



Responses to Comments for the  
Extension Request to the Production Increase  
Mary River Project

Baffinland Iron Mines Corporation  
Mary River Project  
NIRB File No. 08MN053



## TABLE OF CONTENTS

---

Table of Contents.....	i
List of Tables.....	ii
List of Attachments.....	iii
<b>1 Introduction.....</b>	<b>1</b>
<b>2 North Baffin Hamlets.....</b>	<b>2</b>
<b>2.1 General Response.....</b>	<b>2</b>
<b>3 The Mittimatalik Hunters And Trappers Organization.....</b>	<b>3</b>
<b>3.1 General Response.....</b>	<b>3</b>
<b>3.2 Response to Recommendations and Comments .....</b>	<b>5</b>
<b>4 The Qikiqtani Inuit Association .....</b>	<b>6</b>
<b>4.1 General Response.....</b>	<b>6</b>
<b>4.2 Response to Recommendations and Comments .....</b>	<b>6</b>
<b>5 Government of Nunavut.....</b>	<b>7</b>
<b>5.1 General Response.....</b>	<b>7</b>
<b>5.2 Response to Recommendations and Comments .....</b>	<b>7</b>
<b>6 Northern Projects Management Office.....</b>	<b>8</b>
<b>6.1 General Response.....</b>	<b>8</b>
<b>6.2 Response to Recommendations and Comments .....</b>	<b>8</b>
<b>7 Crown-Indigenous Relations and Northern Affairs Canada.....</b>	<b>9</b>
<b>7.1 General Response.....</b>	<b>9</b>
<b>7.2 Response to Recommendations and Comments .....</b>	<b>9</b>
<b>8 Environment and Climate Change Canada.....</b>	<b>10</b>
<b>8.1 General Response.....</b>	<b>10</b>
<b>8.2 Response to Recommendations and Comments .....</b>	<b>10</b>
<b>8.2.1 ECCC 1 – Air Quality and Noise Abatement Management Plan .....</b>	<b>10</b>
<b>9 Fisheries and Oceans Canada.....</b>	<b>11</b>
<b>9.1 General Response.....</b>	<b>11</b>

<b>9.2</b>	<b>Response to Recommendations and Comments .....</b>	<b>11</b>
9.2.1	DFO 3.1 – Shipping.....	11
9.2.2	DFO 3.2 – Ice Breaking.....	13
9.2.3	DFO 3.3 – Ballast Water and Non-Indigenous Species .....	19
9.2.4	DFO 3.4 – Monitoring and Reporting .....	21
<b>10</b>	<b>Parks Canada Agency .....</b>	<b>33</b>
<b>10.1</b>	<b>General Response .....</b>	<b>33</b>
<b>10.2</b>	<b>Response to Recommendations and Comments .....</b>	<b>33</b>
10.2.1	PCA 1 - Management principles for Tallurutiup Imanga NMCA .....	33
10.2.2	PCA 2 – Precautionary Principle .....	34
10.2.3	PCA 3 – Vessel Management Mitigation .....	34
<b>11</b>	<b>Health Canada.....</b>	<b>35</b>
<b>11.1</b>	<b>General Response .....</b>	<b>35</b>
<b>11.2</b>	<b>Response to Recommendations and Comments .....</b>	<b>35</b>
<b>12</b>	<b>World Wildlife Fund .....</b>	<b>36</b>
<b>12.1</b>	<b>General Response .....</b>	<b>36</b>
<b>12.2</b>	<b>Response to Recommendations and Comments .....</b>	<b>36</b>
12.2.1	WWF A - Ministerial Direction Re Impacts and Collaboration with MEWG .....	36
12.2.2	WWF B - Insufficient Information to Support Impact Assessment Conclusions .....	36
12.2.3	WWF C - Previous Comments Relevant to Current Extension Application .....	36
<b>13</b>	<b>Oceans North.....</b>	<b>37</b>
<b>13.1</b>	<b>General Response .....</b>	<b>37</b>
<b>13.2</b>	<b>Response to Recommendations and Comments .....</b>	<b>38</b>
<b>14</b>	<b>Proposed Wording For Terms And Condition 179(a) and 179(b).....</b>	<b>39</b>

## LIST OF TABLES

---

Table 9.1:	Baffinland Mitigation and Monitoring Overview.....	15
Table 9.2	Baffinland Marine Mammal Monitoring Program Overview .....	22
Table 9.3:	Comparison of Abundance Estimates for Eclipse Sound Narwhal Summer Stock (2004-2019) .....	24

## **LIST OF ATTACHMENTS**

---

- Attachment 1: Baffinland Letter to Mayors (December 11, 2019)
- Attachment 2: Draft Terms of Reference for the Marine Environment Working Group
- Attachment 3: Summary of Vessel Speeds in the RSA During the 2019 Season
- Attachment 4: Updates to the Original World Wildlife Fund Submissions on the Production Increase Proposal
- Attachment 4a: Development Of Measures To Reduce Risks Of Use And Carriage Of Heavy Fuel Oil As Fuel By Ships In Arctic Waters

## 1 INTRODUCTION

---

This document comprises Baffinland Iron Mines' (Baffinland's) response to the comments received from Intervenor on the Extension Request to the Production Increase Proposal, including the original December 6 Extension Request and the subsequent submission of Additional Information to Support Further Modification of Conditions 179(a) and 179(b) of Mary River Project Certificate No. 005 (January 6, 2020).

The document is organized by intervenor; general responses are provided in some instances while specific recommendations are addressed individually under relevant headings.

## 2 NORTH BAFFIN HAMLETS

---

### 2.1 General Response

Baffinland appreciates the support shared by the Mayors of Arctic Bay, Clyde River, Hall Beach, Igloolik and Pond Inlet following their independent meeting in Rankin Inlet, as identified in their letter dated November 22, 2019. On December 11, 2019, Baffinland provided a response to the Mayors (Attachment 1) that included a number of commitments in relation to Inuit employees affected by the layoffs and Inuit employment more generally. Baffinland continues to work to reduce the number of Inuit employees affected by the layoffs and will provide additional updates as they are available.

## 3 THE MITTIMATALIK HUNTERS AND TRAPPERS ORGANIZATION

---

### 3.1 General Response

Baffinland values the input provided by the Mittimatalik Hunter and Trappers Organization (MHTO) in their review of the Extension Request. Participation in the various regulatory processes associated with the Mary River Mine is time and resource consuming, but it continually deepens Baffinland's understanding of how the Project interacts with the environment, wildlife and waters that are of great importance to the MHTO and Inuit of the North Baffin more broadly. Through this ongoing engagement Baffinland has been able to make meaningful changes to its operations and expansion plans with the intent of minimizing or eliminating effects of the Project on Inuit rights as defined in Sections 5.7.18 and 5.7.25 of the Nunavut Agreement.

This list represents an overview of mitigation Baffinland has implemented since the Project operations commenced, inclusive of the Production Increase. Should the Extension Request be approved, they would continue to apply for the duration of the approval:

- Confirmation from the MHTO that the floe edge has been closed for hunting prior to the start of the shipping season
- Development of an extensive Shipping Communications Standard Operating Procedure for the Project, that includes the hiring of two-full time shipping monitors within Pond Inlet who provide updates on vessel traffic over the community radio and VHF throughout the shipping season
- Limiting the number of vessels anchored or drifting at Ragged Island to a maximum of three vessels at any time throughout the shipping season
- Establishment of voluntary speed restrictions (9 knots) for all Project vessels travelling along the Northern Shipping Route to minimize ship wake and disturbance to marine mammal harvesting activities
- Establishment of a nominal shipping route for all Project-vessels to follow to increase predictability and safe passage for hunters while Project-vessels are present in the Northern shipping corridor
- Establishment of 'no-go zones', specifically near Saviit (along shoreline of Bruce Head) and Koluktoo Bay which have been identified as important areas by the MHTO
- Development of bowhead hunt management plans with the community of Pond Inlet for years where tags are provided to minimize interference with the community hunt
- Provision of dedicated pick-ups and trailers to move land users and snow machines between the Port and Mine Sites along the Tote Road.
- Providing fuel to hunters who visit the Project site
- Providing food and shelter at the Project site
- Providing maintenance services on the MHTO cabins located near the Project site.
- Support Inuit in identifying, communicating and using safe routes in or around the Project infrastructure
- Establishment of the Hunters Enabling Fund which provides 300L of fuel to Inuit over the age of 12 residing in Pond Inlet

The MHTO notes in their submission that they do not oppose the time limited Extension Request, but that they wish to see more extensive monitoring of the effects of the Project on the marine and terrestrial environment and are concerned about impacts to wildlife and habitat.

Baffinland notes that when Project activities began in 2013, Inuit and the Company acknowledged that impacts to harvesting may occur from the Project. Specifically, Article 13.1 of the Mary River Inuit Impact and Benefit Agreement (Mary River IIBA) includes the following:

“The objective of Article 13 hereof is to ensure that any potential incompatibility of the rights of Inuit to free and unrestricted travel and access for harvesting to all lands, water and marine areas within the Nunavut Settlement Area with the Company’s land use activities and rights of navigation in marine areas may be reduced....The QIA recognizes that the Company’s right to operate and manage their activity within the Project area including the rail and shipping corridor, subject to the provisions of this Agreement and QIA recognizes the restriction on Inuit right of access under Sections 5.7.18 and 5.7.25 of the NLCA...”

Restrictions on the Inuit right of access are primarily addressed by Article 5 “Financial Participation” of the Mary River IIBA which ensures that Inuit receive financial benefits in the form of royalties from the Mary River Project. The amended IIBA ensures that Inuit receive a minimum of \$1,250,000 quarterly, or \$5,000,000 annually, in the form of resource royalties (IIBA 5.6.3, 2018). A fund was also created in the negotiation of the IIBA – the Wildlife Compensation Fund (IIBA 17.6) - to account for potential damage or losses to wildlife or harvesting opportunities as a result of interactions with the Project. Further, in 2018 specifically, Baffinland also committed to providing \$200,000.00 annually through the re-negotiated IIBA to the MHTO in support of wildlife-based monitoring, to be run by the MHTO.

In response to concerns raised during the original Production Increase, Baffinland, the MHTO and the Hamlet of Pond Inlet also signed the “Agreement to Establish the Pond Inlet Committee”. One outcome of this agreement was the commitment by Baffinland to provide \$10,000.00 to the Tasiuqtiit Working Group for every ore carrier required to ship over 4.2 Mtpa. Since the time of signing, a total of \$370,000.000 has been transferred to the Working Group (\$130,000.00 in 2018 and \$240,000.00 in 2019). This agreement will remain in place should the Project continue to be approved to ship above 4.2 Mtpa.

Baffinland appreciates the support for the Extension Request and wants to assure the MHTO that environmental monitoring remains a critical component of the operation. Baffinland supports continuing conversations between our organizations around the monitoring programs run by Baffinland and how these could be further adapted to incorporate or support the MHTOs interests.

To date the monitoring undertaken by Baffinland on an annual basis meets or exceeds the requirements of Project Certificate No. 005. Baffinland also confirms that we have participated in and funded multiple regional monitoring programs or collaborations with other organizations such as Environment Canada, Fisheries and Oceans Canada and the Government of Nunavut.

Feedback from groups such as the MHTO and collaboration with other organizations have helped to inform changes or adaptations to many of these programs over the years, the results of which demonstrate the effects of the Project remain within the FEIS predictions of the ERP (see response to DFO 3.2 and the Supporting Information Summary Report provided as Attachment 1 to the Extension Request). Baffinland is also pleased to be reporting on the increasing involvement of Inuit in environmental monitoring conducted by Baffinland as outlined in Section 4.3 of the Information Package and will continue efforts to build capacity with Inuit researchers involved in the programs. Baffinland looks forward to furthering discussions with the MHTO on their research interests or community-based monitoring initiatives as part of ongoing engagement in relation to the ongoing operation, and the Phase 2 Proposal.

### **3.2 Response to Recommendations and Comments**

Not applicable.

## 4 THE QIKIQTANI INUIT ASSOCIATION

---

### 4.1 General Response

Baffinland appreciates the QIA's support for the Production Increase to continue into 2020 and affirms its commitment to 1) the Stabilization Approach, as described in our January 6<sup>th</sup>, 2020 submission to the Board, and 2) the content contained in the referenced letter to the QIA, dated January 29<sup>th</sup>, 2020.

Baffinland agrees that Inuit must be deeply involved in the Project. Supporting the QIA while they take the time to meaningfully engage the communities in the development of an Inuit Committee is a reflection of our continued prioritization of Inuit interests with respect to the Mary River Mine.

Baffinland acknowledges that QIA has provided a recommendation with respect to Baffinland's proposed wording of Terms and Conditions 179(a) and 179(b). A summary of all recommendations related to Terms and Conditions 179(a) and 179(b), as well as an updated response from Baffinland, is provided in Section 14.

### 4.2 Response to Recommendations and Comments

Not applicable.

## 5 GOVERNMENT OF NUNAVUT

---

### 5.1 General Response

Baffinland agrees with the considerations provided by the Government of Nunavut in their evaluation of the Extension Request, which include:

- The reasons for which the Original Increase was permitted included allowing sufficient time for the NIRB to complete its assessment of Phase 2. This reason is now not capable of being met given that the Original Increase timeline has expired;
- Baffinland's Extension Request does not involve changes to the Project footprint or to any of the current environmental mitigation and monitoring plans that were put in place as a result of the Original Increase decision; and
- Potential mine stoppages due to a 4.2 Mtpa production limit will negatively impact the interests of Nunavummiut employed with the Project and may cause negative socio-economic impacts in Nunavut, and in the North Baffin region in particular.

Baffinland appreciates the GN's confirmation that the concerns and recommendations submitted as part of the Original Increase were addressed in 2018, and continue to be satisfied.

Baffinland acknowledges that the GN has provided a recommendation with respect to Baffinland's proposed wording of Terms and Conditions 179(a) and 179(b). A summary of all recommendations related to Terms and Conditions 179(a) and 179(b), as well as an updated response from Baffinland, is provided in Section 14.

### 5.2 Response to Recommendations and Comments

Not applicable.

## **6 NORTHERN PROJECTS MANAGEMENT OFFICE**

---

### **6.1 General Response**

Baffinland appreciates the work carried out by the Northern Projects Management Office (NPMO) in the coordination and delivery of the federal submission in relation to the Extension Request. Baffinland acknowledges the recommended conditions in the federal submissions and has worked with relevant federal reviewers to propose agreeable paths forward, where possible. The details of this work are provided in the specific responses to parties, as necessary.

### **6.2 Response to Recommendations and Comments**

Not applicable.

## **7 CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA**

---

### **7.1 General Response**

Baffinland acknowledges Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) submission and conclusion that for aspects within their mandate, the proposed extension is not likely to cause significant adverse environmental effects. Baffinland also acknowledges CIRNAC's confirmation that the Extension Request adequately summarizes how concerns identified in the Minister's September 30, 2018 decision letter have been addressed.

With respect to the Waste Rock Management Plan, submitted to the Nunavut Water Board (NWB) on December 31, 2019, Baffinland looks forward to continued discussion with CIRNAC to address comments received.

Baffinland acknowledges that CIRNAC has provided a recommendation with respect to Baffinland's proposed wording of Terms and Conditions 179(a) and 179(b). A summary of all recommendations related to Terms and Conditions 179(a) and 179(b), as well as an updated response from Baffinland, is provided in Section 14.

### **7.2 Response to Recommendations and Comments**

Not applicable.

## 8 ENVIRONMENT AND CLIMATE CHANGE CANADA

---

### 8.1 General Response

Environment and Climate Change Canada's submission has been reviewed, and responses to individual comments are provided below.

### 8.2 Response to Recommendations and Comments

#### 8.2.1 ECCC 1 – Air Quality and Noise Abatement Management Plan

To address concerns related to ambient air quality at the current and proposed 6 Mtpa production rate, Baffinland is implementing components of the revised Air Quality and Noise Abatement Management Plan (AQNAMP) as presented through the Phase 2 reconsideration process in a phased approach. The first phase will include the development and implementation of an ambient particulate monitoring program in 2020 and 2021, including discrete and/or continuous monitoring of total suspended particulate matter (TSP) and particulate matter <2.5µm (PM2.5). In 2020, Baffinland will retain technical expert support to perform a desktop review of historical dustfall and meteorological data; perform site visits to investigate siting locations, feasibility and operational requirements; and develop a draft particulate monitoring program scope. The intention will be to begin implementing the program scope in 2020, including the deployment of new monitoring equipment at site (pending equipment availability, transport, weather, and adequate site resources and logistics). Subsequent phases of implementation will be informed by a review of the deployment effort in 2020, effectiveness of the monitoring equipment and any operational challenges, and expansion of Project infrastructure.

ECCC has reviewed and confirmed that the above proposal satisfies the recommendation included in their February 3, 2020 submission to the Nunavut Impact Review Board. Baffinland looks forward to continued work with ECCC on the implementation of the AQNAMP and appreciates their engagement during this reconsideration process.

## 9 FISHERIES AND OCEANS CANADA

---

### 9.1 General Response

Department of Fisheries and Oceans Canada's submission has been reviewed, and responses to individual comments are provided below.

### 9.2 Response to Recommendations and Comments

#### 9.2.1 DFO 3.1 – Shipping

##### 9.2.1.1 Response to Reviewer Comment

The numeric values and assumptions presented by DFO in their review comment above are incorrect.

The 71.2 km disturbance distance referenced by DFO is based on modelling of a Post-Panamax carrier traveling at 14 knots (26 km/h). Acoustic modelling results for a Post-Panamax carrier traveling at 9 knots (16.7 km/h), which is the maximum allowable transit speed in the RSA, indicate a maximum disturbance distance of 19.2 km, equivalent to a 120 dB exposure period of 2.3 h per transit (38.4 km divided by 16.7 km/h). Since there will be an average of 2.2 ship transits per day in the RSA, the daily 120 dB exposure period would be 5.1 h (equivalent to 18.9 h of 'quiet time' per day). These calculations are based on underwater noise modelling completed for the Phase 2 assessment which considered a Post-Panamax-size ore carrier transiting through Eclipse Sound (the scenario with the largest sound footprint) at the restricted transit speed of 9 knots (16.7 km/h), and are therefore considered conservative. Actual acoustic recordings of a Post-Panamax vessel travelling in Eclipse Sound, collected in 2019 as part of JASCO's acoustic monitoring program, indicate that in reality the daily 120 dB exposure period is, on average, less than 1.3 h per day, or equivalent to 22.7 h of quiet time per day.

Baffinland acknowledges that occasionally, unpredictable Arctic sea conditions and logistical challenges may lead to more than 2.2 carrier passages on a given day. A maximum worst case scenario under current shipping operations can be conservatively assumed at 4 individual ship transits per day in the RSA. Based on actual monitoring results, the worst-case recorded scenario included a maximum daily 120 dB exposure period of 10.6h in 2019, recorded at Ragged Island AMAR on 03 August 2019, when there were 4 confirmed ship transits in the area. It should be noted that this maximum 120 dB exposure period (10.6 h) was notably higher on Aug 03 than all other days of the AMAR deployment, and may have included other noise sources such as smaller recreational boats and/or weather events. A 10.6 h daily 120 dB exposure period is equivalent to 13.4 hours of 'quiet time' per day.

All of the above acoustic measurement results will be summarized in a Technical Memorandum to be delivered to Project Interveners in February 2020 as part of the Phase 2 review process. This will provide ample time for Interveners to review the information in advance of the 2020 shipping season, and provide additional input during the pre-season MEWG teleconference.

It is important to note that for the most common marine mammals occurring in the RSA (i.e. narwhal and ringed seal), the above distances to the disturbance onset threshold (120 dB), and the corresponding exposure periods, are considered conservative estimates as the 120 dB threshold does not account for the frequency of the ship noise source relative to narwhal and ringed seal hearing sensitivity. Shipping noise generally dominates ambient

noise at low frequencies, with most energy occurring between 20 to 300 Hz and some components extending into the 1 to 5 kHz range (Richardson et al. 1995). Narwhal are considered mid-frequency cetaceans (Southall et al. 2007) with their most sensitive hearing occurring in the 20 to 100 kHz range (Richardson et al. 1995). Narwhal vocalization studies indicate that this species primarily vocalizes in the 300 Hz to 24 kHz range (Ford and Fisher 1978; Marcoux et al. 2011; Marcoux et al. 2012). Ringed seal vocalizations occur in the 400 Hz to 16 kHz frequency range, with dominant frequencies concentrated above 5 kHz (Stirling 1973; Cummings et al. 1984). Ship noise is therefore unlikely to result in major disturbance effects in narwhal or ringed seal given it is primarily emitted in the frequency band in which both species have lower hearing sensitivity. The maximum disturbance ranges presented herewith should therefore be considered as conservative estimates.

With the effective implementation of mitigation in place (i.e., 9 knot speed restriction), it is predicted that acoustic disturbance impacts on marine mammals in the RSA will be limited to temporary and localized avoidance behavior.

#### 9.2.1.2 Response to Recommendations and Comments (DFO 3.1)

Based on the corrected noise daily exposure periods presented above, Baffinland remains of the opinion that the number of ore carrier voyages (n=83) proposed per season, as outlined in the PIP application, will not result in significant residual impacts on marine mammals in the RSA. Baffinland confirms that the 2020 season associated with the Extension Request will not see more than 83 ore carrier voyages.

#### References:

- Cummings, W.C., D.V. Holliday and B.J. Lee. 1984. Potential impacts of man-made noise on ringed seals: vocalization and reactions. Outer Continental Shelf Environmental Assessment Program, Final report. Princ. invest., NOAA, Anchorage, AK 37:95–230.
- Ford, J.K.B. and H.D. Fisher, 1978. Underwater acoustic signals of the narwhal (*Monodon monoceros*). Canadian Journal of Zoology 56: 552-560.
- Marcoux, M., Auger- Méthé, M., Chmelnitsky, E.G., Ferguson, S.H. and M.M. Humphries. 2011. Local passive acoustic monitoring of narwhal presence in the Canadian Arctic: A pilot project. Arctic 64: 307-316.
- Marcoux, M., Auger-Méthé, M. and Humphries, M.M. 2012. Variability and context specificity of narwhal (*Monodon monoceros*) whistles and pulsed calls. Marine Mammal Science 28: 649-665.
- Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, and J.H. Miller. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals 33(4): 411-521.
- Stirling, I. 1973. Vocalization in the ringed seal (*Phoca hispida*). Journal of the Fisheries Research Board of Canada 30(10):1592-1594.

## 9.2.2 DFO 3.2 – Ice Breaking

### 9.2.2.1 Response to Reviewer Comment

Baffinland notes that shipping in support of the Production Increase Proposal is consistent with the nominal dates approved under the Early Revenue Phase (ERP). Subsequently, and as implemented in 2018 and 2019, Project vessels do not enter the RSA until landfast ice has broken up along the entire shipping corridor and it has been confirmed with the MHTO that hunters are no longer using the floe edge. The icebreaker contracted by Baffinland in 2018 and 2019 was used for the purpose of providing escort for safe navigation of Project vessels travelling through Eclipse Sounds and Milne Inlet at the beginning and end of the shipping season. While ice breaking does occur at intermittent points during a given transit in the shoulder seasons, it is not continuous along the entire route. Rather, ice concentrations are variable and the icebreakers interactions with ice are similarly variable. It is also noted that this is a limited activity that is only required at the beginning and end of the shipping season.

