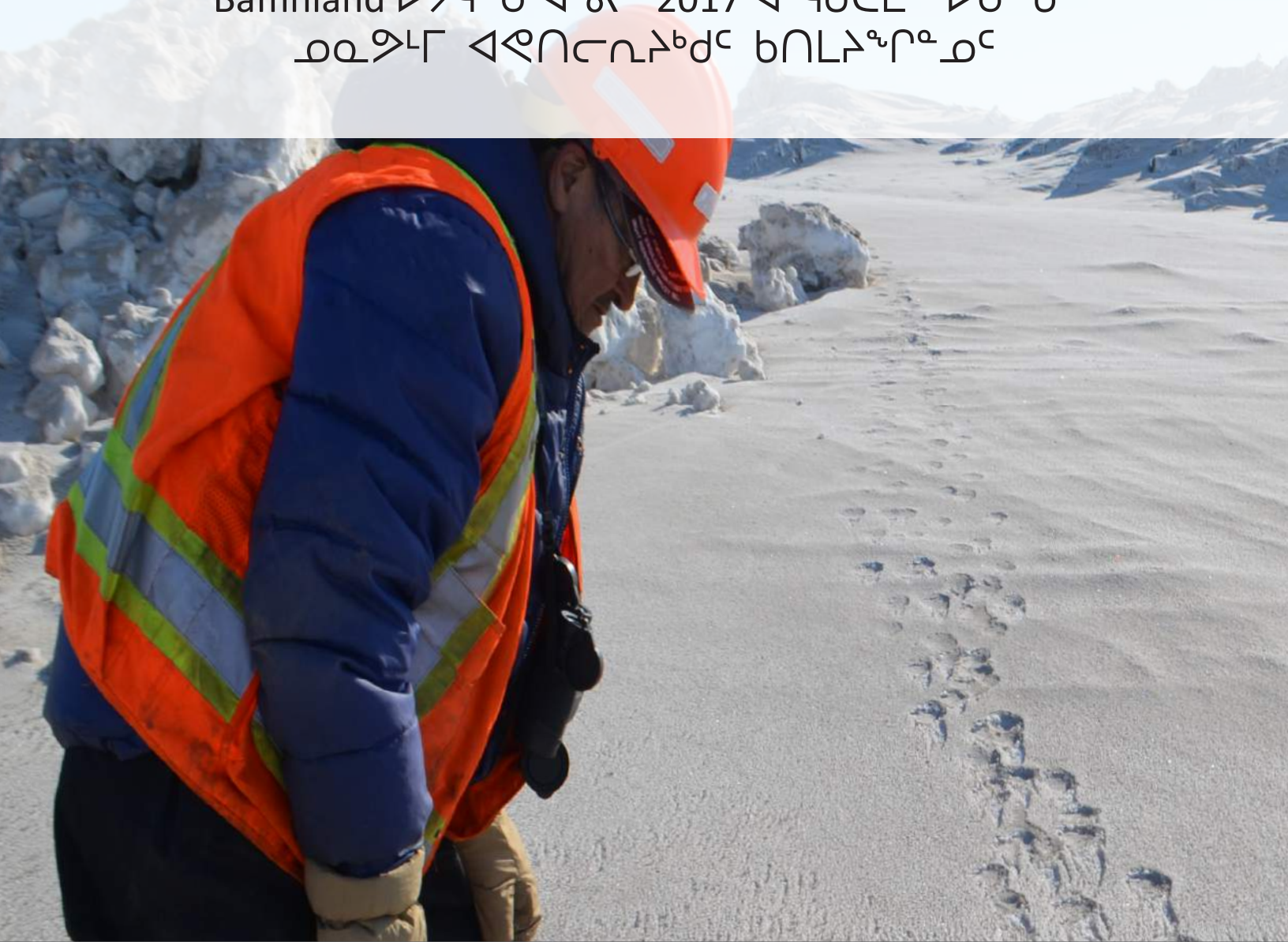




Baffinland Iron Mines 2017 Annual Report to the  
Nunavut Impact Review Board

Baffinland ᐅᓚᑦᓂᑦᑲᑦ 2017 ᑦᑲᑦᑲᑦᑲᑦ ᐅᓂᑲᑦᑲᑦ  
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Project certificate No. 005

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March 31, 2018 / ᐱᑲᑲᑦ 31, 2018



























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## ABBREVIATIONS

the Project .....	Mary River Project
AAQS .....	Ambient Air Quality Standards
AEMP .....	Aquatic Effects Monitoring Plan
exactAIS .....	Automatic Identification System
AIS .....	Aquatic Invasive Species
ARD .....	acid rock drainage
ASR .....	annual security review
Baffinland .....	Baffinland Iron Mines Corporation
BCLO .....	Baffinland Community Liaison Officer
CCG .....	Canadian Coast Guard
CCME .....	Canadian Council of Ministers of the Environment
CDA .....	Canadian Dam Association
CO <sub>2</sub> .....	carbon dioxide
CO <sub>2</sub> eq .....	carbon dioxide equivalent
CoPC .....	contaminant of potential concern
CORI .....	Coastal and Ocean Resources
CPR .....	Cardiopulmonary Resuscitation
CREMP .....	Core Receiving Environment Monitoring Program
dB .....	decibels
dba .....	A-weighted decibels
DFO .....	Fisheries and Oceans Canada
DPA .....	Development Partnership Agreement
EA .....	environmental assessment
ECCC .....	Environment and Climate Change Canada
EDI .....	Environmental Dynamics Inc.
EEM .....	environmental effects monitoring
EFAP .....	Employee Family Assistance Program
EIS .....	environmental impact statement
EPP .....	Environmental Protection Plan
ERP .....	Early Revenue Phase
FAD .....	<i>Fisheries Act</i> Directive
FEIS .....	Final Environmental Impact Statement
FNBC .....	First Nations Bank of Canada
FSWMP .....	Fresh Water Supply, Sewage and Wastewater Management Plan
GDP .....	Gross Domestic Product
GED .....	General Education Development
GHG .....	Greenhouse Gas
GN .....	Government of Nunavut
Golder .....	Golder Associates Ltd.
HADD .....	harmful alteration, disruption or destruction (of fish habitat)
Hatch .....	Hatch Ltd.

HTOs ..... Hunter and Trapper Organization

ICPS ..... Inuit Procurement and Contracting Strategy

ICRP ..... Interim Closure and Reclamation Plan

IFC ..... Issued-for-Construction

IHRS ..... Inuit Human Resources Strategy

IIBA ..... Inuit Impact and Benefit Agreement

INAC ..... Indigenous and Northern Affairs Canada

IOL ..... Inuit-Owned Land

IPCC ..... Intergovernmental Panel on Climate Change

IT ..... Information Technology

JEC ..... Joint Executive Committee (Baffinland and the QIA)

JMC ..... Joint Management Committee (Baffinland and the QIA)

JPCSL ..... Jason Prno Consulting Services Ltd.

kt ..... kilotonne

LSA ..... local study area

MEWG ..... Marine Environment Working Group

MHTO ..... Mittimatalik Hunters and Trappers Organization

MIEG ..... Minimum Inuit Employment Goal

Mining Industry Human Resources Council ..... MiHR

MMER ..... Metal Mining Effluent Regulations

MMER ERP ..... Metal Mining Effluent Regulations Emergency Response Plan

Mtpa ..... million tonnes per annum

NBRLUP ..... North Baffin Regional Land Use Plan

NHC ..... Nunavut Housing Corporation

NIRB ..... Nunavut Impact Review Board

NLCA ..... Nunavut Land Claims Agreement

NO<sub>2</sub> ..... nitrogen dioxide

NPC ..... Nunavut Planning Commission

NPRI ..... National Pollutant Release Inventory

NRCan ..... Natural Resources Canada

NT ..... Northwest Territories

NTI ..... Nunavut Tunngavik Inc.

NT-NU ..... Northwest Territories-Nunavut

NU ..... Nunavut

NWB ..... Nunavut Water Board

OHS ..... Occupational Health & Safety

OPEP ..... Oil Pollution Emergency Plan

PAI ..... Potential Acid Input

PC ..... Project Certificate

PDA ..... Potential Development Area

PM ..... particulate matter

ppb ..... parts per billion

QA/QC ..... Quality Assurance / Quality Control

QIA..... Qikiqtani Inuit Association

QSEMC..... Qikiqtaaluk Socio-Economic Monitoring Committee

QSEMC..... Qikiqtani Socio-economic Monitoring Committee

RCMP..... Royal Canadian Mounted Police

RSA ..... regional study area

SEAP ..... Stakeholder Engagement Action Plan

SEMWG ..... Mary River Socio-economic Monitoring Working Group

MEEMP..... Marine Environmental Effects Monitoring Program

SEMWG ..... Socio-economic Environment Working Group

SEM ..... Sikumiut Environmental Management Ltd.

SEAP ..... Stakeholder Engagement Action Plan

SMWMP ..... Shipping and Marine Wildlife Management Plan

SNP ..... Surveillance Network Program

SO<sub>2</sub>..... sulphur dioxide

SWAEMP ..... Surface Water and Aquatic Ecosystem Management Plan

TC ..... Transport Canada

TDG..... Transportation of Dangerous Goods

TEMMP..... Terrestrial Environment Mitigation and Monitoring Plan

TEWG..... Terrestrial Environment Working Group

the Communities..... North Baffin communities

the Report ..... 2017 Annual Report

ToR ..... Terms of Reference

TREEP..... Tote Road Earthworks Execution Plan

TSP..... total suspended particulate

TSS..... total suspended solids

VEC ..... valued ecosystem component

VSEC ..... Valued Socio-Economic Component

WHMIS ..... Workplace Hazardous Materials Information System

WRF ..... Waste Rock Facility

WRO ..... Water Resources Officer

WSCC..... Workers’ Safety and Compensation Commission

WWF..... World Wildlife Fund

YOY ..... Young-of-Year

## 1 – INTRODUCTION

This 2017 Annual Report (the Report) to the Nunavut Impact Review Board (NIRB) is a requirement of Baffinland Iron Mine Corporation's (Baffinland's) Project Certificate (PC) No. 005 for the Mary River Project (the Project). The Annual Report summarizes:

- Project activities undertaken during the reporting year (January 1 2017 - December 31 2017);
- Baffinland's performance against the requirements of the Terms and Conditions in PC No. 005;
- An evaluation of the Project's effects in relation to those predicted in the Final Environmental Impact Statement (FEIS; Baffinland, 2012); and the Addendum to the FEIS (FEIS Addendum; Baffinland, 2013a) for the Early Revenue Phase (ERP); and
- Planned Project-work for the next reporting year (January 1 2018 - December 31 2018).

### 1.1 PROJECT OVERVIEW

The Project is an open pit iron ore mine located in the Qikiqtani Region of Nunavut on northern Baffin Island, approximately 160 km south-southwest of the nearest community of Pond Inlet (Mittimatalik) and 1,000 km north-northwest of the territorial capital of Iqaluit. (Figure 1.1).

The Project is currently in the Early Revenue Phase (ERP), which consists of a mining rate of up-to 4.2 Million tonnes per annum (Mtpa) at Deposit No. 1. Should Baffinland seek the required permits and approvals to mine other deposits at the Project property, the operation has the potential to last for generations; representing an important long-term opportunity for economic development in the North Baffin region.

During the ERP phase, the Project includes three primary components (Figure 1.1):

- Mine Site;
- Milne Inlet Tote Road; and
- Milne Port.

Operational activities include:

- Ore extraction;
- Ore processing via crushing;
- Transportation of the ore from the Mine site to Milne Port;
- Loading and shipping of ore from Milne Port;
- Stakeholder and Inuit community engagement; and
- Environmental monitoring and reporting.

### 1.2 REGULATORY CONTEXT

On December 28, 2012, the NIRB issued PC No. 005 for the Project to Baffinland (NIRB, 2012a) pursuant to Section 12.5.12 of Article 12 of the *Nunavut Agreement* (Indian and Northern Affairs Canada and Nunavut Tunngavik Inc., 2010). The basis for the Project Certificate is Baffinland's FEIS (Baffinland, 2012), which presented in-depth analyses and evaluation of potential environmental and socio-economic effects associated with mining the reserves of Deposit No. 1 at a nominal rate of 18 Mtpa.

