse Sound stock was possibly displaced to Admiralty Inlet. If animals had been displaced elsewhere, the combined estimate in 2020 would be statistically lower. When comparing abundance estimates between years it is important to remember that these reported values remain estimates and that they should not be considered absolute values. The variability that exists in the calculation of these estimates is represented in the 95% confidence intervals (CIs) that are reported alongside these abundance estimates. Comparing the range of values provided by the 95% CIs is a more representative indicator of changes in regional abundance than comparing only the mean abundance estimate values.
34	QIA-17	Re: "[f]urther desktop analysis and information collection...", there is no mention here at all on how Inuit will be involved in any investigation, or how Inuit Qaujimajatuqangit will be integrated. Reference: Section 4 Potential Contributing Factors to 2020 Findings, p.10		IQ and community involvement are described in Section 5.2 of the Preliminary Summary of 2020 Narwhal Monitoring Programs. Baffinland also encourages QIA to share any specific suggestions they have about how Baffinland can better involve Inuit and integrate IQ in the desktop analysis and information collection. Baffinland also appreciates the contributions provided by the QIA, Hamlet of Pond Inlet and the MHTO through their written submissions and/or participation in the May 13, 2021 meeting of the Marine Environment Working Group (MEWG), where the technical memo and results were discussed. Baffinland has already contacted the QIA, the Hamlet of Pond Inlet and the MHTO to offer an opportunity to discuss and inform the 2021 adaptive management response plan, to be issued prior to the 2021 shipping season.
35	QIA-18	Reference: Section 4.1 Icebreaking Activities, p.11	There was 56 h of icebreaking in 2018, compared to 11 hours in 2019, and 22 h in 2020. How is this measured? Ice concentrations, etc.? How much ice, of what concentrations, did the MSV Botnica interact with?	The measurement is based on the total time (in hours) that the MSV Botnica travelled through ice concentrations greater than or equal to 9/10, over the course of the early shoulder season. Vessel transit information was based on AIS vessel tracking data obtained from exactEarth®. Ice concentrations were based on daily ice charts from the Canadian Ice Service. See also Appendix 2.
36	QIA-19	"During its first transit in the RSA in 2020, the MSV Botnica (escorting two carriers and two tugs) transited in close proximity to the leads where narwhal were confirmed to be holding." See above re: Project Term and Condition 120 and other mitigation committed to by the Proponent. Disturbance of narwhal when they have little open water habitat should not be permitted. Reference: Section 4.1 Icebreaking Activities, p.11		See Baffinland response to QIA-8a.
37	QIA-20	All this descriptive text information isn't very useful; it needs to be numerically summarized. As examples, information on the number of transits through each ice concentration class, amount of ice of each class engaged, the amount and locations of active icebreaking, etc. (some of this information is on page 13). Reference: Section 4.1 Icebreaking Activities, p.11		Please see Appendix 2.

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38	QIA-21	"Slightly more icebreaking occurred in 2020 than 2019, primarily because the icebreaker was required to transit through more extensive heavy ice conditions in order to pass directly over the two JASCO hydrophone stations at Bylot Island and ragged Island for the purpose of acquiring acoustic recordings of active icebreaking in 9-10/10 ice. Normally, the MSV Botnica would adhere to its standard practice of actively avoiding heavy ice conditions during transits along the shipping corridor unless these Areas could not be safely avoided." "As a result, narwhal were highly concentrated in the ice leads in Eclipse Sound, forming a more clumped distribution compared to 2019." This goes against the Proponent's committed mitigation steps (and PCC 120?) and is likely a significant contributor to the reduced narwhal numbers. Reference: Section 4.1 Icebreaking Activities, pp.12-13		See response to QIA-8a.
39	QIA-22	Re: the "... noticeable shift [after the icebreaker transit] in narwhal distribution from 21 to 22 July 2020 where narwhal appeared to move from the 4-6/10 ice area in north Milne to the 9-10/10 ice in Eclipse Sound (Figures 8 and 9)." Reference: Section 4.1 Icebreaking Activities, p.15	This sounds like vessel avoidance (and thus Project-related disturbance effects). Did they keep going to Admiralty Inlet or return to Milne Inlet?	The flight on 22 July was the last flight completed by the Leg 1 aerial survey team prior to their departure from Site. This was a function of the modified flight schedule in and out of Mary River due to COVID-19 restrictions. It is possible that this the observed shift was an avoidance response triggered by icebreaking, as suggested in the April 2021 technical memorandum, but it is also equally possible that this represented a natural tendency for narwhal to return to, or remain in the vicinity of, ice-covered waters even if open-water areas are accessible in close proximity. The MHTO indicated during the 13 May 2021 MEWG meeting that narwhal prefer being in ice covered waters due to optimal foraging opportunities (i.e., it offers a good place to feed on cod which are dependant on the ice). This is part of the uncertainty and limitations of the information that was available at the start of the 2020 shipping season. To try to resolve some of this uncertainty, Baffinland's 2021 marine mammal aerial surveys will be conducted over a continuous six-week period from mid-July until late August. This will increase our understanding of narwhal distribution in the RSA prior to and during the shipping season.
40	QIA-23	The movements of two tagged animals over limited time periods doesn't provide any information on habituation at the scales needed. Reference: Section 4.1 Icebreaking Activities, p.15		We do not disagree with the notion that data from two tagged animals are insufficient to understand overall narwhal behavioural responses to a transiting icebreaker during ice-covered periods. This is acknowledged in the caveat (re: data interpretation) provided on page 19 of the corresponding technical memorandum, which states the limited dataset (short temporal period during late shoulder season only) should be interpreted with caution. Inclusion of this data in the April 2021 technical memorandum is to ensure all available data is recognized and further data collection and analysis would provide additional information to fill existing data gaps. However, it would be a poor use of available data to not include this information in the present investigation evaluating all possible causes.

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41	QIA-24	"It is also possible that increasing ice concentration restricts movements by the animal, causing it to rely more heavily on the path created by icebreaking operations." This is unlikely, given narwhal adaptation to heavy ice conditions and potential for disturbance from vessels. Reference: Section 4.1 Icebreaking Activities, p.19		The possibility that narwhal use the path of transiting icebreakers has been substantiated from observations made by community members. Although it is true that narwhal have adapted to heavy ice conditions, it is also natural for any individual to use the path of least resistance, using that energy instead towards other behaviours, such as feeding or mating. There is potential for disturbance from the icebreaking vessels, however, as the narwhal become habituated to the vessel presence, they will transit paths if they deem it advantageous. Some community members have stated that it is possible that the icebreaking activities induce a temporary impact, and as narwhal habituate to the vessel presence, the path may actually create access for narwhals to use (page 20 of April 2021 technical memorandum). With implementation of enhanced mitigation measures to minimize icebreaking effects during 2021, further analysis of narwhal reaction and collaboration with community members, future studies can highlight narwhal use of icebreaker paths.
42	QIA-25	"… futher data collection and analysis is required to further evaluate this potential avoidance response." Narwhal and Inuit cannot afford to wait for more data collection and analysis, especially when the monitoring programs aren't providing information required (e.g. actual calving rates). Reference: Section 4.1 Icebreaking Activities, p.19		The current monitoring method for calving rate through the EWI is considered a reasonable and logistically feasible approach. Baffinland has acknowledged existing data gaps, which we intend to fill with the proposed monitoring programs for 2021 and in continued consultation with the MEWG. Through our past and proposed monitoring programs, the intention has been to collect as much information as reasonably possible, including further analysis through a 2022 early shoulder season narwhal tagging study, which will be designed in collaboration with MHTO, DFO and MEWG. Baffinland has applied a precautionary approach, in which we suggest proactive mitigation measures to reduce potential for Project-related effects on narwhal even in the absence of data that shows the Project had an effect on narwhal distribution in 2020. While Baffinland and its third party consultants have not identified any options at this time that we believe would be more effective than the EWI, if QIA has specific suggestions about additional monitoring programs that could provide information on actual calving rates, Baffinland is open to continuing these important discussions.
43	QIA-26	Re: Nanisivik, the scale of icebreaking was much smaller, involving few return trips, not recurring trips by multiple vessels over a protracted period. For example, in 1986, the icebreaking tanker MV Arctic was accompanied by the icebreaker des Groseilliers in Lancaster Sound enroute to Admiralty Inlet but was unaccompanied during icebreaking operations in the inlet, the Lady Franklin was accompanied at all times by the des Groseilliers and required icebreaking assistance in Admiralty Inlet (Cosens and Dueck 1993, Marine Mammal Sci. 9: p. 285). The mine required ca. 6 visits annually by ore vessels to transported a total of ca. 130,000 t of zinc and 10,000 t of lead concentrate annually to markets in western Europe and Louisiana (Fish 1979-- Can. Min. J. 100(9)). Reference: Section 4.1 Icebreaking Activities, p.20		Taking QIA's comments into consideration, Baffinland remains of the view that the Nanisivik Project is a highly relevant example to include for comparison to the Project. Although there may have been less icebreaker transits involved at Nanisivik, the icebreaking transits at Nanisivik occurred much earlier (June) and later in the season (November) than they do for the current Project, and by extension, in much heavier and spatially extensive ice conditions due to this timing of icebreaking (Cosens and Dueck 1988; 1993; LGL 1986; Finley et al. 1990). Icebreaking at Nanisivik involved breaking of land-fast ice; which does not occur in the RSA as per existing mitigation commitments (due to higher noise impacts and hunter safety considerations). Icebreaking operations at Nanisivik often involved two icebreakers simultaneously breaking ice (as noted by QIA above) (Cosens and Dueck 1993), which has not occurred in the RSA to date. These factors, both independently and collectively, would result in considerably more extensive underwater noise emissions, larger acoustic disturbance zones and longer disturbance periods for narwhal and other marine mammals at Nanisivik than would be experienced by marine mammals in the RSA based on current Project icebreaking. The purpose of including the Nanisivik mine studies (i.e., assessment of narwhal responses to icebreaking activities) was to ensure our investigation integrates all available relevant data that provides meaningful information on narwhal response behaviour to icebreaking activities in the RSA. By using established peer-reviewed data from a multi-year dataset, we are able to examine the results of other similar studies that provides valuable insight for our own monitoring programs. Because of the intensiveness of monitoring narwhals, it is important to acknowledge existing data relating to other projects experiences with Arctic shipping, and subsequently increase knowledge through current and future monitoring plans. Cosens, S.E. and L.P. Dueck. 1988. Responses of migrating narwhal and beluga to icebreaker traffic at the Admiralty Inlet ice-edge, N.W.T. in 1986. Pages 39- 54 in W. M. Sackinger and M. 0. Jeffries, eds. Port and ocean engineering under arctic conditions, vol. 2. University of Alaska Fairbanks, Fairbanks, AK. Cosens, S.E. and L.P. Dueck. 1993. Icebreaker noise in Lancaster Sound, N.W.T., Canada: Implications for marine mammal behaviour. Marine Mammal Science. 9(3): 285-300.

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				Finley, K.J., G.W. Miller, R.A. Davis and C.R. Greene. 1990. Reactions of belugas, Delphinapterus leucas, and narwhals, Monodon monoceros, to ice-breaking ships in the Canadian High Arctic, p. 97-1l7. Ln T.G. Smith, D. J. St. Aubin, and J. R. Geraci [ed.] Advances in research on the beluga whale, Delphinapterus leucas. Can. Bull. Fish. Aquat. Sci. 224. LGL Environmental Research Associates (LGL). 1986. Reactions of belugas whales and narwhals to ship traffic and ice-breaking along ice edges in the eastern Canadian high Arctic. Dep. of Indian and Northern Affairs Canada, Ottawa, Environmental Studies No. 37: 301 p.
44	QIA-27a	Reference: Section 4.2 Construction Noise from Small Craft Harbour in Pond Inlet, p.20	What did BIMC's cumulative effects assessment (CEA) include for small craft harbour (SCH) construction? How did the CEA inform monitoring and mitigation?	See response to QIA-4.
45	QIA-27b	Reference: Section 4.2 Construction Noise from Small Craft Harbour in Pond Inlet, p.20	These possible cumulative effects may continue in 2021 as the pile installation was not completed. What mitigation has been proposed by the two projects, or is being required by DFO?	Baffinland agrees with QIA that cumulative effects associated with the SCH construction project may occur in 2021. During the May 13 2021 MEWG Meeting, Baffinland presented to the MEWG currently available public information regarding plans for SCH construction, which includes plans for pile driving in July and August of 2021. Implementation of this project and its potential associated effects are beyond Baffinland's ability to influence or responsibility to monitor for. Baffinland looks forward to receiving additional information from the agencies responsible for this work on how effects of the Project will be mitigated and monitored for as part of the 2021 construction activities.
46	QIA-28	Pile driving started on 08 July, and large numbers of narwhal were present in leads before icebreaking started. This suggests that icebreaking had just as much of a role in reduced abundance as SCH construction activities. Pile driving did not preclude narwhal from entering Pond Inlet, Eclipse Sound, and Milne Inlet. Reference: Section 4.2 Construction Noise from Small Craft Harbour in Pond Inlet, p.20		The reference to large numbers of narwhal present in leads in July is not meant to imply they were occupied by the entire Eclipse Sound narwhal stock. During the month of July, narwhal are actively migrating into and potentially through the Eclipse Sound corridor to other summering stock areas. Narwhal detection rates calculated for the Leg 1 marine mammal aerial surveys in the ice leads cannot be interpreted or extrapolated as a density measure for large areas. They are only representative of the small bodies of open water that the leads occupy which correspond to a very small portion of the RSA. There is no evidence to support the notion that icebreaking had just as much a role in the reduced abundance as SCH construction activities, as suggested by QIA. Icebreaking has been identified as an activity having potentially played a role in the reduced narwhal abundance, as has the SCH construction activities (amongst other potential contributors). Currently available information does not enable us to determine if one of these specific activities was the sole driver of the observed change, if several of the activities in combination resulted in the observed change, whether another unknown factor was the cause, or whether the observed change was natural in occurrence. There is also no evidence to confirm that impact pile driving did not preclude a portion of the existing Eclipse Sound narwhal stock (or other stocks) form entering Eclipse Sound, as suggested by QIA, or drive them out of the RSA after being exposed to the sound from pile driving activities. It is well within reason that fewer narwhal entered Eclipse Sound due to pile driving. Animals may have also entered Eclipse Sound but then eventually departed when pile driving activities did not cease. Narwhal may have concentrated in the leads in 2020 because they were avoiding the open water area close to pile driving. If this was a cumulative effect, we currently do not have the information needed to assess whether narwhal in leads reacted to icebreaking in the same manner they would had no pile driving be simultaneously occurring. It is also possible that narwhal did not actively avoid either activity but rather shifted their distribution due to influences from other environmental processes (prey availability, ice conditions, killer whales). These are all possible scenarios for which there is inadequate information (or monitoring on the part of the respective proponents/agencies) presently available to resolve these uncertainties. In light of the existing uncertainty, Baffinland is proposing to implement additional mitigation measures and enhanced monitoring for the 2021 early shoulder shipping season. The proposed additional mitigation and monitoring being put forward aims to