As described in Section 5.3.6 of the Supporting Information Package submitted by Baffinland for the Extension Request, Baffinland has conducted an extensive environmental assessment for the Phase 2 Proposal. While the Extension Request does not contain a dedicated Assessment of Icebreaking Operations, it does make reference to the one provided in relation to Phase 2, which has been publically available since May 17, 2019. This Assessment is suitable for the review of the Extension Request understanding that the Phase 2 Proposal assesses more than double the number of vessels than has been defined for the Extension Application (i.e. a maximum of 83 ore carriers versus 176 for Phase 2). The conclusion of the assessments undertaken for the Phase 2 Proposal clearly demonstrates that effects to marine mammals are predicted to be not significant, taking into account the proposed mitigation. Given the concerns expressed by DFO with respect to the conclusions relating to narwhal, Baffinland took the additional step of arranging for a third-party review to be undertaken by Hemmera (Hemerra, 2019), which overall agrees with the conclusion that with mitigation, effects will be not significant. Given that no significant residual effects are predicted for a 12 Mtpa shipping scenario, in Baffinland's view it is reasonable to conclude that continuing with a 6 Mtpa shipping operation would also have no significant residual effects, particularly in light of the fact that the 6 Mtpa shipping operation includes the application of a comprehensive suite of mitigation.

It is noted that Baffinland's assessment of ice breaking activities (Golder, 2019) proceeded on the basis that there is a potential for significant residual effects on marine mammals to occur as a result of Phase 2 operations if mitigations were not applied. This understanding and conservative approach informed the development of the extensive set of shipping-related mitigation measures described in Section 5.3.4 of the Supporting Information Package (Baffinland 2020). While some of these mitigation measures were developed with specific consideration to narwhal (i.e. transit restricts and implementation of the buffer zone during the spring shoulder season), implementation of these mitigations will also be beneficial and effective for avoiding adverse effects on other marine mammal species in the RSA that will interact with Project activities. Follow-up monitoring commitments have also been made that are appropriate and tailored to manage any uncertainty in the assessment (e.g. end of season aerial survey). These monitoring commitments were completed in 2019, and will equally apply to the 2020 season under the Extension Request.

As shown in Table 9.1, for each potential effect, a mitigation to minimize or eliminate the effect has been applied by Baffinland. Each of these mitigations have been, and will continue to be monitored for at an appropriate frequency throughout the life of the Project to confirm that effects of the Project remain within the range of effects identified in the assessment predictions, to identify any unforeseen effects, should they occur, and to confirm that mitigations are working as intended. Given that monitoring results to date demonstrate that the effects of the Project on marine mammals are within the range predicted, Baffinland has confidence that the suite of mitigation measures proposed for 6 Mtpa operations are already shown to be functioning as intended and there is therefore no substantive rationale or need to apply the “most conservative” mitigation measure of ‘no icebreaking’ as recommended by DFO elsewhere in their submission.

Moreover, DFO has not provided any evidence that supports their assertion and subsequent recommendation that icebreaking operations after the application of Baffinland’s mitigations, still has the potential to significantly deter animals from entering Eclipse Sound, leave the area due to noise disturbance, or to prevent animal movement into and out of preferred marine habitat through displacement. Baffinland also notes that icebreaking activity occurs regularly in the Arctic. To the best of our knowledge, DFO has not mandated any specific mitigations in relation to those shipping activities (i.e. for example vessel management practices, such as speed limits, that are imposed on GoC icebreaking vessels which are annually active in Eclipse Sound). This approach suggests that overall, DFO does not view icebreaking as an inherently significant activity of concern.

Baffinland provided evidence to demonstrate that the voluntary mitigations applied by Baffinland during the 2019 shipping season have been effective and are working as intended to DFO and to the NIRB on October 15 2019 (see Baffinland 2019) and this information was also summarized in the Extension Request. Moreover, since the Extension Application was submitted, monitoring results from 2019 Marine Mammal Aerial Survey show that the 2019 abundance estimate for the narwhal Eclipse Sound summer stock on August 25/26 was 10,830 animals, which falls within the 95% Confidence Interval (CI) of all previous abundance estimates for this stock. This further confirms that effects of the Project remain within FEIS and FEIS Addendum predictions (i.e., no changes in abundance at the population/stock level either through mortality or via seasonal displacement or abandonment of marine mammals in the RSA, no changes in relative abundance and group composition including proportion of calves, disturbance effects are shown to be localized and temporary).

**Table 9.1: Baffinland Mitigation and Monitoring Overview**

Potential Effect	Mitigation	Intended Outcome of Mitigation	Monitoring Program	Summary of Project Monitoring Results 2015-2019
Ship Strike	<ul style="list-style-type: none"> <li>9 knot speed restriction</li> <li>Placement of Marine Wildlife Observers on icebreaking vessels</li> <li>Commitment to not break landfast ice</li> <li>All icebreaking activities will be conducted outside of sensitive life cycle periods for ringed seal (pupping, nursing and mating periods)</li> <li>All Project vessels will maintain constant speed and course (as safe navigation allows)</li> <li>When marine mammals appear to be trapped or disturbed by Project vessel movements, the vessel will implement appropriate measures to mitigate disturbance</li> <li>All Project vessels are provided with standard instructions to not approach within 300m of a walrus or polar bear observed on sea ice</li> <li>All Project vessels are provided with standard instructions to operate their vessel in a manner that avoids separating an individual member(s) of a group of marine mammals from other members of the group.</li> <li>Establishment of restricted “no-go” zones to avoid key sensitive areas (Koluktoo Bay, Tremblay Sound, western shore of Milne Inlet).</li> </ul>	Avoid marine mammal mortality or injury as a result of Project operations	<ul style="list-style-type: none"> <li>Ship-Based Observer Program</li> <li>Bruce Head Shore-Based Monitoring Program</li> <li>Narwhal Tagging Monitoring Program</li> <li>Marine Mammal Aerial Surveys</li> </ul>	<p>No ship-strikes to any marine mammals have been observed since the start of Project operations from any of the marine-based monitoring programs, nor reported by any of the Project vessel operators, through community-based monitoring initiatives or by local community members.</p> <p>2017 and 2018 narwhal tagging data demonstrate that narwhal effectively avoid ships at ranges that would impede being struck by the vessel.</p> <p>Based on aerial survey data, the Eclipse Sound narwhal summer stock population has remained stable since start of shipping operations. Current abundance estimate of the stock is consistent (within 10%) with pre-shipping levels (e.g. 2014) confirmed via 2016 and 2019 aerial surveys.</p>
Ice Entrapment	<ul style="list-style-type: none"> <li>Commitment to not break landfast ice</li> <li>Avoidance of ice if and when safe to do so</li> <li>When marine mammals appear to be trapped or disturbed by Project vessel movements, vessels will implement appropriate management measures to mitigate disturbance.</li> </ul>	To avoid ice entrapment events as a result of icebreaking activities.	<ul style="list-style-type: none"> <li>Narwhal Tagging Monitoring Program</li> <li>Ship-Based Observer Program</li> <li>End of Season Aerial Clearance Survey</li> </ul>	<p>Based on 2017 and 2018 tagging data, all tagged narwhal had migrated out of the RSA into Baffin Bay by mid-October, prior to formation of landfast ice in the RSA.</p> <p>Based on tagging studies and SBO data, icebreaking effects on narwhal during the late shoulder season are consistent with those predicted in the FEIS (limited to temporary and localized disturbance effects, no entrapment predicted). Project-related icebreaking operations did not result in displacement of narwhal from the RSA. Evidence of narwhal actively avoiding the sternward track of icebreaking vessels for a period of several hours following interaction.</p> <p>Based on aerial surveys undertaken during the fall of 2019 (after completion of shipping), no entrapment events were recorded.</p>

**Table 9.1: Baffinland Mitigation and Monitoring Overview**

Potential Effect	Mitigation	Intended Outcome of Mitigation	Monitoring Program	Summary of Project Monitoring Results 2015-2019
Hearing Impairment	Not required as marine mammal acoustic injury thresholds were not exceeded in any of the modelling scenarios. This was subsequently confirmed through passive acoustic monitoring program.	N/A	Passive Acoustic Monitoring Program	Monitoring results confirm modelling predictions that marine mammal injury thresholds are not being exceeded as a result of Project activities.
Acoustic Disturbance	<ul style="list-style-type: none"> <li>Establishment of a 40-km 'buffer zone' at entrance of RSA</li> <li>Avoidance of ice if and when safe to do so</li> <li>Establishment of restricted "no-go" zones to avoid key sensitive areas (Koluktoo Bay, Tremblay Sound, western shore of Milne Inlet).</li> </ul>	Reduce the acoustic disturbance zone (spatial area) in the RSA.	<ul style="list-style-type: none"> <li>Marine Mammal Aerial Survey Program (including pre-season aerial survey and post-season clearance survey)</li> <li>Bruce Head Shore-Based Monitoring Program</li> <li>Ship-Based Observer Program</li> <li>Narwhal Tagging Program</li> <li>Passive Acoustic Monitoring Program (Bruce Head, Milne North, Eclipse Sound)</li> </ul>	<p>Based on aerial survey data, the Eclipse Sound narwhal summer stock population has remained stable since start of shipping operations. Current abundance estimate of the stock is consistent (within 10%) with pre-shipping levels (e.g. 2014) confirmed via 2016 and 2019 marine mammal aerial surveys.</p> <p>Based on aerial survey and SBO data, higher number of bowhead whale recorded in 2019 (when shipping levels were highest in the RSA) than in previous survey years.</p> <p>Based on shore-based monitoring data, the total number of narwhal (standardized by effort) recorded at Bruce Head was higher in heavier shipping years (2016, 2018, 2019) than prior to shipping (2014) and Year 1 of shipping (2015). The mean proportion of calves recorded at Bruce Head was similar across all survey years (and higher in 2019 than all other survey years except for 2015).</p> <p>Based on tagging studies and shore-based monitoring data, disturbance effects on narwhal are consistent with those predicted in the FEIS (limited to temporary and localized effects).</p> <p>Acoustic recordings of a Post-Panamax vessel travelling in Eclipse Sound, collected in 2019 as part of JASCO's acoustic monitoring program, indicate that the daily 120 dB exposure period is, on average, less than 1.3 h per day, or equivalent to 22.7 h of quiet time per day.</p>
	<ul style="list-style-type: none"> <li>Restriction of transits in heavier ice conditions</li> </ul>	To minimize the amount of time narwhal will be exposed to noise levels that would onset disturbance and avoidance behaviours.		
	<ul style="list-style-type: none"> <li>9 knot speed restriction</li> </ul>	Reduce the noise output of all Project vessels		
	<ul style="list-style-type: none"> <li>Commitment to not break landfast ice</li> </ul>	Reduce the noise output of icebreaker operations, and therefore reduce acoustic disturbance zone and daily exposure period.		
	<ul style="list-style-type: none"> <li>All Project vessels will maintain constant speed and course (as safe navigation allows)</li> </ul>	Reduce the acoustic disturbance zone (spatial area) in the RSA		
	<ul style="list-style-type: none"> <li>No drifting of Project vessels in Eclipse Sound (as safe navigation allows)</li> </ul>	Reduce the acoustic disturbance zone (spatial area) and daily exposure period		

**Table 9.1: Baffinland Mitigation and Monitoring Overview**

Potential Effect	Mitigation	Intended Outcome of Mitigation	Monitoring Program	Summary of Project Monitoring Results 2015-2019
	<ul style="list-style-type: none"> <li>Maximum of 3 vessels anchored at Ragged Island</li> </ul>	Reduce the acoustic disturbance zone (spatial area)		
Acoustic Masking	<ul style="list-style-type: none"> <li>Establishment of a 40-km 'buffer zone' at entrance of RSA</li> <li>Establishment of restricted "no-go" zones to avoid key sensitive areas (Koluktoo Bay, Tremblay Sound, western shore of Milne Inlet).</li> </ul>	Reduce the acoustic disturbance zone (spatial area) in the RSA.	<ul style="list-style-type: none"> <li>Marine Mammal Aerial Survey Program (including pre-season aerial survey and post-season clearance survey)</li> </ul>	<p>Based on aerial survey data, the Eclipse Sound narwhal summer stock population has remained stable since start of shipping operations. Current abundance estimate of the stock is consistent (within 10%) with pre-shipping levels confirmed via 2016 and 2019 marine mammal aerial surveys.</p> <p>Based on shore-based monitoring data, the total number of narwhal (standardized by effort) recorded at Bruce Head was higher in heavier shipping years (2016, 2018, 2019) than prior to shipping (2014) and Year 1 of shipping (2015). The mean proportion of calves recorded at Bruce Head was similar across all survey years (and higher in 2019 than all other survey years except for 2015).</p> <p>Based on tagging studies and shore-based monitoring data, disturbance effects on narwhal are consistent with those predicted in the FEIS (limited to temporary and localized effects).</p> <p>Acoustic recordings of a Post-Panamax vessel travelling in Eclipse Sound, collected in 2019 as part of JASCO's acoustic monitoring program, indicate that the daily 120 dB exposure period is, on average, less than 1.3 h per day, or equivalent to 22.7 h of quiet time per day.</p>
	<ul style="list-style-type: none"> <li>Restriction of transits in heavier ice conditions</li> </ul>	To minimize the amount of time narwhal will be exposed to noise levels that would onset disturbance and avoidance behaviors.	<ul style="list-style-type: none"> <li>Bruce Head Shore-Based Monitoring Program</li> <li>Ship-Based Observer Program</li> </ul>	
	<ul style="list-style-type: none"> <li>9 knot speed restriction</li> </ul>	Reduce the noise output of all Project vessels	<ul style="list-style-type: none"> <li>Narwhal Tagging Program</li> </ul>	
	<ul style="list-style-type: none"> <li>Commitment to not break landfast ice</li> </ul>	Reduce the noise output of icebreaker operations, and therefore reduce acoustic disturbance zone and daily exposure period	<ul style="list-style-type: none"> <li>Passive Acoustic Monitoring Program (Bruce Head, Milne North, Eclipse Sound)</li> </ul>	
	<ul style="list-style-type: none"> <li>All Project vessels will maintain constant speed and course (as safe navigation allows)</li> </ul>	Reduce the acoustic disturbance zone (spatial area) in the RSA		
	<ul style="list-style-type: none"> <li>No drifting of Project vessels in Eclipse Sound (as safe navigation allows)</li> </ul>	Reduce the acoustic disturbance zone (spatial area) and daily exposure period		
	<ul style="list-style-type: none"> <li>Maximum of 3 vessels anchored at Ragged Island</li> </ul>	Reduce the acoustic disturbance zone (spatial area)		

#### 9.2.2.2 Response to Recommendations and Comments

Based on the rationale provided above by Baffinland in response to the Detailed Reviewer comment, and given that monitoring shows that the ice management activities undertaken by Baffinland in 2018 and 2019 have not had a significant environmental effect, Baffinland disagrees with DFO Recommendation 3.2 that “Baffinland shall not conduct any icebreaking activities at any point along the Northern Shipping Route...”. For clarity, the Extension Application does not propose to expand upon any activities included in the PIP Proposal or carried out during 2018 and 2019 - Baffinland is simply requesting an extension to continue carrying out these activities during 2020 while the Phase 2 reconsideration completes.

Despite Baffinland’s disagreement with the need to limit shoulder season shipping activity further than what has already been voluntarily implemented, Baffinland notes that there is an existing term and condition under which Baffinland and DFO can continue to explore additional mitigation and monitoring measures, should they be proven necessary. PC Condition No. 183 was added by the Responsible Minister in September 2018 and adequately encompasses the ability for DFO to recommend additional measures should they be warranted such that a new term and condition would be redundant. Baffinland has suggested alternative wording for PC Condition No. 183 in relation to DFO Recommendation 3.4.4 and has provided it here for additional consideration. For more details on the rationale for the amended wording, please see Baffinland’s response to DFO 3.4.4.

*TC 183. "The proponent shall collaborate with the Marine Environmental Working Group to develop impact avoidance or mitigation strategies for the protection of the marine environment. The proponent shall implement any direction from the Department of Fisheries and Oceans **issued in accordance with the Fisheries Act** for any avoidance or mitigation measures, including cessation of any activity, for the protection of the marine environment, **and shall give due consideration to recommendations from other members of the Marine Environmental Working Group. Where recommendations are not implemented, the proponent shall provide written rationale in the Annual Report.**"*

#### References:

Baffinland (Baffinland Iron Mines Corporation). 2019. Final Written Comment Responses Phase 2 Proposal – Mary River Project. October 2019. Public Registry Identification: 327146.

Golder. 2019. Assessment of Icebreaking Operations during the Shipping Shoulder Seasons on Marine Biophysical Values Ecosystem Components (VECs). Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-102-R-Rev1-30000. 17 May 2019.

Hemmera Envirochem Inc. (Hemmera). 2019. Review of the Mary River Phase 2 Assessment Conclusions on the Effects of Icebreaking to Narwhal. Project No. 103182-01. October 11, 2019.

## 9.2.3 DFO 3.3 – Ballast Water and Non-Indigenous Species

### 9.2.3.1 Response to Reviewer Comment

In order to establish the relative risk of introduction of AIS through ballast water exchange and ship hull biofouling, the Milne Port activities associated with the ERP were subjected to a semi-quantitative risk assessment using methods developed by DFO (Chan et al. 2012). The results, as presented in Appendix 8B-4 in the ERP Addendum to the FEIS, indicated that the risk of AIS introductions at Milne Port due to ERP shipping operations was low (Invasion Risk categorized as ‘Lowest’) based on the following combined risk rankings:

- Probability of Arrival = Highest
- Probability of Survival = Lower
- Probability of Introduction = Lower
- Magnitude of Consequence = Lowest

Under the 6 Mtpa scenario (PIP Extension Request), the number of yearly ballast water discharge events would increase from 53 (as assumed in Appendix 8B-4) to 84 vessels. This would increase the total volume of ballast water discharged per year in the marine environment from 662,000 tonnes to 1,025,000 tonnes. Following application of a correction factor (0.10) to estimate for propagule supply (Chan et al. 2012), the corrected volume of discharged ballast water (102,500 tonnes) under a 6 Mtpa scenario would end up resulting in the same probability and consequence rankings as those described above for 4.2 Mtpa, thus continuing to result in a low AIS invasion risk overall.

Ballast water exchange has been shown to be an effective method for preventing the introduction of AIS in Milne Inlet under current shipping volumes (5.9 Mtpa), which is substantially similar to the volume proposed in the Extension Application (6 Mtpa). There have been no invasive species identified in the RSA to date following implementation of a rigorous and extensive AIS monitoring program conducted in accordance with PC Condition No. 76, 87, and 91. For example, in 2018 an estimated total of 745,124 zooplankton organisms (representing 44 taxa), 62,803 benthic infaunal organisms (representing 349 taxa), 25 distinct benthic epifaunal organisms, 1,733 encrusting epifaunal organisms (representing 9 taxa) and 6 distinct macrofloral organisms taxa were identified in samples collected at Milne Port and Ragged Island. All were taxonomically processed and subsequently screened against existing baseline inventories for Milne Inlet and against the national and global invasive species databases. None of these organisms were confirmed as being newly identified Non-Indigenous Species (NIS) in the Project area since Baffinland shipping operations began.

While risks relating to NIS will continue to be low if the permitted 6 Mtpa is extended through 2020, Baffinland has recently committed for ore carriers to undertake both exchange and treatment (in that order, for vessels subject to the D-2 standard) prior to discharge. The Ballast Water Management Plan and Standing Instructions to Masters for the Project will be updated in 2020 to reflect this. This commitment serves to further address any the potential risks for AIS introductions to the marine environment from ballast water discharges under a 6 Mtpa scenario.

### 9.2.3.2 Response to Recommendations and Comments

Baffinland's current operational commitments mean that it is already operating in a manner that is more stringent than the applicable federal requirements relating to ballast water (which are designed to be protective). Given that the predicted risk of AIS is consistent in the 4.2 Mtpa and 6 Mtpa scenarios (for the reasons described above), and given there is monitoring data which demonstrates that no NIS/AIS introductions have occurred since the start of the Project (which indicates the current ballast water management measures are effective in protecting the marine environment), there is no rationale for increasing the current level of NIS/AIS management for the Extension Request to that which is committed under Phase 2.

Baffinland also wishes to provide a review of the commitments that address DFOs recommendations in their Final Written Submissions for the Phase 2 Proposal that apply to the current Project and Extension Request:

DFO 3.10.1: Results of the ballast water dispersion modelling for Phase 2 conditions were already presented in Technical Supporting Document (TSD 18) in Baffinland's Addendum to the Final Environmental Impact Statement (FEIS) for the Phase 2 Proposal.

The 2019 Ballast Water Model Validation Report simply verified the same ballast water dispersion model used for TSD 18 to additional oceanographic data collected in Milne Inlet in 2018 (in response to Board Recommendation No. 9 on the NIRBs 2017-2018 Annual Report). In 2019, the ballast water simulation was re-run for the 2018 shipping season (mid-July to mid-October) using 2018 oceanographic data for comparison and direct observations of ballast water as input. This allowed a second comparison of the model with direct measurements; this time with measurements near Milne Port and near Bruce Head and actual ballast water measurements as input.

TSD 18 included ballast water model results for the existing ore dock for a total of 84 ships of Panamax and Supramax size. TSD 18 also included ballast water model results for the Phase 2 conditions which included a cumulative number of vessels discharging ballast water at the existing and the proposed new ore dock up to a maximum of 176 vessels including Panamax, Supramax and Capesize vessels. The maximum simulated ballast water concentrations during the proposed Phase 2 project (176 ships) is shown in Figure 5.1 of TSD 18. The maximum simulated ballast water concentrations for the 2018 shipping season are shown in Figure 24 of the Ballast Water Model Validation Report, 2019).

In both cases (existing and proposed Phase 2), the following conclusions are supported by the results of TSD #18, the Ballast Water Model Validation Report (2019)

- Ballast water concentrations are low to undetectable within a short distance of the discharge location. This is true even under the increased discharge amounts of the Phase 2 expansion.
- Ballast water has little to no impact on the temperature and salinity of the waters in Milne Inlet. Even near the discharge location, the change in temperature and salinity caused by ballast water is negligible and generally not measurable. This is in part due to the small ballast water volume to ambient water volume ratio and in part due to the similarity between physical characteristics of ballast water and ambient water in Milne Inlet.

- Even by arbitrarily increasing or decreasing temperature by 110% and salinity by 17%, which is more than would be expected in reality, the model continued to show that natural temperature and salinity conditions would not be affected. Note that 2018 measurements show ballast water had an average salinity of 33 PSU.

DFO 3.10.2: Baffinland will continue to require Project vessels currently subject to the D-2 standard to undertake both exchange and treatment. Baffinland notes this commitment exceeds regulatory requirements of Transport Canada and PC Condition No. 89 and 90.

DFO 3.10.3: Baffinland will continue to monitor for compliance with D-1 Regulations on all project vessels prior to discharge of ballast water at Milne Port. This will include conducting salinity and temperature testing of ballast water on a single randomly selected tank. Baffinland will continue to engage DFO with respect to compliance monitoring against the D-2 Regulations through the Phase 2 reconsideration process. Baffinland notes this exceeds regulatory requirements of Transport Canada and PC Condition No. 89 and 90.