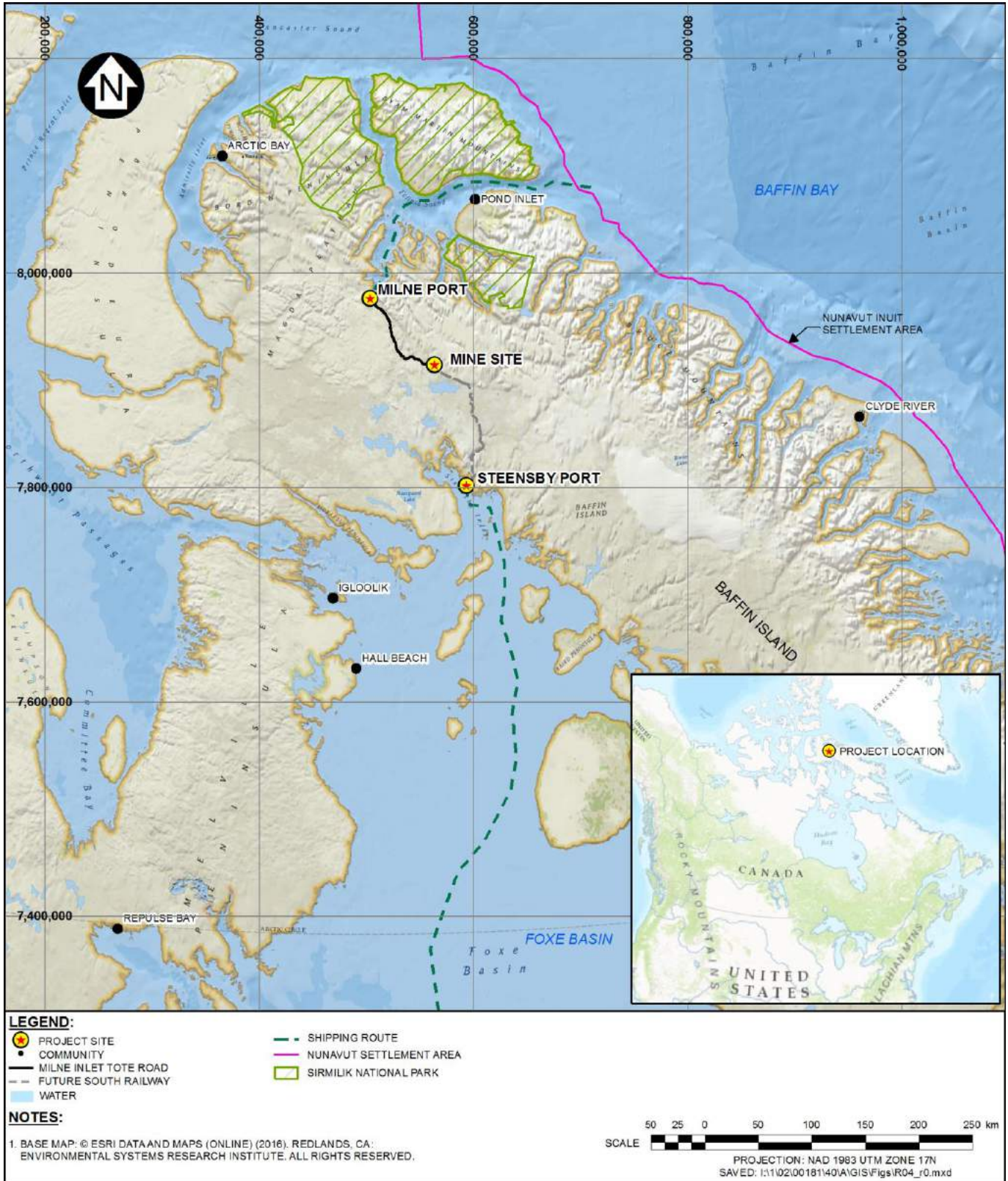


Figure 1.1 Project Location Map

Development of the approved Project includes:

The construction, operation, closure and post-closure activities associated with the Mine and its related infrastructure:

- The development of a Southern Transportation Corridor (southern railway and Steensby Port);
- The construction of a 150-km railway from the Mine Site to a new port facility at Steensby Inlet (Figure 1.1); and
- Year-round shipping along the Southern Shipping Route (Foxe Basin - Hudson Strait).

The FEIS for the approved Mary River Project was prepared in adherence to *Guidelines for the Preparation of an Environmental Impact Statement for Baffinland Iron Mines Corporation's Mary River Project* (the Guidelines; NIRB, 2009); and NIRB's Preliminary Hearing Conference Decision (NIRB, 2011).

Following the issuance of the PC, Baffinland requested an amendment to the PC to undertake the 4.2 Mtpa ERP. The Minister of Aboriginal Affairs and Northern Development Canada (AANDC; now Indigenous and Northern Affairs Canada - INAC) approved the ERP on April 28, 2014 (Minister of Aboriginal Affairs and Northern Development, 2014), and NIRB subsequently issued an amended Project Certificate in May 2014 (NIRB, 2014).

Baffinland operates the ERP in accordance with the permits, licences, approvals, authorizations and agreements identified in Table 1.1. In addition, Baffinland's contractors and consultants undertake various activities on the Project under additional permits in the areas of scientific research, archaeology, and explosives manufacture, storage and use.

**Table 1.1 Permit Registry**

Approval	Project Activity	Expiry
<b>Nunavut Impact Review Board</b>		
<b>Nunavut Agreement, and the Nunavut Planning and Project Assessment Act as of July 9, 2015</b>		
Project Certificate No. 005 <i>Nunavut Agreement</i> (Article 12)	Required to obtain the requisite permits and approvals to proceed with Project	No Expiry
<b>Qikiqtani Inuit Association</b>		
<b>Agreements issued under Articles 6, 20 and 26 of the <i>Nunavut Agreement</i></b>		
Inuit Impact and Benefits Agreement (IIBA) <i>Nunavut Agreement</i> , Article 26	Required under Article 26 of the <i>Nunavut Agreement</i> to proceed with Project - concluded September, 2013	No Expiry
Wildlife Compensation Agreement <i>Nunavut Agreement</i> , Article 6	Wildlife Compensation regime set out in IIBA	No Expiry
Water Compensation Agreement <i>Nunavut Agreement</i> , Article 20	Compensation should the Project substantially affect the quality, quantity, or flow of water on Inuit-owned land	June 10, 2025
Commercial Lease Q13C301	Mine development activities on Inuit Owned Land	December 31, 2043
Quarry Concession Agreement	Required to extract aggregate (quarried rock and borrow sand and gravel) on Inuit Owned Land	N/A
<b>Nunavut Water Board</b>		
<b>Water Licences issued under the <i>Nunavut Agreement</i> (Article 13), the <i>Nunavut Waters and Nunavut Surface Rights Tribunal Act</i>, and the Northwest Territories Water Regulations</b>		
Type A Water Licence 2AM-MRY1325	Water use and waste disposal associated with the mine	June 10, 2025
Type B Water licence 2BE-MRY1421	Regional exploration activities, including exploration drilling	April 16, 2021



Approval	Project Activity	Expiry
<b>Indigenous and Northern Affairs Canada</b>		
<b>Mineral Leases and Land Leases, Land Use Permits, and Quarry Permits on Crown Land, issued under the <i>Territorial Lands Act</i> and associated Canadian Mining Regulations and Territorial Land Use Regulations</b>		
Mineral Leases #2483, #2484 and #2485	Rights to extract minerals; Lease #2484 covers Deposit No. 1.	August 27, 2034
Land Use Permit N2014C0013	Infrastructure and activities on Crown Land at Steensby Port	June 30, 2019
Land Use and Quarry Permit N2014Q0016	Extraction of sand and gravel from Borrow P1 at Km 63 along the Tote Road	June 30, 2019
Land Use Permit N2014J0011	Summer narwhal monitoring camp at Bruce Head, in Milne Inlet	June 30, 2019
Class A Land Use Permit N2014X0012	Port operation on Crown Land (ore dock operation)	June 30, 2019
Foreshore Lease 47H/16-1-2	Use of seabed by current ore dock at Milne Port	June 30, 2035
<b>Department of Fisheries and Oceans</b>		
<b>Authorizations and Letters of Advice issued under the <i>Fisheries Act</i></b>		
Fisheries Authorization 14-HCAA-00525	Authorization to construct the ore dock in fish habitat	December 31, 2020
Fisheries Authorization NU-06-0084	Authorization to construct water crossings in fish habitat along the Tote Road	August 30, 2008; monitoring ongoing
Letters of Advice (various)	DFO issued Baffinland various letters of advice in regard to culvert extensions and replacements along the Tote Road	No Expiry
<b>Transport Canada</b>		
<b>Approvals of in-water works under the <i>Navigable Waters Protection Act</i> (NWPA; now the <i>Navigation Protection Act</i>); and Marine Facility Approval under the <i>Marine Transportation Security Act</i> and Regulations</b>		
Approvals: 8200-07-10273, 8200-07-10267, 8200-07-10269, 8200-07-10268, 8200-07-10274, 8200-07-10272 8200-07-10266. 8200-07-10271	Approvals to interfere with navigation within navigable waters along the Tote Road at crossings: CV040, BG50, CV128, CV223, CV072, BG17, CV217, and CV099	No Expiry
Statement of Compliance of a Marine Facility # 001743	Approval for the Milne Inlet Marine Facility to conduct iron ore operations	June 24, 2020
<b>National Resources of Canada</b>		
<b>Licensing of Explosives Manufacture and Storage Facilities under the <i>Explosives Act</i></b>		
Factory Licence #F76068	Issued to Baffinland's explosives contractor, Dyno Nobel Baffin Island, to manufacture explosives for the mine	June 30, 2018
<b>Nunavut Research Institute</b>		
<b>Issues scientific licences for land and water research, or social and traditional knowledge research, under the <i>Scientists Act</i></b>		
Scientific Research Licence 02 009 18R-M	Environmental monitoring of the land and water environments	December 31, 2018

### 1.3 PERMITTING OF THE PHASE 2 EXPANSION PROJECT PROPOSAL

In consideration of Project economics, Baffinland is in the process of pursuing approvals for an expansion to the Project (the Phase 2 Expansion Project Proposal). Baffinland submitted a Project Proposal for its Phase 2 Expansion Project to the Nunavut Planning Commission (NPC), NIRB and other agencies and stakeholders in October 2014 (Baffinland, 2014a). Public consultation, the collection of traditional knowledge and scientific baseline data, as well as engineering studies have been ongoing since that time in support of the Phase 2 Expansion Project Proposal.

In February 2016, Baffinland announced its intention to revise the mode of overland ore transportation from road haulage, as originally proposed in Phase 2 Expansion Proposal submission, to the use of a railway (Baffinland, 2016a). NIRB subsequently sought feedback from regulatory agencies, stakeholders and the Federal Minister of INAC as to whether this constituted a significant modification to the October 2014 Project Proposal. On October 28, 2016, the NIRB requested further information and clarification regarding the current nature and scope of Baffinland's Phase 2 Expansion Project Proposal for the Mary River Project (NIRB, 2016a). In response, Baffinland submitted a Project Update on the Phase 2 Expansion Project Proposal to the NIRB on November 30, 2016 (Baffinland, 2016b). This revision also included a proposal to conduct winter shipping through the Northern shipping route, however due to community feedback during consultation, this component of the proposal was later removed by Baffinland. On December 19, 2016, the NIRB indicated to Baffinland that switching transportation modes from road to rail constituted a significant modification to the original Phase 2 Expansion Project Proposal (NIRB, 2016b), and that Baffinland would require a new conformity determination to the North Baffin Regional Land Use Plan (NBRLUP; NPC, 2000).

A revised Phase 2 Expansion Proposal was submitted by Baffinland on February 3, 2017 to the NPC for a decision of conformity to the North Baffin Land Use Plan (Baffinland, 2017a). Specifically, Baffinland applied to NPC for an amendment to Appendix Q of the NBRLUP to allow for the use of rail within the existing Milne Inlet Tote Road and Marine Transportation Corridor. As part of the application, Baffinland filed extensive supporting documentation to demonstrate that the proposed amendment complies with the requirements of the NBRLUP, including Appendices J and K. On December 4 and 5, 2017 NPC held public hearing in Pond Inlet as part of the amendment process. Subsequent to the public hearings, letters of support for the Phase 2 Expansion Project Proposal were submitted by the Government of Nunavut (GN), INAC, the NWT & Nunavut Chamber of Mines and other community organizations and individual residents of the North Baffin communities. However, letters of opposition were submitted to the amendment by the Mittimatalik Hunters and Trappers Organization (MHTO) and individual residents of the North Baffin communities. During 2018, Baffinland will expect a recommendation by NPC for Ministerial decision on the land use plan amendment. Baffinland continued the development of the Environmental Impact Statement Addendum throughout 2017 in preparation for the environmental assessment (EA) process required under NIRB to assess the socio-economic and environmental effects related to the Phase 2 Proposal. Throughout this report, reference is made to documentation and studies that are in progress for the EIS Addendum and that will inform monitoring and mitigation strategies for proposed operations. In the event that the EA process does not proceed for the Phase 2 Expansion Project in 2018, Baffinland will revisit any Project Certificate Conditions that require updated studies for current operations.

## 1.4 REPORT STRUCTURE

### 1.4.1 Report Content

This report is structured as follows:

- Section 1: provides an overview of the Project and the regulatory context in which this Report is being submitted.
- Section 2: highlights key activities and consultation efforts conducted with stakeholders for the Project, including the five (5) North Baffin communities (the Communities) the Qikiqtani Inuit Association (QIA), relevant regulatory agencies and the PC mandated Project working groups (Marine Environment Working Group (MEWG), Terrestrial Environment Working Group (TEWG) and the Mary River Socio-economic Environment Working Group (SEMWG).
- Section 3: describes the Project's operational context in 2017, provides an overview of operational successes, and discusses challenges Baffinland faced with respect to meeting PC Terms and Conditions in 2017.

- Section 4: includes a 'summary sheet' detailing compliance for each of the 189 PC Conditions. The summary sheets provide an overview of the work completed towards meeting the requirements of all the PC conditions, and a status of compliance is assigned. This section also describes the status and/or progress Baffinland has made towards fulfilling the commitments the Company made during the Final Public Hearing (NIRB, 2012b) for the Project and a high-level review of the Project's effects in comparison to the potential effects predicted in the FEIS and FEIS Addendum.
- Section 5: outlines the correspondence Baffinland has had with NIRB during 2017 and comments provided by NIRB on Baffinland's 2016 Annual Report to NIRB.
- Section 6: lists all updates made to environmental management plans as a result of monitoring programs and engagement activities throughout 2017.