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				avoid and/or further minimize impacts on narwhal from Project icebreaking, even if the underlying causal factor(s) for the observed decrease in narwhal abundance in Eclipse Sound is unconfirmed. This precautionary approach will allow for a simultaneous investigation of potential causal factors of the observed change while adjusting current shipping operations to reliably manage impacts from icebreaking on narwhal in the RSA. Although it is the proponent's responsibility to monitor for the potential effects of its project activities on the Eclipse Sound narwhal stock, Baffinland is not best situated to investigate and/or collect data on external sources of potential impacts on Eclipse Sound narwhal that may act in a cumulative or additive manner with Project-related impacts (e.g., SCH pile driving program in Pond Inlet). To that end, Baffinland remains committed to contributing to regional monitoring initiatives that take place within the RSA by either carrying out a portion of the monitoring / investigation directly, or supporting others through financial support (i.e. community based monitoring) and/or in kind support (i.e. government research). Additional discussion is required with relevant parties on this subject before more detailed planning can occur.
47	N/A	Reference: Section 4.2 Construction Noise from Small Craft Harbour in Pond Inlet, p.20	What was done, if anything, to address monitoring and mitigation deficiencies outlined in the monitoring report for the SCH construction?	N/A. Question is directed to DFO.
48	QIA-29	"JASCO's 2020 passive acoustic monitoring program detected sequences of impulsive sound in acoustic data collected during July and August 2020 near Bylot Island... [w]hile the origin of this impulsive sound has not yet been confirmed..." Reference: Section 4.2 Construction Noise from Small Craft Harbour in Pond Inlet, pp.22-23	Has this been subsequently confirmed? If so, how was it confirmed? if not, how will it be confirmed? Are Oceans North/Scripps data available for analysis?	Yes, the impulses recorded on July 13, 2020 near Bylot Island correspond exactly in timing with those presented in Appendix 6 of the "Pond Inlet Project - 2020 Construction Season Annual Report" prepared by Advisian Worley Group, confirming that these are the same impulses. The impulses detected at Bylot Island on other dates and times also exhibit the same characteristics, in terms of the temporal spacing between impulses and the frequency content and amplitude of the recorded sounds, and are believed to also have originated at the SCH. Baffinland has requested additional details on the timing for all impact pile driving at the SCH in 2020 to further verify additional recordings in Baffinland's data but to date this information has not been provided. Baffinland has suggested that DFO request acoustic data from Scripps Institute to assist in further understanding the spatial distribution of the impulsive noise. No update on that request has been provided to date.
49	QIA-30	There is little to no likelihood that increased killer whale presence caused such a significant decline in narwhal abundance. One-off observations of maximum numbers of killer whales seen aren't very useful from a monitoring perspective. Inuit have observed large numbers of killer whales in the past too (e.g., reports from Arctic Bay of 100). We know narwhal are well-accustomed to killer whale presence in north Baffin, as killer whales have been regularly present during the summers since at least the 1850s. Scientific research and IQ also provide significant information on how narwhal react to killer whale presence and how they behave. Narwhals typically adjust their distribution, e.g., remain close to shore in shallow water (or even temporarily beach) or seek out protection of sea ice if available. They do not generally depart the area completely, and killer whale presence and numbers (which also isn't necessarily any different than in past years) likely had little to no effect on population size (local distribution within Eclipse Sound would be expected to change, abundance would not). Reference: Section 4.3 Increased Killer Whale Presence, p.28		We generally agree that narwhal in the Arctic are familiar with the occurrence of killer whales in the RSA during their summer residency period. Although it is well documented that narwhal exhibit high-severity behavioural responses to killer whales (i.e., local displacement/avoidance, freeze behaviour, changes in vocal activity that persist beyond the exposure period), there has been no documented evidence of large-scale displacement of narwhal from their summering grounds due to killer whale predation. However, it is necessary to acknowledge the possibility of this occurring should predation pressure reach an upper tolerance limit in narwhal. This is no different from Parties suggesting that increased shipping could eventually reach an upper tolerance limit in narwhal that could lead to displacement. Both are possibilities, although only one is being actively monitored. Given that predation pressure presents a more immediate threat to narwhal than shipping considering the end result is mortality or serious injury rather than acoustic disturbance, it could be argued that displacement or changes in abundance from predation is likely to occur sooner than it would due to noise disturbance. By considering killer whale influences on narwhal abundance, we are neither incriminating predation as a reason for narwhal decline, nor are we ignoring its possibility for it possibly influencing narwhal decline. Its inclusion as a potential contributor is to ensure we examine all possibilities, including the cumulative effects imposed by natural predation in addition to anthropogenic stressors. The increase of killer whale predation has been well noted in the study area, through research as well as available IQ. In a recent publication, Lefort et al. (2020) estimated that killer whales in the Canadian Arctic (with an estimated population size of 163± 27 animals) could consume >1,000 narwhal during their seasonal residency period in Arctic waters. This study involved incorporation of local Inuit Knowledge as well as mark and recapture methods to determine relative killer whale abundance in the area.

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				Results suggested that with longer ice-free periods in the area, killer whale are able to enter previously inaccessible areas. Although the long-term effects of killer whale predation on narwhal abundance remain largely unknown, it would be naïve to eliminate the factor in our considerations. Lefort, K.J., C.J. Garroway and S.H. Ferguson. 2020. Killer whale abundance and predicted narwhal consumption in the Canadian Arctic. Global Change Biology. 26(8): 4276-4283.
50	QIA-31	"A detailed investigation of this potential factor [decreases in narwhal fitness] is beyond the scope of the present report but should be considered with the potential contributing factors discussed above." Reference: Section 4.4 Other Potential Factors to 2020 Findings	If it should be considered, then it is not beyond the scope of the report. What are BIM/Golder doing to address this?	As stated on p. 30 of the technical memorandum, other potential factors, such as narwhal fitness prior to their arrival on summering grounds, is outside the scope of the study because it assumes external factors not attributable to Project effects. Harvesters have noticed changes in narwhal body conditions that they have suggested may be due to changing predator/prey dynamics. This could be the result of various environmental impacts, including changing climate, or commercial fisheries affecting prey availability. This causal factor is outside of BIM's individual monitoring responsibility and capacity with respect to the 2021 adaptive management response. The comment on narwhal fitness was included in the technical memorandum to ensure all potential factors are acknowledged, even if the impacts are external to the Project. As stated elsewhere, to address gaps in regional monitoring that are outside of Baffinland's scope of responsibility with respect to Project-effects monitoring, Baffinland has committed to contributing to regional monitoring initiatives that take place within the RSA by either carrying out a portion of the monitoring / investigation directly, or supporting others through financial support (i.e. community based monitoring) and/or in kind support (i.e. government research). Additional discussion is required with relevant parties on this subject before more detailed planning can occur.
51	QIA-32	"Without corresponding confirmation of a moderate or high severity behavioural response in narwhal to shipping activities, it is appropriate to further investigate the potential sources of the observed stock decline in 2020...". QIA and Inuit strongly disagree. These criteria are not adaptive and not precautionary. They do not respect IQ, and offer little confidence that Baffinland can mitigate impacts. The draft Marine Monitoring Plan (Baffinland 2021) also hasn't been accepted by parties as sufficient (and QIA has identified significant issues with the draft plan that the Proponent has yet to address). Monitoring is limited and insufficient, with no currently-tagged narwhal and little consideration of IQ. This is the exact opposite of a precautionary approach. The decline in narwhal abundance from 2019 to 2020 was ca. 50% (and ca. 75% since 2004). That is a remarkable and worrisome change in the population distribution and/or abundance. The BIMC response will provide a basis for Inuit and others to judge the value of adaptive management for mitigating impacts, or the lack thereof. Golder's suggestions for monitoring and "mitigation" do little to address the significant decline of this narwhal stock and the potential role of Project activities. Reference: Section 5 Adaptive Management Response, pp.30-31		It is worth clarifying that the lower number of narwhal recorded in Eclipse Sound in 2020 does not indicate a 50% decline in narwhal abundance relative to the 2019 aerial survey (or a 75% decline relative to the 2004 survey results), given results of the combined estimate for the Admiralty Inlet/Eclipse Sound stocks. The fact that the Eclipse Sound/Admiralty Inlet combined abundance estimate was similar in 2020 to previous years (2013 and 2019), based on the statistical analysis and the overlap in the 95% confidence intervals (CIs)) suggests that a portion of the Eclipse Sound stock was possibly displaced to Admiralty Inlet (as opposed to removed from the population). If animals had been displaced elsewhere or if the Eclipse Sound stock had decreased in numbers, the combined estimate for Eclipse Sound and Admiralty Inlet in 2020 would have been statistically lower than in 2013 and 2019. This is not the case. The combined abundance estimate for 2020 was similar to that from 2013 and 2019.It is important, when comparing abundance estimates between years, to remember that these reported values remain estimates and that they should not be considered absolute values. The variability that exists in the calculation of these estimates is represented in the 95% CIs that are reported along side these abundance estimates. Comparing the range of values provided by the 95% CIs is a more representative indicator of changes in regional abundance than comparing only the mean abundance estimate values. Baffinland's recent actions in response to the 2020 aerial survey results demonstrate the value of our adaptive management program and our ability to quickly respond to unanticipated effects, to develop new mitigation measures for management of these observed changes, and to develop enhanced monitoring initiatives to further evaluate narwhal responses to shipping and other external potential stressors in the RSA as well as assess the functionality of the newly integrated mitigation measures. We strongly disagree with QIA's comment in that the proposed monitoring and mitigation measures do little to address the significant decline of this narwhal stock and the potential role of Project activities. The proposed additional mitigation and monitoring being put forward aims to avoid and/or further minimize impacts on narwhal from Project icebreaking, even if the underlying causal factor(s) for the observed decrease in narwhal abundance in Eclipse Sound is unconfirmed. This precautionary approach will allow for a simultaneous investigation of potential causal factors of the observed change while adjusting current shipping operations to reliably manage impacts from icebreaking on narwhal in the RSA.

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				Although it is the proponent's responsibility to monitor for the potential effects of its project activities on the Eclipse Sound narwhal stock, Baffinland is not best situated to investigate and/or collect data on external sources of potential impacts on Eclipse Sound narwhal that may act in a cumulative or additive manner with Project-related impacts (e.g., SCH pile driving program in Pond Inlet). To that end, Baffinland remains committed to contributing to regional monitoring initiatives that take place within the RSA by either carrying out a portion of the monitoring / investigation directly, or supporting others through financial support (i.e. community based monitoring) and/or in kind support (i.e. government research). Additional discussion is required with relevant parties on this subject before more detailed planning can occur.
52	QIA-33	"Golder recommends that Inuit Organizations identify how IQ is best integrated..." QIA, MHTO and other parties (including individual members of the public) have been providing information on this to the Proponent for years. Continued monitoring won't address Inuit concerns, and immediate mitigation is required. Reference: Section 5.2 IQ and Community Involvement, p.32		The covering letter to the Preliminary Summary of 2020 Narwhal Monitoring Programs confirms that Baffinland has proposed to implement an enhanced mitigation measure in 2021 despite the underlying causal factor(s) for the observed decrease in narwhal abundance in Eclipse Sound being unconfirmed. It is worth noting that a combination of monitoring and mitigation are essential to adaptive management as monitoring 1) identifies an approach towards, or an exceedance of, a threshold of concern, 2) can determine if an observed effect is project related or an anomaly based on its persistence in relation to project operations, and 3) can assess and improve the effectiveness of mitigation measures, should they be implemented.
53	QIA-34	Given the potential for cumulative effects, ongoing and future, DFO should step in to ensure mitigation measures are followed by the harbour project and that data are shared. To establish the level and extent of potential underwater noise disturbance from pile driving, additional data on noise transmission should be collected from a transect, or transects, that extend offshore from the source until it drops to less than ca. 100 dB. Reference: Section 5.3.2 Construction Noise from Small Craft Harbour in Pond Inlet, p.32-33		N/A. Question is directed to DFO.
54	QIA-35	QIA has been recommending additional KW monitoring (Annual Report reviews, MEWG meetings, etc.) for several years, so it is good to finally see acknowledgement of the importance of this. But ultimately, and as previously noted, killer whale presence is highly unlikely to be a significant contributor to the observed decline in narwhal, which has been occurring steadily since the 2004 DFO survey. Reference: Section 5.3.3 Increased Killer Whale Presence, p.33		Killer whale were not an indicator species for the Project, as identified in the FEIS for the marine mammal Valued Ecosystem Component (VEC), and therefore no follow-up monitoring of potential Project effects on killer whale is required. Killer whale are included in our Technical Memorandum solely to acknowledge their potential role in the decline of narwhal through predation, not to assess whether they are impacted by the Project. The objective of follow-up monitoring in the EIA process is to verify the accuracy of impact predictions made for a project or plan (that has been subject to EIA) and to determine the effectiveness of measures taken to mitigate the adverse environmental effects of a project, such to facilitate management and communication about the environmental performance of a project or plan (Marshall et al. 2005; Morrison-Saunders and Arts 2004; CEAA 2011, 2012). In accordance with standard EA practice, follow-up monitoring programs are not required for every Project effect pathway considered in the EIA. A follow-up program is required where the limitations in, or scientific certainty of, the impact predictions need to be verified (i.e., when an EIA practitioner's confidence in the significance determination is low or moderate), or where the effectiveness of mitigation requires confirmation (e.g. for non-standard mitigation or where new technology is being proposed). The nature of and need for follow-up is also informed by the sensitivity of the receptor to potential Project-related environmental effects that may be greater than predicted or where mitigation may be found to be ineffective. In the case of the current Project, Baffinland's practice is to undertake follow-up programs for those residual effects of the project identified as significant, those associated with low certainty/confidence, those associated with species of conservation concern (i.e., at risk species), and/or those considered as 'key issues' by local stakeholders and the general public (Macharia 2005; CEAA 2011). Killer whales do not trigger any of the above criteria and therefore follow-up monitoring programs specific to this species are not warranted.