DFO 3.10.4: Baffinland has committed to run a pilot program during the 2020 shipping season to perform biological sampling of ballast water on 5 project vessels without treatment systems to evaluate the number of and types of organisms present in ballast tanks prior to discharge. Baffinland will continue to conduct ship hull biofouling surveys on a number of ore carriers, with focused efforts on areas of the hull where biofouling has the greatest potential to occur (e.g. chain lockers, stern tube, rope guard, bottom, rubber side, etc.). Baffinland notes ship hull monitoring is completed in accordance with PC Condition No. 91.

DFO 3.10.5: In addition to monitoring NIS monitoring already being conducted in accordance with PC Conditions No. 76, 87, and 91, Baffinland will also conduct the biological monitoring pilot program as described in 3.10.4 to assist in determining which species should be deemed high risk.

DFO 3.10.6: Baffinland has prepared a draft Rapid Response Plan (RRP) framework and shared this with DFO for review and input. Following approval of Phase 2, Baffinland will work with the MEWG and DFO to establish species-specific Rapid Response Plans. Rapid Response Plans will be developed for species identified as high risk through the monitoring outlined in 3.10.5 and based on a review of the Canadian Marine Invasive Screening Tool.

#### References:

Chan, F.T., J.E. Bronnenhuber, J.N. Bradie, K. Howland, N. Simard and S.A. Bailey. 2012. Risk assessment for ship-mediated introductions of aquatic nonindigenous species to the Canadian Arctic. DFO Can. Sci. Advis. Sec. Res. Doc. 2011/105. Vi + 93 p.

### 9.2.4 DFO 3.4 – Monitoring and Reporting

#### 9.2.4.1 *Response to Recommendations and Comments (DFO 3.4.1)*

The effectiveness of the Project mitigations is measured through the various monitoring programs, as described in response to DFO 3.2. These monitoring programs are reported on annually in detail through dedicated monitoring reports, and summarized for the NIRB Annual Report. Further, the results of these programs and effectiveness of mitigations are regularly discussed at MEWG meetings. A description of Baffinland's monitoring

programs and approach is outlined in the publicly available marine management and monitoring plans for the Project. Specifically, with respect to monitoring of the marine environment, Baffinland's Marine Monitoring Plan (MMP) describes monitoring actions that Baffinland uses so the Project does not unduly prejudice (as defined in the Nunavut Agreement, Section 12.5.5) the integrity of the marine environment and wildlife in the Project area through the application of the mitigations defined for the Project.

It is noted that various monitoring methods and programs identified in the MMP will be conducted at varying frequencies throughout the life of the Project. For a summary of data available by survey method and year, see Table 2 below. Implementation of each of the marine monitoring programs does not need to be implemented annually to measure for the effects of the Project and the relevant effectiveness of mitigations.

**Table 9.2 Baffinland Marine Mammal Monitoring Program Overview**

Survey Method	Year									
	2006	2007	2008	2013	2014	2015	2016	2017	2018	2019
Aerial Surveys	✓	✓	✓	✓	✓	✓	✓*			✓
Narwhal Tagging Program – collaboration with DFO								✓	✓	
Bruce Head Shore-based Monitoring				✓*	✓	✓	✓	✓	*	✓
Ship-based Observer Program					✓	✓			✓	✓
Acoustic Monitoring Program					✓	✓		✓	✓	✓
Marine Ecological Effects Monitoring Program	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: \*Baffinland undertook a photographic analysis of DFO survey photos to conduct an abundance estimate for 2 survey days  
\*\*2018 represents a vessel-based pilot program. Monitoring requirements for Bruce Head under the Project Certificate (PC 101) were formally completed in 2017.

It is important to note that Baffinland is conducting abundance surveys at a frequency which exceeds DFO monitoring of the Eclipse Sound narwhal stock, where abundance surveys are typically conducted every 3-5 years, which is deemed adequate for assessing whether Total Allowable Catch (TAC) quotas need to be adjusted for sustainable population management. Annual updates to the MMP will also consider regional monitoring efforts and/or research initiatives conducted by other agencies, universities and institutes and/or non-government organizations who have a jurisdictional interest and/or responsibilities for monitoring in the Project area (i.e. DFO) as appropriate.

An integrated and holistic summary of all marine environment monitoring programs and results will continue to be reported annually in the Annual Report to the NIRB under PC Conditions No. 76 (marine environment) and 101 (marine mammals) in addition to the submission of summary for all marine monitoring related PC Conditions (No 76-128) and the submission of technical reports for each of the monitoring programs. Compliance with mitigations such as the 9-knot speed restriction and travelling along the established shipping corridor will also continue to be reported to NIRB under PC Conditions No. 104 and 105.

See also response to DFO 3.2.

#### *9.2.4.2 Response to Recommendations and Comments (DFO 3.4.2)*

Baffinland's marine monitoring programs already ensure consistency and a high statistical power. Baffinland's monitoring programs have been conducted in the RSA since 2015 to monitor for potential Project effects from current operations, building on studies that supported the original assessment dating back as far as 2006. Results have contributed to the scientific knowledge and ecological understanding of the Eclipse Sound narwhal summer stock as well as other marine mammals in the RSA, and enabled potential effects to be rigorously assessed and appropriately contextualized. It should be noted that annual implementation of each of the monitoring programs is not a Project requirement. The frequency at which monitoring programs are undertaken is determined based on a number of factors, including, but not limited to, historical monitoring results, potential changes in the Project description (e.g. ship traffic levels) and logistical/financial considerations.

Baffinland's marine mammal monitoring programs conducted to date have yielded empirical data demonstrating that the effects of Project shipping on narwhal are in line with impact predictions made in the original FEIS, that is effects are limited to short-term and temporary disturbance with no evidence of large-scale displacement or abandonment by animals in the RSA, and no changes observed in the absolute abundance or the relative abundance of narwhal in the RSA despite increases in shipping each year.

Behavioral responses observed to date are consistent with low- to moderate severity responses based on Southall et al. (2007). Low severity responses are considered relatively minor and brief, moderate severity responses have a higher potential to affect foraging, reproduction, or survival, whereas high severity responses are considered likely to affect vital rates (SMRU 2014). A brief summary of each monitoring program is provided below along with comments on the overall statistical design and results.

#### Marine Mammal Aerial Surveys

As presented in Smith et al. (2017), year effects on narwhal abundance were evaluated for aerial surveys undertaken in 2014-2016 (in addition to other independent predictor variables) using generalized linear mixed models, where study year was specified as a categorical variable. The study year effect was shown to be not statistically significant (Type III,  $P = 0.52$ ). Smith et al. (2017) also used Tukey adjusted familywise contrasts to test for differences between each pair of study years. Their results indicate no statistical difference in narwhal abundance between 2014 and 2015 ( $P = 0.88$ ), 2014 and 2016 ( $P = 0.46$ ) and 2015 and 2016 ( $P = 0.70$ ). In other words, there was no statistical difference detected among 2014, 2015 or 2016 study years for narwhal abundance, despite annual increases in shipping over the three-year period.

In 2019, preliminary results from the aerial survey flown on 25-26 August demonstrate that narwhal population estimates for the Eclipse Sound stock are consistent with years before Project shipping began (Table 1). The abundance estimate of 10,830 narwhals falls within the 95% CI all of previous DFO abundance estimates for the Eclipse Sound stock. This is consistent with FEIS predictions that the Project will not have a significant effect on narwhal, resulting in large-scale displacement or abandonment of the Project area. Detailed results will be presented in the 2019 aerial survey monitoring report, which will include a power analysis to investigate the power to detect a 50% change in abundance between survey years. Detecting the halving or doubling of a population has been suggested as a minimum benchmark (Maclean et al. 2009) as this level of change at the group or stock level could result in a significant impact at the population level.

**Table 9.3: Comparison of Abundance Estimates for Eclipse Sound Narwhal Summer Stock (2004-2019)**

Stock	Year	Date	Abundance	CV	95% CI	Source
Eclipse Sound	2004	August	20,225	0.36	9,471 – 37,096	Richard et al. 2010
Eclipse Sound	2013	18-19 Aug	10,489	0.24	6,342 – 17,347	Doniol-Valcroze et al. 2015
Eclipse Sound	2016	Aug 07-10, 21	12,039	0.23	7,768 – 18,660	Marcoux et al. 2019
Eclipse Sound	2016	Aug 15	20,093	0.57	6,449 – 104,339	Golder 2018 (DFO data)
Eclipse Sound	2016	Aug 21	12,955	0.16	7,245 – 23,166	Golder 2018 (DFO data)
Eclipse Sound	2019	Aug 25-26	10,830	0.14	8,175 – 14,347	Golder 2020 (Baffinland data)

#### Narwhal Tagging Study

Narwhal tagging studies were undertaken in 2017 and 2018, in collaboration with DFO, to investigate narwhal behavioural response to shipping activities (i.e. during open-water conditions) along the Northern Shipping Route in Milne Inlet. Behavioral responses analyzed included changes in narwhal surface movement (e.g., horizontal avoidance and habituation) and changes in dive behavior; with the latter component including potential changes in surface time, dive rate, bottom dive depth, time at depth, dive duration, and descent speed.

Study results provide evidence of low severity behavioural responses in the presence of large vessels, for example:

- Narwhal avoid close contact with vessels: closest point of approach between individual narwhal and a given vessel ranged between 0.1 km and 3.0 km.
- Surface time significantly decreased when narwhal were within close range of a ship (<1 km).
- No significant change of dive rate in proximity to vessels.
- The effect of 'distance from vessel' on bottom dives was statistically significant when individuals were <5 km from a vessel ( $P \leq 0.009$ ), only if the individual had previously been engaged in a bottom dive (assumed to represent feeding).
- The effect of 'distance from vessel' on time at depth was not statistically significant ( $P > 0.1$ ).
- The effect of 'distance from vessel' on dive duration was significant at close distances only, with dive duration decreasing when <1 km from a vessel, and only when narwhal were undertaking a bottom dive ( $P = 0.026$ ).
- The effect of 'distance from vessel' on descent speed was not statistically significant ( $P > 0.4$ ).
- The effect of 'distance from vessel' on narwhal travel speed was not statistically significant ( $P = 0.2$ ) and had a small effect size. However, the effect of substratum was statistically significant ( $P < 0.001$ ), with travel speeds being highest in Baffin Bay and Milne Inlet North, and lowest in Koluktoo Bay.
- Turning angles were significantly ( $P < 0.05$ ) higher when narwhal were within 1-4 km of vessels relative to when no vessels were within 10 km.
- The orientation of narwhal relative to transiting vessels was predicted to be higher than 90° when within 4-5 km of a vessel prior to CPA, suggesting that narwhal tended to orient themselves away from vessels within this distance. Following CPA, mean model predictions remained above the 90° value for the entire 10 km extent. This may suggest that the effect of vessel transit is evident within 4-5 km from a vessel prior to the CPA, but for the full extent of 10 km post CPA.
- Narwhal may have exhibited marginal seasonal habituation to vessel passage, although neither the effect of day/time or the effect of year were statistically significant ( $P > 0.4$ ). Overall, narwhal crossed the vessel track both shortly before and shortly after vessel passage (minimum value of 4 min), suggesting no long-term avoidance of the shipping route due to vessel passage.

The analysis of the 2017-2018 integrated dataset had sufficient power to detect vessel effects under effect sizes, including 26% (dive duration), 34% (turning angle), -16% (travel orientation relative to vessels), and -47% (surface time). These effect sizes were calculated as either the percent change in response value when a vessel was at close proximity to narwhal relative to when no vessels were within the exposure zone (for non-binomial models) or based on the odds ratio between when a vessel was at close proximity to narwhal relative to when no vessels were within the exposure zone (for binomial models). That is, overall, the analyses had sufficient statistical power to detect narwhal behavioural responses to vessel traffic under a range of effect sizes. Detailed statistical results will be presented in the 2017/2018 Integrated Narwhal Tagging Report.

### Bruce Head Shore-based Monitoring Program

Five years of shore-based monitoring was conducted for narwhal near Bruce Head, from 2014-2019 (no shore-based study was conducted in 2018). Visual survey data were collected on relative abundance and distribution, group composition, and behaviour in order to investigate potential narwhal response to shipping activities along the Northern Shipping Route during the open-water season.

The modelling framework selected was a zero-inflated negative binomial model with a random effect of day and a spatial autocorrelation within each sampling day. The zero-inflation portion of the model was modelled to depend on stratum, substratum, Beaufort scale, and year, thus reflecting the unequal distribution of zero counts between different categories of these variables. Likelihood ratio tests (alpha of 0.05) were used to determine the importance of the zero-inflation component of the model. The full zero-inflated model was tested relative to a zero-inflated model with an intercept-only zero-inflation component and relative to a negative binomial model without zero-inflation. The selected analytical approach allowed for analysis of count data with a high occurrence of zeroes, while specifying an explicit spatial autocorrelation — i.e., accounting for the fact that narwhal are not randomly distributed and that counts in adjacent substrata will likely be more similar than counts in spatially segregated substrata. The models were used for inference of statistical significance based on P values of coefficients, and population-level model predictions were plotted against observed data to visualize the estimated relationships between narwhal counts and the various explanatory variables. Since the model contained multiple predictor variables, the visualization of predictions relative to specific variables of interest required setting the other predictor variables to a constant value. These predictor values were selected based on observed narwhal counts (so that narwhal counts were close to the overall mean of narwhal/substratum values), frequency of occurrence (e.g., the majority of the data were collected in the absence of large vessels or shooting events), or, when possible, their average values (e.g., tide height and depth change).

Results integrated across the 2014-2017 study period demonstrate that responses of narwhal to ore carrier traffic were variable, ranging from “no obvious response” in which animals remain in close proximity to ore carriers in transit to temporary and localized avoidance behaviour. A statistical analysis of narwhal relative abundance over the four-year study period was undertaken using a generalized linear mixed model analysis, with no significant change in narwhal abundance observed in the study area during this period. In other words, the relative abundance of narwhal in the Bruce Head area remained relatively constant over the four years of sampling despite the relative increase in shipping over this period. In 2019, shore-based monitoring of narwhal was re-initiated at Bruce head from August 06 to September 01. Preliminary results indicate that narwhal were present in relatively comparable numbers to previous survey years, and in higher numbers in 2019 than in 2014 when no Project shipping occurred (pre-operations). Detailed statistical results will be presented in the 2019 Bruce Head Monitoring Report.

### Ship-based Observer Program

The primary objective of the Ship-based Observer program is to monitor for potential ship strikes on marine mammals, and therefore no statistical analyses have been undertaken as part of this program (i.e., no power analysis is warranted given the nature of the effect being monitored through the program).

MEEMP Program:

Baffinland completed an a priori power analysis in 2018 which informed the 2019 sampling design (power analysis results indicated a need to increase sampling effort). This process was undertaken in consultation with the MEWG. The MEEMP sampling design was subsequently modified in 2019 to satisfy statistical power requirements for detection of Project effects, as outlined in the 2018 MEEMP Report. Following the analysis of MEEMP data collected in 2019, power analyses will be completed and included in the 2019 MEEMP Report, and will detail power to detect effects sizes at 10%, 20% and 2SD (increase for metal content, decrease for benthic invertebrate indices and fish health indices).

References:

- Maclean, I.M.D., Wright, L.J., Showler, D.A. and Rehfisch, M.M. 2009. A Review of assessment methodologies for offshore windfarms. British Trust for Ornithology Report Commissioned by Cowrie Ltd: 76pp.
- Smith, H.R., V.D. Moulton, S. Raborn, P. Abgrall, R.E. Elliott and M. Fitzgerald. 2017. Shore-based monitoring of narwhals and vessels at Bruce Head, Milne Inlet, 2017. LGL Report No. FA0089-1. Prepared by LGL Limited, King City, Ontario for Baffinland Iron Mines Corporation, Oakville, Ontario. 87 p. + appendices.
- Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, and J.H. Miller. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* 33(4): 411-521.

*9.2.4.3 Response to Recommendations and Comments (DFO 3.4.3)*

Baffinland analyzes all data from each of its marine monitoring programs on an annual basis. Detailed monitoring results from each year are presented in technical annual monitoring reports by program (i.e. 2018 Ship-Based Observer Program Monitoring Report, 2018 Marine Environmental Effects Monitoring and Aquatic Invasive Species Monitoring Program Report, etc.) that include detailed statistical analyses and figures. These reports, which are available to DFO to provide review and comment on through the MEWG are first circulated as Draft and then issued as Final technical data reports once responses to all comments from MEWG members have been addressed. The suggestion that this is currently lacking from Baffinland's monitoring reporting process is highly misleading. Furthermore, each technical annual report by program includes a statistical comparison between monitoring years providing an integrated analysis for each program and a summary of inter-annual trends in Project effects. As noted by DFO, Baffinland also provides an overview of the results included in these technical data reports for all of its monitoring programs in its Annual Report to NIRB.

A separate stand-alone overview report summarizing detailed results of all its monitoring programs would be several thousand pages long, inaccessible to any non-technical audiences and represent an unjustifiable cost versus value expenditure for Baffinland. This is not a reasonable request given that it would not offer any additional information that is not already available to the MEWG, DFO or the public in the above annual report deliverables.

See also response to DFO 3.4.1.

#### 9.2.4.4 Response to Reviewer Comment (DFO 3.4.4)

Recommendations previously made by the Working Group during MEWG meetings and as part of annual feedback by the MEWG on existing marine monitoring programs have been routinely incorporated into these programs. This includes, but is not limited to, the following:

- MEEMP and AIS Program - Undertaking a revised power analysis for MEEMP sampling programs (QIA, DFO, PC)
- MEEMP and AIS Program - Addition of benthic infauna as an EEM indicator for the MEEMP program (QIA, ECCC, DFO)
- MEEMP and AIS Program - Adding additional sampling stations along each transect for benthic and sediment sampling to increase power of detection (DFO, QIA)
- MEEMP and AIS Program - Addition of a new offshore transect in the MEEMP benthic and sediment quality sampling program- extending in a NE direction from the ore dock. This was to cover new area where floating freight dock and proposed second ore dock will be located (QIA, DFO).
- MEEMP and AIS Program - Establishment of permanent belt transects in the MEEMP program in lieu of epibenthic/epifloral underwater towed video surveys along historical transect lines (un-marked) (QIA).
- MEEMP and AIS Program - Adding more sampling stations for benthic and sediment chemistry along established MEEMP transects to increase power of detection (DFO, QIA)
- MEEMP and AIS Program - Modifications to Fukui traps to increase catch rate (literature shared by QIA – incorporated into sampling methods), and also varying sampling methodology (location, depth, bait, checking frequency) to increase catch rate (QIA)
- MEEMP and AIS Program - Addition of hoop/fyke nets to MEEMP fish sampling program to compensate for low catch in Fukui traps (DFO, QIA)
- MEEMP and AIS Program - Introduction of bottom trawls to MEEMP fish sampling program (QIA, DFO) to target other potentially missed species (e.g. Arctic cod) (DFO, QIA)
- MEEMP and AIS Program - Increased jigging and gill net sampling effort to allow for more consistent and repeatable fish sampling between monitoring years in MEEMP Program. (QIA).
- MEEMP and AIS Program - Changes to general study design. When changing from one monitoring method to another, both methods are carried on for minimum of 3 years to facilitate comparison of old and new methods / results (QIA).
- MEEMP and AIS Program - Recommendation to use other species other than char in tissue/body burden monitoring as part of MEEMP program, given that Arctic char are not resident in marine environment throughout year. BIM thus incorporated new monitoring indicators for this, including a local shellfish species (*H. Arctica*) and another cod species (year-round resident fish) (DFO, QIA).
- MEEMP and AIS Program - Arctic char age determinations be verified by expert with extensive experience reading char otoliths as they can be fairly long-lived species (methodology provided). (QIA)
- MEEMP and AIS Program - Recommendation to do ageing study of *H. arctica* so this information can be used to interpret any changes in growth and metal uptake. This was because this species was shown to have an extended lifespan (+100 years) in Greenland and therefore might not be an ideal indicator species for Project body burden tracking. Ageing protocols were shared with BIM – Golder relayed protocol to their respective analytical lab. (QIA)

- MEEMP and AIS Program - Recommendation to change indicator threshold for fish tissue analysis (i.e., use of 0.2 mg/kg as threshold for mercury rather than 0.5 mg/kg (HC guideline) to account for domestic consumption of subsistence harvesters (tend to eat larger quantities of fish) (QIA). This new threshold was adopted.
- MEEMP and AIS Program - Recommendation of using higher resolution video equipment for ship hull monitoring for biofouling including improved lighting systems was incorporated into MEEMP Program (QIA, DFO, WWF, ON)
- MEEMP and AIS Program - geographical expansion of the AIS monitoring program to Ragged Island (recommended by MHTO and DFO)
- MEEMP and AIS Program - Integrating into AIS program the use of an independent secondary taxonomic lab for taxonomic verification of potential AIS. At DFO's request, Laval Univ (Dr. Philippe Archembeaults' Benthic Ecology Lab) was selected for this purpose, as this is DFO's arctic specialist lab which they rely on for their invasive species work (DFO, QIA, PC, ON, WWF)
- MEEMP and AIS Program - Deployment of AIS settlement plates in sets so their recovery can be staggered to allow for longer soak duration and thereby the collection of older specimens of the fouling taxa that are easier to identify. Incorporated into study design in 2018. (QIA).
- MEEMP and AIS Program - Undertake further study to determine influence of Phillips Creek on MEEMP results – prompted the Background Review of Phillips Creek Geomorphology and Hydrology tech memo (QIA).
- MEEMP and AIS Program - Test sampling of ballast water salinity should be undertaken on all vessels calling to port (DFO, QIA, PC). Now part of standard compliance testing program.
- MEEMP and AIS Program- Installation of oceanographic moorings in study area and increased CTD depth profiling to better understand physical oceanographic conditions in Milne Inlet, to be used to further inform monitoring programs and ballast water dispersion (including modelling). As a result, two moorings were installed in Milne Port and one near Bruce Head in 2018 and 2019 (DFO, QIA). Expanded vertical depth profiling program occurred throughout Milne. CTD depth profiling during active ballast water discharges also occurred in 2019.
- MEEMP and AIS Program - Additional work related to the ballast water dispersion model including a sensitivity analysis using actual ballast water volume, temperature and salinity measurements recorded during 2018 shipping operations (QIA, PC, DFO). Also re-running of ballast water model using 2018 data.
- 2019 Marine Mammal Aerial Survey Program. Recommendation to undertake simultaneous surveys of Eclipse Sound and Arctic Bay stock summering grounds to account for exchange between stocks (using two planes based in different areas). This was incorporated into survey design. (DFO, QIA)
- 2019 Marine Mammal Aerial Survey Program. MEWG members reviewed proposed 2019 marine mammal aerial survey program. Study design and data collection improvements were provided by DFO and QIA, and were integrated into the study design (DFO, PC, MHTO, QIA), including re-orientation of survey lines, increased survey effort in certain areas, addition of new areas for survey (e.g. adjacent fjords).
- Shore-Based Observation Program: Installation of physical oceanography mooring at Bruce Head to correlate narwhal behavior with tide /current levels (QIA, DFO). See note above. This data is now collected and analyzed as part of the monitoring study.