#### 1.4.2 Supporting Documents and Appendices

Where PC conditions specify that Baffinland provide supporting documentation to NIRB as part of the submission of this Report, these documents have been appended to the Report. Other appendices, such as reports or documentation that are likely to be of specific interest to NIRB as part of their review of this Report, and those that provide a pertinent context to the discussions are also included in this Report.

In the interest of sustainability, other Project documentation that may be of interest to NIRB and other interested parties has been posted to the Project Document Portal available on the Baffinland website: <http://www.baffinland.com/document-portal-new/?lang=en>. As described in Sections 2.3 to 2.5, a number of reports are shared with the Working Groups and regulatory agencies throughout the year, and through engagement activities during 2017 as described in Section 2.

## 2 – ENGAGEMENT ACTIVITIES

### 2.1 ENGAGEMENT APPROACH

Meaningful stakeholder and Inuit community engagement is valued by Baffinland as a means of building and maintaining community relationships and continuously optimizing community benefits of the Project. Baffinland’s approach to stakeholder engagement emphasizes the importance of informing stakeholders, establishing effective communication strategies, and collecting feedback from stakeholders on potential issues and concerns (Figure 2.1).



**Figure 2.1 Baffinland’s Approach to Stakeholder Engagement**

### 2.2 ENGAGEMENT OBJECTIVES

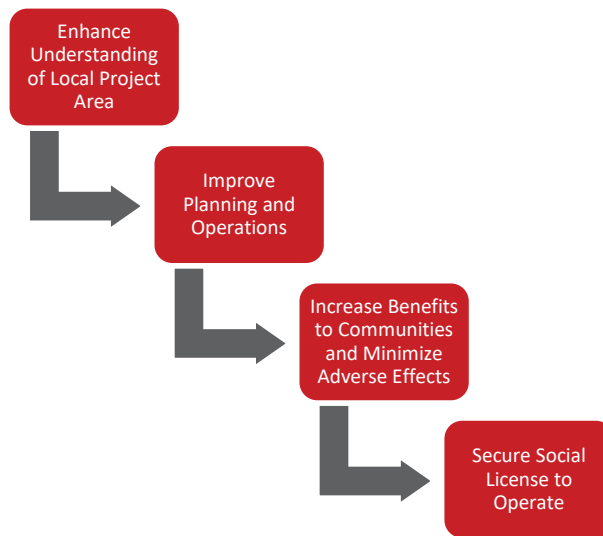
Baffinland is committed to meaningful engagement with stakeholders potentially affected by the Project, including the five (5) North Baffin Inuit Communities (Arctic Bay, Clyde River, Hall Beach, Igloolik and Pond Inlet), the QIA, applicable regulatory agencies and the general public. Baffinland’s approach to meaningful stakeholder engagement is integrally related to its commitment to corporate responsibility and sustainable development.

All engagement initiatives have been designed and implemented to achieve consistency with relevant corporate policies and regulatory authorizations, including the Inuit Impact and Benefit Agreement (IIBA) as well as the conditions of PC No. 005 and other regulatory instruments relating to consultation.

Baffinland’s approach to stakeholder and Inuit community engagement has informed the development and implementation of the Stakeholder Engagement Action Plan (SEAP) for the Project.

The objectives of Baffinland’s engagement efforts are to:

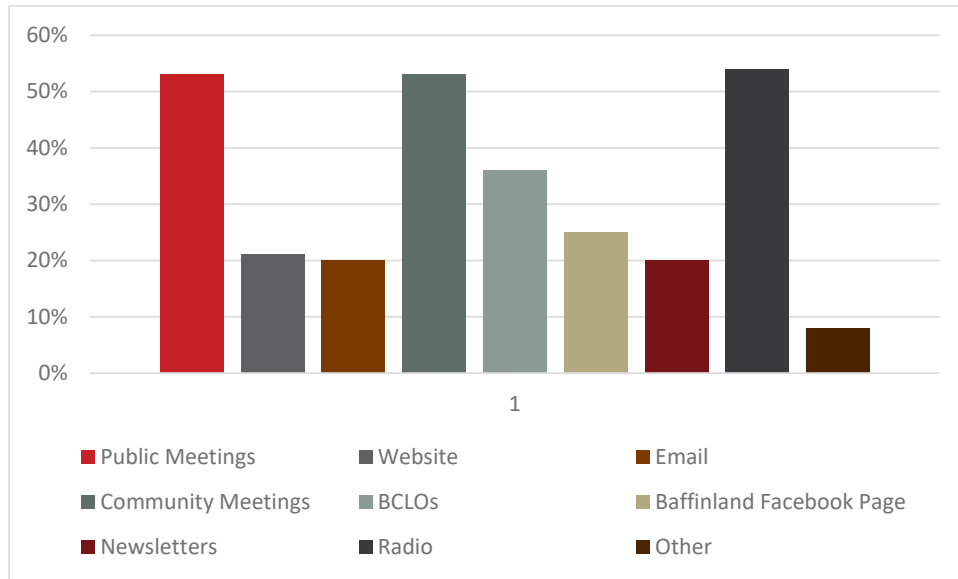
- Provide stakeholders and Inuit communities with relevant Project information in a timely, accessible and culturally appropriate manner in order to enable stakeholders to identify issues and concerns and provide input into the development of appropriate mitigation measures;
- Ensure that stakeholders and Inuit communities have the opportunity to understand and meaningfully engage in the processes initiated by the Project;
- Build constructive and positive relationships with the Communities most likely to be affected by the Project;
- Consider traditional and local knowledge as well as scientific expertise in internal decision-making processes;
- Facilitate effective implementation of and compliance with commitments contained in the IIBA;
- Focus priorities so that potential adverse effects are mitigated and Project benefits are enhanced; and
- Incorporate additional knowledge and expertise from potential partners (e.g. communities, academic researchers, government agencies).



**Figure 2.2 Overview of Baffinland’s Engagement Objectives**

### 2.3 FEEDBACK ON COMMUNITY ENGAGEMENT METHODS

During September 2016, Baffinland executed a Community Survey in the five (5) North Baffin communities, which was presented as Appendix B of the 2016 annual report (Baffinland, 2017I). The survey included questions regarding what type of consultation methods the Communities identified as most effective for sharing information about the Project. Feedback from participants indicated that 54% of community members found the use of radio an effective method for consultation, 53% found public meetings useful, and 36% identified in-person discussions with the BCLOs. Website, email, and newsletters were also identified as meaningful consultation methods for approximately 20 to 25% of respondents. Figure 2.3 presents a chart showing the preferences for each of the consultation methods included in the survey.



**Figure 2.3 North Baffin Communities Preferred Engagement Methods (2016)**

The results of the survey indicated that to-date, Baffinland has been engaging with the communities through methods that are useful to them. However, Baffinland recognizes that engagement on the Project is an iterative and ongoing process and the feedback obtained from this survey has been, and will continue to be used to inform future engagement activities.

## 2.4 ENGAGEMENT ACTIVITIES

In support of the Baffinland’s focus on continuous improvement and the engagement objectives defined for the Project (Section 2.2), the Proponent implements a variety of engagement mechanisms that are intended to ensure that a broad and comprehensive approach to the identification of stakeholders and that the creation of enhanced opportunities for dialogue and input are executed. During 2017, Baffinland completed a number of engagement activities, which included:

Providing regular and ongoing opportunities for the dissemination of Project-related information and receipt of stakeholder input through Baffinland Community Liaison Officers stationed in each of the five (5) North Baffin communities:

- Hosting public meetings and open houses;
- Conducting employee surveys;
- Participating in multi-stakeholder forums (e.g. Working Groups);
- Holding focus groups, workshops and meetings with community groups and hamlet Councils;
- Hosting site meetings for interested observers; and
- Distributing Project-related information through the corporate website, newsletters, advertisements and other means.

### 2.4.1 Public Meetings

In the spring of 2017, Baffinland held public meetings within the five (5) North Baffin communities. These public meetings provided an important opportunity for Baffinland to share information with the Communities related to current operations, the results of ongoing environmental monitoring programs and future planning to support the development of the Project. A list of the Public Meetings held in the Communities is provided in Table 2.1.

**Table 2.1 Public Meetings**

Community	Date(s) of Public Meeting	Information Shared
Arctic Bay	May 31 2017	Project Update and Phase 2 Expansion Project Proposal
Clyde River	May 29 2017	Project Update and Phase 2 Expansion Project Proposal
Hall Beach	June 2 2017	Project Update and Phase 2 Expansion Project Proposal
Igloodik	June 1 2017	Project Update and Phase 2 Expansion Project Proposal
Pond Inlet	May 30 2017	Project Update and Phase 2 Expansion Project Proposal
All communities	April 3-7 2017	Career and Training Information Tour

During the Public Meetings, a number of comments were raised by Community members. The feedback provided by community members was a mix of comments that were both supportive of the Project and comments related to concerns or issues the community members perceived or were experiencing. Most of the comments raised at the Public Meetings were related to:

- Employment and Income;
- Marine Environment;
- Terrestrial Environment
- Potential effects on Land Use and Harvesting Practices;
- Education and Training Opportunities;
- Potential effects of the Project on Climate Change;
- Concerns related to Potential Accidents and Malfunctions; and
- Dust and Air Quality.

#### 2.4.2 Community Group Meetings

Baffinland meets with various community groups on a regular basis to discuss aspects of the Project and ongoing issues, concerns or recommendations community representatives may have. Baffinland engaged with several community groups during 2017 including local community HTOs and other interest groups (i.e., business community or those interested in career and training opportunities). Community Group meetings held in 2017 are presented in Table 2.2.

#### 2.4.3 Social Initiatives

Baffinland understands the importance of, and is committed to proactively pursuing opportunities to continuously improve its relationship with local communities, and in particular the North Baffin communities. To support this, Baffinland undertook a number of community social initiatives during 2017, including:

- Hosting a Procurement and Contracting Workshop in Pond Inlet - January 2017;
- Participating in Community Career Fairs in Clyde River - January 2017;
- Drafting and submitted a Human Resources Strategy to the IIBA JMC - February 2017;
- Drafting and Presented an Inuit Procurement Contracting Strategy to the IIBA JMC - March 2017;
- Attending high school graduation ceremonies in Arctic Bay - May 2017;
- Donating laptops to high school graduates in Hall Beach - May 2017;
- Co-hosting a Career Information Tour in the five (5) North Baffin communities - March to April 2017;
- Ongoing implementation of Baffinland's Apprenticeship program – 2017;

- North Baffin Community Tour to introduce Horizon (Baffinland sub-contractor) and to collect resumes from potential future Inuit employees - August 2017;
- Education and Training North Baffin Community Tour with Baffinland President and CEO - September 2017;
- Launching Community Literacy Initiative - September 2017;
- Developing Workplace Conditions Survey to be administered in Q1 of 2018 - throughout 2017.

Generally, the purpose of these and similar initiatives is to encourage local Inuit community members to consider a career in the mining industry, to enhance local capacity, to increase Inuit participation in the Project workforce and to improve access for Inuit businesses to contracting opportunities.

**Table 2.2 Community Group Meetings**

Community	Stakeholder Group	Date	Topic
Arctic Bay	Hamlet of Arctic Bay	May 31 2017	Project Update and Phase 2 Expansion Project Proposal
	Ikajutit Hunters and Trappers Organization	May 31 2017	Project Update and Phase 2 Expansion Project Proposal
Clyde River	Hamlet of Clyde River	May 29 2017	Project Update and Phase 2 Expansion Project Proposal
	Clyde River Hunters and Trappers Organization	May 29 2017	Project Update and Phase 2 Expansion Project Proposal
Hall Beach	Hamlet of Hall Beach	June 2 2017	Project Update and Phase 2 Expansion Project Proposal
	Hall Beach Hunters and Trappers Organization	June 2 2017	Project Update and Phase 2 Expansion Project Proposal
Igloolik	Hamlet of Igloolik	June 1 2017	Project Update and Phase 2 Expansion Project Proposal
	Igloolik Hunters and Trappers Organization	June 1 2017	Project Update and Phase 2 Expansion Project Proposal
Iqaluit	Iqaluit Business Community	January 16 2017	Procurement and Contracting Workshop
Pond Inlet	Hamlet of Pond Inlet	May 30 2017	Project Update and Phase 2 Expansion Project Proposal
	Mittimatalik Hunters and Trappers Organization (MHTO)	May 30 2017	Project Update and Phase 2 Expansion Project Proposal
	Mittimatalik Hunters and Trappers Organization (MHTO)	June 12-13 2017	2017 Monitoring Program and Opportunities for Community Involvement
	Mittimatalik Hunters and Trappers Organization (MHTO)	November 24 2017	Recap of 2017 Monitoring Programs / Planning for 2018 Monitoring Programs
	Pond Inlet Business Community	January 18-19 2017	Procurement and Contracting Workshops

## 2.5 ENGAGEMENT WITH THE QIA

Baffinland is committed to maintaining a positive relationship with the QIA through ongoing engagement and collaboration. Engagement with the QIA is generally focused on the implementation of the IIBA and on the Commercial Lease (Q13C301), associated Agreements and other regulatory authorizations.



### 2.5.1 Engagement on IIBA Implementation

Implementation of the IIBA is managed by a Joint Executive Committee (JEC) and a Joint Management Committee (JMC). Both committees consist of an equal number of representatives from Baffinland and QIA. The JEC and the JMC meet on a regular basis, by phone or face-to-face. The JEC is responsible for:

- Providing oversight to the implementation of the IIBA through the setting of annual goals, objectives and priorities;
- Establishing and supporting annual implementation budget;
- Reviewing and providing comment on relevant reports; and
- Providing strategic guidance to both parties to optimize benefits and implementation of IIBA.