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				See also response to QIA-30. Canadian Environmental Assessment Agency (CEAA). 2011. Follow-up programs under the Canadian Environmental Assessment Act. Originally released October 2002. Revised December 2011. Available at: https://www.canada.ca/content/dam/iaac-acei/documents/ops/ops-follow-up-programs-2011.pdf. Accessed February 2021. CEAA. 2012. Canadian Environmental Assessment Act, 2012. Amended 28 August 2019. Current to 24 February 2021. Macharia, S.N. 2005. A framework for best practice environmental impact assessment follow-up: a case study of the Ekati Diamond Mine, Canada. A thesis submitted to the College of Graduate Studies and Research in partial fulfillment of the requirements for the Degree of Master of Arts in the Department of Geography, University of Saskatchewan, Saskatoon, Saskatchewan. September 2005. Marshall, R., J. Arts and A. Morrison-Saunders. 2005. International Principles for Best Practice EIA Follow-up, Impact Assessment and Project Appraisal, 23(3): 175-181. Morrison-Saunders, A. and J. Arts. 2004. Assessing Impact: Handbook of EIA and SEA Follow-up, Earthscan James & James, London.
55	QIA-36	The "most conservative" of the options listed is the most precautionary, and therefore the one that should be used at minimum. The question here is "should Option 1 be more precautionary" (e.g., no icebreaking in >4/10ths)? Given the remarkable decline in narwhal presence/abundance, the more precautionary option of no ice breaking whatsoever should also be under consideration. Reference: Section 5.4 Enhanced Mitigation, p.33-36		In recommending shipping mitigations, Baffinland is taking an approach which proceeds in a careful and precautionary manner in light of the observed 2020 narwhal distribution changes. Principle 15 of the 1992 Rio Declaration on Environment and Development states that "[w]here there are threats of serious or irreversible damage; lack of full scientific certainty must not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (UNCED, 1992). Baffinland has also taken into consideration the Canadian Privy Council Office's A Framework for the Application of Precaution in Science based Decision Making About Risk (PCO, 2003) which sets out guiding principles for the application of the precautionary principle to science-based decision-making when the precautionary principle applies. As applied to the current situation, although there is not full scientific certainty regarding the extent to which Project activities caused or contributed to the observed changes, Baffinland is nonetheless recommending new mitigations and monitoring to be implemented in 2021. The CPO policy document states, "The real and potential impacts of making a precautionary decision (whether to act or not to act), including social, economic and other relevant factors, should be assessed." The proposed 2021 mitigations and monitoring will have a financial cost to Baffinland but we believe they are appropriate under the circumstances. Based on the current available information, implementing a further mitigation that would suspend icebreaking as suggested by QIA will not necessarily have any impact on narwhal distribution or abundance but it would cause significant negative economic effects to the Project and Parties that benefit from the success of the Project. Baffinland also anticipates that Parties responsible for implementation and oversight of SCH project will consider adjustments to their activities in 2021 in order to reduce the potential for cumulative effects on narwhal. Government of Canada, Privy Council Office. 2003. A framework for the application of precaution in science-based decision making about risk. Available at: http://publications.gc.ca/collections/Collection/CP22-70-2003E.pdf United Nations Conference on Environment and Development Rio de Janeiro, Brazil). (1993). Agenda 21: programme of action for sustainable development; Rio Declaration on Environment and Development; Statement of Forest Principles: The final text of agreements negotiated by governments at the United Nations Conference on Environment and Development (UNCED), 3-14 June 1992, Rio de Janeiro, Brazil. United Nations Dept. of Public Information.

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56	QIA-37	Option 2 - "… as the leads are unlikely to exist in 9/10 or greater ice concentrations" This is doubtful. Fractures such as leads occur in very close, compact, or consolidated pack ice, which can include 9/10 and 10/10 concentration. Reference: Section 5.4 Enhanced Mitigation, p.34-35		This was a typographical error in the technical memorandum and we thank QIA for flagging this. The statement should say leads are unlikely to exist when conditions are below 9/10ths. We know from 2020 that narwhal were present in the leads in ice concentrations of ≥9/10. Mitigation for Option 2 is that no icebreaker transits will occur in the RSA when ice concentrations of 9/10 or greater cannot be avoided along the shipping route.
57	QIA-38	Reference: Section 5.4 Enhanced Mitigation, p.34-35	Option 3 - when will BIMC/Golder present options for defining "sufficient narwhal absence"? How is BIMC/Golder defining an "aggregation" of narwhal?	As previously acknowledged by DFO, developing a defined trigger for 'sufficient narwhal absence' or 'narwhal aggregation in collaboration with DFO and Inuit organizations is likely not feasible within the time frame available before the 2021 shipping season. This was the primary reason why this specific mitigation option was not selected for implementation in 2021.
58	QIA-39	Reference: Section 5.1 Project Level, p.36	There is nothing listed re: IQ, no plans for integration?	Please see response to QIA-33.
59	QIA-40	Re: "drone-based aerial photogrammetry to estimate narwhal body condition", more information is needed. This is not likely to be as effective as other methods such as assessments of hunted animals, etc. The program would also require training data, as photos alone are not sufficient without associated morphometric information to link to body condition and health. Reference: Section 5.5.2 Regional Level, p.37		See response for QIA-21.
60	QIA-41	Reference: Section 5.5.2 Regional Level, p.37	Did the Proponent's CEA identify all these cumulative effects and consider ways to integrate them into monitoring plans and development of mitigation options?	Please see response to QIA-04.
65	QIA-5GENERAL	Pile driving has also occurred during the open-water season since 2018 and survey numbers were high in August 2019, when pile driving was also happening.		Baffinland has not been provided with information on pile driving that confirms this statement. Should QIA, GN and/or DFO have access to detailed information respecting this activity, Baffinland requests that it can be shared so this potential contributing factor to the 2020 narwhal distribution changes can be better understood.
DFO				
70	DFO-1a	In the Introduction on page 2 of the Technical Memo, Golder recommends that Baffinland undertake "instrumentation of narwhal with satellite tags during early season ice conditions to fill data gaps associated with narwhal interactions with icebreaking." Narwhal tagging data during icebreaking activities could provide valuable data and information that could help to inform impacts to narwhal from project-related icebreaking activities, and could be beneficial to inform future mitigation and adaptive management measures. However, DFO notes that currently there are health and safety restrictions imposed by both the Government of Nunavut and by Baffinland due to the COVID-19 pandemic. Narwhal tagging at this time may be a significant challenge,	DFO recommends that Baffinland consider alternative monitoring methodologies to acquire this information in the event that COVID-19 restrictions remain in place throughout 2022.	See response to PC-3a.

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		therefore Baffinland should investigate alternative monitoring methods in order to obtain this type of information.		
71	DFO-1b	Same as above.	DFO further recommends that Baffinland engage with the Mittimatalik Hunters and Trappers Organization and the Nunavut Wildlife Management Board to determine the approach preferred by these organizations for the acquisition of this data.	Baffinland has committed resources in 2021 to actively engage with the MHTO and the NWMB with respect to the planning initiatives for the potential future acquisition of narwhal and killer whale tagging data in the RSA that would support the overall monitoring initiatives. Baffinland is presently developing an engagement plan for this purpose which it plans to share with these parties in the near future for their consideration. The timing of a tagging program has been tentatively proposed for July 2022 acknowledging the high level of engagement and discussions that would need to be completed prior to a program moving forward, recognizing the importance of Inuit being actively involved in all aspects of this program.
72	DFO-2	In the Introduction on page 2 of the Technical Memo, three potential factors are identified that may have caused decreased abundance of narwhal within Eclipse Sound in 2020. These factors include: Baffinland's icebreaking operations, increased killer whale presence within the Regional Study Area (RSA), and pile-driving activities at the Pond Inlet Harbour. DFO acknowledges that Baffinland has committed to further investigate these contributing factors through desktop analyses and additional monitoring, but has not specifically indicated if they will be further investigating each of these potential causal factors individually, or if Baffinland will also be further investigating combined and cumulative impacts of these factors. DFO notes that Baffinland does have a responsibility to determine and monitor combined and cumulative impacts within the impacted Project Area.	DFO recommends that an analysis of combined and cumulative effects for these factors should be undertaken by Baffinland, including the potential accumulation of project-related impacts on narwhal since project-related shipping began in 2015.	To undertake a thorough quantitative cumulative effects assessment of shipping operations in conjunction with the Pond Inlet Marine Infrastructure Project, Baffinland would require the following information from the Government of Nunavut – Community and Government Services (GN-CGS), as proponent of the Pond Inlet Marine Infrastructure Project: - Acoustic modelling results undertaken in support of the Fisheries Act Authorization application for the Pond Inlet Marine Infrastructure Project, which would include detailed sound propagation modelling results for all in-water works with potential to result in adverse acoustic impacts on marine mammals and fish, which would include vibratory pile driving, impact pile driving and dredging activities. - detailed acoustic monitoring results and/or raw acoustic recordings for in-water pile driving and dredging activities undertaken in 2020 in support of the Pond Inlet Marine Infrastructure Project, and from previous years if pile driving or dredging also occurred in those years. - a detailed description on the methods used to compute the root-mean-square (RMS) sound pressure levels (SPL)s reported in the construction monitoring report (Advisian, 2021), as well as peak SPL and cumulative sound exposure levels (SELs). - Description of the hydrophone systems used for acoustic monitoring of in-water works, including hydrophone make/model, sensitivity and frequency response specifications. - Details of the non-compliance events regarding exceedances of underwater noise/overpressure thresholds during active pile driving at the site in 2020 (e.g., exceedance notice for pile driving on July 22 that was submitted to DFO) - pile driving logs or hammer logs from the pile driving contractor that provide the actual times and dates when all impact pile driving occurred in 2020 (and previous years is applicable) - detailed description of the type of dredging activities performed in 2020 and dredging logs from the dredging contractor that provide the actual times and dates when all dredging occurred in 2020 (and previous years if applicable). A quantitative cumulative effects assessment cannot be completed without the above information. Baffinland notes a request to DFO to be provided this information was sent on April 22 2021, however DFO indicated in a response on the same day that they would not be seeking to share this information with Baffinland. Baffinland's responsibility with respect to cumulative effects monitoring for the Project is prescribed in Project Certificate conditions 110, 111 and 112; with monitoring requirements all directly related to vessel noise. Although it is Baffinland's responsibility to monitor for the potential effects of its Project activities on the Eclipse Sound narwhal stock, the lack of publicly available information on the Pond Inlet Marine Infrastructure Project impedes the ability for Baffinland to properly assess effects of construction activities in Pond Inlet on marine mammals in the RSA. By extension, Baffinland is not best situated to investigate and/or collect data on this external source of

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				potential impacts on Eclipse Sound narwhal that may act in a cumulative or additive manner with Project-related impacts. Baffinland remains committed to contributing to regional monitoring initiatives that take place within the RSA by either carrying out a portion of the monitoring / investigation directly, or supporting others through financial support (i.e. community based monitoring) and/or in kind support (i.e. government research). Additional discussion is required with relevant parties on this subject before more detailed planning can occur. For the benefit of the NIRB and in support of the above initiatives, Baffinland requests that DFO describe what its internal responsibilities are for cumulative effects monitoring on a regional scale with respect to managing cumulative effects on marine mammals in Canadian Arctic waters. We request that DFO provide its proposed strategy for cumulative effects assessment in this regard, and describe what level of cumulative effects monitoring has been completed by the Government of Canada to date in support of this work, given that DFO has acknowledged that the study and management of cumulative effects is of critical importance to DFO, and is required to support management decisions by multiple DFO sectors (Murray et al. 2020). Advisian. 2021. Pond Inlet Project – 2020 Construction Season Annual Report. Fisheries Act Authorization Nos: 17-HCAA-00551 / 19-HCAA-01020. Prepared for Fisheries and Oceans Canada. 30 January 2021. 307071-01148. Murray, C., Hannah, L. and Locke, A. 2020. A Review of Cumulative Effects Research and Assessment in Fisheries and Oceans Canada. Can. Tech. Rep. Fish. Aquat. Sci. 3357: vii + 51 p. Available at: https://waves-vagues.dfo-mpo.gc.ca/Library/40851576.pdf
73	DFO-3	Figure 13 on page 26 of the Technical Memo depicts the transects followed for Leg 1 of the Marine Mammal Aerial Survey Program, and includes a satellite image of ice conditions within Eclipse Sound. Within the area of the consolidated ice field, it appears that the survey plane largely followed ice leads west of Pond Inlet where narwhal congregated. It is unclear to DFO whether this survey methodology was intentional, and it is unclear if the satellite image presented is representative of ice conditions on the day that Leg 1 survey activities were undertaken.	DFO recommends that Baffinland clarify how survey transects were determined for Leg 1 of the Marine Mammal Aerial Survey, and that Baffinland confirm if the satellite image of ice conditions in figure 13 is from the same day that Leg 1 survey activities were undertaken.	The satellite image present in Figure 13 is from 13 July 2020. This is the same day that the survey was flown. The objective on Leg 1 of the marine mammal aerial survey program was to determine the relative abundance and distribution of narwhal, and other marine mammals, near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations. Because large areas of the RSA are covered in ice concentration of greater than 9/10 ice, systematic transects would not be recommended in these areas since narwhal could not be seen under the ice and density estimates would underestimate actual narwhal numbers. Thus, the methodology used during Leg 1 applied two different types of transects to be flown depending on ice conditions. A pre-established grid of systematic transect lines was surveyed in areas in the RSA with <9/10 ice concentrations. This included open-water areas and areas associated with low to moderate ice cover. Dedicated transect lines were surveyed along open-water leads associated with consolidated sea ice (^{3}9/10 ice concentrations), along the floe edge, and along the ship route. Additional details on Leg 1 survey methodology and results are provided in the 2019 and 2020 Marine Mammal Aerial Survey Program Reports (Golder 2020,2021). When interpreting the results of the Leg 1 aerial surveys, it is important to consider that flight paths are not meant to represent structured, systematic survey grids. At times, the aerial surveys followed open water leads, shorelines where the leads are present and the nominal ship trackline to record the extend of narwhal distribution in open water, in areas with ice cover and along the ship trackline. Golder. 2020. 2019 Marine Mammal Aerial Survey. Final Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-191-R-Rev0-22000. 5 August 2020. Golder. 2021. Draft 2020 Marine Mammal Aerial Survey. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-270-R-RevB-39000. 22 April 2021.