- Shore-Based Observation Program: develop a means to determine sighting detection in furthest offshore strata. This drove the incorporation of drone surveys throughout strata undertaken simultaneously with dedicated observer data collection (PC, QIA).
- Shore-Based Observation Program: request to increase survey effort to capture more ship transit events and increase overall samples size (MHTO, QIA, DFO, WWF). This was accomplished through moving the field camp to the observer platform and doubling the number of observers in 2019 to achieve 16 to 18 of sampling effort per day (compared to 8 to 10h in 2017). Also improved down time due to weather.
- Passive Acoustic Monitoring (PAM) Program - Recommendation to deploy additional acoustic recorders in other parts of the RSA to better understand ship noise levels in those areas, including proportion of time sound levels exceeded 120 dB. As such, one AMAR was installed in Eclipse and one AMAR was installed in Northern Milne during the 2019 field season, with recordings collected over ice-covered periods and during open water period (QIA, DFO, PC, ON, WWF).
- PAM Program - Improvements requested re: the automated vocalization detector to better refine calls from different species (e.g. killer whale vs. narwhal). JASCO has been contracted to improve the detector (work in progress) based on improved training algorithms (QIA/DFO).
- Narwhal Tagging Program – Recommendation to install shore-based MOTE stations to increase tag data recovery for narwhal tagging study (DFO). Two MOTES were installed in 2017 (Tremblay and Bruce Head), and two more were installed in 2018 (Herodier and Emmerson Island).
- Ship Based Observer (SBO) Program – Request to include daily or weekly ice charts as part of SBO technical report to compare sightings data with ice conditions. This has been integrated. (QIA, PC, DFO).
- SBO - DFO recommended modifying the data collection methodology for the analysis regarding marine mammal behavior including movement characteristics relative to a vessel (by lowering the number of categories) – this has been adopted (DFO).
- SBO Program - Adoption of Environment Canada Seabird at Sea (CSAS) survey protocol for seabird surveys as part of the SBO program (QIA and ECCC)
- Based on feedback from MTHO that very few narwhal were seen in 2018, and that people were concerned that this may be linked to increased shipping activity, additional mitigation was introduced in 2019 (adaptive management example). This included buffer zone, implementation of restricted number transits in thicker ice conditions, early shoulder season aerial surveys, multi-vessel escorts, targeted icebreaker noise monitoring studies, permanent video recordings on board the ice breaker to record full transit.
- General feedback regarding Early Warning Indicators (body condition, calving rate, etc) has been considered and will feed into final list of EWIs and adaptive management measures.

In early 2018, Baffinland also introduced the Working Group Comment Response Form, which as noted by DFO, is another opportunity that allows the MEWG to provide specific comments on each of the draft marine monitoring program reports. Responses to each of these comments are provided by Baffinland, and if responses have resulted in a change to the monitoring program for future years, this is noted in the response. In light of the above, Baffinland is unsure how DFO remains unclear or unsatisfied with how recommendations from the MEWG are being incorporated into the marine monitoring programs.

It is noted that although DFO has expressed generalized and non-specific concerns that their feedback is not being integrated into marine monitoring program design or analysis (despite the lengthy list of examples above), DFO does not always provide feedback on topics within their area of expertise even when the opportunity to do so is there:

- No comments were provided by DFO on the 2014-2017 Bruce Head Data Integration Report
- DFO did provide comments on the report format for the 2018 Passive Acoustic Monitoring Program, but no comments related to study design or results analysis were submitted.

Baffinland's commitment to weigh science and Inuit Qaujimanituqangit equally relies on full participation in, and understanding of the Project by DFO, which as outlined above has not been realized to date.

Notwithstanding, proposed changes to the ToRs have been under consideration by the MEWG throughout the summer 2019, with drafts available to the NIRB for review. In response to recommendations made by several MEWG members to date, Baffinland has submitted proposed revisions to the ToRs in Appendix O of this submission that reflect a more consensus-based approach to decision making that more clearly identifies how recommendations are identified, supported, communicated, and tracked. Baffinland believes the updated draft ToR provide a more effective mechanism for the implementation of recommendations made by the MEWG, including DFO.

As identified by DFO, the current wording for Term and Condition No. 183 includes the statement that, "*The proponent shall implement any direction from the Department of Fisheries and Oceans for any avoidance or mitigation measures, including cessation of any activity, for the protection of the marine environment*".

DFO is granted the authority to issue such directions under the *Fisheries Act* as part of its legislative mandate. The Term and Condition appears to be intended to recognize this power and is not intended to grant DFO any additional powers outside of its legislated mandate under the *Fisheries Act*. Other MEWG members do not have the same legislative authority or mandate to issue "directions" and so Baffinland does not agree it would be appropriate to update this condition in the manner suggested by DFO. Should the NIRB wish to consider revisions to this wording, Baffinland suggests the following wording could be considered:

*"The proponent shall collaborate with the Marine Environmental Working Group to develop impact avoidance or mitigation strategies for the protection of the marine environment. The proponent shall implement any direction from the Department of Fisheries and Oceans **issued in accordance with the Fisheries Act** for any avoidance or mitigation measures, including cessation of any activity, for the protection of the marine environment, **and shall give due consideration to recommendations from other members of the Marine Environmental Working Group. Where recommendations are not implemented, the proponent shall provide written rationale in the Annual Report.**"*

#### 9.2.4.5 Response to Recommendations and Comments (DFO 3.4.4)

Baffinland will update the Terms of Reference for the MEWG in a fair and transparent process. This cannot happen, however, until Baffinland receives feedback from MEWG members on the draft Terms of Reference released on October 15, 2019 (Attachment 2).

Baffinland will continue to update its marine monitoring programs based on input provided by MEWG members. Moving forward these updates will be more clearly tracked and reported for the benefit of all MEWG members as well as the NIRB.

Baffinland does not believe DFO intended the above commitments to be completed prior to the completion of the Extension Request review period.

## 10 PARKS CANADA AGENCY

---

### 10.1 General Response

While it is understood that the Tallurutiup Imanga National Marine Conservation Area (TINMCA) has yet to be established, and that the Government of Canada must amend the Canada National Marine Conservation Areas Act to do so, Baffinland has proceeded and planned on the basis of the assumption that this will occur.

Baffinland recognizes that the Parks Canada submission is intended to address the potential risk from marine shipping to TINMCA's ability to protect and conserve the representative marine ecosystems for which it was selected. Baffinland has engaged with Parks Canada staff on an ongoing basis with respect to the development of the TINMCA Interim Draft Management Plan and the Phase 2 reconsideration process. Baffinland is confident the Mary River Mine's shipping activities align with the management principles outlined by Parks Canada, and that continued dialogue between Parks Canada and DFO will resolve any outstanding issues with respect to Phase 2.

### 10.2 Response to Recommendations and Comments

#### 10.2.1 PCA 1 - Management principles for Tallurutiup Imanga NMCA

Baffinland acknowledges that its shipping activities interact with the Tallurutiup Imanga National Marine Conservation Area (TINMCA) and has worked diligently with Parks Canada staff to ensure our operations are consistent with proposed zoning. To date this has largely occurred by reviewing the preliminary zoning areas outlined in the Draft Zoning Map for TINMCA, which Baffinland understands was presented to communities during Parks Canada Spring 2019 consultation activities. Consistent with recommendations included in the draft Zoning Map for TINMCA, Baffinland has also identified Tremblay Sound and Koluktoo Bay as restricted areas within the RSA (characterized by Parks Canada as Zone A areas). It is further noted that the self-imposed and voluntary mitigations (i.e. speed restrictions) Baffinland has applied in Zone B areas of the TINMCA exceed all regulatory requirements for vessel management and are demonstrably more conservative than mitigations taken by any other vessel travelling in the area, including Federal and Territorial procured-vessels (Attachment 3).

Other seasonal feature considerations to be addressed in the draft Interim Management Plan for TINMCA is the floe edge, polynyas and sea ice. Through the Phase 2 Assessment, Baffinland has clearly demonstrated an understanding of the importance of these areas both from an ecological and community perspective, implementing commitments to:

- keep vessels 40 km away from the most easterly point of the floe edge at the start of the shipping season;
- eliminating winter shipping through the Northern corridor based on community feedback regarding the importance of sea ice as a travel route; and
- ensure all vessels do not travel or drift in Northern Baffin Bay to ensure there is no disturbance to the North Water Polynya.

### 10.2.2 PCA 2 – Precautionary Principle

See response to DFO 3.2

### 10.2.3 PCA 3 – Vessel Management Mitigation

Baffinland will implement the vessel management mitigation measures listed in Section 5.3.4 of the Information Package (Page 36 of Part 1) during the 2020 shipping season. Baffinland will continue to implement the vessel management mitigation measures listed in Section 5.3.4 of the Information Package (Page 36 of Part 1) during the 2020 shipping season.

## **11 HEALTH CANADA**

---

### **11.1 General Response**

Baffinland appreciates Health Canada's consideration of the information submitted in support of the Extension Request and confirmation that it has no regulatory role related to the review.

### **11.2 Response to Recommendations and Comments**

Not applicable.

---

## 12 WORLD WILDLIFE FUND

---

### 12.1 General Response

Baffinland acknowledges the letter provided by WWF in relation to the Extension Request and the broad themes it touches upon. Baffinland notes that no additional technical analysis appears to have been provided with respect to the documents referenced as relevant to the Extension Request that would otherwise have supported the statements provided in their letter. In lieu of any technical analysis to respond to, Baffinland provides the following responses to the three broad themes discussed by WWF.

### 12.2 Response to Recommendations and Comments

#### 12.2.1 WWF A - Ministerial Direction Re Impacts and Collaboration with MEWG

Impact avoidance and/or mitigation measures have been developed and made available to MEWG members for review and input since late 2018. Such mitigation includes transit restrictions during the spring shoulder season, as well as setbacks from the floe edge for vessels waiting to enter Eclipse Sound. Understanding all MEWG members had equal access to the relevant documents, and were informed via verbal updates during the April and June 2019 MEWG meetings (e.g. prior to the 2019 shipping season), Baffinland feels there was ample opportunity for input to be provided.

#### 12.2.2 WWF B - Insufficient Information to Support Impact Assessment Conclusions

See Response to DFO 3.1, 3.2, 3.3 and 3.4

Baffinland also refers WWF to CIRNACs Final Written Submission on the Extension Request that acknowledges CIRNACs confirmation that the Extension Request adequately summarizes how concerns identified in the Minister's September 30, 2018 decision letter have been addressed.

#### 12.2.3 WWF C - Previous Comments Relevant to Current Extension Application

Baffinland understands that WWF has resubmitted their Final Written Submission to the NIRB in relation to the Production Increase Application from July 2018 and indicated that 'most' of their comments remain pertinent to the Extension Request. Acknowledging that a significant amount of work has been carried out in relation to the existing projects ongoing operations, as well as its expansion planning for Phase 2, Baffinland has provided an updated table (Attachment 4), summarizing WWF's original recommendations and Baffinland's response, with an additional column to provide pertinent updates for NIRB consideration.

---

## 13 OCEANS NORTH

---

### 13.1 General Response

Baffinland acknowledges the letter provided by Oceans North to the Nunavut Impact Review Board (NIRB) respecting the Extension Request. As previously described by Baffinland in response to Oceans North Final Written Submission ON-03-09, Baffinland believes its approach has been responsive to Minister Leblanc and Minister Bennett's comments in their letter of September 30, 2018. This sentiment was echoed by CIRNAC in their Final Written Submissions on the Extension Request which identifies that the Supporting Information Summary Report provided by Baffinland adequately summarizes how concerns raised in the Minister's September 30, 2018 decision letter have been addressed.

Oceans North provided no comments on the Production Increase Proposal (2018) and has not provided any specific recommendations or substantive comments related to the Extension Request (2020). Instead, they have attached a copy of their Final Written Submissions in relation to Phase 2 as part of their review of the Extension Request. Since the Oceans North submission does not include any substantive comments on the Extension Request, Baffinland is of the view it should not be considered in the NIRB's decision making process on the Extension Request.

For the benefit of the NIRB, Baffinland has provided the following clarification on the inaccurate statements contained in their letter.

#### *Incorrect Interpretation of Monitoring Results*

Oceans North has incorrectly suggested that Baffinland has failed to understand the results of shipping associated with the PIP or to share the results of its monitoring programs. On the contrary, the marine mammal monitoring data collected by Baffinland in 2019 presented in the Supporting Information Summary Report attached to the Extension Request, as well as the 2019 Preliminary Marine Mammal Monitoring Technical Memo submitted as part of Baffinland's response to Final Written Submission (Golder, 2019) clearly demonstrates that effects on marine mammals are consistent with those predicted in the FEIS for the Early Revenue Phase. Specifically, these results confirm that marine mammals will experience temporary and localized disturbances as a result of Project shipping, but that large-scale displacement and abandonment as a result of the Project will not occur. These predictions have been confirmed through extensive data collected through the marine mammal monitoring programs from 2015-2019, including the 2017-2018 Narwhal Tagging Monitoring Program, the Bruce Head Shore-Based Monitoring Program and Marine Mammal Abundance Aerial Surveys.

Baffinland agrees that the monitoring programs have been effective in identifying fine-scale changes to narwhal behavior in the presence of vessels (i.e. change in travel), and wishes to clarify that these effects are consistent with the characterization of temporary and localized disturbances Baffinland predicted in the FEIS for the ERP. It is notable that Oceans North has incorrectly referenced a 'stoppage in nursing' as a Project effect observed and reported on by Baffinland through its monitoring programs. Baffinland has not reported this effect through its and therefore recommends the NIRB dismiss this characterization of Project effects as incorrectly stated by Oceans North. Aligned with FEIS predictions however, the temporary and localized disturbances that have been

captured and recorded through Baffinland’s monitoring programs are confirmed as not resulting in population-level changes of the Eclipse Sound Stock (i.e. large-scale displacement or abandonment). Results from the 2019 Shore-Based Monitoring Program show that relative abundance and distribution of narwhal has remained consistent with pre-shipping (e.g. before 2015) levels, preliminary results of the 2019 Marine Mammal Aerial Survey show that the 2019 abundance estimate for the narwhal Eclipse Sound summer stock on August 25/26 was 10,830 animals, which falls within the 95% Confidence Interval (CI) of all previous abundance estimates for this stock. This estimate will be further described in an updated to the 2019 marine mammal monitoring plan memo, expected prior to the next technical meeting for Phase 2.

For a greater understanding of Baffinland’s marine mammal monitoring programs and mitigation, please see Baffinland’s responses to DFO 3.4.1-3.4.4

#### *Repeated Misunderstanding of Publically Available Information*

In ON-03-03 of their Final Written Submission on the Phase 2 Proposal, Ocean’s North suggested that Baffinland had concealed the results of the 2015 marine mammal aerial survey conducted by LGL on Baffinland’s behalf, to which Baffinland took great exception. Ocean’s North cover letter on the Extension Request still asserts that this information is not publically available, despite Baffinland clearly identifying that the report is on the NIRB Public Registry and was commented on by both QIA and DFO. For a final time, Baffinland wishes to clarify that this draft report was never finalized due to the number of deficiencies identified in the survey design and data analysis, which were described in the peer review conducted by Golder (Golder 2017).

Golder Associates Ltd. (Golder). 2017. Peer Review: Marine Mammal Aerial Surveys in Eclipse Sound, Milne Inlet and Pond Inlet, 01 August – 17 September 2015. Submitted to Baffinland Iron Mines Corporation. 31 March 2017. 40pp.

#### *Repeated Reference to Inadmissible Evidence*

In its submission, Oceans North has persisted in referring to evidence that the NIRB has ruled is inadmissible. Baffinland has repeatedly confirmed, and the NIRB has accepted, that there are no applications or current plans for an 18 Mtpa project. Oceans North has disregarded the NIRB’s procedural authority, demonstrating a continued lack of respect for the NIRB’s process. Oceans North should not be permitted to proceed in a manner in contempt of the NIRB’s ruling. Allowing this submission to stand could create confusion through the transmission of false information to Nunavummiut.

For these reasons, Baffinland submits it is of the utmost importance that the NIRB address the issue of Oceans North’s non-compliance with NIRB’s order. In accordance with section 6.1(b) of the NIRB’s Rules of Procedure, where a party fails to comply with the Rules or a direction on procedure issued by the Board, the Board may “Take such other steps as it considers just and reasonable.” Baffinland trusts that the NIRB will take the appropriate step to address this non-compliance by Oceans North.

## **13.2 Response to Recommendations and Comments**

Not applicable.

---

## 14 PROPOSED WORDING FOR TERMS AND CONDITION 179(A) AND 179(B)

---

In Baffinland's Extension Request Supporting Information Summary Report the following amended wording was proposed for Terms and Conditions 179(a) and 179(b):

*179(a) Until December 31, 20~~19~~20, the total volume of ore shipped via Milne Inlet may exceed 4.2 million tonnes per year, but must not exceed 6.0 million tonnes in any calendar year. After December 31, 01920, the maximum total volume of ore shipped via Milne Inlet in a calendar year returns to 4.2 million tonnes per year, unless ~~this condition has been further modified under section 112 of the Act~~, otherwise directed.*

*179(b) Until December 31, 20~~19~~20, the total volume of ore transported by truck on the Milne Inlet Tote Road may exceed 4.2 million tonnes per year, but must not exceed 6.0 million tonnes in any calendar year. After December 31, 201920, the maximum total volume of ore transported by truck on the Milne Inlet Tote Road in a calendar year returns to 4.2 million tonnes per year, unless ~~this condition has been further modified under section 112 of the Act~~, otherwise directed.*

Both the QIA and CIRNAC have recommended that the provision requiring further modification under section 112 of NuPPAA, remain. Alternatively, the GN's recommendation is to only make it explicit the direction come from the Nunavut Impact Review Board. Baffinland is hopeful that the Phase 2 reconsideration process will be complete by the end of 2020, and that therefore there will be no need for a further extension of the Production Increase Proposal in 2021. However, in the unlikely event that the Phase 2 reconsideration further extends past December 31, 2020 Baffinland trusts that the Board would require Baffinland to submit detailed rationale for an extension, and establish an opportunity for all parties to comment before making any decision to approve a further extension.

The Board has been granted authority over its process under the Nunavut Agreement and NuPPAA and possesses the wisdom to make such a decision. For this reason, Baffinland believes that its proposed wording for 179(a) and 179(b) should provide the ability for either the Board or the Minister to grant further extensions to the date. This language would ensure that any extension would proceed in an appropriate manner in compliance with NuPPAA, utilizing the limited resources of all parties in the process on the issues most important to Inuit and to Nunavut.

**ATTACHMENT 1:  
BAFFINLAND LETTER TO MAYORS  
(DECEMBER 11, 2019)**



December 11, 2019

His Workshop Moses Oyukuluk  
Mayor of Arctic Bay

His Worship Jerry Natanine  
Mayor of Clyde River

Her Worship Stacy Kadlutsiak  
Acting Mayor of Hall Beach

His Worship Merlyn Recinos  
Mayor of Igloolik

His Worship Joshua Arreak  
Mayor of Pond Inlet

Dear Mayors,

Thank you for your letter dated November 22, 2019 in which you share your support for continued production at the Mary River Mine at 6 million tonnes per annum (mtpa) until the Phase 2 Development Proposal assessment is completed. I understand that the support provided is conditional on the premise that no more layoffs to members of your communities occur, and that those members that have been laid off are accommodated. I am writing to you today to provide an update on the success of our efforts to date, and what Baffinland can reasonably commit to for the near future.

As I mentioned in a letter to Mayor Recinos, dated November 20, 2019, Baffinland's employees, and the employees of our contractors, both Inuit and Non-Inuit, are the centre of our business. As the President and CEO I have an obligation to each and every single person who takes on a career at Mary River. The decision to demobilize our contractor workforce was not taken lightly by me or anyone at Baffinland. It is a decision that Baffinland had to take to ensure the Company can continue to operate. The Contractor demobilization that has occurred is not tied to production activities at Mary River but tied to activities that support ongoing operations of the site as a whole.

The wellbeing of the affected individuals and their families is something I personally take very seriously. That is why I have instructed the Baffinland team to do absolutely whatever it can to find new employment for these individuals and to ensure they all have access to available support programs. To date we have held productive discussions with several departments at the Government of Nunavut, Government of Canada, and other Nunavut based mining companies to ensure that Inuit staff negatively affected by this decision receive every available support. Demobilizing this workforce prior to work being completed was never part of Baffinland's plan for 2019 but was in direct response to economic circumstances created by the delay in the Phase 2 hearings. As of December 2, 2019 the number of Inuit staff impacted by the demobilization of contractors has been reduced by half, from 96 to 48 individuals.

Baffinland has worked diligently with other contractors and within its own operations to absorb as many Inuit as possible, and to accommodate the others as much as possible under the circumstances. Regrettably, Baffinland cannot absorb all Inuit staff affected by the demobilization into the current workforce at Mary River. There are key structural differences between the construction workforce affected by the demobilization and the resident operations workforce. In the letter provided by

Baffinland to the Nunavut Impact Review Board on December 6, 2019 related to the Extension request to the Production Increase Proposal, the following three commitments were made:

1. Baffinland confirms that it will continue to support those workers and their families affected by the demobilization of contractors to the extent possible under the present circumstances
2. Baffinland will continue to prioritize Inuit employment at the Mary River Mine and commits not to lay off its Inuit employees while it maintains production at 6 million tonnes per year during the extension period.
3. Should Phase 2 be approved, Baffinland is further committed to continue the upward trend in the number of Inuit employed at the Mary River Mine, as has been experienced steadily since 2017.

Baffinland sincerely appreciates the support provided by the Mayors of Pond Inlet, Arctic Bay, Clyde River, Hall Beach and Igloolik and their intent to come together to discuss the Phase 2 Proposal. Moving forward, Baffinland is committed to work with the North Baffin communities to identify and address outstanding issues and concerns related to Phase 2 for the purpose of finding mutual understanding and resolution.

Sincerely,



Brian Penney  
President and CEO  
Baffinland Iron Mines

c.c. Hon. David Akeeagok, Minister of Economic Development and Transportation, Government of Nunavut  
Aluki Kotierk, President, Nunavut Tunngavik Inc.  
P.J. Akeeagok, President, Qikiqtani Inuit Association  
David Rochette, Regional Director General Nunavut, Indigenous and Northern Affairs Canada  
Megan Lord-Hoyle, Vice President Sustainable Development, Baffinland  
Udlu Hanson, Vice President, Community and Strategic Development, Baffinland

**ATTACHMENT 2:  
DRAFT TERMS OF REFERENCE FOR THE MARINE  
ENVIRONMENT WORKING GROUP**

Terms of Reference  
Marine Environment Working  
Group  
(MEWG)

## 1 Enacting Provisions

The Marine Environment Working Group (“MEWG”) is established pursuant to Nunavut Impact Review Board (“NIRB”) Project Certificate No. 005 for Baffinland Iron Mine Corporation’s (“Baffinland”) Mary River Project (“Project”). The MEWG shall function as set out in this Terms of Reference (“ToR”).