The JMC is responsible for monitoring the ongoing operations and management of the Project as it relates to the IIBA. The JMC is also an important forum for sharing information regarding the progress of training initiatives, employment targets and contract awards. Disputes that arise in JMC are referred to the JEC for resolution.

At various points throughout the year, the JMC hosts weekly teleconference calls to address ongoing issues related to IIBA implementation. In addition to these regular teleconference calls, Baffinland met with the JEC and JMC on a number of occasions throughout 2017. These meetings are listed in Table 2.3.

**Table 2.3 JMC and JEC Meetings in 2017**

Date	Location	Topics Discussed
<b>Joint Management Committee (JMC)</b>		
February 6-8 2017	Oakville	<ul style="list-style-type: none"> <li>• Inuit Procurement and Contracting Strategy</li> <li>• Cross-cultural awareness training</li> <li>• Baffinland Inuit Human Resources Strategy (current recruitment, hiring and retention procedures and practices)</li> <li>• Designated Inuit Firm List</li> </ul>
March 13 2017	Teleconference	
March 23-24 2017	Iqaluit	
April 21 2017	Teleconference	
May 2 2017	Teleconference	
May 25 2017	Teleconference	
June 16 2017	Teleconference	
June 27 2017	Iqaluit	
August 28-29 2017	Ottawa	
September 19-20 2017	Ottawa	
November 15-17 2017	Oakville	
December 7-9 2017	Iqaluit	
<b>Joint Executive Committee (JEC)</b>		
April 5 2017	Iqaluit	<ul style="list-style-type: none"> <li>• Annual Project Review Forum</li> <li>• Planned and proposed HR initiatives to maximize Inuit employment through pre-employment training initiatives</li> <li>• Skills and Partnership Fund: new QIA staff to manage funding roles and responsibilities of both QIA and Baffinland in implementation of the four-year Q-STEP program</li> <li>• NPC Land Use Amendment update</li> </ul>
May 9 2017	Arctic Bay	
June 28 2017	Iqaluit	
September 28-29 2017	Ottawa	
October 25 2017	Oakville	

In addition to the work of the two Joint Committees, QIA and Baffinland host an annual IIBA Forum where both parties provide Project updates and progress reports to representatives of the five (5) North Baffin communities. In 2017, the IIBA forum was held in two locations: Arctic Bay and Iqaluit. The 2018 IIBA Forum is planned to be held in Hall Beach. The Annual Project Review Forum provides a valuable opportunity to discuss and address Project-related issues of concern identified by community

members and to develop collaborative solutions. An IIBA Report is also produced annually by Baffinland that describes implementation plans and priorities for the preceding calendar year.

### 2.5.2 Engagement on the Commercial Lease and Associated Agreements

In addition to engagement related to the implementation of the IIBA, Baffinland and QIA also engage on a regular basis with respect to the Commercial Lease, associated Agreements and a range of management plans. Meetings in 2017 were primarily focused on discussing the Annual Work Plan, Annual Securities Review, water management plans and snow management plans with a continued focus on Tote Road Management. Regular engagement with QIA on the commercial lease and associated agreements has been ongoing for the past several years and will continue to be a priority.

### 2.5.3 Engagement with Regulatory Agencies

Baffinland regularly participates in meetings or communications with the regulatory agencies that have a jurisdictional interest in the Project. The purpose of such engagement is to ensure that regulators are provided with the full range of relevant Project-related information and frequent updates on Project progress. In addition to meetings with various regulatory agencies, site inspections were regularly undertaken by regulatory agencies in 2017 (Table 2.4). The purpose and outcomes of key site inspections carried out in 2017 are captured in more detail in Section 3.2.2.

**Table 2.4 2017 Regulatory Inspections**

Date	Regulatory Agency
March 1-7 2017	WSSC - Mines Inspector
March 22-24 2017	NIRB - Site Visit
May 9-16 2017	WSSC - Mines Inspector
May 29 - June 1 2017	ECCC and INAC - Environmental Inspectors and Water Resources Officers
June 20-22 2017	QIA - Auditor
July 18-19 2017	ECCC - Environmental Inspector
August 1-3 2017	QIA - Auditor
August 18-19 2017	WSSC - Geotechnical Inspectors
August 22-29 2017	WSSC - Mines Inspector
August 22-24 2017	INAC - Geotechnical Inspector, Water Resources Officer
August 22-24 2017	ECCC - Environmental Inspector
August 24-26 2017	NIRB - Site Visit
September 14-20 2017	QIA - Environmental Auditors
November 8-9 2017	INAC - Water Resources Officer

### 2.6 ENGAGEMENT WITH WORKING GROUP'S

NIRB Project Certificate No. 005 Conditions required that Baffinland establish three working groups for the Project, namely:

- Terrestrial Environment Working Group (TEWG);
- Marine Environment Working Group (MEWG); and
- Socio-Economic Monitoring Working Group (SEMWG).

The Working Groups provide a valuable forum for ongoing Project communication and reporting between Baffinland and interested parties. The Working Groups also serve as an advisory board to provide recommendations on monitoring and management approaches related to the Project.

The meetings are structured to enable participants to have the opportunity to provide input on monitoring program design and implementation and follow-up at the conclusion of the field programs prior to finalization of the Annual Monitoring Reports. The group receives presentations on the implementation of field programs and the subsequent results in order to prioritize monitoring plans and suggest measures for mitigation where required. The Working Groups provide a platform for the discussion of collaborative research opportunities between parties and to identify monitoring programs suited for community based monitoring and Inuit participation. The TEWG and MEWG includes both member-status and observer-status participant organizations.

Updates on 2017 activities specific to each working group are provided below. A record of meeting minutes for all Working Group meetings held in 2017 are provided in Appendix C.

### 2.6.1 Terrestrial and Marine Environment Working Groups

Project Certificate Conditions No. 49 and 77 mandated the establishment of working groups related to the terrestrial and marine environments. Members for each group include the Government of Nunavut, the QIA, Environment and Climate Change Canada, Mittimatalik Hunters and Trappers Organization and Baffinland. Fisheries and Oceans Canada, Parks Canada and Makivik are also members of the Marine Environment Working Group. World Wildlife Foundation - Canada participate as an observer on both groups, and Oceans North participates as an observer to the MEWG.

Generally, the Working Group meetings are structured in such a way to include time for:

- Baffinland to provide a Project update to the members;
- Discussion of ongoing concerns and outstanding actions items;
- Discussion of monitoring planning;
- Discussion of results of monitoring programs; and
- Various research presentations (given by Baffinland, Baffinland technical consultants and other members).

A critical focus of the TEWG and MEWG in 2017 was enhancing the process for distributing monitoring reports to the working groups and for receiving their feedback. Subsequently, a schedule for distribution of reports and an associated comment period the Working Groups review was developed. This schedule and process will be implemented in 2018, to the extent practicable. By establishing clearer guidelines on how information will be shared with the working groups and how their feedback will be responded to and considered in the monitoring program planning and results, Baffinland expects to generate even more valuable input from the Working Groups in 2018. A list of the meetings with the TEWG and MEWG in 2017 is provided in Table 2.5.

**Table 2.5 Terrestrial Environment and Marine Environment Working Group Meetings in 2017**

Date	Location	Topics Discussed
<b>TEWG</b>		
March 16, 2017	Teleconference	<ul style="list-style-type: none"> <li>• Discussion regarding effects from dust on vegetation communities</li> <li>• Caribou survey</li> <li>• Road crossing and snow banks</li> <li>• Bird monitoring</li> <li>• Monitoring frequency</li> </ul>
May 4, 2017	Ottawa	<ul style="list-style-type: none"> <li>• Baffinland Project update and update on Phase 2 Expansion Project Proposal</li> <li>• Overview of 2017 terrestrial monitoring program</li> <li>• Caribou monitoring</li> <li>• Transportation / dust and vegetation</li> <li>• Helicopter flights and air traffic</li> <li>• Bird nest surveys</li> <li>• Vegetation survey</li> <li>• Community-based monitoring programs</li> </ul>
October 3, 2017	Teleconference	<ul style="list-style-type: none"> <li>• NPC Land Use amendment Project update</li> <li>• 2017 field program status update</li> <li>• Caribou surveys</li> <li>• Raptor study</li> <li>• Vegetation monitoring</li> <li>• Metal sampling</li> <li>• Logistical considerations for future TEWG meetings</li> </ul>
November 29, 2017	Iqaluit	<ul style="list-style-type: none"> <li>• Update on dust fall monitoring program</li> <li>• Vegetation monitoring and contaminants of concern</li> <li>• Discussion on effects related to air traffic</li> <li>• Caribou and other wildlife species monitoring</li> </ul>
<b>MEWG</b>		
March 15, 2017	Teleconference	<ul style="list-style-type: none"> <li>• Baffinland presentation on 2017 monitoring programs</li> <li>• 2018 field season and MEWG scheduling</li> </ul>
May 3, 2017	Ottawa	<ul style="list-style-type: none"> <li>• ECCC presentation on seabird monitoring program</li> <li>• Baffinland presentation on marine mammal monitoring program</li> <li>• Baffinland presentation on Marine Ecological and Aquatic Invasive species monitoring program</li> <li>• Community-based monitoring programs</li> </ul>
September 13, 2017	Teleconference	<ul style="list-style-type: none"> <li>• Update on field programs</li> <li>• DFO presentation on aquatic invasive species</li> <li>• Use of ice management vessels</li> <li>• Shipboard observer program update</li> <li>• NPC land use amendment process</li> <li>• MEWG review of monitoring reports</li> <li>• NIRB's draft monitoring framework</li> </ul>

Date	Location	Topics Discussed
November 30, 2017	Iqaluit	<ul style="list-style-type: none"> <li>• Project update</li> <li>• MEWG roles, responsibilities and decision-making authority</li> <li>• Baffinland approach to adaptive management</li> <li>• Cumulative effects assessment</li> <li>• Aerial surveys and shipboard observer program</li> <li>• Shipping and mammal monitoring</li> <li>• ECCC update on seabird monitoring program</li> <li>• Presentation from Oceans North on their acoustics monitoring program</li> <li>• WWF presentation on Lancaster Sound Mariners Guide</li> <li>• DFO presentation on invasive species monitoring</li> <li>• NIRB's draft monitoring framework</li> </ul>

### 2.6.2 Mary River Socio-Economic Monitoring Working Group

In fulfillment of Project Certificate Condition No. 129, Baffinland coordinates the Mary River Socio-Economic Monitoring Working Group (SEMWG). The SEMWG is a sub-group of the Regional Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC), which meets annually. Baffinland also acts as a participant in the QSEMC. The SEMWG includes members from the GN, the QIA, INAC and Baffinland.

A list of the meetings with the SEMWG in 2017 is provided in Table 2.6.

**Table 2.6 Socio-economic Monitoring Working Group Meetings in 2017**

Date	Location	Topics Discussed
<b>SEMWG</b>		
February 2, 2017	Teleconference	<ul style="list-style-type: none"> <li>• Update on the 2016 Socio-economic monitoring report</li> <li>• Baffinland Employee Information Survey</li> <li>• Socio-economic impact assessment for Phase 2 Expansion Project Proposal</li> </ul>
September 14, 2017	Iqaluit	<ul style="list-style-type: none"> <li>• NIRB's draft monitoring framework</li> <li>• Role of Socio-economic monitoring in NIRB Community Information Sessions</li> <li>• Plan for 2017 Socio-economic monitoring report - incorporation of workshop deliverables</li> <li>• Baffinland Phase 2 Expansion Project Proposal update</li> <li>• SEMWG follow-up to reviewer comments on the 2016 Socio-economic monitoring report</li> <li>• Review and update of the SEMWG Terms of Reference</li> </ul>
<b>QSEMC</b>		
July 5 and 6, 2017	Arctic Bay	<ul style="list-style-type: none"> <li>• Food security</li> <li>• Public Housing</li> <li>• Infrastructure for social service and commercial development</li> <li>• Employment-related challenges:</li> <li>• Childcare</li> <li>• Workplace conditions (rotation, length of work-days, cross-cultural issues)</li> <li>• Work readiness and technical training opportunities</li> <li>• Inuit recruitment and retention</li> <li>• Programs to support mental health</li> </ul>

## 2.7 LOOKING AHEAD

Baffinland will continue to implement a proactive approach to engagement with various stakeholders through meetings, workshops, surveys and dissemination of information and reports. This will ensure that the communities, QIA, regulators and the public are informed in a timely manner of the Project's progress and the potential environmental and social impacts of ongoing operations.

### 3 – OPERATIONS OVERVIEW

#### 3.1 SITE ACTIVITIES COMPLETED IN 2017

Baffinland continued to focus on mine production from Deposit No. 1 in 2017. Key activities undertaken in 2017 occurred at the active Project component areas including Milne Port, the Milne Inlet Tote Road, and the Mine Site. No Project activities were undertaken related to the development of the South Railway or at Steensby Port in 2017.