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74	DFO-4	On page 5 of the Technical Memo, Golder indicates that Leg 2 aerial surveys were undertaken from August 28-29, 2020. Previous marine mammal aerial surveys conducted by DFO have taken place prior to August 25th in order to ensure that narwhal have not yet left Eclipse Sound due to fall migration (Watt et al., 2015). The Leg 2 survey for the Eclipse Sound narwhal stock was completed on August 29, 2020, and DFO is concerned that this may have coincided with when narwhal were starting their fall migration out of Eclipse Sound. This may have impacted Golder's 2020 narwhal abundance estimate calculated for this stock.	DFO recommends that the narwhal abundance estimate calculated from the 2020 Leg 2 aerial survey be compared to the narwhal abundance estimate calculated from 2019 Leg 2 Survey 5, as this survey was completed from August 29-30, 2019 and may provide a suitable comparison for the 2020 Leg 2 aerial survey results. Alternatively, the 2020 Leg 2 aerial survey narwhal abundance estimate could also be compared to the average of the abundance estimates for Surveys 3, 4, and 5 from the 2019 Leg 2 aerial survey. These surveys were completed on August 21-22, 25-27, and 29-30 of 2019, and capture potential fluctuations in narwhal abundance as they begin to migrate out of Eclipse Sound.	Survey 5 conducted in 2019 was not included in the abundance estimate because we had reasons to believe that the narwhal numbers collected during this survey were not an accurate representation of the actual numbers present in the RSA. Survey 5 was not able to cover the fjords. There were killer whales in the RSA during Survey 5 and fjords are, at times, used as a refuge by narwhal from killer whales. The fjords had been fully surveyed during the 2019 Surveys 3 and 4 which is why these surveys were used as more accurate estimates for the 2019 narwhal population abundance in Eclipse Sound. In addition, a large narwhal aggregation was missed in between survey lines near Pond Inlet. The survey only recorded one sighting of four narwhals near Pond Inlet, but the Inuit researchers participating in the aerial surveys informed the survey team that a large number of narwhal had passed by Pond Inlet, travelling east, earlier in the day and that hunters had been out harvesting. For these reasons, and because the total count for Survey 5 was less than either photographic counts from Surveys 3 and 4 (the photographic counts are considered more accurate counts because they cover an entire areas), it was determined that the abundance estimate from Survey 5 is not likely to be an accurate representation of abundance of narwhal in the RSA in 2019, and therefore, not worth comparing with 2020 results. While the calendar dates of the 2019 Survey 5 and the 2020 Survey 3 (used as the 2020 abundance estimate) are more closely linked, a number of additional factors can also affect narwhal abundance in a region from year to year. The reasons why Survey 5 was not retained for the 2019 Eclipse Sound abundance estimate calculate are outline above. Conditions in 2020 were different. The number of narwhal recorded during Survey 3 on 29 August 2020 were statistically significantly higher than the number of narwhal recorded during Survey 1 on 20 August 2020, which is why Survey 3 was used as the abundance estimate for Eclipse Sound in 2020 (Golder, 2021). This also supports the argument that narwhal were not migrating out of Eclipse Sound during the 2020 marine mammal aerial survey period. To try to resolve some of the uncertainty around the timing of the marine mammal aerial surveys, Baffinland's 2021 marine mammal aerial surveys will be conducted over a continuous six-week period from mid-July until late August. Golder. 2021. Draft 2020 Marine Mammal Aerial Survey. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-270-R-RevB-39000. 22 April 2021. Watt, C.A., M. Marcoux, N.C. Asselin, J.R. Orr and S. Ferguson. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (Monodon monoceros) in the Canadian High Arctic. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/044. v + 13 p
75	DFO-5	Further, on page 5 of the Technical Memo, Golder indicates that the Coefficient of Variation (CV) calculated for the 2020 Leg 2 Eclipse Sound narwhal abundance estimate is 0.03, but no details are provided on how this analysis was performed. DFO is concerned there are no additional details on the survey methodology provided in the Technical Memo to justify and explain this low CV. These additional details would provide certainty that the low CV is accurate.	DFO recommends that Baffinland provide further details on whether the survey was completed with full photographic coverage or if a mix of photographic and visual methods were used in some strata, and if a CV was calculated for strata surveyed using multiple methods. Additionally, DFO recommends that Baffinland provide details on what values were used as a correction factor to account for availability bias, and if not, a justification of why a correction factor was not applied. DFO further recommends that a detailed analysis on the CV calculation be provided for further review.	The details of the 2020 marine mammal aerial survey methodology are provided in the monitoring report (Golder 2021). The methodology is consistent with the 2019 marine mammal aerial surveys (Golder 2020). This was communicated to the MEWG during the 25 June 2020 MEWG meeting (teleconference call due to COVID-19 restrictions). The 2019 and 2020 surveys were conducted using DFO's adaptive survey plan that includes visual surveys combined with photographic surveys in areas of high narwhal concentration. The 2019 and 2020 CVs were calculated using the same methodology. This methodology was described in detail in Section 2.5.3 of the 2019 Marine Mammal Aerial Survey Report (Golder 2020). The availability bias correction factor used in the 2019 and 2020 analyses were 3.16 and 2.92 for photographic and visual surveys, respectively, based on the late August tagging data (Doniol-Valcroze et al. 2015; Watt et al. 2015). These values were provided in Table 2 of the 2019 and 2020 Marine Mammal Aerial Survey Report (Golder 2020,2021). Doniol-Valcroze, T, Gosselin, J.F., Pike, D., Lawson, J., Asselin, N., Hedges, K., and S. Ferguson. 2015. Abundance estimates of narwhal stocks in the Canadian High Arctic in 2013. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/060. v + 36 p. Golder. 2020. 2019 Marine Mammal Aerial Survey. Final Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-191-R-Rev0-22000. 5 August 2020.

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			DFO acknowledges that the requested details are potentially included in the Draft 2020 Marine Mammal Aerial Survey Program Report, but expects that these details are additionally provided in Baffinland's June 4th response to comments on the Technical Memo.	Golder. 2021. Draft 2020 Marine Mammal Aerial Survey. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-270-R-RevB-39000. 22 April 2021. Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (Monodon monoceros) in the Canadian High Arctic. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/044. v + 13 p.
76	DFO-6a	On page 7 of the Technical Memo, Golder states: "Results from the 2020 behavioural and group composition study components are consistent with existing impact predictions in the FEIS in that ship noise effects on narwhal will be limited to temporary, localized avoidance behaviour."	Finally, DFO recommends that Baffinland provide clarification on what is meant by 'temporary, localized avoidance behaviour', and if Baffinland considers displacement of narwhal outside of the RSA to be 'temporary, localized avoidance behaviour'.	Temporary localized avoidance behaviour represents a measurable deviation from pre-exposure behavior for a period not extending beyond the acoustic exposure period (i.e., short term effect). Temporary, localized avoidance would be consistent with animals returning to their pre-exposure behavior over a short time frame following exposure. In contrast, a response would be considered 'long-duration' if it lasted up to several hours, or enough time to significantly disrupt an animal's daily routine, similar to that described in Finneran et al. 2017. Displacement of narwhal outside of the RSA, or from the RSA as a whole, would not be considered temporary, localized avoidance. With respect to narwhal recorded in the study area for the 2020 Bruce Head Shore-based Monitoring Program, narwhal behavioural responses to shipping were limited to temporary, localized avoidance responses consistent with previous years' findings and similar to results from the 2017/2018 narwhal tagging study. Finneran, J., E. Henderson, D. Houser, K. Jenkins, S. Kotecki, and J. Mulsow. 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical report by Space and Naval Warfare Systems Center Pacific (SSC Pacific). June 2017. 194 pp.
77	DFO-6b	It is unclear to DFO what is meant by 'temporary, localized avoidance behaviour', and if displacement of narwhal out of the RSA would still qualify as 'temporary, localized avoidance behaviour'. Further, DFO would like to note that 'temporary, localized avoidance behaviour' may still qualify as a significant impact if the disturbance is recurrent. Further on page 7, Golder additionally states: "Similar to previous years, calves were observed during most sampling days and mean annual proportion of calves observed in 2020 (11.3%) was higher than three of the previous years […]".	DFO notes that it would be beneficial for Baffinland and Golder to establish an estimate of standard error for the annual proportion of calves to account for variability each year, and recommended that Baffinland and Golder create an estimate of variation during the May 13th MEWG meeting hosted by Baffinland for further discussion on the Technical Memo. Baffinland indicated that this could be further discussed during a MEWG meeting anticipated for June 2021. DFO looks forward to further discussing this recommendation during the next scheduled MEWG meeting, but requests that Baffinland provide further detail on how an estimate of variation could be established in their June 4th response to comments.	As confirmed during the 13 May 2021 MEWG Meeting, Baffinland has agreed to further discussing with DFO the recommendation for Baffinland to establish an estimate of standard error for the EWI (proportion of calves and yearlings) to account for variability each year. Further details of the methodology (e.g., whether the variability should be calculated using daily or weekly values) will be discussed during the upcoming June 2021 MEWG meeting.
78	DFO-6c	On page 7, it is indicated that two narwhal nursing events occurred within 4.25 km and 9.08 km of a vessel. DFO acknowledges these findings, and recommends that narwhal nursing events continue to be monitored in the future through the marine mammal monitoring programs, as these are important behaviours that could be impacted by project-related shipping activities.	DFO additionally recommends that Baffinland provide any additional info acquired on these narwhal nursing events identified in the 2020 monitoring, such as the duration of each event, and the number of different nursing sessions that took place during these events.	Nursing was observed in the presence of vessels during FF104 and FF106. FF104 was 3 minutes and 21 seconds in duration and included nursing 63% of the time, occurring consistently from approximately 1 minute into the survey onward. FF106 was 10 minutes in duration and included nursing 52% of the time, occurring consistently from approximately 3 minutes into the survey until approximately 8 minutes and 30 seconds. Also see response to QIA-13. A detailed account of all focal follow surveys, including those involving nursing, is provided in the Draft 2020 Bruce Head Shore-based Monitoring Report (Golder 2020), which was distributed to the MEWG on May 13 2021.

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79	DFO-7	Figure 2 on page 9 of the Technical Memo demonstrates the two locations of JASCO's acoustic recorder stations, however it is unclear how deep the acoustic recorders are located, as well as the water depth in these locations. Underwater depth of the acoustic recorder plays an important role in the sound levels measured by the recorder. Overall, more information is required to understand and interpret the results of the underwater acoustic modelling during icebreaking activities. In particular, information on ice condition, as well as icebreaking activities, together with the maximum recorded noise is required. DFO notes that the recorders are at are different locations than what was anticipated in the noise modelling.	DFO recommends that Baffinland provide further information the depth of the acoustic recorder, the total water depth at their location, ice condition, icebreaking activities and the maximum recorded noise for each recorder. Further, DFO recommends that the implications of the discrepancy between the modelled noise level and field location of acoustic recorders be analysed and discussed in the context of comparing measured versus modelled sound levels and associated impacts to narwhal. DFO reiterates that the requested details are potentially included in the Draft 2019-2020 Shoulder Season Acoustic Monitoring Program Report, but expects that these details are additionally provided in Baffinland's June 4th response to comments on the Technical Memo.	The Draft 2019-2020 Shoulder Season Acoustic Monitoring Program Report (Austin and Dofher 2021) provides details on the ice conditions, icebreaking activities, and recorded sound levels during the icebreaker transits. JASCO's acoustic recorder at Bylot Island was deployed at a water depth of -297 m. At Ragged Island, the recorder was deployed at a water depth of -105 m. Note in Austin and Dofher (2021), this depth is listed as 91 m and this will be amended in the final version). Each recorder floated approximately 4m above the seafloor. The water depth at the Eclipse Sound modelling location was 472 m and this model location was meant to be representative of locations within Eclipse Sound. The acoustic monitoring locations were selected based on the following criteria: 1) location with a higher likelihood of ice coverage, 2) subject to a range of ice conditions throughout the season; 3) in proximity to the shipping lane; and 4) offers water depths suitable for the pressure housings used for the acoustic recorders. The acoustic monitoring recorders could therefore not be placed directly at the exact model location, but it is reasonable to expect the results at the model site to be comparable to the results from the monitoring site. The differences in water depths at the model location compared to the measurement locations is not expected to be the main driver of discrepancies between the data. Discrepancies between the modelled and measured sound levels are thought to be mainly due to differences in the assumed source levels, and secondarily due to uncertainty about the geoacoustics and the bathymetry in the area assumed for propagation modelling. Where uncertainties existed, intentionally conservative assumptions were made in the modelling as a precautionary approach. Differences in the measured and modelled exposure durations are due to the conservative assumptions of the sound propagation modelling as well as due to real-life fluctuations of the sound levels during the icebreaker transits as opposed to the assumed constant output (at the maximum sound level) used to estimate exposure durations based on the modelling. Austin, M.E. and T. Dofher. 2021. Underwater Acoustic Monitoring: Baffinland Iron Mines Shoulder Season Shipping 2019–2020. Document 02330, Version 1.0. Technical report by JASCO Applied Sciences for Golder Associates, Ltd.H85"
80	DFO-8	Throughout section 4.1 of the Technical Memo, Golder draws comparisons between 2018 and 2020 ice conditions. DFO acknowledges the similarities in ice conditions between these two years, but notes that the Bruce Head Shore-based Monitoring Program and the Marine Mammal Aerial Survey Program were not operated in 2018. Consequently, it is not possible to compare the narwhal densities during 2018 with the narwhal densities of the other survey years. This further highlights the need for consistent and long-term monitoring programs in order to effectively compare data between years and draw conclusions. On page 14 of the Technical Memo, Golder argues that narwhals did not exhibit a startle response to icebreaking in 2019 based on the following statement: "2019 narwhal abundance increased after icebreaking activities were underway with an initial abundance of 5,793 narwhal (CV=0.23) on 15-16 2019 July prior to Baffinland vessel in the RSA to 15,591 narwhal (CV=0.19) on 21-22 July 2019 after Baffinland vessels entered the RSA (Golder 2020)." DFO is of the opinion that Golder and Baffinland do not have sufficient data to support the above statement regarding startle response. The number of narwhal surveyed on July 21 and 22 may actually suggest that narwhals from other stocks might have passed through the area. In order to effectively determine if narwhal are experiencing a startle response from icebreaking activities, narwhal tagging data, acoustic monitoring data,	DFO recommends that Baffinland undertake an integrated analysis of narwhal tagging data, acoustic monitoring data, and vessel location data to determine if narwhal experience startle responses, and other behavioural responses, during icebreaking activities. DFO acknowledges that the additional information requested is potentially included in the Draft 2020 Marine Mammal Aerial Survey Program Report, but expects that these details are additionally provided in Baffinland's June 4th response to comments on the Technical Memo.	To date, the only tagged narwhals that have been exposed to icebreaking while tagged were NW21 and NW22 during the 2018 late shoulder season. Dive data was not available for either animal during this period (only location data). Furthermore, high resolution (i.e., Fastloc) GPS data was only available for one of the two narwhals (i.e., NW22) during this period. These factors currently preclude the ability undertake an integrated analysis to assess fine-scale behavioral responses (e.g., startle responses) of narwhal to icebreaking activities and associated noise. A narwhal tagging study is being developed for implementation in 2022 (pending community support and regulatory approval) that would include tags deployed on animals that collect both high-resolution location and dive movement data during the early shoulder season, for the purpose of evaluating fine-scale and wide-scale movements of narwhal in relation to icebreaking activities.