The Terms of Reference (“ToR”) establish the process for implementation of Project Certificate Term and Condition no. 077. The MEWG shall function in accordance with Project Certificate 005 Term and Condition No. 077, as follows:

Category: Marine Environment – Working Group
Responsible Parties: The Proponent, Environment Canada (now named Environment and Climate Change Canada, Fisheries and Oceans Canada, Qikiqtani Inuit Association (QIA), and interested parties
Project Phase(s): All phases
Objective: The MEWG will consult with, and provide advice and recommendations to the Proponent in connection with mitigation measures for the protection of the marine environment, monitoring of effects on the marine environment and the consideration of adaptive management plans. The role of the MEWG is not intended to either duplicate or to affect the exercise of regulatory authority by appropriate government agencies and departments.
Term or Condition: A Marine Environment Working Group ("MEWG") shall be established to serve as an advisory group in connection with mitigation measures for the protection of the marine environment, and in connection with the Project Environmental Effects Monitoring program, as it pertains to the marine environment. Membership on the MEWG will include the Proponent, Environment Canada (now named Environment and Climate Change Canada), Fisheries and Oceans Canada, Parks Canada, the Government of Nunavut, the Qikiqtani Inuit Association, the Mittimatalik Hunters and Trappers Organization (MHTO), and other agencies or interested parties as determined to be appropriate by these key members. Makivik Corporation shall also be entitled to membership on the MEWG at its election. The MEWG members may consider the draft terms of reference for the MEWG filed in the Final Hearing, but they are not bound by them.

## 2 Purpose

- 2.1 The purpose of the Marine Environment Working Group is to act as an advisory group for Baffinland and a forum for the discussion of ongoing cooperation, communication, reporting, proactive review and consideration of supplemental baseline needs, environmental effects monitoring, mitigation measures, adaptive management processes and to make recommendations on appropriate management approaches related to the project. This would allow for the fulfillment of Project Certificate conditions as appropriate relating to the interaction between the Mary River Project and the marine environment. Pursuant to Project Certificate 005 Term and Condition No. 77 these ToR provide the framework for the MEWG and the objectives it will fulfill.
- 2.2 This ToR will provide the framework for the MEWG and the objectives it will fulfill.
- 2.3 It is the intention of Baffinland to establish cooperative environmental arrangements between the company, members of the MEWG and Inuit to protect both the environment as well as the traditional relationship of the Inuit with the natural environment. The objectives of these arrangements are to:
- Develop sufficient baseline from which the Project can be effectively monitored and managed;
  - Develop a comprehensive and integrated environmental monitoring program as required in the Project Certificate;
  - Incorporate an integrated approach for monitoring and management of Project-related environmental effects;
  - Include the meaningful participation of members of the MEWG and local Inuit in all aspects of the environmental monitoring program in all phases of Project development, including decommissioning and reclamation;
  - Integrate Inuit Qaujimajatuqangit (IQ) into the development and implementation of the environmental monitoring programs;
  - Where deemed necessary by the working group, report in an effective and timely manner on the environmental monitoring program and its results in ways that are meaningful to Inuit people; and
  - Support adaptive management systems and processes.

### 3 Composition

3.1 Pursuant to Project Certificate No. 005 Term and Condition No. 77, the MEWG consists of an appointed member from each of the Parties. The parties of the MEWG will be the following, all of whom shall be called a “Member” in this ToR:

- One Member representing the Qikiqtani Inuit Association (QIA);
- One Member representing Baffinland;
- One Member representing Environment and Climate Change Canada (ECCC);
- One Member representing Fisheries and Oceans Canada (DFO);
- One Member representing the Government of Nunavut’s Department of Environment (GN);
- One Member representing Parks Canada (PC);
- One Member representing the Mittimatilik Hunters and Trappers Organization (MHTO); and
- One Member representing Makivik, at the election of Makivik to participate in the MEWG.

In addition to the members listed above, the following organizations may participate in the Working Group as Observers:

- Canadian Northern Economic Development Agency;
- Nunavut Impact Review Board (NIRB);
- Oceans North; and
- World Wildlife Fund.

3.2 All Parties must consent to the addition or removal of a Party or Observers to the MEWG. In the event of an addition or removal of a Party, these ToR will be amended accordingly.

3.3 Each Member will appoint an alternate Member and may send other experts, staff, their legal counsel, or observers to any meeting of the MEWG.

**3.4 Given that Baffinland is the responsibility party mandated by NIRB to facilitate the Working Group meetings, covers all meeting and relevant participant’s costs for members, and that Baffinland must be present at each of the meetings to provide updates on the Project, Baffinland will chair all MEWG meetings.**

**3.5 Baffinland will continue to request input from parties on proposed draft meeting agendas in advance of meetings.**

## 4 Meetings of the Marine Environment Working Group

- 4.1 The MEWG will meet twice per year and will also host two teleconferences but may refine the schedule of meetings based on input of MEWG Members. Meetings may be held jointly with the Terrestrial Environment Working Group.
- 4.2 **Baffinland will develop annual schedules with the MEWG during the first face-to-face meeting of the Working Group each year. Meeting schedules will correlate with key information periods from Baffinland (i.e. results of past year monitoring programs are available for discussion, or during monitoring program design planning phases of each year).**
- 4.3 Correspondence, documentation and meetings of the MEWG will be conducted primarily in English. However, Members agree that MEWG meetings will require simultaneous translation when MHTO members are present and that copies of meeting materials (i.e. presentations, agendas, meeting minutes and executive summaries of reports) will be provided in both English and Inuktitut to allow for more meaningful participation of all members present.

## 5 Project Monitoring

- 5.1 Project monitoring programs will comply with:
- the NLCA, specifically Articles 12.7.2 and 12.7.3
  - applicable legislation and regulations; and
  - the Terms and Conditions of Project Certificate No. 005.
- 5.2 As part of Baffinland's Environmental Management System, Baffinland has produced the Project Marine Monitoring Plan (MMP). The purpose of the MMP is to select and design full environmental effects monitoring studies that are capable of meeting all of the relevant criteria and thereby able to detect and measure Project-induced changes in the environment. The environmental effects monitoring studies will also provide a context under which the design of the MMP can be evaluated, with the aim of enabling continuous improvement.
- 5.3 The specific purposes of the MMP are to:
- Verify the accuracy of Project effects predictions, namely Project FEIS and FEIS Addendum predictions;
  - Identify and select appropriate target species, indicators and linkages for monitoring;
  - Measure the relevant effects of the Project on marine wildlife;
  - Evaluate the effectiveness of Project mitigation measures and to support any required improvement of those measures;
  - Identify any unforeseen environmental effects caused by the Project;
  - Conform with relevant Project Certificate 005 Terms and Conditions issued by NIRB for the Mary River Project; and
  - Determine and identify any cause-and-effect interactions between the Project and the environment.

- 5.4 Participation in the MEWG does not inhibit members from collaborating on research programs, activities, or initiatives designed to support the objectives of the MMP or other research objectives in the area.
- 5.5 In accordance with Article 12.7.4 of the NLCA, s. 135(5) of the *Nunavut Planning and Project Assessment Act*, and any other relevant Federal and Territorial Government Mandates and applicable legislation, responsible government agencies and departments shall fulfil their responsibilities for monitoring and data collection in addition to their participation in the MEWG.

## 6 Function of the Marine Environment Working Group

Baffinland has an obligation to fulfill requirements contained within the Project Certificate 005. As such, Baffinland will seek advice and recommendations from Members of the MEWG with respect to monitoring programs that will be designed and drafted by Baffinland and their experts to collect baseline data, monitor potential effects of the Project and determine any adaptive management measures that may be required during the construction, operation and closure of the Project in relation to the marine environment.

### **6.1 The MEWG will participate in supporting Baffinland to meet its requirements and advising on the Baffinland's status of compliance with Project Certificate No. 005 through the following:**

- **Review ongoing updates to the MMP;**
- Review the implementation of the MMP;
- Review draft and final monitoring reports and results;
- Review the assessment of potential impacts of the Project on marine mammals and the marine environment;
- Discuss the effectiveness of Project mitigation measures; and
- Provide guidance on the development and implementation of appropriate Project adaptive management measures.

**Baffinland will be required to review comments from members of the MEWG and finalize field programs and/or documents taking into consideration input from the members.**

### **6.2 Baffinland will consider advice rendered by the MEWG, as described in s. 7 of this TOR. For other matters, Baffinland will finalize field programs and/or documents in consideration of advice rendered by the MEWG and its members.**

### **6.3 Notwithstanding the delineation of MEWG roles and responsibilities in Section. 6.1 of this TOR, the MEWG may make recommendations to Baffinland on any aspects of the MMP in relation to the marine environment for the adoption of mitigation measures in order to comply with applicable regulatory requirements or that may help to mitigate adverse Project effects. Baffinland will consider such recommendations as deemed appropriate and will capture the recommendations and any relevant subsequent actions, as part of meeting minutes to be included as appendices in the Annual Report to the Nunavut Impact Review Board.**

- 6.4 Pursuant to Project Certificate 005 Section 4.1(1), MEWG Members may consult NIRB Monitoring Officers to consider and provide advice regarding (1) the adequacy of the monitoring programs as they relate to the requirements under the MMP and/or (2) the achievement of specific objectives associated with particular Project Certificate 005 Terms and Conditions. If the MEWG consults with and receives advice from the NIRB Monitoring Officers, this activity does not limit or otherwise affect the responsibilities and oversight respecting MEWG Members' mandates. The MEWG's consultation with the NIRB Monitoring Officers does not prevent Baffinland and agencies, including MEWG Members and other interveners, from working together to resolve monitoring and adaptive management challenges in a preventative and precautionary manner.

## 7 Recommendations and Decision-Making

- 7.1 Any formal recommendations made by Members must be characterized as such to discriminate from advice or guidance rendered through meetings and/or comments on draft monitoring reports. Recommendations must be weight-of-evidence based (i.e., based on a combination of various information sources). The term 'evidence-based' refers to the following sources of evidence: Peer-reviewed research, IQ, government approved best practices, guidelines and standards, and expert professional opinion.
- 7.2 In accordance with the mandate of the MEWG under Project Certificate No. 077, recommendations must be directly related to monitoring the effectiveness of mitigation measures being implemented by Baffinland and must include concrete and realizable solutions.
- 7.3 Recommendations cannot require Baffinland to supersede or duplicate responsibilities or agencies of government agencies.
- 7.4 Recommendations must take into consideration preferences or modified input by MHTO, include the presence of a response variable, the potential for data availability (e.g. some indicators may not be present in sufficient quantity to provide a meaningful evaluation of Project effects) and an evaluation of cost versus effort (e.g. the effort required to collect sufficient data may be unreasonable when there is a low to nil possibility that the Project will have a significant impact or only a small interaction with a response variable).
- 7.5 Recommendations must include an outline of the member's technical expertise and jurisdictional mandate for submitting the particular Recommendation, and the relevance of their specific expertise for doing so.
- 7.6 Recommendations must be submitted in writing to all members of the Working Group.
- 7.7 Recommendations will be sent in a draft form, and all MEWG members, including Baffinland, will be provided with a 30-day comment period to provide input into Recommendations.
- 7.8 Incorporating feedback from other Working Group members, as appropriate, final recommendations will then be submitted to Baffinland for consideration.
- 7.9 Baffinland will be provided with a 60-day review period to respond to recommendations. Baffinland will be required to provide a weight-of-evidence based response to substantiate its position and will include a consideration of operational limitations.

- 7.10 A record of all recommendations, comments from MEWG members on recommendations and Baffinland's response and subsequent actions, as relevant, will be reported on in the Annual Report to NIRB under Project Certificate Condition No. 077.
- 7.11 In the event that Baffinland opts not to implement a Recommendation made by the MEWG, a vote on the Recommendation will be held at the following face-to-face meeting and results of the vote will be recorded in official minutes.

## 8 Minutes of MEWG Meetings

- 8.1 Baffinland will provide a summary of discussion and outcomes in final minutes of MEWG meetings. MEWG members will be provided an opportunity to provide comments on draft minutes for each meeting.
- 8.2 Baffinland will provide the official minutes to NIRB as part of the submission of the NIRB Annual Report.

## 9 Materials Supporting the MEWG

- 9.1 Baffinland will make reasonable efforts to provide the MEWG with:
- Copies of all MMP documentation related to the marine environment;
  - Copies of all operational plans relating to the marine activities of the Project including shipping and port facilities;
  - Copies of all monitoring reports relating to the MMP in relation to the marine environment;
  - Copies of all reports relating to interactions between the Project and marine mammals; and
  - Any other documentation reasonably required by the MEWG relating to the interaction between the Project and marine mammals.
- 9.2 A summary of the MEWG work and activities will be included in the NIRB Annual Report prepared by Baffinland.

## 10 Costs

- 10.1 Each Member, with the exception of Makivik and the Mittimitalik Hunter and Trappers Organization, will be responsible for its own costs, including travel costs, relating to participation in the MEWG. Regarding Makivik and the MHTO, Baffinland will cover costs associated with travel, accommodations, and incidentals, including an agreed upon daily honorarium. Baffinland will be responsible for the cost's incidental to meetings such as venue costs, translation services (if required, as per [Section 3.3](#)) and notices.
- 10.2 Baffinland will be responsible for the costs of the MMP related to the Project. Government and regulatory agencies will continue to be responsible for the costs of research and regional resource management studies in accordance to their legislative mandates. Baffinland may provide in-kind and financial support on a project-based manner, at Baffinland's discretion.

## 11 Community Participation

- 11.1 Baffinland and the QIA will seek to coordinate the work of the MEWG with programs for community participation and IQ.
- 11.2 The QIA shall work with Baffinland to ensure that affected communities receive reports on the MMP in an effective and timely manner and that the results of the MMP are communicated in ways meaningful to Inuit.

## 12 Regulatory Requirements Prevail

- 12.1 Nothing in these TOR will have the effect of altering the requirements of any legislative or regulatory requirements applicable to the Project.
- 12.2 These TOR will not cause any duplication in adhering to requirements of any legislative or regulatory requirements applicable to the Project.
- 12.3 The participation of QIA, Baffinland, ECCC, GN DOE, DFO, Makivik Corporation, and MHTO or any other appointed members of the MEWG does not affect or change their obligations for consultations.

## Terms of Reference Terrestrial Environment Working Group (TEWG)

### 1 Enacting Provisions

The Terrestrial Environment Working Group (“TEWG”) is established pursuant to Nunavut Impact Review Board (“NIRB”) Project Certificate No. 005 for Baffinland Iron Mine Corporation’s (“Baffinland”) Mary River Project (“Project”). The TEWG shall function as set out in this Terms of Reference (“ToR”).

The Terms of Reference (“ToR”) establish the process for implementation of Project Certificate Term and Condition No. 049. The TEWG shall function in accordance with Project Certificate 005 Term and Condition No. 049, as follows:

Terrestrial Wildlife and Wildlife Habitat – Terrestrial Environment Working Group
Responsible Parties: The Proponent
Project Phase(s): All phases
Objective: To provide environmental oversight
Term or Condition: The Proponent shall establish a Terrestrial Environmental Working Group (“TEWG”) which will act as an advisory group in connection with mitigation measures for the protection of the terrestrial environment and in connect with its Environmental Effects Monitoring Program, as it pertains to the terrestrial environment. Members may consider the draft terms of reference for the TEWG filed in the Final Hearing, but they are not bound by them. The role of the TEWG is not intended to either duplicate or to affect the exercise of regulatory authority by appropriate government agencies and departments.

## 2 Purpose

- 2.1 The purpose of the Terrestrial Environment Working Group is to act as an advisory group for Baffinland and a forum for ongoing cooperation and communication in the review and consideration of Baffinland's environmental effects monitoring, mitigation measures and fulfillment of the Terrestrial Environment Monitoring and Mitigation Plan ("TEMMP") and Project Certificate 005 Terms and Conditions, as applicable, relating to the interaction between the Project and the terrestrial environment.
- 2.2 Pursuant to NIRB, Project Certificate 005 Term and Condition No. 49, these TOR provide the framework for the TEWG and the objectives it will fulfill.
- 2.3 This ToR will provide the framework for the TEWG and the objectives it will fulfill.
- 2.4 It is the intention of Baffinland to establish cooperative environmental arrangements between the company, members of the TEWG and the Inuit of the Qikiqtaaluk region to protect both the environment as well as the traditional relationship of the Inuit with the natural environment. The objectives of these arrangements are to:
- Develop sufficient baseline from which the Project can be effectively monitored and managed;
  - Develop a comprehensive and integrated environmental monitoring program as required in the Project Certificate;
  - Incorporate an integrated approach for monitoring and management of Project-related environmental effects;
  - Include the meaningful participation of members of the TEWG and local Inuit in all aspects of the environmental monitoring program in all phases of Project development, including decommissioning and reclamation;
  - Integrate Inuit Qaujimajatuqangit (IQ) into the development and implementation of the environmental monitoring programs;
  - Where deemed necessary by the working group, report in an effective and timely manner on the environmental monitoring program and its results in ways that are meaningful to Inuit people; and
  - Support adaptive management systems and processes.

## 3 Composition

- 3.1 Pursuant to Project Certificate No. 005 Term and Condition No. 49, the TEWG consists of an appointed member from each of the Parties. The parties of the TEWG will be the follow, all of whom shall be called a "Member" in this ToR:
- One member representing the Qikiqtani Inuit Association ("QIA");
  - One member representing Baffinland Iron Mines ("Baffinland");
  - One member representing the Government of Nunavut's Department of Environment (GN);
  - One member representing Environment and Climate Change Canada (ECCC); and
  - One member representing the Mittimitalik Hunters and Trappers Organization (MHTO)

In addition to the members listed above, the following organizations may participate in the Working Group as observers:

- World Wildlife Fund;
  - Nunavut Impact Review Board; and
  - Canadian Northern Economic Development Agency.
- 3.2 All Parties must consent to the addition or removal of a Member to the TEWG. In the event of an addition or removal of a Member, these Terms of Reference will be amended accordingly.
- 3.3 Each Member will appoint an alternate member and may send other experts, staff, their legal counsel, or observers to any meeting of the TEWG.
- 3.4 Given that Baffinland is the responsibility party mandated by NIRB to facilitate the Working Group meetings, covers all meeting and relevant participant's costs for members, and that Baffinland must be present at each of the meetings to provide updates on the Project, Baffinland will chair all TEWG meetings.**
- 3.5 Baffinland will continue to request input from parties on proposed draft meeting agendas in advance of meetings.**

## 4 Meetings of the Terrestrial Environment Working Group

- 4.1 The TEWG will meet twice per year and will also host two teleconferences, but may refine the schedule of meetings based on input of TEWG Members. Meetings may be held jointly with the Marine Environmental Working Group.
- 4.2 Baffinland will develop annual schedules with the TEWG during the first face-to-face meeting of the Working Group each year. Meeting schedules will correlate with key information periods from Baffinland (i.e. results of past year monitoring programs are available for discussion, or during monitoring program design planning phases of each year).**
- 4.3 Correspondence, documentation and meetings of the TEWG will be conducted primarily in English. However, Members agree that TEWG meetings will require simultaneous translation when MHTO members are present and that copies of meeting materials (i.e. presentations, agendas, meeting minutes and executive summaries of reports) will be provided in both English and Inuktitut to allow for more meaningful participation of all members present.

## 5 Project Monitoring

- 5.1 Project monitoring program will comply with the requirements as set out in
- the NLCA, specifically Articles 12.7.2 and 12.7.3;
  - applicable Federal and Territorial legislation and regulations; and
  - the Terms and Conditions of Project Certificate 005.

- 5.2 As part of Baffinland’s Environmental Management System, Baffinland has produced the Project TEMMP. The purpose of the TEMMP is to select and design full environmental effects monitoring studies that are capable of meeting all of the relevant criteria and thereby able to detect and measure Project-induced changes in the environment. The environmental effects monitoring studies will also provide a context under which the results from TEMMP can be evaluated, and enable continuous improvement.
- 5.3 The specific purposes of the TEMMP are to:
- Verify the accuracy of Project effects predictions, namely Project FEIS and FEIS Addendum predictions;
  - Identify and select appropriate target species, indicators and linkages for monitoring;
  - Measure the relevant effects of the Project on terrestrial wildlife;
  - Evaluate the effectiveness of Project mitigation measures and to support any required improvement of those measures;
  - Identify any unforeseen environmental effects caused by the Project;
  - Conform with relevant Project Certificate 005 Terms and Conditions, namely those Terms and Conditions related to the protection of terrestrial wildlife; and
  - Determine and identify any cause-and-effect interactions between the Project and the environment.
- 5.4 Participation in the TEWG does not inhibit members from collaborating on research programs, activities, or initiatives designed to support the objectives of the TEMMP or other research objectives in the area.
- 5.5 In accordance with Article 12.7.4 of the NLCA, s. 135(5) of the *Nunavut Planning and Project Assessment Act*, and any other relevant Federal and Territorial Government Mandates and applicable legislation, responsible government agencies and departments shall fulfil their responsibilities for monitoring and data collection in addition to their participation in the TEWG.

## 6 Function of the Terrestrial Environment Working Group

Baffinland has an obligation to fulfill requirements contained within the Project Certificate 005. As such, Baffinland will seek advice and recommendations from Members of the TEWG with respect to monitoring programs that will be designed and drafted by Baffinland and their experts to collect baseline data, monitor potential effects of the Project and determine any adaptive management measures that may be required during the construction, operation and closure of the Project in relation to the marine environment.

### **6.1 The TEWG will participate in supporting Baffinland to meet its requirements and advising on the Baffinland’s status of compliance with Project Certificate No. 005 through the following:**

- Review ongoing updates to the TEMMP
- Review the implementation of the TEMMP in relation to the terrestrial environment;
- Review draft and final monitoring reports and results;
- Review the assessment of potential impacts of the Project on terrestrial wildlife and wildlife habitat;

- Discuss the effectiveness of mitigation measures; and
- Provide guidance on the development and implementation of appropriate Project adaptive management measures.

**6.2 Baffinland will be required to review comments from members of the MEWG and finalize field programs and/or documents taking into consideration input from the members.**

**6.3 Baffinland will consider advice rendered by the TEWG, as described in Section. 7 of this TOR. For other matters, Baffinland will finalize field programs and/or documents in consideration of advice rendered by the TEWG and its members.**

**6.4 Notwithstanding the delineation of MEWG roles and responsibilities in Section. 6.1 of this TOR, the TEWG may make recommendations to Baffinland on any aspects of the TEMMP in relation to the terrestrial environment for the adoption of mitigation measures in order to comply with applicable regulatory requirements or that may help to mitigate adverse Project effects. Baffinland will consider such recommendations as deemed appropriate, and will capture the recommendations and any relevant subsequent actions, as part of meeting minutes to be included as appendices in the Annual Report to the Nunavut Impact Review Board.**

6.5 Pursuant to Project Certificate 005 Section 4.1(1), TEWG Members may consult NIRB Monitoring Officers to consider and provide advice regarding ( 1 ) the adequacy of the monitoring programs as they relate to the requirements under the Terrestrial Environmental Mitigation and Monitoring Program and/or (2) the achievement of specific objectives associated with particular Project Certificate Terms and Conditions. If the TEWG consults with and receives advice from the NIRB Monitoring Officers, this activity does not limit or otherwise affect the responsibilities and oversight respecting TEWG Members' mandates. The TEWG's consultation with the NIRB Monitoring Officers does not prevent Baffinland and agencies including TEWG members and other agencies from working together to resolve monitoring and adaptive management challenges in a preventative and precautionary manner.