Mining and hauling activities from the Mine Site to Milne Port continued throughout 2017, with 4.54 million tonnes mined and hauled using the Tote Road. The 4.54 million tonnes resulted in an exceedance of the approved limits for hauling ore on the Milne Tote Road as prescribed in PC Condition No. 179b by 7.5%. The exceedance is largely attributable to the fact that Baffinland achieved higher levels of production than anticipated and that ceasing the road haulage operation in December would have required temporarily laying off Project employees and shutting down operations. Subsequently, a decision was made by Baffinland to proactively inform NIRB of the anticipated exceedance and maintain operations for the remainder of the year. Discussions with NIRB and other regulators related to the limits prescribed in this condition will likely be initiated in 2018.

2017 also marked the third season of open water shipping of iron ore with a total of 4.04 million tonnes of iron ore shipped between August 2 and October 17. This represents a record-setting performance for the Company, and the largest shipping program by volume ever executed in the Canadian High Arctic.

Construction activities in 2017 included the expansion of the crusher pad storage area, expansion of the ore stockpile storage area, assembly of a tire shop and parts staging area at ore haul truck line up pad, construction of an additional truck wash building and continued development of Mine Site landfill.

Operational activities in 2017 included:

1. Development and operation of the mine, ore crushing and land transportation, stockpiling and marine shipment of ore.
2. The continued development and construction of infrastructure required at Milne Port and the Mine Site and along the Tote Road.
3. Mobilization of additional 49-person camp at Milne Port and continued operation of Mine Site and Milne Port Camps to support ongoing operations and construction activities, which will include the use of water and deposition of waste as authorized under existing permits.
4. Ongoing operation of permitted quarry and borrow sources.
5. At Milne Port, vessels carrying fuel, equipment and supplies for use at the Mine Site and Milne Port arrived during open water. Material, fuel and supplies required for operational and construction activities were transported to the Mine Site year round via the Tote Road.
6. Use of ore carrier escorts during the end of the shipping season to maximize shipping during the open water season.
7. Geotechnical drilling required to support engineering design and construction activities of the Project.
8. Ongoing environmental effects studies and baseline data collection will continue to support the construction and operation of the Project as well as for future engineering requirements.
9. Continued environmental monitoring in accordance with the approved Project Certificate, licences, authorizations, management plans and environmental effects monitoring programs.
10. Ongoing regional exploration activities including mapping, prospecting, sampling and geophysics.

11. Execution of the Tote Road Execution Plan and Design Report.
12. Replacement of accommodation camps.
13. Development of required support infrastructure for increased work force (e.g. fuel storage and water treatment).

Representative photographs showing major 2017 site activities are included in the Photo Essay (Appendix D).

## 3.2 2017 HIGHLIGHTS AND CHALLENGES

The Project has been in operation since September 2014 and the operational experience gained has proved that high volume, bulk commodity mining in the Canadian Arctic is feasible. Despite harsh environmental and economic conditions, Baffinland's investors continue to support the Project with the goal of increasing production to reach an economically sustainable operation.

2017 marked a successful year of operations. During 2017, Baffinland experienced its best year of production and shipping, and the Project continued to ramp up. Baffinland also participated in the NPC Land Use Hearings for the Phase 2 Expansion Project Proposal, which will support the ongoing development and expansion of the Project.

### 3.2.1 Project Economics

Baffinland recognizes local Inuit communities, regulatory agencies and other interested stakeholders have an interest in the Proponent's evolving strategy for the development of the Project. The following provides a high-level overview of the context in which Baffinland has made decisions related to Project-planning over the past couple of years and throughout 2017.

One of the primary drivers of the ERP was to validate the Company's ability to operate the Project in ever-changing market conditions, and to deal with the complex and unique challenges associated with producing and shipping a bulk commodity in the Arctic. Given the technical complexity of the Project and the challenge of the environmental context in which the Project operates, Baffinland determined in 2014 that initiating the Project through the ERP would provide an opportunity to better understand the conditions of the operations and would eliminate the reliance on immediate capital to fund the development of Steensby Port and the South Railway.

During 2015 and 2016, when the price of iron ore dropped significantly, Baffinland was forced to assess the Project's vulnerabilities to global economic demands for iron and to review areas of the operation where cost-cutting measures could be taken. Subsequently, actions were taken in 2015 to demonstrate the Company's ability to respond to changing market conditions. As the price of iron re-stabilized in 2016, Baffinland determined a course of action for developing the Project that better insulated it from varying market conditions. This will be supported by developing the Phase 2 Expansion Proposal for the Project in advance of initiating the full development of the Approved Project. As part of the Phase 2 Expansion Proposal, Baffinland is also seeking to increase the overall annual production and shipping rate from 22 Mtpa (as currently approved in Project Certificate No. 005) to 30 Mtpa. The Phase 2 Expansion Proposal also includes a proposal to switch the transportation of ore between the Mine and Port site from trucking to rail operations. To ensure that shipping of iron ore continues to remain within the open water season, Baffinland proposes to build a second ore dock capable of berthing larger vessels and implementing the use of ice management vessels at the start and end of the open water season to improve operational project planning. This annual production increase will support Baffinland in ensuring that the cost of developing and operating the Project is equitable to Baffinland's ability to sell and deliver iron ore to its global consumers.

Throughout 2017, the market price of iron ore remained relatively stable overall, with an average annual market price of \$72US/t. This represents an increase in the average annual price of iron ore from 2016, where the average value was closer to \$58/t. A confluence of the stabilization in the price of iron ore throughout 2017, and an overall increased average annual price provided impetus to Baffinland to continue planning the Phase 2 Expansion Proposal in 2017. Additionally, in 2017 Baffinland



expanded its markets from predominantly European steel mills; shipping to buyers in the United Kingdom and Japan. This increased market-base also provides further confidence in the operational viability of the Phase 2 proposed project.

Given the number of deposits and the quality of the iron ore at the Project site, Baffinland expects that the mine life of the Project is multi-generational. The primary objective of the ERP and the Phase 2 Expansion Project Proposal is to generate capital, which will ultimately serve to fund the construction of the railway to Steensby Port and the ongoing development of the Project. By taking a phased approach with the development of the Project, Baffinland can secure the capital necessary to grow the Project at a sustainable rate. Ultimately, a phased approach safeguards the Project from vulnerability to market fluctuations, which will subsequently aid in preventing temporary or early closure of the Project.

### 3.2.2 Non-Compliance

#### 3.2.2.1 Fisheries Act Directive - 2016 to 2017

In June of 2016, Baffinland was issued a *Fisheries Act Directive* (FAD) by Environment and Climate Change Canada (ECCC, 2016a). The FAD was a result of the release of sediment above applicable regulatory guidelines in run-off during freshet, as noted by INAC and ECCC during their joint site inspection on May 18 and 19, 2016. In response, Baffinland completed a number of construction projects designed to reduce sediment release and prepared a completion report outlining the measures to be taken to address dust and sediment issues (Baffinland, 2016c), including a schedule of actions outlined in the Sediment and Dust Mitigation Action Plans, to reduce future impacts (Golder, 2016a,b).

Baffinland's ongoing corrective actions that were taken in relation to the *Fisheries Act Directive* and letter of non-compliance resulting from freshet in 2016 have helped to reduce the impacts from snow freshet in 2017, and no additional letters of non-compliance were received during freshet in 2017. Throughout 2017, ongoing efforts have been underway at site to help plan for continued improvement and management of runoff during freshet in 2018.

#### 3.2.2.2 INAC Directive - Port Construction Camp Lay-Down Pad

Following a May 31, 2017 inspection, INAC issued a Directive to Baffinland on June 9, 2017 which instructed the Proponent to stop all work at the "Port Construction Camp" site lay-down pad. The Directive was issued on the basis that the pad was built otop a stream, and that rock fill had also subsequently been placed in the stream. It was noted by INAC that Baffinland had not received approval for this activity vis-à-vis Baffinland's submission of the 2017 Amended Work Plan submitted to the NWB on May 26, 2017.

Baffinland provided a response to INAC on June 14, 2017 to acknowledge receipt of the Inspector's Direction and to provide information related to the corrective actions Baffinland undertook as a result. In the response, Baffinland noted that work on the laydown pad had been stopped and that the contractor had been demobilized from the laydown pad site. It was also acknowledged that the work was undertaken in error, and that Baffinland had initiated actions to improve their performance and any sub-contractor's performance vis-a-vis the implementation of a "Permit to Work" protocol. Baffinland also confirmed that the drainage path was seasonal, and not classified as fish habitat, and that based on monitoring observations, it did not appear that the quality of the streamflow had been affected. Baffinland also provided notice to INAC that the Proponent would be seeking an amendment to the Water License to divert the drainage path around the lay down in accordance with the Surface Water and Ecosystem Management Plan.

On July 19, 2017, Baffinland submitted to the NWB a Request for Modification under the Type A Water Licence to construct a diversion system to redirect surface water from the impeded drainage path(s) around the pad. On September 8, 2017, the NWB issued to Baffinland an approval letter to construct the proposed diversion system around the camp pad. Construction of

the diversion system around the pad was completed on October 26, 2017 and is documented in the construction summary report titled 'Construction Summary Report: Milne Port Camp Pad Natural Stream Diversion' submitted to the NWB on January 24, 2018.

### 3.2.2.3 INAC Directive - Waste Rock Facility

During 2017, controlled effluent discharges from the Waste Rock Facility (WRF) pond began in early July and continued, as required, until freeze-up in September. Controlled discharges from the WRF pond involved pumping effluent from the pond to the final discharge point (MS-08-FDP) established under the MMER.

During controlled discharges from the WRF pond, effluent water quality samples were collected as outlined in the MMER and Type A Water Licence to ensure effluent discharged to the receiving environment was in compliance with applicable water quality discharge criteria. During 2017, exceedances of the applicable water quality discharge criteria during controlled discharges from the WRF pond, consisted of two (2) minor exceedances of 15 mg/L TSS limit in early July followed by multiple exceedances of the applicable pH and TSS limits in August and September. Acute toxicity<sup>1</sup> samples taken on August 8, 2017 and September 5, 2017 at the WRF pond failed for select organisms with mortality rates greater than 50% of test organisms<sup>1</sup>. Applicable Spill Reports were submitted for these exceedances to the appropriate regulators.

During August 2017, the pH of runoff collected in the WRF pond dropped below the pH discharge limits outlined in the MMER. Observations indicated the decrease in pH may have been the result of potential acid rock drainage (ARD). In addition, during July and early August several large precipitation events resulted in significant volumes of runoff being retained within the WRF pond. With limited capacity remaining in the pond for additional runoff, Baffinland submitted a letter on August 16, 2017 notifying regulators and stakeholders of the Company's immediate need to treat and conduct a controlled discharge to the receiving environment.

The pond was subsequently batch treated with sodium carbonate in mid-August 2017 to increase the pH within the permissible range for discharge. Although the batch treatment was initially successful in raising the pH of runoff contained within the pond, subsequent active discharges from the pond during late August and September resulted in several exceedances of the MMER discharge criteria for pH and total suspended solids (TSS). Exceedances for the non-compliant discharges were reported to the relevant regulators and are documented in NT-NU Spill Reports 17-289, 17-312, 17-328 and 17-361.

During an on-site INAC and ECCC inspection in late August, uncontrolled seepage originating from the toe of the pond's berm was observed not previously identified in routine internal inspections and annual third party geotechnical or regulator inspections. The seepage was reported by Baffinland to relevant regulators and is documented in NT-NU Spill Report 17-312.

An updated Phase 1 Waste Rock Management Plan (Rev. 1; Baffinland, 2018a) was submitted by Baffinland on January 15, 2018, and details the deposition and management of waste rock at the Project up until the end of 2018. Baffinland plans on submitting further revisions to the Phase 1 Waste Rock Management Plan and revisions to the Life-of-Mine Waste Rock Management Plan by the end of 2018. The revised plans will outline the management of waste rock and surface water at the WRF for the next five years and will incorporate geochemistry data collected during the field monitoring programs planned at the WRF in 2018, updated water quality modelling results and lessons learned from the 2017 events.

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<sup>1</sup> Acute lethality to Rainbow trout, *Oncorhynchus mykiss* (as per ECCC's Environmental Protection Series Method EPS/1/RM/13)  
Acute lethality to *Daphnia magna*, (as per ECCC's Environmental Protection Series Method EPS/1/RM/14)

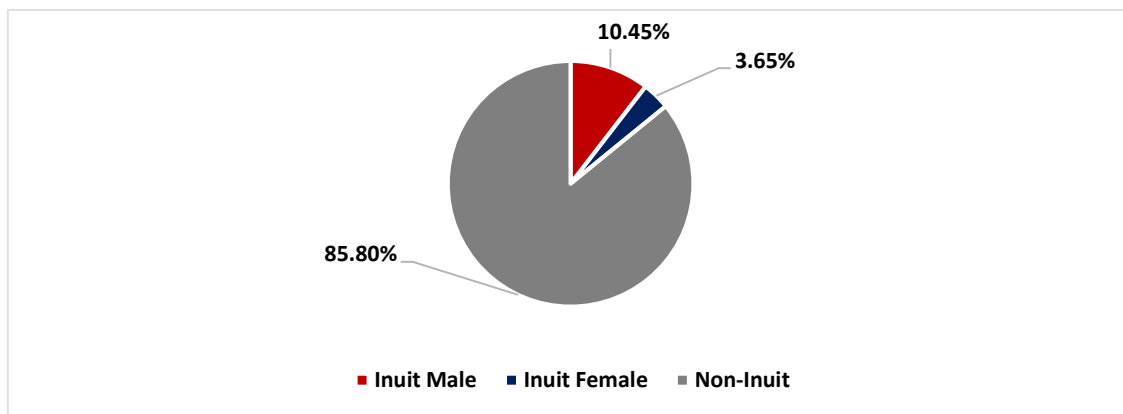
Key actions taken to date to address the concerns at the WRF include the following:

- Batch treatment of the pond with sodium carbonate to raise the pH within applicable water quality discharge criteria, in consultation with the engineers from Wood Group PLC (formerly AMEC Foster Wheeler);
- Retained third party consultants (Hatch, Golder, Le Group Desfor) to assess the observed seepage and WRF pond design and make recommendations to Baffinland for the appropriate corrective actions;
- Constructed an emergency ditch network and containment sumps around the outer perimeter of the WRF pond in efforts to contain observed seepage;
- Injected rhodamine dye into the WRF pond to identify the potential source of observed seepage;
- Sourced a dedicated water treatment plant to manage effluent discharges from the WRF pond in 2018 (the water treatment plant is planned to be installed by May 1, 2018);
- Developed a MMER Emergency Response Plan to: clarify roles & responsibilities; clarify emergency spill response procedures; and outline the controls in place to ensure effluent discharges from Project infrastructure are compliant with the water quality discharge criteria;
- Developed Interim Waste Rock Deposition Plan detailing how waste rock would be managed in the short-term;
- Continue to engage with regulators, and provide updates and responses to information requests as required; and
- Continue to work with Golder on developing the appropriate corrective actions to address concerns identified in 2017 at the WRF.