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		focused behaviour observation and the vessel location information should be analysed together to draw conclusions.		
81	DFO-9	Further on page 14, Golder states: "Based on the AIS vessel tracking data, the icebreaker appeared to have transited in close proximity to one of the leads upon its initial entry through the ice field (Figure 8). The following day, narwhal relative abundance increased from 2.21 animals/km (from 21 July 2020) to 4.25 animals/km in leads in Eclipse Sound (on non-systematic transects) and decreased from 0.16 animals/km (on 21 July 2020) to 0.02 animals/km in Milne Inlet (systematic transects) after the icebreaker transited the RSA." As limited information was included in the Technical Memo, it is unclear what methodology Golder used to estimate the number of narwhal congregating in the ice leads, and if Golder used photographic or visual survey methods to gather this information.	DFO recommends that Baffinland clarify the methodologies used to survey and estimate the number of narwhal in ice leads. DFO acknowledges that the additional information requested is potentially included in the Draft 2020 Marine Mammal Aerial Survey Program Report, but expects that these details are additionally provided in Baffinland's June 4th response to comments on the Technical Memo.	The objective on Leg 1 of the marine mammal aerial survey program was to determine the relative abundance and distribution of narwhal, and other marine mammals, near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations. Because large areas of the RSA are covered in ice concentration of greater than 9/10 ice, systematic transects would not be recommended in these areas since narwhal could not be seen under the ice and density estimates would underestimate actual narwhal numbers. Thus, the methodology used during Leg 1 applied two different types of transects to be flown depending on ice conditions. A pre-established grid of systematic transect lines was surveyed in areas in the RSA with <9/10 ice concentrations. This included open-water areas and areas associated with low to moderate ice cover. Dedicated transect lines were surveyed along open-water leads associated with consolidated sea ice (^{3}9/10 ice concentrations), along the floe edge, and along the ship route. Additional details on Leg 1 survey methodology and results are provided in the 2019 and 2020 Marine Mammal Aerial Survey Program Reports (Golder 2020,2021). When interpreting the results of the Leg 1 aerial surveys, it is important to consider that flight paths are not meant to represent structured, systematic survey grids. At times, the aerial surveys followed open water leads, shorelines where the leads are present and the nominal ship trackline to record the extend of narwhal distribution in open water, in areas with ice cover and along the ship trackline. Golder. 2020. 2019 Marine Mammal Aerial Survey. Final Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-191-R-Rev0-22000. 5 August 2020. Golder. 2021. Draft 2020 Marine Mammal Aerial Survey. Draft Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-270-R-RevB-39000. 22 April 2021.
82	DFO-10	In section 4.3 on page 28, Golder references Lefort et al. (2020) and speculates that an increased presence of killer whales in the area may result in increased narwhals mortality, population decline, and range contraction. DFO notes that the Lefort et al. (2020) reference was an estimate of potential direct narwhal removal by killer whales in the Baffin region via predation based on bioenergetics modelling, and is not an appropriate reference for speculations on range contractions, as that would require long-term narwhal telemetry data. Therefore, DFO notes that the referenced paper does not use any telemetry data from narwhals and so any reference to this paper about narwhal range contractions are inappropriate. Further, it is important to note that the provided estimates of killer whale abundance and the proportion of narwhals removed in the referenced paper are extrapolated to the entire Baffin Region, and are not representative of only Eclipse Sound where the killer whales were identified. DFO notes that the killer whale abundance estimate from the capture-mark-recapture analysis of photo-identified whales is appropriate and is our best current estimate of killer whale abundance for the Baffin Region, but further reiterates that it is based on photos from throughout Baffin Island and is not just an estimate for the Eclipse Sound Region. As indicated by Golder in the Technical Memo: "A systematic comparison between narwhal and killer whale abundances across years is not possible	DFO recommends that Baffinland work with DFO as we may be able to provide Baffinland with additional information on killer whales in Eclipse Sound and Admiralty Inlet.	Baffinland looks forward to working with DFO on this initiative. Baffinland will establish contact with DFO to determine what the best approach is to acquire this information from DFO prior to the 2021 shipping season. Although killer whales were recorded during both 2019 and 2020 aerial surveys in Eclipse Sound, they were not present in Admiralty Inlet during either of these surveys, so any additional information that DFO is able to provide to better resolve killer whale presence in Admiralty Inlet summering grounds in 2019 or 2020 will be of great value to the ongoing investigation.

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		because reliable abundance estimates for killer whale are not available". DFO further notes that it is also not possible to assess whether current rates of predation pressure on narwhals by killer whales represents an increase or no change relative to historic levels because historic levels are not available. Further on page 28, Golder summarizes the findings of Laidre et al. (2006) and Breed et al. (2017) on the impact of the presence of killer whales on narwhals. DFO acknowledges that the summaries presented by Golder are accurate overall, however it is important to note that while killer whale presence induced large changes in narwhal behaviour and distribution, the tagged narwhals in these studies did not leave Admiralty Inlet when killer whales were present. Therefore, it cannot be drawn from these studies that the killer whales reduced numbers of narwhal in the area by displacing them. However, the impacts of killer whales on narwhal distribution (e.g., changes in spatial distribution patterns as well as potentially non-random movements between survey transects or strata) could impact aerial survey results. On pages 28 and 29 of the Technical Memo is it stated: "It is unclear to what extent killer whale presence may have contributed to lower narwhal numbers observed in Eclipse Sound in 2020, either by direct removal (i.e., hunting and feeding) and/or via seasonal displacement, but an increase in killer whale numbers in the RSA was apparent in 2020 and available IQ indicates that killer whales are likely to influence narwhal distribution and abundance in the RSA." DFO attempts to collect sightings reports of killer whales in communities throughout the eastern Canadian Arctic. That being said, there are higher numbers of sightings reports of killer whales from the Eclipse Sound region over the past decade, which could reflect a number of (or combination of) factors, including: increased numbers of killer whales; shift in the extent of killer whale range; longer occupancy of the area by killer whales; increased effort (i.e., DFO itself began a killer whale research program in the area in 2013 and most of the sightings are directly from that program and the monitoring program at Bruce Head began within the same time period); and increased awareness and participation to DFO's program. DFO acknowledges that there are difficulties in drawing conclusions about trends in killer whale's numbers from this data. That being said, the range of dates killer whale observations were reported in the Eclipse Sound Milne Inlet in 2020 (18 Aug to 4 Sept) was less than or similar to (but not longer than) those reported in 2017 (31 July to 11 Sept), 2018 (12 Aug to 8 Sept), and 2019 (26 Jul to 5 Sept) in DFO's sightings database. DFO also notes that killer whales have been more regularly observed in neighboring Admiralty Inlet throughout the month of August for at least the past decade, according to the DFO sightings database, where high numbers of narwhals also occur without any significant trends in narwhal abundance. On page 29 of the Technical Memo, Golder cites Inuit observations that killer whale number are increasing from three different IQ interview		

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		reports. DFO acknowledges these statements, and further notes that Higdon et al. (2013) summarized Inuit knowledge on killer whales through semi-directed interviews in 11 Nunavut communities from 2007 to 2010, and found most of them said there were either increasing numbers of killer whales, or increasing sightings. However, 2 of 6 people interviewed in Pond Inlet said killer whale numbers were decreasing, but it is important to note that this information dates before 2010. Overall, DFO is of the opinion that there is currently insufficient information to infer trends in the killer whale population in the Baffin area, and any subsequent impacts on narwhal that reside in this area.		
83	DFO-11	DFO acknowledges Golder's analysis of impact pile-driving activities undertaken at the Pond Inlet Harbour in 2020. At present, DFO is unable to provide further comments on this potential factor, as the Department is further reviewing and investigating these activities. DFO will continue to work with the Government of Nunavut, and Baffinland, as necessary, to acquire the data and information required for the Department to complete this investigation, and to ensure that the potential impacts to marine mammals from pile-driving are fully mitigated.		Baffinland is available to support DFO and GN in these efforts as needed.
84	DFO-12	On page 30 of the Technical Memo, Golder cites the document 'draft Marine Monitoring Plan (Baffinland 2021)', and further references this document as 'Baffinland Iron Mines Corporation (Baffinland). Marine Monitoring Plan (MMP) (DRAFT)' in the reference section on page 41. DFO acknowledges that updates to the Marine Monitoring Plan, and other monitoring and management plans, occur periodically and are provided for review. However, DFO has not yet seen an updated draft of the Marine Monitoring Plan for 2021.	DFO recommends that Baffinland clarify if a draft Marine Monitoring Plan has been provided for review from parties, and if not, when parties can anticipate receiving this updated draft plan for review.	Please see response to PC-6 above.
85	DFO-13a	In section 5.4 from pages 33 to 36 of the Technical Memo, Golder identifies five 'enhanced mitigation' options to manage icebreaking activities for the upcoming 2021 shipping season. To justify each option, Golder attempts to provide 'biological rationale'. However, the justifications that Golder provides for each option are focused on ice conditions and whether or not narwhal are present in ice leads, rather than identifying the biological considerations that impact whether or not narwhal are present in ice leads. Further, DFO is concerned that there is insufficient biological data to comprehensively inform and review each option. DFO has reviewed the five enhanced mitigation options proposed by Golder, and notes the following: · Option 1 restricts icebreaking activities at ice concentrations greater than 6/10 and appears to be more conservative compared to Baffinland's transit restrictions mitigations utilized in previous years. However, there is insufficient biological data to determine the if ice concentrations below 6/10 are biologically relevant to narwhal, and to determine if this option would be effective in reducing potential icebreaking impacts on narwhal.	DFO recommends that Baffinland clarify if biological considerations were considered for each option, and if there is any biological significance for narwhal at ice concentrations ranging between 3/10 and 9/10.	Yes, biological considerations were considered for each option. These are partially summarized in Section 5.4.1 (under the heading 'Biological Rationale for Option #1, Biological Rationale for Option #2, etc.). Further to this, we considered the acoustic disturbance range (R95% distance in which the 120 dB re 1 µPa disturbance threshold would be exceeded) and the acoustic disturbance period (total exposure duration per transit in which the 120 dB disturbance threshold would be exceeded for a stationary narwhal) for icebreaking in different ice concentration regimes, based on acoustic modelling estimates in comparison to icebreaking noise monitoring results collected in 2019 and 2020. Detailed results are presented in JASCO's icebreaking acoustic monitoring report (Austin and Dofher 2021). Overall, acoustic monitoring results demonstrated that the measured per-transit noise exposure periods exceeding 120 dB were approximately 80-90% lower than modelled estimates for an icebreaker transiting in ice between 3/10 and 9/10 concentration, and at least 60% lower than the modelled exposure period when the icebreaker was in open water. Results further demonstrated that the acoustic disturbance range and acoustic disturbance period did not vary substantially between different ice concentration conditions (see Table 13 in Austin and Dofher 2021). That is to say, the measured noise fields from icebreaking were similar in size and duration between ice covered and open water conditions. These findings support the idea that if icebreaking was in fact the driver of the decreased number of narwhal observed in Eclipse Sound in 2020, it was less likely a direct result of icebreaker noise disturbance, and more likely a function of being physically exposed to the icebreaker itself at a time when narwhal were confined in narrow leads

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		· Option 2 appears to be following current transit restrictions, with the additional mitigation of ensuring that ice concentrations 9/10 and greater are avoided along the shipping route. There is insufficient biological information to determine if this option would be effective in reducing potential icebreaking impacts on narwhal. · Option 3 requires use of a density threshold to determine 'sufficient narwhal absence', however DFO is uncertain of the feasibility of this option as it would likely require rapid analysis of the survey data to generate narwhal density. · Option 4 requires determination of 'sufficient narwhal presence' in Milne Inlet and DFO comments on Option 3 apply here as well. Further, this option seems quite similar to option 3, and 'sufficient narwhal presence' in Milne Inlet at the beginning of the season does not necessarily indicate that these animals could not still be later displaced by icebreaking activities. · Option 5 restricts icebreaking activities until two weeks after land-fast ice has initially fractured, at which point it is assumed that ice concentrations will be below 6/10. This option appears to be similar in nature to option 1 and more conservative compared to Baffinland's transit restriction mitigations utilized in previous years. However, there is insufficient biological data to determine the if ice concentrations below 6/10 are biologically relevant to narwhal, and to determine if this option would be effective in reducing potential icebreaking impacts on narwhal, and ice concentrations greater than 6/10 may still persist after two weeks following initial fracturing of landfast ice.		with few options to actively avoid the icebreaker. The selection of Option 2 (no icebreaking in the RSA when ice conditions are ≥9/10 along the shipping route) would effectively eliminate this risk as the same type of narrow leads do not exist in <9/10 ice conditions. The selection of Option 2 would effectively result in a level of icebreaking equal to or less to the level of icebreaking that incurred in 2019, which was a year in which narwhal numbers in the RSA were shown to be stable (relative to previous survey years) and when no evidence of displacement was recorded. This lends confidence to the effectiveness of this mitigation option, assuming icebreaking was in fact the driver of the decreased number of narwhal observed in Eclipse Sound in 2020. Option #1 (no icebreaking in the RSA when ice conditions are >6/10 along the shipping route) is likely over precautionary in nature as it effectively eliminates icebreaking altogether. Based on 2019 monitoring results, there is evidence that narwhal remain in the RSA in similar abundances despite icebreaking still occurring during the early shoulder season. Austin, M.E. and T. Dofher. 2021. Underwater Acoustic Monitoring: Baffinland Iron Mines Shoulder Season Shipping 2019–2020. Document 02330, Version 1.0. Technical report by JASCO Applied Sciences for Golder Associates, Ltd.H85"
86	DFO-13b	Same as above.	DFO recommends that Baffinland continue to engage with the MEWG and with Inuit to review the five options proposed by Golder, as well as to determine if any other enhanced mitigation options exist that may provide greater protection to narwhal during icebreaking activities, have more biological relevance to narwhal, or have sufficient data to demonstrate potential effectiveness.	Baffinland has invited members of the MEWG, as well as the Hamlet of Pond Inlet, to further discuss the memo, responses to comments provided and to inform the 2021 adaptive management response plan.
Ikajutit HTO				
87	IK-1	Ikajutit has serious concerns about the statistically significant reduction in narwhal observed and reported by Golder.		Baffinland echo's your concerns regarding the change in the Eclipse Sound stock abundance in 2020. This is the reason we have shared this information for feedback from Parties and committed to the implementation of additional mitigation measures for the 2021 shipping season.

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88	IK-2	The study period of 88 days while brief is the same time that marine mammals would normally be abundant. Any exposure at high intensity sounds are not acceptable.		For clarity, the narwhal abundance aerial surveys - referred to as the "Leg 2 aerial surveys" in the technical memo only occurred for a period of 12 days, consistent with traditional approaches for running marine mammal aerial surveys. However, Baffinland acknowledges that this limited survey time could have resulted in potential inaccuracies in the survey results. Subsequently, Baffinland is revising its approach for the 2021 monitoring season to aim for 'continuous coverage' of the Eclipse Sound stock, which will include surveying for approximately 6 weeks, beginning mid-July to the end of August.
89	IK-3	Use of Inuit Qaujimajatuqangit (IQ) in the report is inadequate. Providing quotes from what individuals say in a meeting does not equate to use of IQ in decision-making.		As noted in response to comments above, Baffinland reconfirms its commitment to IQ integration and will continue to work with QIA, HPI and MHTO on this topic. Baffinland would be glad to schedule a meeting to discuss the Ikajutit HTOs concerns related to these findings if there is interest in furthering conversations on either the 2020 results or details on our plan for the 2021 shipping season.
90	IK-4	While Ikajutit agrees that other factors such as increase in killer whales, construction of the Small Craft Harbour in Pond Inlet and climate change are also potentially factors, icebreaking has been observed to change narwhale behavior. The suggested adaptive management measures are not sufficient. Narwhal behaviour has already changed and awaiting adaptive management at "high-risk" threshold.	Of these other factors, icebreaking is a controllable factor that can and must be eliminated, if recommended by the Mittimatalik Hunters and Trappers Organization and the Hamlet of Pond Inlet.	Please refer to the response to PC-8 and QIA 36, which provides further details on why the proposed 2021 shipping mitigations are a precautionary approach.
	IK-5	Ikajutit has read and analyzed other materials in relation to narwhal and icebreaking. Most studies regarding narwhal are lumped with studied about beluga. 120 db (decibels) is used as an example a relative measure of loudness or sound. A thunderclap is said to be the equivalent of 120 db.		Baffinland has also observed that there are several studies that consider narwhal and beluga together, or where comparisons are made between narwhal and beluga. Narwhal and beluga are expected to have very similar hearing abilities because they have a close evolutionary relationship and they inhabit similar environments. Since there are few scientific studies about noise impacts on narwhal, and there is comparatively more information about beluga, the information known about beluga is thought to be the best available representation from a scientific perspective of what might be expected for narwhal. Baffinland appreciates the opportunity to explain in more plain language terms what the 120 db threshold means in the marine environment, and why the threshold will not be as loud as a thunderclap. Decibels in air are not the same as decibels underwater - a measurement of an "in air decibel" is not equivalent to an "underwater decibel". A sound in air will be roughly 63 dB lower than a sound of the same intensity measured underwater. So, while a thunderclap can be as loud as 120 dB when heard in air, that is much louder than something that is 120 dB underwater. A vessel that is measured as 120 dB underwater would be equivalent to a sound measured to be around 60 dB in air, which is the sound level of a normal conversation between people. So, Baffinland has based their studies on a threshold that is similar to the noise level of a normal conversation between people, not the noise level of a thunderclap. To explain the difference between in air decibels and underwater decibels in scientific terms, this is because sound levels are a measure of pressure, and they describe the amplitude of the sound pressure relative to a reference pressure value. Different reference pressures are used to define decibels in air compared to underwater. In air, that reference pressure is 20 µPa and underwater that reference pressure is 1 µPa. Also, air is more compressible, it has a lower sound speed and a lower density than water. Sounds with the same pressure amplitude have a lower intensity underwater than in air.