## 7 Recommendations and Decision Making

- 7.1 Any formal recommendations made by Members must be characterized as such to discriminate from advice or guidance rendered through meetings and/or comments on draft monitoring reports. Recommendations must be weight-of-evidence based (i.e., based on a combination of various information sources). The term ‘evidence-based’ refers to the following sources of evidence: Peer-reviewed research, IQ, government approved best practices, guidelines and standards, and expert professional opinion.
- 7.2 In accordance with the mandate of the TEWG under Project Certificate No. 049, recommendations must be directly related to monitoring the effectiveness of mitigation measures being implemented by Baffinland, and must include concrete and realizable solutions.
- 7.3 Recommendations cannot require Baffinland to supersede or duplicate responsibilities or agencies of government agencies.
- 7.4 Recommendations must take into consideration preferences or modified input by MHTO, include the presence of a response variable, the potential for data availability (e.g. some indicators may not be present in sufficient quantity to provide a meaningful evaluation of Project effects) and an evaluation of cost versus effort (e.g. the effort required to collect sufficient data may be unreasonable when there is a low to nil possibility that the Project will have a significant impact or only a small interaction with a response variable).
- 7.5 Recommendations must include an outline of the member’s technical expertise and jurisdictional mandate for submitting the particular Recommendation, and the relevance of their specific expertise for doing so.
- 7.6 Recommendations must be submitted in writing to all members of the Working Group.
- 7.7 Recommendations will be send in a draft form, and all TEWG members, including Baffinland, will be provided with a 30-day comment period to provide input into Recommendations.
- 7.8 Incorporating feedback from other Working Group members, as appropriate, final recommendations will then be submitted to Baffinland for consideration.
- 7.9 Baffinland will be provided with a 60-day response period to respond to recommendations. Baffinland will be required to provide a weight-of-evidence based response to substantiate its position and will include a consideration of operational limitations.
- 7.10 A record of all recommendations, comments from TEWG members on recommendations and Baffinland’s response and subsequent actions, as relevant, will be reported on in the Annual Report to NIRB under Project Certificate Condition No. 040.
- 7.11 In the event that Baffinland opts not to implement a Recommendation made by the TEWG, a vote on the Recommendation will be held at the following face-to-face meeting and results of the vote will be recorded in official minutes.

## 8 Minutes of TEWG Meetings

- 8.1 Baffinland will provide a summary of activities and outcomes in official minutes of TEWG meetings, as agreed to by all Members.
- 8.2 Baffinland will provide the official minutes to NIRB as part of the submission of the NIRB Annual Report.

## 9 Materials Supporting the Terrestrial Environment Working Group

- 9.1 Baffinland will make reasonable efforts to provide the TEWG with:
  - Copies of all TEMMP documentation in relation to the terrestrial environment;
  - Copies of all operational plans relating to the mine operations and railway operations of the Project;
  - Copies of all monitoring reports relating to the TEMMP in relation to the terrestrial environment;
  - Copies of all reports relating to interactions between the Project and terrestrial wildlife and habitat; and
  - Any other documentation reasonably required by the TEWG relating to the interaction between the Project and the terrestrial environment.
  - A summary of the TEWG work and activities will be included in the NIRB Annual Report prepared by Baffinland.

## 10 Costs

- 10.1 Each Member will be responsible for its own costs, with the exception of the MHTO, including travel costs, relating to participation in the TEWG. Baffinland will be responsible for the costs incidental to meetings such as venue costs, translation services (if required, as per Section 3.5) and notices. Baffinland will also cover the costs associated with travel, accommodations and incidentals, including an agreed upon daily honorarium for MHTO participation.
- 10.2 Baffinland will be responsible for the costs of the TEMMP related to the Project. Government and regulatory agencies will continue to be responsible for the costs of research and regional resource management studies in accordance with their legislative mandates. Baffinland may provide in-kind and financial support on a Project-based manner, at Baffinland's discretion.

## 11 Community Participation

- 11.1 Baffinland and the QIA will seek to coordinate the work of the TEWG with programs for community participation and traditional knowledge.
- 11.2 The QIA shall work with Baffinland to ensure that affected communities receive reports on the TEMMP in an effective and timely manner and that the results of the TEMMP are communicated in ways meaningful to Inuit.

## 12 Regulatory Requirements Prevail

- 12.1 Nothing in these Terms of Reference will have the effect of altering the requirements of any legislative or regulatory requirements applicable to the Project.
- 12.2 These Terms of Reference will not cause any duplication in adhering to requirements of any legislative or regulatory requirements applicable to the Project.
- 12.3 The participation of Qikiqtani Inuit Association, Baffinland Iron Mines Corporation, Environment Canada, and the Government of Nunavut's Department of Environment or any other appointed Parties of the TEWG does not affect or change their obligations for consultations.

## **Background and Context**

The Terrestrial and Marine Environment Working Groups (the Working Groups) for the Project, have been operating since 2013 in accordance with Project Certificate No. 005 (PC) Term and Condition No. 49 and 77, respectively. The Working Groups include members from Department of Fisheries and Ocean, Environment and Climate Change Canada, the Government of Nunavut, Makivik, the Mittimitalik Hunter and Trappers Organization, Parks Canada and the Qikiqtani Inuit Association. World Wildlife Fund, Oceans North, Canadian Northern Economic Development Agency and the Nunavut Impact Review Board are also participating observers to the Working Group.

The Working Groups typically meet twice per year in-person and via teleconference twice annually. Teleconferences or follow-up emails amongst the Working Group members may also occur ad hoc to discuss focused issues. The meetings are structured to enable participants to have the opportunity to provide input on monitoring program design and data analysis, prior to the finalization of monitoring reports. Working Group members are also provided an opportunity to comment on draft meeting agendas and are invited to make presentations to the Working Group on items of relevance. Interpreters are present at all meetings to support full participation for MHTO members.

Baffinland provides presentations and other meeting materials in advance of the meetings, in both Inuktitut and English. Final versions of the meeting minutes are also filed in the Annual Reports to NIRB, after comments from Working Group members on the meeting minutes have been received.

Draft versions of the monitoring reports are made available to Working Group members for review and comment. Several comments are submitted by Working Group members on various monitoring reports. For example, on the 2018 marine and terrestrial monitoring draft reports, Baffinland received the following number of comments from Working Group members:

- 2018 Bruce Head Vessel-based Monitoring Program Field Summary Report: 30 comments (Parks Canada, QIA, DFO Science)
- 2018 Milne Inlet Marine Environmental Effects Monitoring Program and Aquatic Invasive Species Monitoring Program Report: 63 comments (Parks Canada, QIA)
- 2018 Passive Acoustic Monitoring Program Report: 52 comments (Parks Canada, DFO Science and QIA)
- 2018 Ship-based Observer Program Report: 61 comments (Parks Canada, DFO Science, QIA)
- 2014-2017 Bruce Head Shore-based Monitoring Program Data Integration Report: 52 comments (Parks Canada and QIA)
- 2018 Mary River Project Terrestrial Environment Annual Monitoring Report: 43 comments (Environment and Climate Change Canada, Government of Nunavut and QIA)

Meaningful responses to each of these 301 comments were provided by Baffinland, and where appropriate updates to the Reports were made before a Final version was issued. A copy of all comments and responses made by Working Group members are included in the back of each Final Report for transparency. In some cases, these comment result in changes to study design or data analysis methodology for future years, where appropriate. If recommendations contained within these comments made by Working Group members has not occurred, a substantial rationale has been provided by Baffinland in responses to comments to explain that decision.

It is noted by Baffinland that although being provided countless opportunities through the mechanisms listed above, not all members or observers have opted not to fully participate in the Working Group

process (e.g. submitting comments on draft reports, meeting minutes and agendas, and attendance at Working Group meetings).

### **Proposed Changes to the Working Group Terms of Reference**

Following a discussion led by Baffinland during the June 20 and 21 2019 Working Group meetings in Iqaluit, NU to seek feedback on the effectiveness of the Working Groups, the GN took the initiative to begin drafting proposed revisions to the Working Group Terms of Reference (ToR). Subsequently, throughout the course of summer 2019, several parties to the Working Groups, namely Parks Canada, QIA and the GN provided in-text edits and comments on the ToRs. Generally, the comments received from these Parties have been echoed in their and other members Final Written Submissions (FWS), and can be summarized as follows:

- Request for an established process for Working Group members to make recommendations to Baffinland that result in substantial changes to monitoring program design.
- Request for an established process for Working Group members to obtain decision-making authority that would require Baffinland to operationalize recommendations made.
- Request for an improved means of reporting on recommendations provide by Working Group members to Baffinland.
- Request for NIRB or other Working Group members to Chair meetings of the Working Group and for NIRB to take a more active role in responding to recommendations made by the Working Groups.

Baffinland wishes to express its gratitude to the GN, QIA and PC for providing comments on the ToR throughout the summer and to Parties who have provided FWS that contain recommendations for Baffinland to consider on how to enhance the effectiveness of the Working Group.

Subsequent to Baffinland's review of comments received on the ToR and FWS, Baffinland is proposing the following notable revisions to the ToRs for both Working Groups:

- Inclusion of reference to mandate of Working Groups as described in PC Conditions 49 and 77.
- Confirmation that Baffinland will remain the Chair of the Working Group and a rationale to support.
- Further clarity on the process for scheduling Working Group meetings
- Establishment of a process for Working Group members to provide recommendations for monitoring program changes to the Baffinland for consideration, and Baffinland's responsibility for responding to and reporting on the outcomes of these recommendations.

In summary, Baffinland has updated the ToR to contain an established process for recommendations to be evaluated by Working Group members. This will require Working Group members who have the technical expertise and jurisdictional mandate, and the desire to make recommendations on select aspects of the monitoring programs, to submit an evidence-based recommendation for consideration by the Group, noting the specific expertise they have for doing so. Each Working Group member, including Baffinland will have an opportunity to provide comments on these recommendations, and the submitting Party can then update and provide a final recommendation for consideration by Baffinland. If a recommendation is not implemented by Baffinland, a substantial and evidence-based response will be provided. The NIRB will continue to be included in these discussions, and may weigh in at any time in the process, however for operational purposes, Baffinland will remain the Chair of the Working Groups.

To ensure ease of review, Baffinland has not tracked all proposed revisions to the ToR, but has underlined edits or additions that reflect the aforementioned critical changes being proposed.



Baffinland is pleased to provide these proposed revisions to the Terms of Reference (ToRs) for the Working Groups in Attachment 1 and 2.

**Next Steps**

Baffinland also notes its commitment to the development and implementation of an Inuit Advisory Panel, with a Terms of Reference to be developed with Inuit and the QIA, and to be submitted to the NIRB within 12 months following the issuance of a revised Project Certificate 005. It is expected that the outcomes of the Inuit Advisory Panel and the additional commitments that Baffinland has made for further integration of IQ into the marine and terrestrial environment management plans and the development of a CRLU Monitoring Program that will consider limits of acceptable change from an Inuit perspective will serve strengthen Baffinland's approach to the management of the marine and terrestrial environment as the Project continues to grow.

Baffinland intends to finalize updates to the ToR with the Working Groups following this submission and welcomes further feedback at the next face-to-face meeting with Working Group members.

**ATTACHMENT 3:  
SUMMARY OF VESSEL SPEEDS IN THE RSA  
DURING THE 2019 SEASON**

## Vessel speeds in RSA during 2019 Shipping Season:

PROJECT-RELATED VESSELS		
Vessel Type	% of time < 9 knots	% of time <10 knots
Ore Carrier (n=39)	98.99	99.67
Ice Management Vessel (n=1)	99.58	99.95
Cargo (n=8)	87.01	89.78
Fuel (n=2)	97.81	99.2
Tugs (n=3)	94.39	98.82

FEDERAL GOVERNMENT VESSELS		
Vessel Type	% of time < 9 knots	% of time <10 knots
Icebreaker (n=3)	54.84	68.94
Navy (n=3)	50.16	54.08
Search and Rescue (n=4)	32.12	36.46

OTHER VESSELS		
Vessel Type	% of time < 9 knots	% of time <10 knots
Cruise Ships (n=12)	32.46	38.65
Fishing Vessel (n=4)	99.33	99.35
Fuel Tanker (n=3)	8.37	10.46
General Cargo (n=6)	61.8	67.55
Service Ship (n=12)	88.01	90.15
Small and Medium Passenger Vessels (n=33)	60.03	79.41
Tugs (n=4)	99.75	99.89

Vessel Speeds in RSA during 2019 Shipping Season

**ATTACHMENT 4:  
UPDATES TO THE ORIGINAL WORLD WILDLIFE  
FUND SUBMISSIONS ON THE PRODUCTION  
INCREASE PROPOSAL**

Identifier	Recommendation	Baffinland Response	Updated Response
WWF#1	WWF recommends that the NIRB require Baffinland to update its submission with an alternatives assessment for the NIRB (and parties) to include in the consideration of the PIP. The production increase should not be approved prior to reviewing information that provides adequate basis for the decision to proceed with the preferred option.	As indicated in response to CIRNAC No. 3, the Application was prepared following guidance provided by NIRB in a letter to Baffinland dated June 11, 2018. The assessment methods used, including the identification of potential interaction and significance determination, are consistent with the FEIS and ERP Addendum and are in compliance with the requirements of NuPPAA. As described in Section 2.1.2 of the application Baffinland has taken a phased approach to the Project in order to safeguard the Project from vulnerability to market fluctuations, which will subsequently aid in preventing temporary or early closure of the Project. The ERP of the Project allowed Baffinland to successfully demonstrate the operational viability of the Project. As a result, Baffinland is well positioned to meet an increasing demand for its ore supply. The 6 Mtpa application provides a mechanism to sustain relationships with existing markets, capitalizing on the demand for ore and contributing to the long-term viability of the Project. Increases in production and transportation of ore to Milne Port will support Baffinland's ability to sell and deliver iron ore to its global consumers in quantities and values sufficient to equal the cost of developing and operating the Project.	Baffinland restated the purpose and need for the Extension Request in Section 1.3 of the Information Package. A description of the Extensions Requests economic feasibility was provided in Section 1.4.
WWF#2	WWF recommends that the NIRB reject the Production Increase Proposal and that Baffinland be directed to continue iron ore production and shipment at rates initially approved by the NIRB. WWF is of the opinion that the proposed Phase 2 development is the appropriate mechanism for increasing production at Mary River.	Please refer to response to WWF No. 1.  Baffinland has demonstrated operational improvements and efficiencies during the first three years of production which have allowed for the maximum production rate of the ERP. Current forecasts estimate that 4.2 Mtpa will be reached as of October 2018. Increasing production reduces operating cost and allow access to a larger range of global iron ore prices. If operations cease during the year, there will be adverse impacts on employees, contractors and other direct and indirect Project beneficiaries.  Increasing production reduces operating cost and allow access to a larger range of global iron ore prices. There is an increasing demand for the ore, and Baffinland can only sustain relationships with existing markets by meeting demand. Not meeting current demands puts the future of the Project at risk. The 6 Mtpa will bridge the gap between the 4.2 MTPA production rate and the Phase 2 proposal, which would not see an increase in production until 2020 at the earliest.	Baffinland restated the purpose and need for the Extension Request in Section 1.3 of the Information Package. A description of the Extensions Requests economic feasibility was provided in Section 1.4.
WWF#3	All project ships should be fit for purpose and be prohibited from the use or carry for use of Heavy Fuel Oil and blends with similar properties.  <b>NEW TERM AND CONDITION:</b> Ships commissioned for movements related to the Mary River project occurring along the northern (and southern) shipping route(s) are prohibited from using or carrying for use, Heavy Fuel Oil and blends with similar properties.	The prohibition on the use of Heavy Fuel Oil (HFO) proposed by the International Maritime Organization has not yet come into force. While the Government of Canada supports the proposed prohibition, it has requested more time to allow for further study of the economic impact on Arctic communities.  For Baffinlands operations all contracted vessels are Polar Code compliant. Moving forward, Baffinland will continue to work with Transport Canada on the implementation of any federally regulated rules and procedures for safe operations in the Arctic.	As of January 1, 2020 the International Maritime Organizations (IMO) Global Sulphur Cap 2020 was applicable to shipping worldwide, requiring all vessels to use fuels with less than .5% Sulphur content, or to install scrubbers.  The IMO is contemplating a ban on Heavy Fuel Oil (HFO) in the Arctic, subject to an ongoing investigation by the federal government. Baffinland is participating in this investigation and will comply with any regulatory outcomes.  On December 13 <sup>th</sup> , the Government of Canada made a submission to the IMO's Sub-Committee on Pollution Prevention and Response that demonstrates there are mixed environmental and economic impacts to an HFO ban in the Arctic (Attachment 4a). The following conclusions were provided and support Baffinlands position that it is premature to add any additional constraints on the Project prior to the development of well informed and appropriate regulations.  <ul style="list-style-type: none"> <li>The impact assessment of the impact of an HFO ban on Canada's Arctic communities and economies shows both positive and negative impacts. A switch to distillates means any oil spill would be less persistent than an HFO spill (though possibility more toxicity for fish and other marine life). There are also estimated</li> </ul>

Identifier	Recommendation	Baffinland Response	Updated Response
			<p>health benefits from a reduction in air pollutant emissions as a result of a shift from HFO to distillate fuel.</p> <ul style="list-style-type: none"> <li>• There are, however, also potentially significant economic impacts of banning HFO for use and carriage for use as fuel by ships, as the majority of northern coastal communities rely on marine transportation for community resupply. The size of these impacts depends of transitions that are happening in the coming years and linked to the 2020 Global Sulphur Cap. Any projected increase in fuel prices that would result from a ban will be transferred to consumers, who already face very high prices for goods and store-bought foods.</li> <li>• In addition to the community impacts, the impact assessment suggests that the increased costs associated with the proposed HFO ban could impact the competitiveness of Canada’s mining sector and Canada’s only northern port shipping grain overseas.</li> </ul>
WWF#4	<p>It is recommended that the NIRB revisit the intention behind the MEWG, and that it assume greater responsibility for the structure of the working group and the function of its operations. Specifically, it is suggested that the NIRB function as a member (non-voting if desired), that it attend and potentially chair the working group meetings (which are meant to be technical meetings by their very nature), and that it consider rotating the position of chair among regular member agencies.</p> <p>Additionally, WWF suggests that the current requirement for confidentiality around working group meetings and discussions be removed permanently, and that the NIRB clarify that the advice and consultation provided via the working group should not be held inaccessible to the public or interested parties.</p> <p><b>MODIFY TERM AND CONDITION 77:</b> recommend amendment to reflect changes in form and function of MEWG as outlined above.</p>	<p>Baffinland would like to provide perspective on the intention and implementation of the MEWG as outlined in Project Certificate Condition No. 77.</p> <p>The condition states that the MEWG shall be established to serve as an advisory group. As per the description of the condition, the NIRB outlined that membership on the MEWG shall include Baffinland, Environment and Climate Change Canada, Fisheries and Oceans Canada, the Government of Nunavut, the Qikiqtani Inuit Association and the Mittimatalik Hunters and Trappers Organization. The World Wildlife Fund-Canada and Oceans North also participate in the Working Group as observers. As the MEWG is an advisory body, there is no ‘voting’ procedures associated with decision making outcomes that occur within the MEWG. The MEWG’s productive review of the marine monitoring programs and Project mitigation is conducted by Baffinland sharing marine monitoring reports and giving presentations to participants at the four annual MEWG meetings. The MEWG thereby provides feedback on monitoring reports and presentations both in-person, over teleconference, and by use of the Working Group comment forms.</p> <p>The comment forms were developed and implemented in 2017 to allow for written comment periods on monitoring reports and responses are provided by Baffinland to these written comments with additional information, further clarification, or changes to the report and program design. When changes to marine monitoring program design and mitigation are not made as a result of feedback received from MEWG members, a rationale explaining why the feedback has not been incorporated is provided. This rationale is captured in the Working Group Comment and Response forms and the Working Group meeting minutes which are circulated to all Working Group members and observers.</p> <p>The MEWG meetings continue to be chaired by Baffinland to facilitate these meetings and ensure any information related to the Project, or marine monitoring program and mitigation updates are being effectively shared, however all members and observers are provided an opportunity to add an item to the agenda for each meeting. Subsequently, presentations, and conversations led by MEWG members and observers, including WWFCanada, have occurred to-date on numerous occasions during Working Group meetings.</p> <p>The WWF has indicated in their comment that confidentiality limitations exist within the Working Groups that has created a transparency deficit with other non-participating members of the public or regulatory agencies.</p> <p>Baffinland notes for clarity that a copy of the Working Group meeting minutes are shared annually in Baffinland’s Annual Reports to NIRB, which are posted on both the Baffinland</p>	<p>Since December 2018 the NIRB has regularly participated in the Marine and Terrestrial Working Group as an observer.</p> <p>Baffinland notes that in recent Terrestrial and Marine Working Group meetings (June 20 and 21, 2019, Iqaluit) the functionality of the Working Groups and updates to the Terms of References were discussed. It was noted by some members during these meetings, including WWF, that they had already observed improvements to the functioning of the Working Groups. Notwithstanding, proposed changes to the ToR’s have been ongoing for approximately 8 months, with drafts periodically made available to the NIRB for review.</p> <p>Baffinland publically released the most recent draft of the ToR’s on October 15, 2019 through the NIRB’s Phase 2 reconsideration process (Attachment 2 of the main document). These draft ToR’s generally reflect a more consensus-based approach to decision making and more clearly identifies how recommendations are identified, supported, communicated, and tracked. Baffinland believes the updated draft Terms of Reference provide the mechanism and accountability for the implementation of recommendations made by the MEWG. Baffinland is yet to receive any feedback on the draft ToR’s, despite their issuance approximately 4 months ago. Baffinland has added a discussion of the draft ToR’s at the MEWG and TEWG Working Group meetings planned for the week of February 24<sup>th</sup>, 2020.</p> <p>See also responses to DFO 3.4</p>