A timeline of key events related to this Directive can be found in the QIA/NWB Annual Report (Baffinland, 2018b).

### 3.2.3 Employment

In 2017, Baffinland saw an increase in the total number of hours worked by Inuit employees at the Project, however the overall participation of Inuit employees relative to non-Inuit employees decreased in 2017 from 2016 by 1.4% (Figure 3.1).



**Figure 3.1 Workforce Breakdown by Ethnicity and Sex (2016-2017)**

In 2017, Baffinland continued to struggle with the retention of Inuit employees and continues to fall short of the Minimum Inuit Employment Goal (MIEG) of 25%. A number of efforts were made in 2017 with the aim of improving the overall numbers of Inuit employed by the Project.

### 3.2.4 Training Initiatives

Key training initiatives undertaken in 2017, included the development of the Work Ready (Mining Essentials) Program. The Program is a result of a partnership created by Baffinland and the Mining Industry Human Resources Council (MiHR). The free program will help prepare Inuit for a career in mining, providing practical skills and preparing Inuit community members to work in a heavy industrial setting and to adapt to the unique challenge of working on a fly-in-fly-out / two week on-two week off rotation. Baffinland also began accepting applications from Inuit candidates for a free, three-month training program for a Heavy Equipment Operator training program. Baffinland also continues to implement several training programs for current Inuit employees. In 2017, Inuit employees represented 11% of Project employees that participated in training courses.

### 3.2.5 Community Engagement

Baffinland also undertook several community engagement initiatives geared towards recruiting members from the five (5) north Baffin communities. See Section 2.3.2, 2.3.3 and 2.3.4 of this Report for more details.

### 3.2.6 Relationship with QIA

On July 19, 2016, QIA issued a Notice of Arbitration claiming that Baffinland was in default of its Advance Payment obligations under the IIBA, which had been entered into in September 2013 (QIA and Baffinland, 2013). The arbitration involved a disagreement as to the meaning of ‘commercial production’ and the ‘intended capacity’ of the Project. Hearings were originally scheduled for October 2016 but were later deferred until 2017.

During the first half of 2017, Baffinland and QIA participated in arbitral proceedings related to QIA’s financial participation in the Project based on Article 5 of the IIBA. On July 5, 2017 the Arbitration Panel released its decision, ruling in favour of QIA and holding that BIM must pay outstanding quarterly advance payments and continue to make quarterly payments until the Project reaches a capacity of 60% of 18 Mt/a to a maximum of \$75 Million. Additional clarification and guidance was subsequently provided by the Panel on August 14, 2017, which further characterized items and issues related to the implementation of the IIBA.

Notwithstanding the arbitration proceedings, Baffinland was able to successfully coordinate with QIA on a number of other key issues related to the implementation of the IIBA, including the development of the Inuit Human Resources Strategy, Inuit Procurement and Contracting Strategy, the Skills and Partnership Fund and ongoing management of compliance with the commercial lease (see Section 2.5).

## 3.3 LOOKING AHEAD

The proposed 2018 Work Plan was submitted to the Nunavut Water Board (NWB) and the QIA on November 6, 2017 (Baffinland, 2017b). This submission is a requirement under Part J, Item 3 of Amendment No. 1 of Type ‘A’ Water Licence 2AM-MRY1325 and under Section 6.1 of Commercial Lease No. Q13C301 agreed between Baffinland and the QIA (QIA, 2013). A revised version of the Work Plan dated January 10, 2018 was resubmitted to the parties (Baffinland, 2018c).

A summary of the planned 2018 activities are as follows:

1. Development and operation of the mine, ore crushing and land transportation, stockpiling and marine shipment of ore.
2. The continued development and construction of infrastructure required at Milne Port and the Mine Site, and along the Tote Road.
3. Continued operation of Mine Site and Milne Port Camps to support ongoing operations and construction activities, which will include the use of water and deposition of waste as authorized under existing permits.

4. Ongoing operation of permitted quarry and borrow sources; additionally, there is one (1) quarry (Q5) identified for development in 2018.
5. At Milne Port, vessels carrying fuel, equipment and supplies for use at the Mine Site and Milne Port will arrive during open water (approximately between mid-July and mid-October 2018). Material, fuel and supplies required for operational and construction activities will be transported to the Mine Site year round via the Tote Road.
6. Use of ice management vessels to escort ore carriers in order to maximize shipping during open water season.
7. Ongoing environmental effects studies and baseline data collection will continue to support the construction and operation of the Project as well as for future engineering requirements.
8. Environmental monitoring in accordance with the approved Project Certificate, licenses, authorizations, management plans and environmental effects monitoring plans.
9. Ongoing exploration activities including drilling, mapping, prospecting, sampling and geophysics. Planning of the details of the summer drilling and/or trenching program is not yet finalized.
10. Tote Road improvements to address freshet runoff issues and poor road conditions during the spring and summer periods.
11. Continued construction of the 800-person hard wall camp at the Mine site to address retention issues and safety concerns with continued long-term use of the tent camp at the Mine.
12. Continued construction of additional fuel storage at the Milne Port.
13. Installation of communications towers and infrastructure along the Tote Road to improve safety and data transfer between Milne Port and the Mine Site.
14. Site grading and laydown construction for supplies and equipment to support future construction activities and remove ponding and permafrost degradation issues and current infrastructure.
15. Installation of a floating freight dock to improve efficiencies on offloading of sealift as well as provide an opportunity for shore based connection for fuel ships to potentially avoid future use of floating hose for fuel receipt.
16. Erection of additional maintenance facilities to safely service equipment.

No activities are planned to be undertaken along the south railway or at Steensby Port in 2018.

In addition, Baffinland will continue the preparation of the EIS addendum and continued community and regulator engagement for the Phase 2 Expansion Project Proposal.

## 4 – PERFORMANCE ON PC CONDITIONS

The following sections provide a discussion of Baffinland’s self-assessed status of compliance and performance related to each of PC conditions for the Project in 2017.

The discussion of compliance with PC conditions has been disaggregated into the following categories:

- Performance on General Conditions;
- Performance on Compliance with Regulatory Instruments;
- Performance on Ecosystemic Terms and Conditions;
- Performance on Socio-Economic Terms and Conditions; and
- Performance on Other Terms and Conditions.

### 4.1 METHODOLOGY AND CRITERIA

Table 4.1 outlines the status of compliance levels and describes the criteria related to each of these options. The proposed levels of compliance have been refined from the 2016 Annual NIRB Report to reflect comments received from regulatory authorities on the 2016 Annual Report and to simplify and align with the status of compliance terms applied in the NIRB’s 2016-2017 Annual Monitoring Report for the Project (NIRB, 2017a).

**Table 4.1 Status of Compliance Terminology and Criteria**

Status of Compliance	Criteria
In-Compliance	Condition requirements have been met
Partially-Compliant	Condition requirements have been partially met <i>*Demonstrable efforts towards meeting compliance requirements is evidenced.</i>
Non-Compliant	Conditions requirements have not been met <i>*Rationale for being unable to meet compliance requirements is provided.</i>
Not Applicable	Condition is tied to a project phase or component that was not active during the 2017 reporting year, or the responsible party is not the Proponent

Each PC condition is assigned a status of compliance. Where a PC condition is designated as being only ‘partially compliant’ or ‘non-compliant’, a rationale explaining why ‘in-compliance’ was not achieved in 2017 and, where applicable, a strategy for moving towards full compliance for the 2018 reporting year has been provided.

Baffinland has taken a conservative approach to self-assessing the status of compliance with PC Conditions for 2017. When determining a status of compliance for each of the PC conditions, the following process was implemented by Baffinland and its technical experts:

1. A review of the specific requirements outlined in each PC condition is conducted.
2. A review of all relevant work completed by Baffinland in the reporting year and/or previous reporting years (if applicable) relevant to the PC condition is conducted.
3. A gap analysis is completed to assess whether or not there is a delta between the requirements of the PC condition and the work completed by Baffinland to meet these requirements.
4. Stakeholder comments relevant to the PC condition are considered.
5. A status of compliance based on the results of the analysis is assigned.

This process has proven to be an effective approach to-date. In NIRB's 2016-2017 Annual Monitoring Report for the Project, 93% of NIRB's evaluation of compliance aligned with Baffinland's self-assessment for 2016.

## 4.2 APPROACH TO REPORTING ON PERFORMANCE

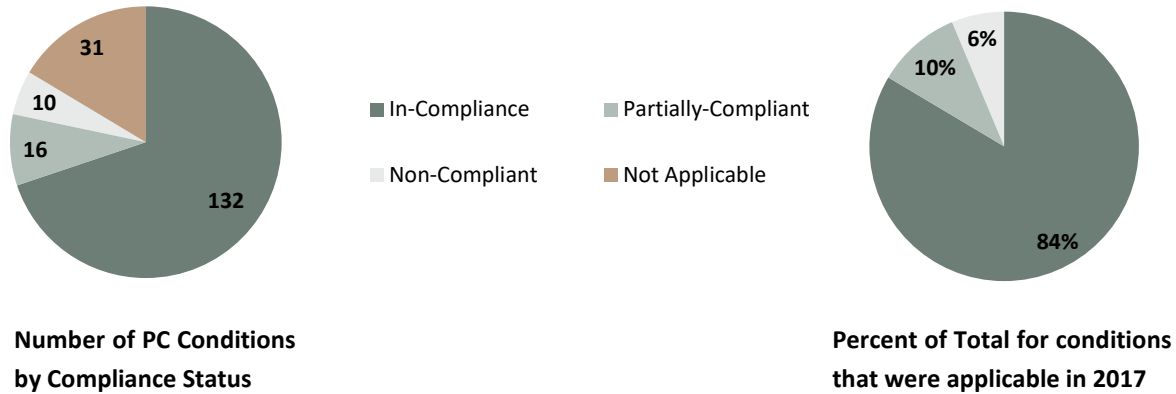
An individual summary sheet for each of the ecosystemic, socio-economic and 'other' terms and conditions has been provided in Section 4.5 to Section 4.7. The category and content of information provided in these summary sheets is outlined in Table 4.2.

**Table 4.2 Layout of PC Condition Summary Sheets**

Item	Summary of Content
Category	<ul style="list-style-type: none"> <li>Category as defined in PC No. 005.</li> </ul>
Responsible Parties	<ul style="list-style-type: none"> <li>Responsible party as defined in PC No. 005.</li> </ul>
Project Phase(s)	<ul style="list-style-type: none"> <li>Phase(s) of the Project the PC Condition is applicable to:                             <ul style="list-style-type: none"> <li>Construction</li> <li>Operations</li> <li>Temporary Closure / Care and Maintenance</li> <li>Closure</li> <li>Post-Closure Monitoring (as outlined in PC No. 005)</li> </ul> </li> </ul>
Objective	<ul style="list-style-type: none"> <li>The objective as outlined in PC No. 005</li> </ul>
Term or Condition	<ul style="list-style-type: none"> <li>The term or condition as written in PC No. 005</li> </ul>
Relevant Project Commitment	<ul style="list-style-type: none"> <li>List of all corresponding Baffinland commitments outlined in the Final Hearing Report (NIRB, 2012b).</li> </ul>
Reporting Requirement	<ul style="list-style-type: none"> <li>The reporting requirement as outlined in PC No. 005.</li> </ul>
Status of Compliance	<ul style="list-style-type: none"> <li>A self-assessed status of compliance for the PC Condition:                             <ul style="list-style-type: none"> <li>In-Compliance</li> <li>Partially-Compliant</li> <li>Non-Compliant</li> <li>Not Applicable</li> </ul> </li> </ul>
Stakeholder Review	<ul style="list-style-type: none"> <li>Stakeholders and other interested parties that participate in discussions and reviews related to aspects and implementation of regulatory submission of actions or documents relevant to the PC condition.</li> </ul>
Reference	<ul style="list-style-type: none"> <li>Description / title of relevant documents where supporting information related to PC condition status of compliance is available for review.</li> <li>Hyperlink to web-portal where referenced documentation can be accessed.</li> </ul>
Methods	<ul style="list-style-type: none"> <li>The methods employed to complete work required to meet compliance to the PC condition.</li> <li>Summary of any adaptive management measures employed that year in support of achieving compliance to the PC condition.</li> </ul>
Results	<ul style="list-style-type: none"> <li>Summary of efforts or work that were completed in support of achieving PC condition compliance in 2017, and previous reporting years, where applicable.</li> </ul>
Trends	<ul style="list-style-type: none"> <li>Summary of notable trends from previous years.</li> </ul>
Recommendations / Lessons Learned	<ul style="list-style-type: none"> <li>Summary of any operational changes undertaken or recommended for the future to achieve compliance or to further enhance environmental performance.</li> <li>Assessment of effectiveness of monitoring program and whether any changes to the scope of monitoring are appropriate.</li> <li>Identification of any challenges related to implementing mitigation measures, undertaking monitoring, or obtaining data from other sources.</li> </ul>

### 4.3 SUMMARY OF 2017 COMPLIANCE WITH CONDITIONS

Baffinland’s performance in fulfilling the PC conditions in 2017 is presented on Figure 4.1. A summary of each of the conditions and the Project status with respect to the conditions in 2017 is presented in Appendix A.