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Oceans North				
94	ON-1	Given the general agreement amongst harvesters and the research community that narwhal numbers significantly declined in Eclipse Sound in 2020, an issue that requires attention within the summary document is the adaptive management response plan. Five mitigation options are presented by Golder with a biological rationale for each (pages 33-36). However, in the cover letter to the technical memorandum, the Proponent appears to have decided to proceed with only one of the options presented. This appears to contradict representations made in the recent MEWG meeting (May 13, 2021), at which Baffinland noted that a decision will be made within the next two months and that consultation with all parties is underway but not yet completed. Our concern lies not only with the apparent decision being made prior to consultation with the working group on all options, but that the option Baffinland has selected may be ineffective in mitigating potential displacement of narwhal within the regional study area. Golder has noted in the memo (and other parties have asserted) that acoustic disturbance from icebreaking was potentially a contributing cause of the 2020 decrease in narwhal abundance in Eclipse Sound. Given this possibility, it is our position that operations should err on the side of caution throughout 2021. This is particularly important considering the need to minimize the likelihood of cumulative impacts.		For consultation purposes, Baffinland presented the mitigation options along with its recommended approach to the NIRB and the MEWG. Baffinland confirms that a final 2021 adaptive management response plan will be finalized that will take into consideration all comments shared in relation to the 2020 monitoring results, including those received through the recent MEWG meeting, those received through the NIRB facilitated written comment exchange, and through additional direct engagements that have yet to occur.
95	ON-2	Taking into account the potential risk of significant impacts to the stock as a whole and to north Baffin communities, we strongly suggest implementing the most conservative approach this year (Option 1: no ice breaking in the RSA when ice conditions are >6/10). Should another season of ice breaking contribute to further decreases in abundance, we have no information to suggest that these animals will return in years following.		If icebreaking was the primary factor of the decreased number of narwhal observed in Eclipse Sound in 2020, it was less likely a direct result of icebreaker noise disturbance, and more likely a function of being in close proximity to the icebreaker itself when narwhal were confined in narrow leads with few options to actively avoid the icebreaker. The selection of Option 2 (no icebreaking in the RSA when ice conditions are ≥9/10 along the shipping route) would effectively eliminate this risk as the same type of narrow leads do not exist in <9/10 ice conditions. Furthermore, the selection of Option 2 would effectively result in a level of icebreaking equal to or less to the level of icebreaking that incurred in 2019, which was a year in which narwhal numbers in the RSA were shown to be stable (relative to previous survey years) and when no evidence of displacement was recorded. This lends confidence to the effectiveness of this mitigation option. Option #1 (no icebreaking in the RSA when ice conditions are >6/10 along the shipping route) is likely over precautionary in nature as it effectively eliminates icebreaking altogether. Based on 2019 monitoring results, there is evidence that narwhal remain in the RSA in similar abundances despite icebreaking still occurring during the early shoulder season. With respect to Ocean North's second point, there is in fact evidence of narwhals returning to the RSA in years following an absence. In 2018, low narwhal numbers in the RSA were widely reported by local hunters and community members but returned in 2019 in similar numbers as was recorded during the 2016 aerial survey.

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Hamlet of Pond Inlet				
96	HPI-1	The results show a significant decline in narwhals in Eclipse Sound. The number of narwhals, estimated at 5,018, is a decline of almost 50% from the number recorded in 2019. This is also approximately 42% of the number recorded in 2016. The number of narwhals in Admiralty Inlet increased slightly by about 7.5% from the numbers recorded in 2019, but the increase does not account for the decline in Eclipse Sound. Displacement from Eclipse Sound to Admiralty Inlet, where numbers increased from 28,746 in 2019, to 31,026 in 2020, accounts for only about 53% of the decline in the Eclipse Sound population. This assumes displacement from Eclipse Sound to Admiralty Inlet. Estimates of narwhals taken at Bruce Head, Milne Inlet, are consistent with aerial survey results from Eclipse Sound. These are based on the average number observed per hour over observation periods for the years in question (standardized by effort). They show a decline from 126.7 narwhal/hour in 2019, to 47.5 narwhal/hour in 2020 (p.7). This is a decline of 62.5%. In comparison to 2016, when 178.0 narwhal/hour were recorded, this is a decline of 73.3%.	These figures suggest there has been a very significant decline in the narwhal population of Eclipse Sound and Milne Inlet that cannot be accounted for by displacement to Admiralty Inlet. The result s are significant given the narrow 95% confidence interval - an estimate of the accuracy of the results - associated wit h the 2020 aerial survey of narwhals in Eclipse Sound.	The fact that the Eclipse Sound/Admiralty Inlet combined abundance estimate was similar in 2020 to previous years (2013 and 2019), based on the statistical analysis and the overlap in the 95% confidence intervals (CIs)) suggests that a portion of the Eclipse Sound stock was possibly displaced to Admiralty Inlet. If animals had been displaced elsewhere or if the Eclipse Sound stock had decreased in numbers, the combined estimate for Eclipse Sound and Admiralty Inlet in 2020 would have been statistically lower than in 2013 and 2019. This is not the case. The combined abundance estimate for 2020 was similar to that from 2013 and 2019. When comparing abundance estimates between years, it is important to remember that these reported values remain estimates and that they should not be considered absolute values. The variability that exists in the calculation of these estimates is represented in the 95% CIs that are reported along side these abundance estimates. Comparing the range of values provided by the 95% CIs is a more representative indicator of changes in regional abundance than comparing only the mean abundance estimate values.
97	HPI-2	Information provided to Baffinland by Golder (Technical Memorandum p.12) notes that sea ice was more concentrated in the study area in 2020 compared to 2019. This was early in the season when narwhal would normally be entering Eclipse Sound. Narwhal distribution was different between 2019 and 2020 because of these ice conditions. As a result, and because sea ice was not fragmented as it had been in 2019, narwhal were more concentrated in the ice leads of Eclipse Sound. However, Golder notes that with regard to other areas, "Narwhal distribution in the Baffin Bay and Pond Inlet strata was similar between 2019 and 2020, with narwhal dispersed throughout the open water". There is nothing in the Technical Memorandum to confirm that ice conditions played a role in diverting narwhal to other locations. This is presented as a possibility. It is noted that the concentration of narwhals in the ice leads of Eclipse Sound was greater than has been the case in previous years. The distribution of narwhals in Baffin Bay and the Pond Inlet strata was similar to 2019. (p.13) Research, however, suggests that narwhal select their habitats in relation to elements critical to their survival. This suggests that narwhal may be inclined to 'put up' with anthropogenic circumstances that are less than ideal in order to meet immediate and important needs. They will do this, if necessary, in the presence of an activity like ice-breaking that may be stressful and have longer term implications for their health and well-being. For example, the measurement of ocean depths (bathymetry) in relation to the presence of narwhal reveals that they will congregate in areas and depths at which prey are found, and that this is of greater importance to		During leg 1, large areas of the RSA are covered in ice concentration of greater than 9/10 ice, therefore systematic transects would not be recommended in these areas since narwhal could not be seen under the ice and density estimates would underestimate actual narwhal numbers. When interpreting the results of the Leg 1 aerial surveys, it is important to consider that flight paths are not meant to represent structured, systematic survey grids. At times, the aerial surveys followed open water leads, shorelines where the leads are present and the nominal ship trackline to record the extend of narwhal distribution in open water, in areas with ice cover and along the ship trackline. Because ice conditions, and therefore the survey conditions, differed between 2019 and 2020, a direct comparison cannot be made between the two years.

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		determining location and habitat than ice concentration or floe size (Kenyon et al., 2018). In other words, narwhal are strongly committed to areas where species on which they feed are found (Greenland halibut, for example). It is possible that narwhal stay and return to leads despite an ice breaker passing, as that area has resources critical to their survival. Research conducted by Kenyon et al (2018) in Admiralty Inlet, suggests that within mobile pack ice, narwhal do not show a preference to sea ice thickness, floe size, and concentration. This suggests that the relationship of narwhal to sea ice and ice-breaking is likely more complex that what is indicated in the Technical Memorandum. As Kenyon et al suggest, climate change and changes in sea ice cover are likely to have implications for narwhal populations. More information could have been gathered from Elders and hunters as to whether or not being concentrated in ice leads early in the season, might play any role in dispersing narwhal to other summer grounds. (i.e. they give up on entering Eclipse Sound). IQ might also have provided insights into the behaviour of narwhals confined to ice leads in relation to food sources and the presence of killer whales. The decline in the number of narwhals is consistent with observations made by Mittimatalingmiut hunters.		
98	HPI-3	Shipping and ice-breaking introduce new sources of under-water anthropogenic noise to the waters of Eclipse Sound and Milne Inlet. The issue is whether these sounds affect narwhal and if so, what is the severity or nature of the effect. Baffinland notes that the results of its 2020 monitoring suggest that recorded sounds from Baffinland icebreaking were 10-20 dB lower than originally modelled and that consequently, the 120 dB exposure durations are 60-90% lower than predicted (Technical Memorandum, p.1). According to Golder, the ice-breaker MSV Botanica periodically produces high intensity sound lasting several minutes or less (p.9). While the current Technical Memorandum focuses on ice-breaking, this activity involved the escort of ore carriers and tugs. The issue is noise levels made by ships. Claims about noise levels made in the Technical Memorandum, and elsewhere, should be examined in relation to the results of a recently released study on vessel noise and impacts the includes attention to Milne Inlet and Eclipse Sound. This exhaustive study and the results do not deal with ice-breaking, but deal with ship noise and effects on marine mammals, including narwhal. It was published recently in Marine Policy by Kochdnowicz et al. 2021, "Using western science and Inuit knowledge to model ship-source noise exposure for cetaceans (marine mammals) in Tallurutiup Imanga (Lancaster Sound), Nunavut, Canada"Lavailable online 8 May 2021. The conclusion reached, based on data for the period 1993-2017, was that: "The highest potential behavioural disturbance events for narwhals occurred in Eclipse Sound and Milne Inlet, both in cetacean utilisation distribution areas (identified by western scientific knowledge) and in Inuit-identified cetacean-populated areas (identified by Inuit knowledge)" (p.12).		The analysis of the sound levels measured during icebreaking does also include the noise from all the vessels that accompanied the icebreaker during each measured transit. The measurements collected during icebreaker transits in 2019 and 2020 measured the total sound from all the vessels that were in escort with the icebreaker. When computing exposure durations based on the measurements, we calculate the total time during which the 120 dB threshold was exceeded, from the time that the icebreaker approached the acoustic recorder until a sufficient time after the final vessel in the convoy went past. The entire collection of vessels is treated as a single transit. During icebreaking, the majority of the noise is generated by the engines and propulsion system of the icebreaker, the sounds of the actual ice breaking is secondary to those vessel sounds. So, the Hamlet and Golder agree that the underwater noise from vessels is an issue of concern, which is why so much effort has been put into mitigating and monitoring this. We note that the referenced paper by Kochdnowicz et al. (2021) does not provide any revelatory information about underwater noise from vessels. The fact is that vessels generate underwater noise, and areas where there is increased vessel activity are going to experience increased underwater sound levels as a result. Nothing about that finding is contrary to, or offers and increased understanding from, any of the research conducted for Baffinland. However, these sound level increases are localized to areas around the ship and are temporary. When the vessels are not present they do not contribute noise to the environment. The sheltered fjord system of Eclipse Sound and Pond Inlet results in land-shielding of the vessel noise. Persistent, low level vessel noise from long-range vessel traffic is not a major contributor to the soundscape in this region, contrary to more open environments that are exposed to long-range noise from distant vessels. Environments such as those are susceptible to a persistent and measurable change of the soundscape from long-range vessel noise. But that phenomenon is a minimal contributor to the soundscape in this particular environment because of its geography. The Kochdnowicz et al. (2021) paper is a modelling exercise using sound data from another locations as a proxy; Baffinland's research is based on empirical data collected in the Project area, and as such it provides the best understanding of the actual sound environment and the potential resulting impacts. Austin, M.E. and T. Dofher. 2021. Underwater Acoustic Monitoring: Baffinland Iron Mines Shoulder Season Shipping 2019–2020. Document 02330, Version 1.0. Technical report by JASCO Applied Sciences for Golder Associates, Ltd.

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		The Nunavut Impact Review Board might be well-advised to ask a third party to examine the research conducted by Baffinland and conclusions with regard to the impact of ship noise - including both ore carriers and ice-breakers - and the results reported by Kochdnowicz et al, (2021), as a way of reaching an informed conclusion about the likely impact of ship noise on narwhal in Eclipse Sound and Milne Inlet. As noted below, the Hamlet's concern is not restricted to the direct impact of emitted noise on narwhal, but the indirect effect on narwhal as a result of the impact of sound from ship passage and ice-breaking on the soundscape of the marine environment of Milne Inlet and Eclipse Sound. Introducing these anthropogenic noises changes the soundscape, and could disrupt the behavior and life processes of other marine organisms with systemic implications for narwhal and other species. Duarte et al., (2021), note that while there has been a long-standing recognition of the effect s of anthropogenic noise on terrestrial systems, we are only starting to understand the effect of changing ocean soundscapes on marine animals. The Duarte et al (2021) review of the literature on the topic is extensive, with evidence showing that "the impacts of human alterations to ocean soundscapes are pervasive across all ocean areas and detrimentally affect marine life (p.7).		
99	HPI-4	The Technical Memorandum discusses the relationship between narwhal behaviour and ice-breaking. The text includes observations from ice-breaking for the Nanisivik Mine in Admiralty Inlet (Finlay, 1990), a study by LGL and Greeneridge (1986), and observations by Baffinland in 2019 and 2020. Golder suggests that the observations made by Finley are of a startle response, given that some narwhals returned to the area in which ice-breaking had occurred, a few days later. How many is unclear. They were reported to have engaged in "normal diving and foraging behaviour" (p.14). On 21 July, 2020, the ice-breaker Botnica escorted two ore carriers and two tugs through a large, consolidated ice field in North Milne/West Eclipse Sound with several narrow ice leads occupied by a large number of narwhals (Technical Memorandum, p.14). The observations made on the effect of these transits on narwhals don't support any particular conclusion on the effects of ice-breaking on narwhal behaviour, or their concentration in leads. The research and information available on the effects of ice-breaking on narwhals is 'thin ' at best. The number of variables intersecting with narwhals' response to ice-breaking is potentially many. These are not discussed. Golder has, as true elsewhere, placed an emphasis on narwhal response to one sensory input - directly received ship noise. It is possible, with regard to shipping, and in this instance with regard to ice-breaking, that a number of intersecting variables account for what may be highly variable and 'difficult to predict' responses. For example, narwhals may not relocate from ice leads when an ice-breaker is approaching or in		Baffinland and the Hamlet agree that acoustic metrics alone cannot be used to determine how narwhal would respond to an ice lead that overlaps with the shipping track. In 2020, we prioritized completing objectives for the Passive Acoustic Monitoring program, and in 2021 we are including additional mitigation measures to avoid sharing ice leads with narwhal. In 2018, the study of stress hormones as a potential early warning indicator (EWI) was brought forward by Fisheries and Oceans Canada through MEWG. The recent DFO manuscript (Watt et al., 2021) highlights uncertainties and limitations relating to the use of stress hormones as EWIs, stating that there are concerns with the ability to compare future samples to a threshold based on historical samples collected through DFO with sufficient statistical power. Given the limitations of available baseline, and limitations associated with correlating stress hormones directly to Project activities, the study of stress hormones is not currently being considered further as an EWI. Watt, C., J. Simonee, V. L'Herault, R. Zhou, S. H. Ferguson, M. Marcoux, and S. Black. 2021. Cortisol levels in narwhal (Monodon monoceros) blubber from 2000-2019. Arctic Science. 0(ja):.https://doi.org/10.1139/AS-2020-0034.