Identifier	Recommendation	Baffinland Response	Updated Response
		<p>website and NIRB public registry and can be accessed by members of the public at any time. Further, final versions of the draft reports that are shared with the Working Groups are also posted to the Baffinland website and continue to be available to the public at any time. For verification, a list of these meetings is also outlined in Baffinland’s</p> <p>Annual Reports to NIRB. The content of presentations given at the MEWG by Baffinland may be circulated through other venues with the community of Pond Inlet, the QIA and the MHTO. The only time when confidentiality is requested by Baffinland to the Working Groups, is when draft materials are being shared to the members and observers, for their feedback – with the express purpose of having the Working Group function as an advisory body as intended in Project Certificate No. 77.</p> <p>It should be noted, that in Baffinland’s opinion, WWF-Canada has not taken full advantage of the MEWG process and notes specifically that comments on draft reports or meeting minutes have not been received from WWF Canada in 2017 and 2018.</p> <p>Baffinland acknowledges and appreciates the importance of this group to facilitate information sharing on potential Project related effects and provides a platform to receive advice from subject matter experts and regulatory agencies. Baffinland believes the intent of this group is best served by addressing issues and concerns in an open and transparent manner and by all parties investing in the success of the group. Baffinland has made significant strides to respond to comments received on the functioning of the working group and to provide a transparent process.</p> <p>Baffinland believes the intent of Project Certificate No. 77 is currently and will continue to be served within the current structure of the Working Group, however participation of the NIRB in the MEWG would be welcomed by Baffinland at any time.</p>	
WWF#5	<p>The NIRB’s Project Certificate General Terms and Conditions Item 3.2 (g) states: “As noted in the Final Hearing Report and the Public Hearing Report, for those items where a more stringent version of the precautionary principle has been applied, it is the Board’s expectation that the adaptive management strategies chosen will be highly responsive to early warning signs that risks may materialize, and that rather than waiting for impacts to be noted before mitigation measures are triggered, thresholds and triggers will be set to require responses long before adverse impacts are likely.”</p> <p>WWF strongly advises that the NIRB require Baffinland engage in the development of indicators and thresholds as is required of project proponents in other jurisdictions across the country, and suggests that by allowing this proposed amendment to proceed without having indicators and thresholds in place to indicate when and how much an impact is</p>	<p>Please refer to the response to QIA No. 8.</p> <p>The NIRB Annual Report (Baffinland 2018) indicates Baffinland’s compliance status with the noted PC Conditions and provides additional information on the adaptive management plan to sustain or improve compliance. As referred to in response to QIA No. 8, this includes ongoing work with the MEWG to develop appropriate criteria and indicators for acoustic monitoring in the marine environment.</p>	<p>Baffinland provided additional information related to the development of Early Warning Indicators in the Extension request Information Package (Section 5.3.2.1). This information was consistent with what was provided in response to Board Recommendation No. 4 of the NIRBs 2018-2019 Annual Monitoring Report (Baffinland, 2019s). For clarification, the following indicator data is being tracked for narwhals as a key indicator species:</p> <ul style="list-style-type: none"> <li>• Relative abundance and distribution</li> <li>• Group composition (e.g. gender ration, mother/calf pairs to infer calving rates)</li> <li>• Change in behaviour (e.g. travel speed, change in direction, distance from shore, etc.)</li> <li>• Mortality</li> <li>• Underwater noise levels</li> <li>• Narwhal vocal behaviour (e.g. call rate, proportional call use, call frequency)</li> <li>• Narwhal abundance, distribution and density in the RSA</li> <li>• Dive behaviour</li> <li>• Surface Movement</li> </ul> <p>Long-term datasets on these indicators will allow Baffinland to develop reasonable thresholds, which will complement trend analysis and inform the implementation of additional adaptive management measures. This information will be used to finalize Early-Warning Indicators for marine mammal monitoring as required by PC Conditions No. 110 and 111. A timeline for finalizing this work with the MEWG and a summary of all activities undertaken by Baffinland and the MEWG with respect to the development of the EWIs to-date was provided in response to Board Recommendation No. 4 from the NIRBs 2018-2019 Annual Report.</p>

Identifier	Recommendation	Baffinland Response	Updated Response
	<p>occurring, the NIRB is ignoring its responsibility to protect and promote Nunavut’s ecosystemic integrity as the agency providing the ultimate approval for this development.</p> <p>Conditions 99, 110, 111, and 112 all require the development of indicators and/or thresholds to guide the mitigation, monitoring, and adaptive management applied throughout the Mary River project. Baffinland should be required to comply with these prior to the approval of any additional or amended project development.</p> <p><b>NEW TERM AND CONDITION:</b> (Assuming NIRB approval): Baffinland be required to develop indicators and thresholds for all biophysical (marine) VECs prior to conducting any work associated with the proposed amendment.</p>		<p>Baffinland has also started the process of including Inuit in the development of EWIs for the Project, including a dedicated session spent with the MHTO. This initiative is being actively worked on through the MEWG and will likely benefit from the future establishment of an Inuit Committee. Baffinland views the creation of the Inuit Committee as a critical step to addressing concerns about the integration of IQ and Inuit perspectives into operations and planning at the Project level.</p>
WWF#6	<p>NIRB require Baffinland to include beluga, bowhead, and seal species within its ongoing abundance and distribution monitoring programs, or to develop appropriate monitoring, in consultation with the NIRB, to better understand current population numbers and impacts of project activities on abundance and distribution.</p> <p>[Term and Condition] 119 – require that even in the absence of ice breaking shipping, Baffinland undertake ice lair abundance monitoring as a means to assessing abundance and winter distribution. The condition could be further modified to require Baffinland undertake aerial (or via another method) population surveying during open water to inform its current understanding of seal distribution and abundance during the project shipping season.</p> <p><b>NEW TERM AND CONDITION:</b> Baffinland shall include an assessment of beluga, bowhead, and seal species abundance and distribution within its existing and ongoing marine mammal (narwhal) monitoring programs.</p>	<p>The existing monitoring programs were developed based on the recommendations of technical experts, and regulatory authorities including DFO and NIRB. These monitoring programs are intended to provide validation of the methods used to predict environmental impacts, and to provide data that will enhance mitigation and future monitoring strategies to be employed as the project evolves. Importantly, these monitoring programs are relevant and tailored to the project activities. As such, adaptive management is a built-in component. Additionally, mitigation and monitoring are the focus on the MEWG where these issues are reviewed at regular intervals and would provide a more appropriate venue for the tabling of such changes. Furthermore, monitoring of beluga and bowhead whales is included in Baffinland’s existing marine mammal monitoring programs, including shore-based monitoring, aerial surveys, passive acoustic monitoring, and ship-based observer program on BIM’s Ice Management Vessel (IMV).</p>	<p>Marine mammal aerial surveys were conducted in July and August 2019. This included surveying for all marine mammal species in the RSA, including ringed seal, bearded seal, bowhead whale, narwhal, beluga, walrus and polar bear. Monitoring for ringed seal was also conducted during the 2019 Ship-Based Observer monitoring program off the MSV Botnica.</p> <p>See also responses to DFO 3.4</p>

Identifier	Recommendation	Baffinland Response	Updated Response
	<p>OR</p> <p>Baffinland shall, in consultation with the NIRB, conduct ongoing monitoring to assess population numbers and impacts of project activities on abundance and distribution of bowhead, beluga, and ringed and bearded seals along the northern shipping route.</p>		
WWF#7	<p>Baffinland should be required to undertake caribou Height of Land surveying up to 8 times per year, especially during the calving period, which would reflect a 0.2% effort level.</p> <p><b>NEW TERM AND CONDITION:</b> Baffinland shall undertake Height of Land caribou surveying during the calving period, using methods outlined in its Terrestrial Environment Mitigation and Monitoring Plan, a minimum of 8 times each year.</p>	<p>Baffinland acknowledges WWF's specific recommendation for increased survey effort. Please refer to the response to GN No. 1.</p>	<p>Height-of land surveys are already occurring during the calving period as suggested over a period of two weeks during the peak-calving season.</p> <p>The intent of the HOL survey is not to detect all caribou – rather have a focused effort near the calving season to determine if there may be caribou calving near project activities. The HOL survey effectively surveys areas near project activities.</p>
WWF#8	<p>Baffinland be required to update its impact prediction values with quantitative descriptions of impact frequency, magnitude, and probability. In the absence of undertaking this work, Baffinland should update its impact predictions with a finding of “unknown” for all species other than narwhal for which active and ongoing monitoring programs can inform its work on the PIP addendum.</p> <p>Baffinland should clarify whether its current marine mammal monitoring programs apply to bowhead, beluga, and seal species. If not, update impact predictions with a value of “unknown” in regard to impacts to these species from PIP activities.</p> <p><b>NEW TERM AND CONDITION:</b> Please refer to recommendation provided for WWF#6.</p>	<p>Please refer to the response to CIRNAC No. 3, which describes that the Application was prepared following guidance provided by NIRB in a letter to Baffinland dated June 11, 2018. The assessment methods used, including the identification of potential interaction and significance determination, are consistent with the FEIS and ERP Addendum and are in compliance with the requirements of NuPPAA.</p> <p>Please also refer to the response to WWF No. 6.</p>	<p>Marine mammal aerial surveys were conducted in July and August 2019. This included surveying for all marine mammal species in the RSA, including ringed seal, bearded seal, bowhead whale, narwhal, beluga, walrus and polar bear. Monitoring for ringed seal was also conducted during the 2019 Ship- Based Observer monitoring program off the MSV Botnica.</p>

**ATTACHMENT 4A:  
DEVELOPMENT OF MEASURES TO REDUCE RISKS  
OF USE AND CARRIAGE OF HEAVY FUEL OIL  
AS FUEL BY SHIPS IN ARCTIC WATERS**

SUB-COMMITTEE ON POLLUTION PREVENTION AND RESPONSE

7th session

Agenda item 14

PPR 7/INF.X

13 December 2019

Original: ENGLISH

Pre-session public release

## **DEVELOPMENT OF MEASURES TO REDUCE RISKS OF USE AND CARRIAGE OF HEAVY FUEL OIL AS FUEL BY SHIPS IN ARCTIC WATERS**

Assessment of the benefits and impacts associated with a ban on the use and carriage of heavy fuel oil as fuel by ships operating in the Arctic

Submitted by Canada

### **INTRODUCTION**

- 1 This report discusses the potential environmental, economic and social impacts on, and benefits to, northern Indigenous and Inuit communities and economies in Canada of a ban on the use and carriage of heavy fuel oil (HFO) for use as fuel by ships in Arctic waters. It concludes that a ban on HFO would have positive environmental benefits, but result in economic impacts on communities, industrial exports and industrial resupply. An understanding of these impacts must be considered to inform any decision making.

## SUMMARY

Executive summary: This document contains an assessment of the expected benefits and impacts of a ban on heavy fuel oil (HFO) on Canadian northern, Indigenous and Inuit communities and economies in Canada. Canada is of the view that, when weighing action to reduce the environmental risks associated with the use and carriage for use as fuel of HFO in the Arctic, social, economic and other impacts on vulnerable Arctic communities must also be taken into account.

Strategic direction, if applicable: 6

Output: 6.11

Action to be taken: Paragraph 56

Related documents: MEPC 71/14/4, MEPC 72/11/1, MEPC 73/9, MEPC 73/9/1, MEPC 73/9/2, MEPC 73/INF.19, PPR 6/12/4, PPR 6/INF.24

## BACKGROUND

### Defining the scope

- 2 At the sixth session of the Sub-Committee on Pollution, Prevention and Response (PPR), there was agreement on a draft methodology to analyze the impacts of a ban on HFO use and carriage as fuel by ships in Arctic waters. The goal of this methodology was to allow individual Member States to fully assess the positive and negative effects of such a ban in Arctic waters on their northern, Indigenous and Inuit communities and economies, along with coastal and marine ecosystems.
- 3 Canada has built upon this methodology to estimate the impacts of an HFO ban on its northern, Indigenous and Inuit communities and economies. Canada is committed to enhancing the protection of the Arctic environment, which includes mitigating the risks associated with the use and carriage of all fuels, including HFO, used in the Arctic, while taking into account potential impacts of a ban on northern, Indigenous and Inuit communities and economies.

### Methodology of the Impact Assessment

- 4 The impact assessment uses publicly available information, engagement with Indigenous and Inuit partners, and data from federal government departments and industry stakeholders to assess the potential costs and benefits of implementing an HFO ban in the Arctic. The impact assessment also includes analyses conducted by consulting firms and
-

---

academia. It identifies environmental, social and economic impacts and benefits to communities, industrial exports and industrial resupply in Canada's Arctic.

- 5 One of the challenges faced when undertaking the impact assessment is the uncertainty associated with the implementation of the 0.5% Global Sulphur Cap (the Cap), which enters into force January 1, 2020. To comply with the Cap, some ship operators (e.g., the international fleet) currently burning fuel types high in sulphur content, such as HFO, will either switch to compliant low-sulphur fuels (e.g., distillates or 0.5% low sulphur fuel blends, that could be compliant with the HFO definition to be agreed upon at PPR 6) or install scrubbers (exhaust gas cleaning systems). New fuel blends are currently being developed and marketed ahead of the enforcement of the Cap that will provide industry more options. Other ship operators (including the Canadian domestic fleet), who navigate in the North American Emissions Control Area and use HFO when operating up North, will likely move directly from HFO to distillate.
- 6 The industry response to the Cap (e.g., fuel switching vs. use of scrubbers) remains uncertain. The Cap will result in several changes to the fuel market in terms of prices, availability and properties of available fuels, both in terms of their use as propulsion fuels or if spilled in Arctic waters, which impacts the accuracy of our assessment (See Annex A for a more detailed analysis).

## ANALYSIS OF IMPACTS

### Geographic, Demographic and Environmental Snapshot of Canada's Arctic

- 7 The Arctic is an important part of the Canadian landscape, encompassing 39% of Canada's total land area at 3.5 million km<sup>2</sup>, including over 36,000 islands, and over 2.1 million km<sup>2</sup> of maritime coverage. Home to a diversity of people, wildlife, natural resources and ecologically sensitive areas, Canada's Arctic is culturally, economically and environmentally valuable both nationally and internationally.
- 8 As shown in Figure 1, the Polar Code applies to Canadian waters located above the 60<sup>th</sup> parallel north.<sup>1</sup> Three territories – Yukon, the Northwest Territories and Nunavut – lie above 60° N and make up the vast majority of Canada's Arctic land. For a detailed analysis and overview of Canada's Arctic, see PPR 6/INF.24, *An overview of Canada's Arctic and role of maritime shipping*.

---

<sup>1</sup> International Maritime Organization, *International Code for Ships Operating in Polar Waters* (Polar Code).

---



**Figure 1**

**Figure 1: Map of Canada situating the Polar Code Limit**

9 Figure 2 illustrates the communities in Canada whose costs would be affected by an HFO ban. In addition to communities in the Northwest Territories and Nunavut, parts of northern Quebec and northern Labrador and communities along Hudson Bay and James Bay would be affected. The majority of the population in these communities are Indigenous, primarily Inuit, Innu, and Cree. Inuit Nunangat is a term used by the Inuit to describe their homeland in Canada. It is the comprehensive area of the four Inuit Land Claim Agreements: Nunavik (northern Quebec); Nunatsiavut (northern Labrador); the territory of Nunavut; and the Inuvialuit Settlement Region (the northern Northwest Territories and Yukon North Slope). These Land Claim Agreements are protected under Canada's constitution and generally address a broad range of issues including political and environmental rights and concerns (such as water and environmental management regimes, wildlife management, harvesting rights, public sector employment and contracting). The Government of Canada has discussed the HFO ban with many communities to understand their concerns as part of the assessment conducted and will continue consulting with the communities going forward.



---

does not evaporate as quickly as other fuels, it is more likely to be trapped in ice. Recovery of oil in ice-infested waters can make mechanical recovery difficult. It has also been estimated that the clean-up costs for an HFO spill in the Arctic could be more expensive.

- 13 Although other, lighter fuels (e.g., marine diesel) that could replace HFO have higher toxicity to marine life, they evaporate more quickly and are less persistent in the environment. Therefore, HFO presents a greater longer-term ecological risk compared to other marine fuels that are available, such as marine diesel and other distillate fuels.
- 14 The changes in fuel usage brought on by the Cap, wherein demand for lighter fuels are expected to increase and demand for HFO to decrease, will also reduce the likelihood of an HFO spill, but uncertainty remains regarding the full benefit given that physico-chemical information of new and incoming blends remains limited.

### Spill Response

- 15 Spill response capacity in the North was reviewed to establish a baseline of existing resources that could be used in the case of an HFO spill. The Canadian Coast Guard (CCG) has 20 caches of environmental response equipment designed for a small, non-persistent oil spill, as well as four depots with equipment designed for both persistent and non-persistent oil spills. Contractors in some communities also have marine spill response training and access to response equipment. Spill response equipment can be brought in from depots either by air (Hay River) or marine transit (Tuktoyaktuk, Churchill, Iqaluit).
- 16 If a spill occurs in a community with access to equipment suitable for that type of oil, and there are personnel with marine spill response training situated locally, then equipment could be mobilized immediately. Otherwise, depending on the proximity to an airport or marine base and availability of vessels/helicopters, it may take days to transit resources for spill response.
- 17 Canada has also incorporated the "polluter pays principle" in legislation and requires polluters to pay for the cost of pollution damages and of clean-up. Under recent amendments to Canada's *Marine Liability Act* to modernize the Canadian Ship Source Oil Pollution Fund, the Fund's per-incident liability cap has been lifted, meaning eligible claims are now 100% compensable, regardless of the size of the spill.
- 18 Finally, in 2016, the Government of Canada launched the \$1.5 billion Oceans Protection Plan (OPP), to enhance marine safety. The OPP includes Arctic-specific components that involve over \$175 million in investments to enhance marine safety, environmental protection, search and rescue, and emergency response services, as well as Indigenous,
-

---

Inuit and coastal community engagement.<sup>2</sup> These Arctic-specific measures, including land-based marine infrastructure, improved monitoring of vessel traffic, and improved hydrography and charting, are intended to strengthen the existing prevention measures, as well as spill response capability.

## Air Emissions

- 19 In light of the changes anticipated from the Cap, and based on the assumption that ships will comply with the new sulphur requirements, Environment and Climate Change Canada undertook an analysis to estimate the incremental impact of an HFO ban in the Arctic on air pollutant emissions for the year 2020.
- 20 This particular assessment of air emission impacts assumes that ships will be in compliance with the Cap, and considers the incremental benefits to the environment of a switch to distillate fuels under an HFO ban.<sup>3</sup> The analysis covers waters within the 200 nautical mile Canadian Exclusive Economic Zone above 60°N latitude and Hudson Bay. It captures emissions from all vessels, including merchant bulk vessels for mining and community resupply, which typically use HFO and therefore would be directly impacted by the HFO ban. Note that the assessment assumes that these vessel would comply with the sulphur cap by using 0.5% sulphur Very Low Sulphur Fuel Oil (VLSFO). Under an HFO ban it is assumed that these sulphur cap compliant merchant bulk vessels would need to switch from VLSFO to distillate fuel.
- 21 The assessment also includes tugs, cruise, and CCG ships, which typically already use distillate fuels and therefore would not be impacted by the HFO ban. These vessels are assumed to continue to use distillate fuels under the HFO ban, with no associated air emission reduction impacts. Emissions of other key pollutants from marine fuels, such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrogen oxides (NO<sub>x</sub>) are not considered, as the reduction in these pollutants due to a switch from HFO to distillate fuels is not estimated to be significant.
- 22 It is estimated that, in addition to reductions gained through the Cap with the expected use of VLSFO, a transition to distillate fuels under the HFO ban could further reduce emissions of sulphur oxides (SO<sub>x</sub>), black carbon (BC), and fine particulate matter by up to (PM<sub>2.5</sub>) by 80%, 23% and 31% respectively. The following paragraphs provide a summary of the incremental impact an HFO ban could have on each of these air pollutants.

## Sulphur oxides emissions

---

<sup>2</sup> Government of Canada, Transport Canada, Government of Canada Introduces New Measures to Protect the Marine Environment and Coastal Communities in Canada's Arctic.

<sup>3</sup> For a detailed description of the Global Sulphur Cap please refer to Annex A.

---

- 
- 23 An HFO ban could result in an 80% reduction in SO<sub>x</sub> emissions compared to emissions under the Cap only. Sulphur oxides are emitted from ship engines when marine fuels containing sulphur, like HFO and other fuels derived from crude oil, are combusted. Once in the atmosphere, SO<sub>x</sub> can lead to acid rain, with associated acidification and eutrophication impacts on sensitive Arctic aquatic and terrestrial systems.

### **Black Carbon (BC) emissions**

- 24 Black Carbon is a component of particulate matter, with emission levels highly dependent upon fuels, engines, and operations. HFO is associated with roughly two thirds of BC emissions from shipping in the Arctic in 2015.<sup>4</sup> As the second most important atmospheric climate forcer, after CO<sub>2</sub>, BC in the Arctic is of particular concern, due to its enhanced atmospheric and surface warming impacts. BC emitted within the Arctic has been estimated to have an almost five times larger surface temperature response (per unit of emitted mass) compared to emissions at midlatitudes.<sup>5</sup> In the absence of an HFO ban, BC deposition to ice and snow is expected to roughly double from 2010 levels by 2030.
- 25 Under an HFO ban, BC emissions from all shipping in Canada's Arctic (including vessels currently using distillate fuels) are estimated to be 23% lower than emissions under just the Cap, with an average reduction of 31% for vessels switching from HFO to distillate fuels.
- 26 Research by the National Research Council of Canada supports these estimates. In this research, BC emissions were higher when fuels contained a fraction of residual fuel<sup>6</sup> compared to purely distillate fuels.
- 27 Although there is some uncertainty as to the exact mix of new cap-compliant fuels that will become available in 2020, it is expected that the majority of new cap-compliant VLSFO entering the market will meet the specifications of a residual fuel as opposed to a distillate fuel. As such, uptake of these fuels will not lead to a decrease in BC emissions under the Global Sulphur Cap. In the absence of an HFO ban, reductions of BC emissions in the Arctic could be dependent upon the development of additional control measures for fuels.

### **Particulate matter emissions**

---

<sup>4</sup> Comer, B.; Olmer, N.; Mao, X.; Roy, B.; Rutherford, D. "Prevalence of Heavy Fuel Oil and Black Carbon in Arctic Shipping, 2015 to 2025." International Council on Clean Transportation. May 2017.

<sup>5</sup> Sand, M., T. K. Berntsen, Ø. Seland, and J. E. Kristjansson (2013), "Arctic surface temperature change to emissions of black carbon within Arctic or midlatitudes," *Journal of Geophysical Research: Atmospheres*, 118, 7788–7798, doi:10.1002/jgrd.50613.

<sup>6</sup> Residual fuels are the remaining fraction of crude oil that cannot be distilled (boiled off into lighter fuel products) at the refinery. They contain heavy, non-volatile carbon-based compounds, as well as high fractions of ash.

---

- 28 PM<sub>2.5</sub> is a complex and variable mixture of very small particles and liquid droplets that can contain BC, organic compounds, metals and acids such as sulphates. PM<sub>2.5</sub> is released in primary emissions from many combustion sources, including marine vessels, and it is formed secondarily in the atmosphere from other air pollutant emissions. Particulate matter in the atmosphere contributes to local haze, and has both direct (atmospheric forcing) and indirect (through clouds and precipitation) radiative effects. While the indirect effects are mostly thought to be cooling, the direct effects can be either warming or cooling, depending on the optical properties of the particles.
- 29 Under an HFO ban, it is estimated that reductions in PM<sub>2.5</sub> emissions from all shipping in Canada's Arctic would be 31%, with an average reduction for vessels switching from HFO to distillate of 39%. These reductions are in addition to reductions in PM<sub>2.5</sub> emissions from the Cap.