**Figure 4.1 Baffinland's Overall Performance against Project Certificate Conditions in 2017**

Overall, Baffinland is in-compliance the required terms and conditions for the Project. Of the 158 PC conditions that were applicable to the Project in 2017, Baffinland is 84% in-compliance with these terms and conditions. In areas where improvement is required Baffinland will continue to make operational changes and work with regulators and the communities to ensure the Project remains in compliance with Project Certificate No. 005.

### 4.4 PERFORMANCE ON GENERAL CONDITIONS

The following presents the performance on general conditions set out in Section 4.1 of the Project Certificate, and Baffinland’s comment on the condition performance. Items one to four in this section of the Project Certificate speak to the NIRB’s monitoring responsibilities. Sections five through 12 describe additional requirements for Baffinland. A 2017 status on these items is provided below.

*5. The Proponent must obtain all required federal and territorial permits and other approvals, and shall comply with the requirements of such regulatory instruments.*

Baffinland has received the necessary approvals from NIRB to construct and operate the 18 Mtpa rail project and the 4.2 Mtpa ERP with Project Certificate No. 005, as well as the permits necessary to operate the 4.2 Mtpa ERP (Table 1.1). Baffinland will obtain additional permits prior to initiating construction of the 18 Mtpa rail project.

These authorizations often include their own annual reporting requirements. Other major annual reports include the combined annual report pursuant to Baffinland’s Type A Water Licence and Commercial Lease. The Annual Report to the NWB and QIA is substantial and, in comparison to the NIRB Annual Report, includes much greater detail on water, waste rock and waste management activities, as well as spill management and other topics related to water.

As required under the IIBA, a separate report on the status of implementation of the agreement will be issued to the QIA and Joint Executive Committee on March 31, 2018. The contents of the IIBA address or partly address many components of socio-economic monitoring and management. These reports can be found on Baffinland’s Document Portal at: <http://www.baffinland.com/shareddocuments/>.



The Company's performance on compliance with its regulatory instruments is described in Section 4.5.

*6. The Proponent shall take prompt and appropriate action to remedy any occasion of non-compliance with environmental laws and regulations and/or regulatory instruments, and shall report any non-compliance as required by law immediately. A description of all instances of non-compliance and associated follow up is to be reported annually to the NIRB.*

The Company's performance on compliance with its regulatory instruments is described in Section 4.5.

*7. The Proponent shall meet with respective licensing authorities prior to the commencement of construction to discuss the posting of adequate performance bonding. Licensing authorities are encouraged to take every measure to require that sufficient security is posted before construction begins.*

Closure and reclamation costs and resulting corresponding bonding requirements for the Mary River Project are determined under the Annual Security Review (ASR) process conducted in accordance with Schedule C of the Type A Water License Amendment No. 1 2AM-MRY1325 and QIA Commercial Lease. Under the ASR process, Baffinland, the respective landowners (the QIA & the Crown), the Nunavut Water Board, and other interested parties meet and confer to determine the estimated closure and reclamation costs for an upcoming year. Baffinland submitted that Annual Securities Review to the NWB on November 16, 2017, and a subsequent revised version was re-submitted on January 10, 2017. Publically available ASR document submissions for a respective year, describing in detail annual estimated closure and reclamation costs, can be downloaded from the NWB FTP site at: <ftp.nwb-oen.ca>.

Items eight to twelve speak to conditions related to monitoring records. The conditions and Baffinland's responses are included below.

*8. All monitoring information collected pursuant to the Project Certificate and various regulatory requirements for the Project shall contain the following information:*

- a. The name of the person(s) who performed the sampling or took the measurements including any relevant accreditations;*
- b. The date, time and place of sampling or measurement, and weather conditions;*
- c. The date of analysis;*
- d. The name of the person(s) who performed the analysis including any relevant accreditations;*
- e. A description of the analytical methods or techniques used; and*
- f. A discussion of the results of any analysis.*

Baffinland ensures that the records for all monitoring programs includes the above information. Baffinland has included this requirement in all monitoring program outlines and notifies all external consultants of the requirements.

*9. The Proponent shall make its monitoring results available, to the fullest extent possible, in English and Inuktitut.*

From 2014 to 2017 Baffinland included a summary of all monitoring programs in the executive summary of the NIRB annual report which was translated into Inuktitut. In 2017, Baffinland ensured that a popular / executive summary was developed for the Socio-economic, Terrestrial and Marine Annual Monitoring Reports, and translated these summaries into Inuktitut. Meeting minutes from the Working Group meetings were also translated into Inuktitut.

*10. The Proponent shall keep and maintain the records, including results, of all Project-related monitoring data and analysis for the life of the Project, including closure and post-closure monitoring.*

Baffinland keeps and maintains all Project-related monitoring data and will continue to do so.

*11. The Proponent shall maintain the Final Environmental Impact Statement and the Environmental Effects Monitoring program developed for the Project, with predictions updated as new baseline data is collected.*

The Environmental Effects Monitoring programs are reviewed on a regular basis through discussions with the Terrestrial and Marine Environmental Working Groups. Monitoring programs that are not managed under one of the environmental working groups, are reviewed with applicable regulatory agencies. A summary of the effects of the Project compared to those predicted in the FEIS is also provided in Sections 4.5.1 through Section 4.7.4.

*12. The Proponent shall establish a Project-specific web portal or web page as a means of making all non-confidential monitoring and reporting information associated with the Project available to the general public. This does not limit what the Proponent may be required to submit to the NIRB or other regulatory authorities to meet reporting requirements.*

In 2017 Baffinland launched a Project-specific Document Portal on its corporate website in order to provide monitoring and reporting information to the public ([www.baffinland.com/documents](http://www.baffinland.com/documents)). The web portal was live as of March 31, 2017. Where possible the web portal will provide links to English and Inuktitut versions of the popular summary of reports as well as the main body of the report or document.

Baffinland will continue to provide all documentation required by regulatory agencies directly to the appropriate body.

## 4.5 PERFORMANCE ON COMPLIANCE WITH REGULATORY INSTRUMENTS

General regulatory requirements under the Project Certificate requires Baffinland to take prompt and appropriate action to remedy any event of non-compliance, and to report all instances of non-compliance and associated follow-up annually to NIRB. Baffinland's compliance in 2017 with its applicable regulatory instruments is discussed below.

### 4.5.1 Agency Inspections and Site Visits

To validate compliance with the Project's various regulatory instruments, Baffinland hosted numerous regulatory inspections with representatives from INAC, ECCC, QIA and the Workers' Safety and Compensation Commission (WSCC) during 2017. Documentation and correspondence associated with these inspections are available in the 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b). The following subsections outline the inspections conducted by regulatory agencies and stakeholders at the Project in 2017.

#### 4.5.1.1 INAC Inspections

During 2017, three (3) inspections were conducted by INAC:

- May 29 - June 1 2017;
- August 22-24 2017; and
- November 8-9 2017.

Inspection results were conveyed during close-out meetings and are documented in Water Licence Inspection Reports subsequently distributed to Baffinland and the NWB. Baffinland responded to any concerns identified in the inspections to provide additional information and/or address the identified concerns. More details are available in the 2017 QIA and NWB Annual Report for Operations.

#### 4.5.1.2 QIA Inspections

In 2017, two (2) inspections were conducted on the following dates by the QIA under the agreement of the Commercial Lease:

- June 20-22 2017; and
- August 1-3 2017.

In addition to the inspections, the QIA conducted one (1) environmental audit between September 14 - 20, 2017.

The findings from the audit and inspections were conveyed during the close-out meetings between QIA personnel and Baffinland representatives as well as documented in subsequent reports and correspondence. Baffinland responded to the concerns identified in the inspections to provide additional information and/or address the identified concerns. More details are available in the 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b).

#### 4.5.1.3 ECCC Inspections

In 2017, three (3) inspections were conducted on the following dates by ECCC:

- May 29-June 1 2017;
- July 18-19 2017; and
- August 22-24 2017.

Inspection results were conveyed during close-out meetings following each inspection and subsequent correspondence. Baffinland responded to the concerns identified in the inspections to provide additional information and/or address the identified concerns.

#### 4.5.1.4 Workers' Safety and Compensation Commission (WSCC) Mine Inspections

During 2017, the WSCC conducted a total of five (5) inspections at the Mine Site and Milne Port. WSCC inspections were held on the following dates:

- March 7-14 2017;
- May 9-16 2017;
- August 18-23 2017;
- August 22-30 2017; and
- October 12-19 2017.

The reports for these inspections were distributed to Baffinland management as well as Baffinland's Occupational Health & Safety (OHS) Committee.

#### 4.5.2 Unauthorized Discharges and Spills

During 2017, forty-eight spills were reported to the Northwest Territories-Nunavut (NT-NU) Spill Line, NWB, INAC and QIA. The 2017 reportable spill events are outlined in Table 4.3. Five (5) spills were unauthorized releases of sediment to receiving water bodies during freshet. Corrective actions taken and planned to address these sediment releases are documented in the 2017 Freshet Monitoring Reports (Baffinland, 2017c and 2018g). Corrective actions taken and planned for the remaining forty-three spills are detailed in the follow-up spill reports submitted within thirty days of each reported spill, in addition to the initial spill report submitted within 24 hours of each spill event. The follow-up reports include a description of the event, the immediate cause(s), corrective and preventative action(s), and a map showing the location of the spill. Copies of the 2017 initial

and follow spill reports along with the 2017 Freshet Monitoring Reports are provided in the appendices of the 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b).

**Table 4.3 List of Unauthorized Discharges in 2017**

Date of Occurrence	Quantity (m <sup>3</sup> )	Material Spilled	Location	Proximity to a Water body?	Spill Line ID No.
January 1 2017	0.25	Sewage (Untreated)	Mine Site	> 100 m	17-001
January 2 2017	1	Waste Oil	Port Site	> 100 m	17-002
January 7 2017	0.2	Sewage (Untreated)	Mine Site	> 100 m	17-008
January 11 2017	0.5	Sewage (Untreated)	Mine Site	> 100 m	17-012
January 13 2017	0.6	Sewage (Untreated)	Mine Site	> 200 m	17-014
January 24 2017	1	Sewage (Untreated)	Mine Site	> 100 m	17-026
January 31 2017	2	Grey Water	Mine Site	> 100 m	17-032
February 14 2017	2	Sewage (Untreated)	Mine Site	> 100 m	17-045
February 28 2017	0.12	Coolant	Mine Site	> 100 m	17-061
February 28 2017	120	Sewage (Treated)	Port Site	0 m	17-068
March 1 2017	1	Grey Water	Port Site	> 100 m	17-063
March 20 2017	4	Contaminated Water	Tote Road (KM 51-100)	> 1000 m	17-088
March 25 2017	0.4	Contaminated Water	Mine Site	> 200 m	17-092
April 5 2017	0.1	Fuel - Diesel	Tote Road (KM 51-100)	> 50 m	17-105
April 12 2017	0.11	Fuel - Diesel	Tote Road (KM 51-100)	> 500 m	17-109
April 22 2017	0.13	Sewage (Untreated)	Mine Site	> 75	17-117
April 29 2017	0.17	Sewage (Untreated)	Mine Site	> 100 m	17-133
April 29 2017	0.27	Fuel - Diesel	Mine Site	> 100 m	17-134
May 3 2017	0.22	Coolant	Mine Site	> 500 m	17-141
May 11 2017	-	Sediment	Mine Site	0 m	17-161
May 13 2017	-	Sediment	Mine Site	0 m	17-162
May 23 2017	-	Sediment	Tote Road	0 m	17-209
May 25 2017	-	Non-Compliant Contact Water	Port Site	0 m	17-178
May 28 2017	1	Waste Oil	Mine Site	> 500 m	17-183
June 13 2017	0.1	Contaminated Water	Mine Site	> 100 m	17-207
June 17 2017	-	Sediment	Port Site	0 m	17-214
June 17 2017	0.2	Fuel - Diesel	Mine Site	> 100 m	17-215
June 18 2017	-	Sediment	Port Site	0 m	17-217
July 1 2017	-	Non-Compliant Contact Water	Mine Site	> 3 km	17-230
July 12 2017	-	Sediment	Mine Site	> 100	17-253
August 7 2017	465	Non-Compliant Contact Water	Mine Site	> 3 km	17-289
August 26 2017	-	Non-Compliant Contact Water	Mine Site	> 3 km	17-312
August 27 2017	523	Non-Compliant Contact Water	Mine Site	> 3 km	17-328
August 30 2017	0.005	Waste Oil	Port Site	0 m	17-322
September 3 2017	0.5	Diesel Exhaust Fluid	Port Site	> 150 m	17-331
September 6 2017	2	Contaminated Water	Port Site	0 m	17-336
September 8 2017	0.2	Fuel - Jet A	Mine Site	> 500 m	17-340
September 11 2017	-	Non-Compliant Contact Water	Mine Site	> 3 km	17-361