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		their vicinity, because of limited options at the time for relocation, and considerations unknown to an observer. Under these circumstances, the effect may not be obvious from any change in behavior, but may be a matter of increased levels of stress and anxiety. For this reason, a continuation of the study conducted by Watt et al. (2020) to examine cortisol levels in narwhal blubber would contribute to a more holistic understanding of the effect of shipping and ice breaking on narwhal health. There is reason to believe that the relationship of ship noise to narwhal behavior is more complicated that what is shown by historical research on the topic.		
100	HPI-5	Narwhals may respond, in terms of behaviour or disposition, to other sensory inputs; the movement of surface ice, and movements of surface and subsurface water. Whether or not they return to an area after the passage of an ice-breaker may be related to foraging and a trade-off made between the value of a resource upon which they depend, relative to the level of danger suggested by what they have experienced. As noted later in the text, it may be that the response of narwhal to ice-breaking and ship passage is an indirect one. Underwater soundscapes can be incredibly noisy, a product of the calls and sounds produced by other mammals and species in any particular environment. These species may be able to detect and react to that which narwhal cannot hear. Changes in the location or calls of other whales or species that narwhal can detect, may affect narwhal behaviour and act as a secondary trigger. In other words, the impact of anthropogenic noise, such as that generated by a ship or ice-breaker, may be indirectly received by narwhals and marine species, responding to the response of, and changes in the behaviour of other species directly affected. Their response may alter the soundscape in a manner detected by narwhal (and other species) and it is this altered soundscape to which they then respond. Research suggests that marine soundscapes are used by species in all levels of food webs. While marine mammals are often the main focus of noise research in marine environments, lower trophic levels also depend on sound for critical life processes. A meta-analysis of 42 studies and 2,354 data points, "Sound the alarm: A met a-analysis on the effect of aquatic noise on fish behaviour and physiology", (Cox et al., 2018) lends support to a large number of studies documenting the impact of noise in aquatic environments on fish behaviour. If ship noise has implications for narwhal prey, it obviously has implications for the behaviour, location and distribution of narwhals. For these reasons, and given the concerns of hunters and elders and opposition by the MHTO to ice breaking, the Hamlet's support for the MHTO position on ice-breaking is well-founded. While the Hamlet respects and appreciates the research and observations made by Golder, working for Baffinland, it also recognizes the limitations.		Baffinland acknowledges that narwhal may respond to the presence and activities of vessels (including) icebreakers due to factors other than sound level - context and prey availability are among such factors. It is for this reason that additional mitigative measures are being adaptively implemented for 2021 despite the results of the acoustic monitoring program indicating that vessel noise did not exceed our impact predictions.

Cmt. #	ID #	Reviewer's Detailed Comment	Reviewer's Question/Recommendations	Baffinland's Response
101	HPI-6	See section on Pile-Driving outlined in Hamlet of Pond Inlet submission	The Hamlet is asking DFO and NU Community and Government Services to meet with the Hamlet to: (1) Explain how and why the violations of mitigative measures set up to protect the marine environment were allowed to persist over such a long period of time, and why these matters were not addressed in a more effective and timely manner. (2) Explain why these difficulties were not clearly communicated to the Hamlet. (3) Outline steps to be taken during the final 2021construction season to ensure that these problems and violations of mitigative measure have been, and will be addressed.	N/A. Comment directed to DFO and the Government of Nunavut.
102	HPI-7	Research has yet to detail the impact of changes in ice cover on the presence of killer whales in the Canadian Arctic. But there is good reason, given casual observations about the relationship between ice cover and the presence of killer whales, to believe that climate change and ice cover are affecting the distribution of killer whales. It has been suggested by Higdon and Ferguson (2009) that ice barriers exist which limit the range of killer whales. The removal of these choke points could lead to a drastic shift if the range of killer whales. The most comprehensive review of the ecology of killer whales and Arctic waters that we are familiar with has was published in the Canadian Journal of Zoology in 2020 (Lefort et al. 2020). While this source has not been cited by Golder, a subset of the information reviewed by the authors has been noted (Lefort, Garraway & Ferguson, 2020). Lefort et al., 2020, note that: The frequency of killer whale sightings in Canadian Arctic waters has increased in recent years (Higdon et al. 2012; Higdon et al. 2014), likely associated with a climate-linked increase in the extent of ice-free water and duration of the open-water season (Higdon and Ferguson 2009). Increases in abundance or shifts in the distribution of this predator could disrupt the Canadian Arctic marine ecosystem through effects on prey not historically exposed to high levels of killer whale predation (Breed et al. 2017). (p. 245) There is little reason, knowing the relationship between ice cover and the presence of narwhal and their season migrations in relation to ice cover, to not assume that there are, and are likely to be further changes in the relationship between narwhals and killer whales in Eclipse Sound and Milne Inlet. Inuit hunters note the importance of shallow water to narwhals escaping killer whales. For this reason, access to Koluktoo Bay and other inlets that offer shallow water protection are more important than ever to narwhals in Milne Inlet and Eclipse Sound.		The significance of killer whale predation on narwhal abundance in the Arctic is a topic with many unknowns. The incorporation of killer whale predation in the technical memo was to acknowledge it as one possible causal factor for decline in narwhal numbers. Comments from Parties have ranged from 'little to no likelihood' that killer whales could cause such a significant decline (QIA-30) to ' there are, and are likely to be further changes in the relationship between narwhals and killer whales in Eclipse Sound and Milne Inlet' (HPI-7). As exhibited through differing opinions on killer whale impacts on narwhal, it is clear that the long-term effects are widely unknown. Based on the fact that even under a 'worse-case scenario' icebreaking would only affect 0.33% of available marine / sea ice habitat in the RSA, it is Golder's professional opinion that the limited icebreaking activities associated with the Project will not result in significant ecological changes to killer whale migration in the area. However, we do agree with HPI that the changing predator/prey dynamics between killer whales and narwhals may be of concern in the future due to a changing climate, which is why we have considered killer whale as a potential contributor to cumulative effects on narwhal in the RSA.

Cmt. #	ID #	Reviewer's Detailed Comment	Reviewer's Question/Recommendations	Baffinland's Response
104	HPI-9	For reasons already noted, the Hamlet questions Golder's reliance, in drawing conclusions, on behavioural responses to a disturbance zone area. This is especially the case in relation to ice-breaking and situations where the behaviour of narwhals may be limited by other considerations, including ice conditions and/or the presence of killer whales and the presence of species on which they prey. The desirability of an area (for unknown reasons) may be a factor in the decision by narwhals to return within a short period of time to the area they have left in response to ship passage. Some narwhals may return. Others may decide not to. Inuit grant far more agency to animal species than western science allows.		Acknowledging factors such as ice conditions, presence of killer whales and external anthropogenic activities is not to detract from assessing the effects of the Project. Rather this is a means of thoroughly analyzing the environment of the narwhal and all the effects that may act in isolation or in a cumulative fashion with respect to the observed decrease in narwhal numbers in 2020. The desirability of an area may be for unknown reasons, as the Hamlet suggests, which is why further scientific monitoring and community engagement is necessary to fill existing data gaps. We recognize the value of Inuit perspective and insight on this topic, particularly for a whale species in which they have come to know and understand over an extended time period, therefore we encourage suggestions from relevant parties on monitoring methods to be done in conjunction with those presented in our current and future plans. Further investigation of narwhal through the satellite tagging program will allow for a larger dataset and a more accurate representation of narwhal responses to icebreaking activity, and their subsequent return or not to the disturbance area. As of now, empirical data indicates that when narwhal react to vessels, they do so at close range and return to pre-exposure behaviour shortly following the exposure event.
106	HPI-11	The Hamlet does not believe that drone-based aerial photogrammetry is an adequate way to estimate narwhal body condition. The Hamlet supports the work of James Simonee and Dr. Vince l'Herault, and their intentions to measure both narwhal body fat and cortisol levels in research planned in relation to the forthcoming study of food security in the Hamlet of Pond Inlet.		Baffinland is of the opinion that both options (UAV-based photogrammetry surveys and measurements of narwhal body fat and cortisol levels in harvested narwhal) offer a complementary assessment of narwhal body condition. Baffinland recognizes that Inuit community members have, in recent years, expressed concerns that narwhal body condition has deteriorated over the past two decades. Hunter observations are an available tool to assess historical changes in narwhal body condition and potential interactions with Project activities. Baffinland remains committed to collaborating with local hunters and other regulatory bodies to further assess these concerns. The use of drones allows for recordable visual evidence that can be referenced and replicated annually as part the shore-based narwhal monitoring program. Drones can be used for detailed aerial photogrammetry, in which high resolution photographs are analyzed during the post-processing stage in order to evaluate body condition of free-ranging narwhal. This tool offers a non-invasive approach to quantitatively track the condition of narwhal over time, potentially allowing for mitigation before decreased body condition results in mortality. There are numerous examples in the literature in which aerial photogrammetry has been used very successfully as a tool to evaluate the body condition of marine mammals (Christiansen et al. 2016, 2018; Durban et al. 2016; Fearnback et al. 2018; Miller et al. 2012; Perryman and Lynn 2002 and Feambach et al. 2020). Christiansen, F., A.M. Dujon, K.R. Sprogis, J.P.Y Arnould and L. Bejder. 2016. Non-invasive unmanned aerial vehicle provides estimates of the energetic cost of reproduction in humpback whales. Ecosphere. 7(10). Christiansen, F., F. Vivier, C. Charlton, R. Ward, A. Amerson, S. Burnell and L. Bejder. 2018. Maternal body size and condition determine calf growth rates in southern right whales. Marine Ecology Progress Series. 592: 267–281. Durban, J. W., M.M. Moore, G. Chiang, L.S. Hickmott, A. Bocconcelli and G. Howes, P. Bahamonde, W.L. Perryan and D.J. L Leroi. 2016. Photogrammetry of blue whales with an unmanned hexacopter. Marine Mammal Science. 32: 1510–1515. Fearnbach, H., J.W. Durban, D.K. Ellifrit and K.C. Balcomb. 2018. Using aerial photogrammetry to detect changes in body condition in endangered Southern Resident killer whales. Endangered Species Research. 35: 175–180. Fearnback, H., J.W.Durban, L.G. Barrett-Lennard, D.K. Ellifrit and K.C. Balcolm. 2020. Evaluating the power of photogrammetry for monitoring killer whale body condition. Marine Mammal Science. 36: 359-364. Miller, C. A., P.B. Best, W.L. Perryman, M.F. Baumgartner and M.J. Moore. 2012. Body shape changes associated with reproductive status, nutritive condition and growth in right whales Eubalaena glacialis and E. australis. Marine Ecology Progress Series. 459: 135–156.

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				Perryman, W. L and M.S Lynn. 2002. Evaluation of nutritive condition and reproductive status of migrating gray whales (Eschrichtius robustus) based on analysis of photogrammetric data. Journal of Cetacean Research and Management. 4: 155–164.
107	HPI-12	Elders, hunters and others question Baffinland's interpretation of narwhal behaviour in relation to shipping and ice-breaking, as noted earlier in the text. The Hamlet, based on discussions with elders, hunters and others, questions Baffinland's reliance on noise levels and assumptions drawn from the hearing range of bowhead whales - in relation to the hearing range of narwhals. There are very many uncertainties, unexamined alternative hypotheses, and assumptions associated with the science being used in regard to the effects of ship noise and ice-breaking. There are different conclusions about what may be happening, based on Inuit Qaujimajatuqangit.		Baffinland appreciates the opportunity to clarify that the memo did not base its conclusions on acoustic monitoring results alone. If conclusions were based on acoustic monitoring results alone this would tend to support a determination that the changes to narwhal distribution observed in 2020 were in fact not Project-related. However, consideration of acoustic monitoring alone does not provide the full picture. In the Technical Memo summarizing the results from the 2020 monitoring programs, it was acknowledged that the underwater noise generated during the icebreaker and vessel transits is likely not the only factor that characterizes the potential for vessels to disturb narwhal. The context of physical proximity is also important. However, to date there is no quantifiable way to account for context in terms of defining a threshold for response. Underwater sound level provides a measurable quantity that can be used to define a threshold at which there is a high probability for a response. The 120 dB threshold that has been used in the assessment is currently the best available scientific data that is used in many jurisdictions for predicting the likely potential for behavioural responses to vessels. Baffinland acknowledges, however, that narwhal may respond to the presence and activities of icebreakers and vessels even at lower sound levels. That is precisely why a precautionary approach is being adopted for 2021, whereby additional measures are being put in place to mitigate the potential for narwhal disturbance during the early portion of the shipping season, despite the fact that the acoustic measurements do not point to underwater noise levels during icebreaker transits as being a primary candidate to explain the lower numbers of narwhal observed in Eclipse Sound in 2020.