### Health Impacts

- 30 Marine vessel emissions of sulphur oxides (primarily sulphur dioxide) can have direct effects on human health, especially for those with pre-existing respiratory diseases (e.g., asthma). Sulphur dioxide is also transformed in the atmosphere to sulphate, which, like BC, is an important component of fine particulate matter (PM<sub>2.5</sub>). PM<sub>2.5</sub> causes multiple adverse human health effects that are well recognized internationally. Health Canada has concluded that exposure to PM<sub>2.5</sub> increases the risk of cardiorespiratory mortality, asthma exacerbation and adverse cardiovascular outcomes,<sup>7</sup> and there is evidence it may be associated with other adverse health outcomes, such as diabetes and pre-term birth. About 9,700 premature deaths a year in Canada are attributable to PM<sub>2.5</sub> exposure.<sup>8</sup> Importantly, the evidence indicates that there is no exposure threshold: that is, any incremental reduction in exposure is associated with a reduction in risk. Canada's Air Quality Management System recognizes the importance of the principle of continuous improvement in air quality, given that there is no "safe" level of exposure.
- 31 An HFO ban could reduce the air pollution health risks of Arctic populations in areas with improved air quality resulting from the ban.

### ECONOMIC CONSIDERATIONS

---

<sup>7</sup> <http://publications.gc.ca/site/eng/447367/publication.html>

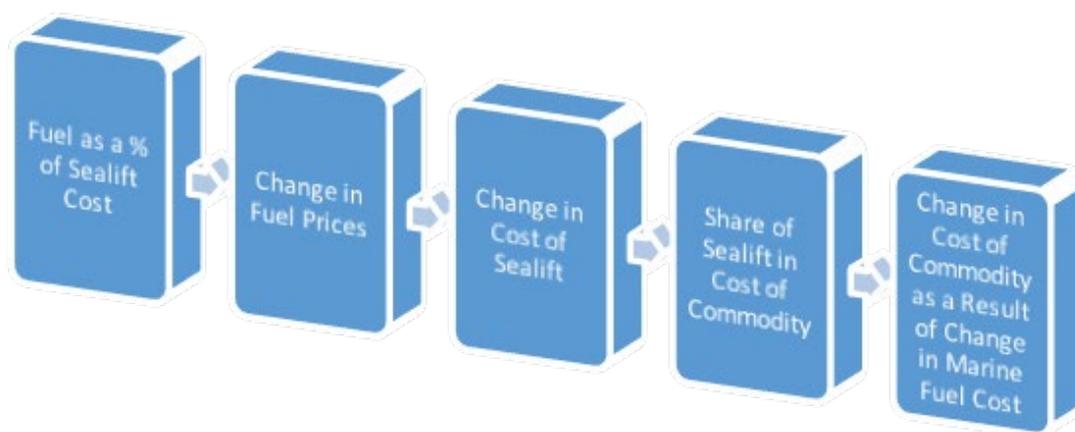
<sup>8</sup> [http://publications.gc.ca/collections/collection\\_2019/sc-hc/H144-51-2019-eng.pdf](http://publications.gc.ca/collections/collection_2019/sc-hc/H144-51-2019-eng.pdf)

---

32 A ban on HFO in the Arctic would result in higher shipping costs, which, if passed through to end consumers by the shippers, will lead to higher prices at the consumer level. The higher shipping costs have two components:

- .1 a fuel switch from HFO to lighter distillates, which cost more; and
- .2 de-bunkering<sup>9</sup> and cleaning fuel tanks to eliminate HFO may be required, given that ships serving the Arctic also serve other regions for parts of the year.

33 In order to understand the financial impacts of an HFO ban on the Arctic sealift program, it is important to understand the pricing of the community resupply program. Figure 3 illustrates how increase in fuel prices flow through to cost impacts on the sealift communities.



**Figure 3 – Flow through of Fuel Price increases to Change in Commodity Prices**

34 In the sealift program, yearly freight rates are established for communities that vary depending on the remoteness and accessibility of the community. Table 1 illustrates the freight rates that were in effect for the 2019 sealift season and vary based on distance.

**Table 1 – Shipping Rates to Arctic Communities (2019 data)**

	Destinations	Northbound Rate per Revenue Ton	Northbound 20' Merchant Container
<b>Nunavik</b>		\$418	\$6,432

<sup>9</sup> De-bunkering includes the shipboard logistics of unloading fuel from available tanks on ships, known as bunker tanks.

	<b>Destinations</b>	<b>Northbound Rate per Revenue Ton</b>	<b>Northbound 20' Merchant Container</b>
<b>Nunavut</b>	Iqaluit	\$275	\$4,230
	High Arctic	\$359	\$5,536
	Foxe Basin	\$360	\$5,545
	South Baffin	\$305	\$4,702
	Kivalliq	\$335	\$5,158
	Kugaaruk	\$417	\$6,416
	Kitikmeot	\$446	\$6,870
	Sanikiluaq	\$342	\$5,268
	Kivalliq (loading in Churchill)	\$242	\$3,727

35 Table 2 provides the current breakdown of the distribution of costs that make up the shipping rates, normalized to 100 for the base case of using current HFO fuel. It shows the forecasted changes in the cost distribution resulting from the implementation of the 2020 Global Sulphur Cap through to the forecast with an HFO Ban in place.

**Table 2 - Estimated distribution of costs that make up the shipping rates – normalized to 100 in considering projected use of fuels**

	<b>Type of fuel used</b>	<b>Crewing</b>	<b>Repairs, Maintenance, Capital Costs, Insurance</b>	<b>Fuel for Propulsion</b>	<b>Management</b>	<b>Other</b>	<b>Overall Cost Index</b>
<b>Current</b>	Current Marine Fuels, including HFO	37	37	13	10	3	100
<b>Projected Marine Fuels with Global Sulphur Cap in Place</b>	0.5% sulphur content – low price estimate	37	37	22	10	3	109

	Type of fuel used	Crewing	Repairs, Maintenance, Capital Costs, Insurance	Fuel for Propulsion	Management	Other	Overall Cost Index
	0.5% sulphur content – high price estimate	37	37	25	10	3	112
<b>Projected Marine Fuels (Distillate) with HFO Ban in place</b>	Low price estimate	37	37	26	10	3	113
	High price estimate	37	37	33	10	3	120

Note: Cost distribution information based on interviews and then normalized.

- 36 For example, a Northbound 20' Merchant Container currently costing \$5,000 to ship could cost \$5,450-\$5,600 after the implementation of the 2020 Global Sulphur Cap, and could cost approximately \$5,650-\$6,000 under an HFO ban.
- 37 Based on interviews, including with retailers in the Arctic communities, and using the cost pass-through model as illustrated by Figure 3, the price increases from an HFO ban could result in additional product price increases for community resupply products in the range of 0.7% to 1.9%, as shown in Table 3. Extrapolating from household expenditure tables published by Statistics Canada for Nunavut and assuming a 100% pass-through of fuel cost increases, these fuel price increases could increase household expenditures by CAD\$248-CAD\$679 per household per year (see Table 3)<sup>10</sup>. These estimates are based on the two distillate pricing scenarios shown in Table 2 (in green).
- 38 In the short term, we expect the Global Sulphur Cap to drive distillate prices up, as demand increases. As the fuel supply chain adapts, and those fuels become more readily available

<sup>10</sup> The median annual household income for Nunavut Inuit is approximately CAD\$24,768.

over a few years, these prices should moderate and be closer to the lower range of our estimates, as outlined in Table 2.

**Table 3 - Estimated Annual End User Price Effects based on Use of Distillates – Nunavut with 2020 Sulphur Cap estimates as baseline**

Range of Estimate	Community Resupply Cost Increase	Estimated End User Retail Effects – Community Resupply	Increased End User Prices - Nunavut	Annual Increase in End User Prices per Household
Low Range	4%	0.7%	\$2.2M	\$248
High Range	11%	1.9%	\$6.1M	\$679

39 As noted above, there is some uncertainty in predicting the incremental impact of the HFO ban, given uncertainties in fuel prices for both distillate and HFO, as a result of the 2020 Global Sulphur Cap.

### De-bunkering Costs

40 A ban on HFO in the Arctic would also require de-bunkering and cleaning of fuel tanks prior to the shipping season in the Arctic for those ships that use HFO fuel when sailing in non-Arctic waters outside of the Arctic shipping season. The costs of de-bunkering and fuel tank cleaning (including time costs) have not been included in the estimates above, as there is a significant variability in costs (\$50,000-\$100,000 per vessel per instance).

### SOCIO-ECONOMIC (COMMUNITIES) – Impacts

41 Canadian Arctic communities are highly dependent on marine shipping for almost all commodities. In the Canadian Arctic, food security is an ongoing challenge for a population with a lower income compared with the rest of Canada. Furthermore, costs for food and other consumer goods are already high in the Arctic region relative to the rest of the country.

42 A pattern of income disparity exists for Indigenous and Inuit peoples living in the Arctic, who have lower average total incomes in all regions. As an example, the median income for Nunavut Inuit aged 15 years and over was CAD\$24,768 compared with CAD\$84,139 for non-Inuit living in Nunavut and CAD\$53,625 for the average Canadian.

- 43 The combination of higher living costs, lower incomes and higher unemployment levels helps explain why many regions in the Arctic are experiencing a food security crisis. For example, 55% of adults aged 25 and over in Nunavik and Nunavut live in a household experiencing food insecurity. For Nunatsiavut and the Inuvialuit Settlement Region, the percentages are 42% and 33%, respectively.<sup>11</sup> Any increase in consumer goods costs (Table 3), even as low as 4%, will impact the purchasing power of already vulnerable communities.
- 44 In this context, a ban on HFO in the Arctic resulting in higher shipping costs passed on to the consumer would have a significant impact on households and communities. This could include direct and indirect effects on the health and quality of life of Indigenous and Inuit peoples living in the Arctic. For example:
- Food security would be impacted by an increase in shipping costs.
  - Costs of all household items (e.g., furniture, refrigerators, and stoves) would increase.
  - Food harvesting could also be impacted due to the increased cost of shipping non-food items (e.g., firearms, ammunition, fuel and camping supplies). Many harvesters do not have additional sources of income, making them even more susceptible to increases in prices.
  - The cost of housing would increase due to higher construction and material costs, which could lead to a reduction in the number of housing projects developed to address the current housing crisis in the Arctic.
  - There would be increased costs to territorial governments, which import medical equipment along with other goods to meet the needs of communities.
  - There would be an increase in electricity rates. For example, estimates based on the expected increase in fuel costs due to the Global Sulphur Cap suggest an increase of about 1% at the consumer level. An increase in fuel costs of a similar magnitude due to an HFO ban could be expected to increase rates even further.
  - Perishable products delivered by air would be impacted. The air resupply of perishable foods, in its current form, could not exist without the community resupply. For example, perishable foods are reliant on the cost of refrigerators, generators and low-sulphur diesel, all of which are delivered by sea due to the lack of road access in these communities.
- 45 It is also important to note that impacts on the mining sector (see below) could also affect the communities through the provisions of the Impacts and Benefits Agreements.<sup>12</sup> Any

---

<sup>11</sup> Statistics Canada, Food Insecurity among Inuit Living in Inuit Nunangat, 1.

<sup>12</sup> Agreements signed between natural resource development companies and regional Indigenous or Inuit organizations. These agreements help ensure local surrounding communities benefit from operations. [Original wording means the organizations help ensure...]

---

---

increase in freight costs that would impact mine sales revenues would have an adverse impact on the amount of the royalty payments paid to Indigenous and Inuit organizations. In addition, mining companies contribute support to, for example, youth recreation, cultural activities, day care centers, food banks and community programming. Such support could be affected by an increase in operating costs to the companies.

## **SOCIO-ECONOMIC (COMMUNITIES) - Benefits**

46 In addition to the environmental benefits noted above, an HFO ban in the Canadian Arctic could contribute to socio-economic (community) benefits through:

- the avoidance of loss of marine and coastal natural resources important to food security;
- the avoidance of loss of culturally important subsistence activities; and
- the avoidance of adverse impacts to Arctic marine and coastal ecosystems resulting from an HFO spill.

## **MINING AND AGRICULTURAL EXPORTS - Impacts**

47 Mining activity in the Arctic could also be directly and indirectly affected by an HFO ban. Mines located in the Canadian Arctic are important for local economic development and for international markets that import these materials. The natural resources sector is one of the largest employers of Indigenous and Inuit peoples in Canada's Arctic, and accounts for one-sixth of all jobs in the North.

48 A proposed HFO ban, with a switch to the use of distillate fuels, would increase fuel costs and could translate into an increase cost of shipping ore by an estimated CAD\$0.75 -CAD\$1 per tonne of ore shipped, above any impacts from the 2020 Global Sulphur Cap. This calculation does not take into consideration additional costs associated with increased costs of shipping equipment or material to the mine site, nor does it include costs associated with any de-bunkering and tank cleaning that might be required. As mining is a global industry, projects that are currently at the exploratory phase could become less attractive, and projects in operation may face a reduction in the number of vessels available for chartering purposes.

49 Assuming cost increases are passed on to resource companies by shipping companies, this could affect the competitiveness of Canadian mining companies. Furthermore, when the de-bunkering costs and impacts on equipment and materials, along with the increased life costs for communities are added, this may make some mining projects at the exploratory stage less attractive than similar projects based in the south.

---

- 50 Although the focus of the impact assessment was on the Arctic region, the Port of Churchill would also be impacted. This is because vessels transiting to and from the Port of Churchill must transit north of 60° N through the Hudson Strait. This implies that all vessels transiting to and from Churchill would be subject to the HFO ban. This could potentially impact the economic viability of the newly re-opened port by increasing shipping costs.
- 51 The Arctic Gateway Group is currently owned by First Nations and communities, Fairfax and AGT Foods. It reopened the Port of Churchill in 2018 and has started shipping grain and specialty crops to both Europe (Antwerp and Murmansk) and Asia (Beijing). However, increased fuel rates passed through to the shippers of grain could threaten profitability of shipping grain via the Port of Churchill as an Arctic gateway, as other ports in Canada located south of 60° N (and not requiring a transit through Arctic waters and not impacted by the HFO ban) could allow shippers to ship grain at more competitive rates.

### **INDUSTRIAL RESUPPLY - Impacts**

- 52 Currently, data specific to industrial resupply is not collected, making a detailed analysis difficult. The information collected as part of Canada's impact assessment suggests, however, that there would be increased fuel costs for the industrial sector, translating into extra costs for materials and equipment, along with additional costs for electricity. In addition to dedicated supply ships, material and equipment for the industrial sector are sometimes carried on the same ships carrying cargo for community resupply. It can therefore be assumed that the cost increase impacts estimated for communities with respect to resupply cargo and commodities would also be felt by the industrial sector.

### **SUMMARY AND CONCLUSIONS**

- 53 The impact assessment of the impact of an HFO ban on Canada's Arctic communities and economies shows both positive and negative impacts. A switch to distillates means any oil spill would be less persistent than an HFO spill (though possibility more toxicity for fish and other marine life). There are also estimated health benefits from a reduction in air pollutant emissions as a result of a shift from HFO to distillate fuel.
- 54 There are, however, also potentially significant economic impacts of banning HFO for use and carriage for use as fuel by ships, as the majority of northern coastal communities rely on marine transportation for community resupply. The size of these impacts depends of transitions that are happening in the coming years and linked to the 2020 Global Sulphur Cap. Any projected increase in fuel prices that would result from a ban will be transferred to consumers, who already face very high prices for goods and store-bought foods.
-

- 55 In addition to the community impacts, the impact assessment suggests that the increased costs associated with the proposed HFO ban could impact the competitiveness of Canada's mining sector and Canada's only northern port shipping grain overseas.

**ACTION REQUESTED OF THE SUB-COMMITTEE**

- 56 The Sub-Committee is invited to note the information in this document.
-

---

## BIBLIOGRAPHY

Comer, B., Olmer, N., Mao, X., Roy, B., Rutherford, D. "Prevalence of Heavy Fuel Oil and Black Carbon in Arctic Shipping, 2015 to 2025." International Council on Clean Transportation. May 2017. [https://theicct.org/sites/default/files/publications/HFO-Arctic\\_ICCT\\_Report\\_01052017\\_vF.pdf](https://theicct.org/sites/default/files/publications/HFO-Arctic_ICCT_Report_01052017_vF.pdf).

Government of Canada, Health Canada. "Canadian smog science assessment. Volume 2: Health effects." July 2013. <http://publications.gc.ca/site/eng/447367/publication.html>

Government of Canada, Health Canada. "Health Impacts of Air Pollution in Canada: Estimates of morbidity and premature mortality outcomes – 2019 Report." June 2019. [http://publications.gc.ca/collections/collection\\_2019/sc-hc/H144-51-2019-eng.pdf](http://publications.gc.ca/collections/collection_2019/sc-hc/H144-51-2019-eng.pdf)

Government of Canada, Transport Canada. "Government of Canada introduces new measures to protect the marine environment and coastal communities in Canada's Arctic." Last modified August 27, 2017. [https://www.canada.ca/en/transport-canada/news/2017/08/government\\_of\\_canadaintroducesnewmeasurestoprotectthemarineenvir.html](https://www.canada.ca/en/transport-canada/news/2017/08/government_of_canadaintroducesnewmeasurestoprotectthemarineenvir.html)

IHS Markit. "World Fleet Statistics 2018: A composition of the world fleet developments as of 31st December 2018." 2019. <https://cdn.ihs.com/www/prot/pdf/0719/WorldFleetStatistics2018Report-LoRes.pdf>.

International Maritime Organization. *International Code for Ships Operating in Polar Waters (Polar Code)*, 2014. Resolution MSC.385(94).

Jiang, Y., Yang, J., Gagné, S., Chan, T.W., Thomson, K., Fofie, E., Cary, R.A., Rutherford, D., Comer, B., Swanson, J., Lin, Y., Van Rooy, P., Asa-Awuku, Akua, Jung, H., Barsanti, K., Karavalakis, G., Cocker, D., Durbin, T.D., Miller, J.W., Johnson, K.C.: "Sources of variance in BC mass measurements from a small marine engine: Influence of the instruments, fuels and loads." *Atmospheric Environment*, 182 (March 9, 2018): 128-137. <https://doi.org/10.1016/j.atmosenv.2018.03.008>

Miron, Kahlan. "Canada invests in Nunavut's coasts." *Nunatsiaq News*. August 2019. Accessed August 20, 2019. <https://nunatsiaq.com/stories/article/canada-invests-in-nunavuts-coasts/>.

Mishra, Baibhav. "Sulphur Cap 2020: Global Impact & Market Trends." *Sea News*. January 2019. Accessed August 20, 2019. <https://seanews.co.uk/features/sulphur-cap-2020-global-impact-market-trends/>.

---

Sand, M., T. K. Berntsen, Ø. Seland, and J. E. Kristjansson. "Arctic surface temperature change to emissions of black carbon within Arctic or midlatitudes." *Journal of Geophysical Research: Atmospheres*, 118 (July 30, 2013): 7788–7798. DOI:10.1002/jgrd.50613.

University of Ottawa. *Mapping Characterization of the Arctic: Shipping trends and Inuit- identified culturally significant marine areas*. Prepared for Transport Canada by Jackie Dawson, Alison Cook, Nicolien van Luijk, and Natalie Carter. 2019.

Webster, Jamie et al. *Just How Disruptive Will IMO 2020 Be?* Boston Consulting Group. May 2019. Accessed August 20, 2019. [http://image-src.bcg.com/Images/BCG-Just-How-Disruptive-Will-IMO-2020-Be-May-2019\\_tcm38-220210.pdf](http://image-src.bcg.com/Images/BCG-Just-How-Disruptive-Will-IMO-2020-Be-May-2019_tcm38-220210.pdf).

---

## ANNEX A - GLOBAL 2020 SULPHUR CAP – IMPACTS

- 1 On January 1, 2020, the IMO's Global Sulphur Cap will enter into force. This global measure, which aims to reduce the sulphur content of marine fuels from 3.5% to 0.5%, will result in several changes to the fuel market in terms of prices, availability and properties of the fuels available. To meet these requirements, vessel owners can either switch to more expensive lower-sulphur fuel (i.e., marine diesel or new blends that are currently entering the market for which limited information is available) or continue to use HFO but use emission abatement technology (e.g., scrubbers) on each ship.
- 2 Table A-1 below presents the projected increase in average fuel prices (all fuels combined) for carriers immediately following the adoption of the 2020 Global Sulphur Cap.

**Table A-1 - Estimated Average Fuel Price (all fuels combined) paid by Carriers per metric tonne**

Average Fuel Prices (all fuels combined) in metric tonnes	
Before the Global Sulphur Cap	CAD\$591 ( <i>per metric tonne</i> )
Following the implementation of the Global Sulphur Cap	CAD\$985 - 1,115 ( <i>per metric tonne</i> )

- 3 Although difficult to predict accurately ahead of implementation, estimated price increases to freight rates in the Canadian Arctic resulting from the coming into force of the 0.5% Global Sulphur Cap are estimated to increase community resupply costs by 9% to 12%, factoring the relationship between fuel prices and community resupply discussed in the body of the impact assessment paper. These estimates are based on an assumption that distillate fuel will be used to meet the cap. Table A-2 illustrates the corresponding impacts on households, which are estimated to range from CAN\$535 to CAN\$713 per household per year.

**Table A-2 - Estimated Annual End User Price Impacts of the 0.5% Global Sulphur Cap – Nunavut**

Community Resupply Cost Increase	Estimated End User Retail Effects – Community Resupply	Increased End User Prices - Nunavut	Annual Increase in End User Prices per Household
9%	1.5%	CAD\$4.8M	CAD\$535
12%	2.0%	CAD\$6.4M	CAD\$713

- 4 Globally, recent surveys<sup>13</sup> of plans to comply with the sulphur cap indicate that less than 10% of the deep sea fleet plan to have scrubbers in place by January 2020, suggesting the majority will switch to lighter distillates, at least for the time being until

<sup>13</sup> Vessels over 100 GRT: see <https://cdn.ihs.com/www/prot/pdf/0719/WorldFleetStatistics2018Report-LoRes.pdf> .

there is more market certainty regarding fuel availability and pricing. While many are deferring final decisions on how to comply, it is clear that the cap is driving a major shift to use lighter fuels instead of focusing on scrubbers only, due not only to the purchase and installation costs, but also operation and maintenance costs, including availability of spare parts. In addition, several port areas have started to ban washwater discharges from open-loop scrubbers because of environmental concerns, creating uncertainty for vessels operating globally, leaving hybrid and closed loop systems as the favoured options.

- 5 Trend analysis of fuel prices over the next four years, based on world fuel markets, suggests an increase in price of nearly 30% for HFO between now and January 2023, while alternate diesel fuels will decrease in price by nearly 8%. This trend supports the idea that, with the implementation of the Global Sulphur Cap, ship owners will initially pay more overall for fuel. However, over time, the price of distillate will decrease, while the price of HFO will increase as the demand for HFO decreases and the fuel becomes scarce.

Table 2 below demonstrates price increases of HFO and alternate diesel fuels resulting from the Global Sulphur Cap.

**Table 2 – Price Increases of HFO and Alternate Diesel Fuels – Global Sulphur Cap**

	<b>Heavy Fuel Oil (High Sulphur Fuel Oil) (CAD\$ per metric tonne)</b>	<b>Ultra-Low Sulphur Diesel (CAD\$ per metric tonne)</b>	<b>Difference in Price (CAD\$ per metric tonne)</b>
November 2019	\$387	\$919	\$532
January 2023	\$505	\$848	\$343
Price change	+30.7%	-7.7%	

*These figure are based on market and futures data, not actual prices paid by shipping companies.*