Appendix 1

Baffinland Ice Concentrations – 1997 - 2020

Table 1 : Baffinland Ice Dates - Concentrations at Opening

Year	Break-up Date	Ice Concentration			Open Water Date
		less than 9/10ths	6/10ths	3/10ths	
1997	24-Jul	no data	no data	no data	07-Aug
1998	16-Jul	no data	no data	no data	10-Aug
1999	26-Jul	no data	no data	16-Aug	18-Aug
2000	12-Jul	no data	no data	no data	31-Jul
2001	22-Jul	30-Jul	07-Aug	11-Aug	15-Aug
2002	26-Jul	no data	08-Aug	08-Aug	15-Aug
2003	22-Jul	no data	25-Jul	29-Jul	29-Jul
2004	27-Jul	04-Aug	05-Aug	05-Aug	12-Aug
2005	28-Jul	04-Aug	07-Aug	10-Aug	13-Aug
2006	24-Jul	28-Jul	28-Jul	31-Jul	31-Jul
2007	22-Jul	29-Jul	29-Jul	29-Jul	06-Aug
2008	20-Jul	29-Jul	29-Jul	29-Jul	30-Jul
2009	21-Jul	26-Jul	01-Aug	03-Aug	06-Aug
2010	16-Jul	26-Jul	28-Jul	29-Jul	04-Aug
2011	11-Jul	23-Jul	25-Jul	26-Jul	27-Jul
2012	14-Jul	22-Jul	22-Jul	25-Jul	25-Jul
2013	19-Jul	26-Jul	26-Jul	28-Jul	30-Jul
2014	28-Jul	05-Aug	07-Aug	07-Aug	08-Aug
2015	20-Jul	31-Jul	02-Aug	05-Aug	05-Aug
2016	11-Jul	20-Jul	21-Jul	21-Jul	24-Jul
2017	15-Jul	29-Jul	01-Aug	05-Aug	08-Aug
2018	20-Jul	29-Jul	06-Aug	06-Aug	14-Aug
2019	12-Jul	21-Jul	24-Jul	24-Jul	25-Jul
2020	19-Jul	26-Jul	29-Jul	29-Jul	30-Jul
Mean, 1997-2020	**19-Jul**	**27-Jul**	**30-Jul**	**19-Aug**	**04-Aug**
Earliest / shortest season	**11-Jul**	**20-Jul**	**21-Jul**	**21-Jul**	**24-Jul**
Latest / longest season	**28-Jul**	**05-Aug**	**08-Aug**	**16-Aug**	**18-Aug**
Variability (days)	**17**	**16**	**18**	**391**	**25**
Mean, last 15 years	**18-Jul**	**26-Jul**	**28-Jul**	**30-Jul**	**01-Aug**

Note

Cells with light grey indicate that this concentration threshold was skipped. It means that from one day to the next, the concentration decreased rapidly - for example, from 5/10 to open water overnight. This would likely have been due to strong winds, or very warm and sunny weather.

Example: 07-Aug

Appendix 2

Distance Vessels would have Travelled in Different Ice Concentrations at the Beginning of the Shipping Season, Within the RSA, from 2015 - 2020

FEDNAV

Distance vessels would have travelled in different ice concentrations at the beginning of the shipping season, within the RSA, from 2015-2020

May 31, 2020

The charts below (Figures 1-5) show the distance that vessels would have travelled, within the RSA, in different ice concentrations based on the following considerations:

- vessels navigated along the established route defined by the established waypoints
- ice conditions experienced were as defined in the Canadian Ice Service (CIS) daily ice charts.

These charts depict the distance along which vessels might have encountered various ice concentrations, daily, at the beginning of each shipping season for Baffinland since shipping began in 2015. There is no chart for 2016 as there were open water conditions (<1/10 ice concentration) when the shipping season began.

This analysis was completed by measuring the sections of the shipping route which passed through various ice regimes in the daily CIS ice charts. This analysis was completed along the established route, without deviations from the waypoint route to avoid areas of heavy ice concentration (i.e. 9/10).

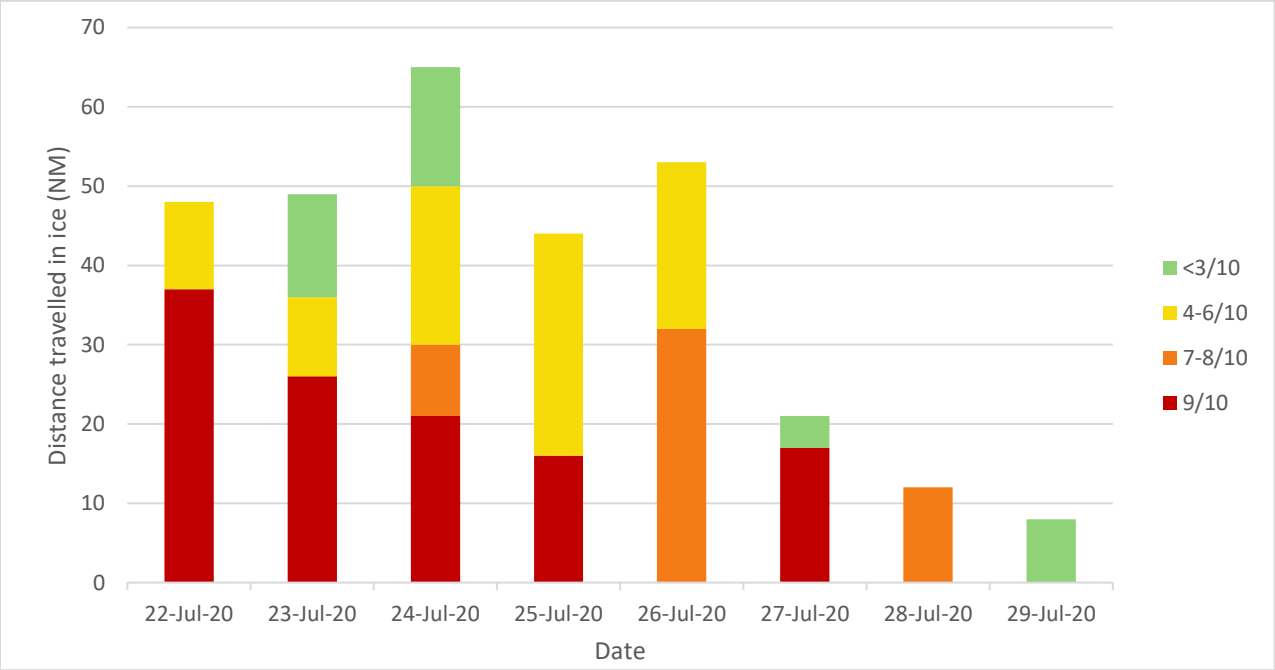

Figure 1. Distance (NM) travelled by vessels in various ice concentrations along the established shipping route, within the RSA, in 2020.

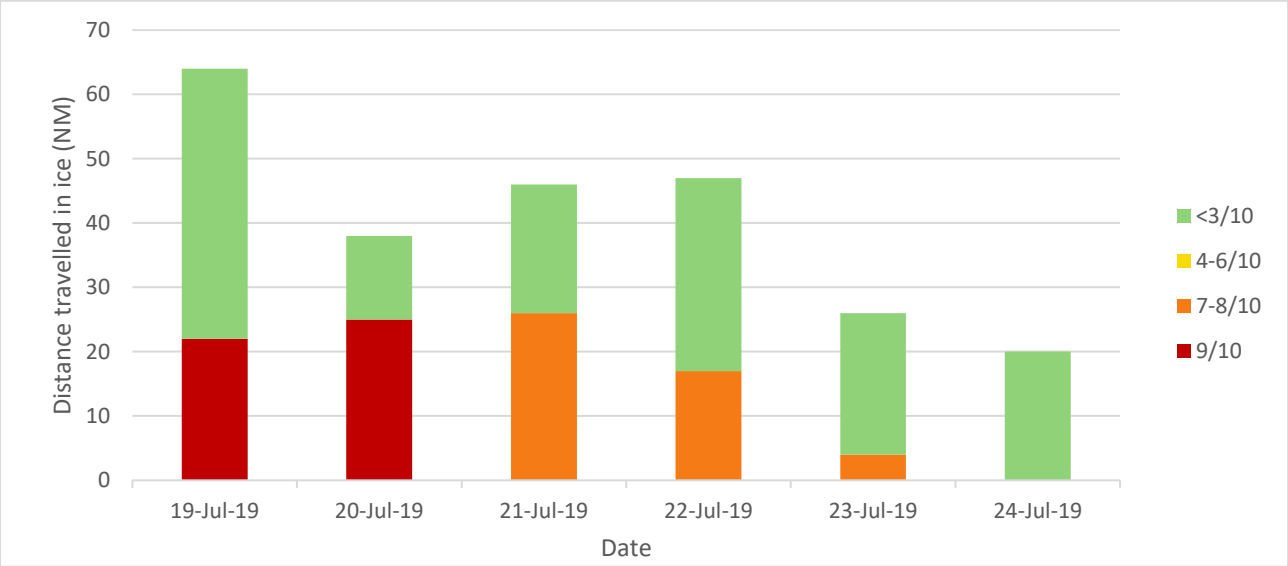

Figure 2. Distance (NM) travelled by vessels in various ice concentrations along the established shipping route, within the RSA, in 2019.

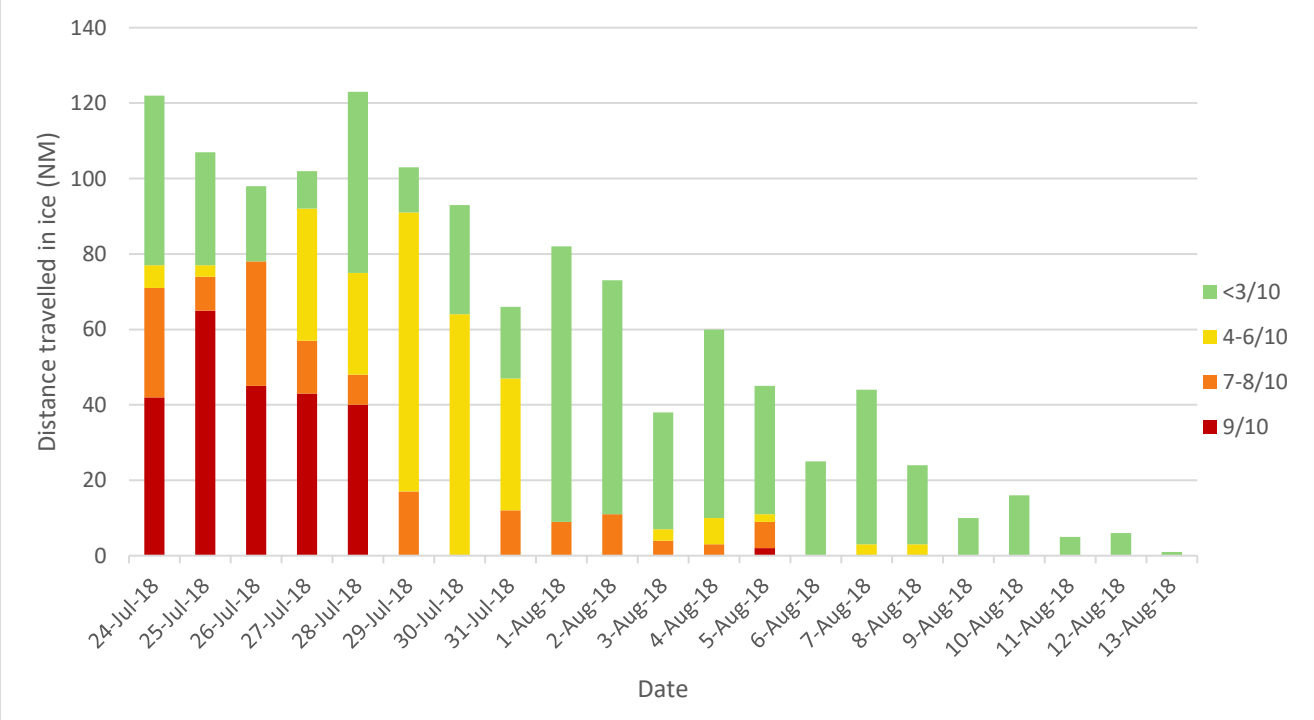

Figure 3. Distance (NM) travelled by vessels in various ice concentrations along the established shipping route, within the RSA, in 2018.

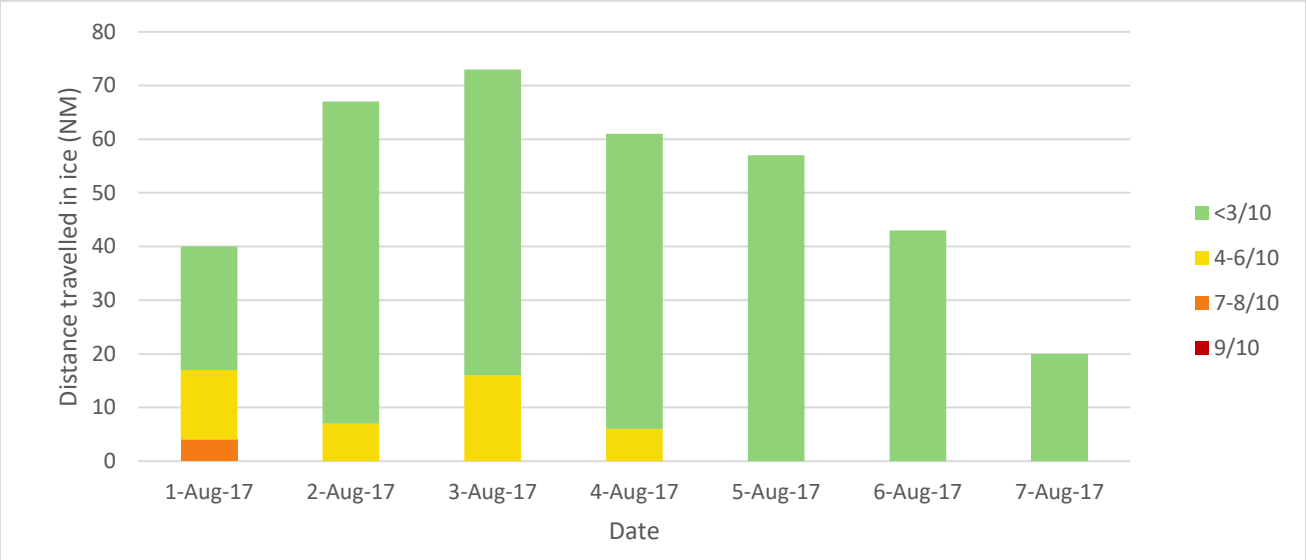

Figure 4. Distance (NM) travelled by vessels in various ice concentrations along the established shipping route, within the RSA, in 2017.

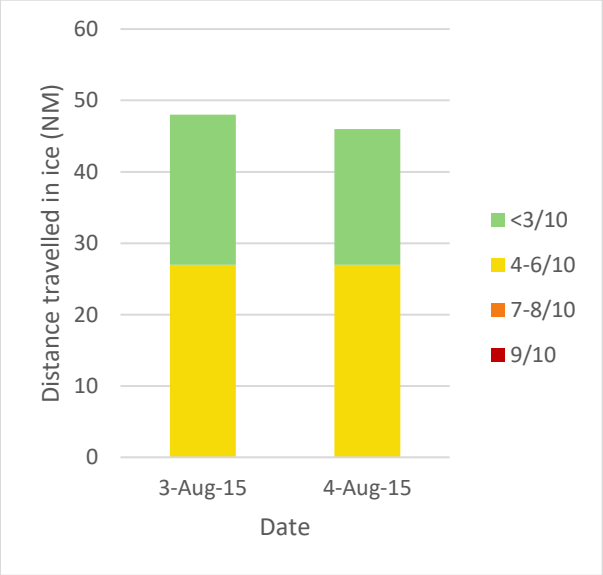

Figure 5. Distance (NM) travelled by vessels in various ice concentrations along the established shipping route, within the RSA, in 2015.