Date of Occurrence	Quantity (m <sup>3</sup> )	Material Spilled	Location	Proximity to a Water body?	Spill Line ID No.
September 12 2017	0.1	Fuel - Diesel	Tote Road (KM 51-100)	> 10 m	17-342
September 12 2017	200 lbs	Ammonium Nitrate	Tote Road (KM 51-100)	> 250 m	17-343
September 13 2017	25	Water (Treated)	Mine Site	> 100 m	17-346
September 21 2017	1	Sewage (Treated)	Port Site	> 100 m	17-3601
September 27 2017	-	Non-Compliant Contact Water	Mine Site	> 3 km	17-3122
October 23 2017	0.2	Fuel - Diesel	Port Site	> 200 m	17-392
November 25 2017	0.3	Waste Oil	Mine Site	> 400 m	17-428
December 21 2017	0.6	Grey Water	Mine Site	> 200 m	17-451
December 23 2017	0.15	Sewage (Untreated)	Port Site	> 150 m	17-452
December 24 2017	0.3	Sewage (Untreated)	Port Site	> 100 m	17-453

#### 4.5.3 Water Licence Compliance (Type A 2AM-MRY1325 and Type B 2BE-MRY1421)

In 2017, Baffinland operated the Mary River Project under its Type A Water Licence (2AM-MRY1325 - Amend. No. 1) and a Type B Water Licence (2BE-MRY1421). The scope of the Type A Water Licence focuses on Early Revenue Phase (ERP) operations while the scope of the Type B Water Licence focuses on geotechnical and exploration activities, including drilling operations and the establishment of satellite exploration camps. Both water licences include conditions on water use, wastewater management and water quality monitoring as well as the management of fuel and waste.

Compliance to the conditions and requirements outlined in the Type A Water Licence during 2017 is discussed in the 2017 QIA and NWB Annual Report for Operations. Similarly, compliance to the conditions and requirements outlined in the Type B Water Licence is discussed in the 2017 QIA and NWB Annual Report for Exploration and Geotechnical Activities (Baffinland, 2018d).

## 4.6 PERFORMANCE ON ECOSYSTEMIC CONDITIONS

### 4.6.1 Meteorology and Climate (PC Conditions 1 through 6)

The first six (6) PC conditions relate to the potential impacts of the Project on meteorology and the climate, including climate change.

#### *Stakeholder Feedback*

Baffinland’s stakeholders have identified climate change as a key issue in Nunavut, with communities reporting observations of the changing climate. NIRB prescribed several conditions in Baffinland’s Project Certificate related to climate change, requesting Baffinland to identify GHG emissions reduction opportunities and to share any research or observations of climate change with communities, agencies and researchers. Participants from the Mary River Inuit Knowledge Study (2007-2010; Baffinland, 2014b) shared observations related to climate change in the Arctic. In 2015 and 2016, Baffinland engaged the communities of Pond Inlet and Arctic Bay through workshops to discuss the Phase 2 Proposal, and a limited amount of feedback was received in regard to observations of climate change (JPCSL, 2017). Baffinland recorded questions from one community member during consultation events in 2017; the individual asked if the permafrost and the ocean was being monitored for climate change, if Baffinland was combining Inuit and scientific knowledge, and if huge rapid changes were being observed (Appendix B).

#### *Monitoring Activities*

Baffinland operates two meteorological stations, and this information is made publically available on its website and through The Weather Network. To date, no climate change impacts have been observed through Project monitoring. Baffinland continues to track and monitor Greenhouse Gas (GHG) emissions and report as per Environment and Climate Change Canada’s GHG Emissions Reporting Program (ECCC, 2016), which is included as part of the Air Quality and Noise Abatement Plan (Baffinland, 2016d). Baffinland is in the process of developing a Climate Change Strategy.

Table 4.4 provides a summary of climate effects monitoring completed in 2017, and an evaluation of impacts relative to the predictions presented in the FEIS and FEIS Addendum. The calculated gaseous emissions in 2017 are below the maximum annual GHG emissions predicted in the FEIS.

**Table 4.4 Climate Impact Evaluation**

Component	Effect	Monitoring Program	Impact Evaluation
Greenhouse Gases (GHGs)	Increased GHG emissions	GHG emissions calculated from fuel combustion: Emissions below FEIS forecast	Effect within FEIS predictions
SO <sub>2</sub> and NO <sub>2</sub>	Increased SO <sub>2</sub> and NO <sub>2</sub> emissions	SO <sub>2</sub> and NO <sub>2</sub> emissions calculated from fuel combustion: Emissions below FEIS forecast	Effect within FEIS predictions

#### *Path Forward*

Baffinland is in the process of developing a Climate Change Strategy. The Climate Change Strategy will be an important tool to guide and articulate Baffinland’s efforts on PC conditions 2, 3 and 4. Baffinland will continue to conduct monitoring activities and develop initiatives to ensure any impacts that the Project may have on the climate are measured to the extent possible. Reporting on each PC condition is included in the pages that follow.

## Project Certificate Condition No. 1

Category	Meteorology and Climate
Responsible Parties	The Proponent
Project Phase(s)	All phases
Objective	To provide feedback on the impacts that climate change might be having on the port facilities.
Term or Condition	The Proponent shall use GPS monitoring or a similar means of monitoring at both Steensby Port and Milne Port, with tidal gauges to monitor the relative sea levels and storm surges at these sites.
Relevant BIM Commitment	N/A
Reporting Requirement	The Proponent shall summarize and supply these monitoring results to NIRB in the annual project report.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

#### Milne Port:

In 2014, tide data was collected using a tidal gauge installed at Milne Port (ASL Environmental Sciences 2015). The data retrieved at that time was used to support oceanography and ballast water dispersion modelling for the Project. Following completion of the modelling exercise, the gauge was removed and was not re-installed at Milne Port in 2015 or 2016. As such, no tidal data were collected or are available from Milne Port for the 2015 or 2016 reporting periods. Following NIRB's review of the 2016 Annual Report, NIRB requested that Baffinland recommence the monitoring of sea levels and storm surges at Milne Inlet in 2017 to support trend analysis, highlighting in their recommendation that trends related to sea levels and storm surges from the Milne Inlet area cannot be predicted based on the data available for 2014 only. Further, NIRB reiterated that the submission of the annual monitoring data is required to clarify whether implementation of additional mitigation is necessary to ensure that impacts of climate change on Project infrastructure, including Milne port facilities, are adequately minimized and mitigated.

In response to NIRB recommendations and pursuant to PC Condition No. 01 of the Project Certificate, Baffinland re-installed a tide gauge system at Milne Port and resumed tidal monitoring on-site during the 2017 open-water season. Tide monitoring instrumentation consisted of an RBRconcerto CTD (RBR) sensor programmed to continuously measure pressure, temperature, and conductivity between 20 July and 17 October. Conductivity and pressure were respectively converted to salinity (practical scale PSU) and depth (m). The instrument was mounted on a ladder located on the west end of the existing ore dock. The ladder provided a stable mounting point that could be reinstalled each year at the same location and position as part of standard port operations. A steel plate at the top of the ladder was surveyed with a Real Time Kinematic Global Positioning System (RTK GPS) survey instrument. The elevation and position of the top plate of the ladder was surveyed using five survey points and the average elevation of the five points has been used to reference the position of the tide gauge to the Canadian Geodetic Vertical Datum (CGVD) and local Chart Datum (CD). The standard deviation of the 5-point measurements was 0.020 m.

Steensby Port:

No tidal gauge systems were installed at Steensby Port in 2017, as that component of the Project is currently inactive.

## RESULTS

Milne Port:

A continuous time-series of water level, temperature, and conductivity data was collected from July 20 to October 17, 2017. Water level data recorded at Milne Port indicate typical fluctuations resulting from tidal forcing and good agreement with tidal constituents derived from previous measurements. During the measurement period, a total of six (6) neap-spring tidal cycles were observed. Temperature and salinity time-series data indicate a stratified water column present from July through early September. Low magnitude oscillations of temperature and salinity occurring in phase with the tidal cycle indicate smaller internal wave events driven by spring-neap tidal variations. Observed fluctuations in temperature and salinity occurring out of phase with the tidal cycle indicate either:

- The presence of internal waves that are likely driven by wind events, with mixing occurring over some portion of the water column in the direct vicinity of Milne Port; or
- The presence of local discharges of ballast water from ships using the port while loading ore.

The agreement in the time series of conductivity and specific conductivity indicate the validity of the salinity measurements, and the convergence of the two profiles in late October represent a fully mixed water column.

Steensby Port:

No activities took place at Steensby Port during 2017.

## TRENDS

Trends cannot be currently evaluated based on data available only from 2014 and 2017, and without collection of long-term site-specific geodetic elevation data.

## RECOMMENDATIONS / LESSONS LEARNED

Milne Port:

The tide gauge system will be re-deployed at Milne Port in the summer of 2018, with the intention of continuing annual monitoring of relative sea levels and storm surges at the site. A tide gauge monitoring plan has been included in Golder (2018), which provides guidelines for annual management and maintenance of the tide gauge station such to develop a long-term record of water levels at Milne Port during the open-water season. Tide gauge measurements are currently limited to the ice free season, typically mid-July to late October. To support a future trends analysis of local relative sea level at the site, collection of site-specific geodetic elevation data would be required to account for the relative uplift / subsidence of the land surface. Additionally, site-specific measurements of wind and barometric pressure would be required to conduct a more in-depth tidal analysis in relation to ballast water discharges.

Steensby Port:

The measurement of sea level and storm surges at Steensby Port will be re-evaluated when activities are renewed at Steensby Port.



## Project Certificate Condition No. 2

Category	Meteorology and Climate - Climate Change Validation and Studies
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide feedback on the impacts that climate change might be having on the Project.
Term or Condition	The Proponent shall provide the results of any new or revised assessments and studies done to validate and update climate change impact predictions for the Project and the effects of the Project on climate change in the Local Study Area and Regional Study Area as defined in the Proponent's Final Environmental Impact Statement.
Relevant BIM Commitment	58
Reporting Requirement	The Proponent shall provide new or revised assessments and studies to the NIRB, the affected communities, relevant regulatory authorities, and interested parties.
Status	Not Applicable
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will prepare a Climate Change Assessment as part of the Proponent's submission for the Phase 2 Expansion Project. The Climate Change Assessment will include a review of the latest climate change models described in the Intergovernmental Panel on Climate Change's fifth assessment report (IPCC, 2014).

Baffinland is also in the process of developing a Climate Change Strategy for the Project. The strategy will identify commitment's and actions Baffinland will undertake to minimize the potential effect of the Project on climate change and to adapt to changing climatic conditions as a result of global climate change.

## Project Certificate Condition No. 3

Category	Meteorology and Climate - Green House Gas Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To confirm that the Proponent is exploring and implementing concrete steps to reduce greenhouse gases.
Term or Condition	The Proponent shall provide interested parties with evidence of continued initiatives undertaken to reduce greenhouse gas emissions.
Relevant BIM Commitment	N/A
Reporting Requirement	The Proponent shall include relevant information in the Annual Report submitted to the NIRB.
Status	Not Applicable
Stakeholder Review	Nunavut Inuit Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

To date, Baffinland has calculated its annual Greenhouse Gas (GHG) emissions in accordance with PC Condition 6.

Baffinland is in the process of developing a Climate Change Strategy for the Project. The strategy will identify commitments and actions Baffinland will undertake to minimize the potential effect of the Project on Climate Change and to adapt to changing climatic conditions as a result of global climate change.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 4

Category	Climate Change - Consultation on Climate
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To promote public awareness and engagement of affected groups.
Term or Condition	The Proponent shall endeavour to include the participation of Inuit from affected communities and other communities in Nunavut when undertaking climate-change related studies and research.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will prepare a Climate Change Assessment as part of the Proponent's submission for the Phase 2 Expansion Project Proposal. The Climate Change Assessment will include a review of the latest climate change models described in the Intergovernmental Panel on Climate Change's fifth assessment report (IPCC, 2014).

Baffinland is in the process of developing a Climate Change Strategy for the Project. The strategy will identify commitments and actions Baffinland will undertake to minimize the potential effect of the Project on climate change and to adapt to changing climatic conditions as a result of global climate change.

Consultation with local Inuit communities will occur as part of the Phase 2 regulatory process, and this consultation will include a discussion of the results of Baffinland's forthcoming Climate Change Assessment and Climate Change Strategy for the Project.

## Project Certificate Condition No. 5

Category	Meteorology and Climate - Weather Monitoring Data
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide families of employees with up to date information.
Term or Condition	The Proponent shall endeavour to explore and implement reasonable measures to ensure that weather-related information for the various Project sites is readily accessible to the public on a continual basis throughout the life of the Project.
Relevant BIM Commitment	5
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Baffinland Corporate Website
Ref. Document Link	<a href="http://www.baffinland.com/?lang=en">http://www.baffinland.com/?lang=en</a> ;

### METHODS

Baffinland ensures that weather related information is publicly accessible for the Mary River Project Site by posting current weather information on the Baffinland website ([www.baffinland.com](http://www.baffinland.com)).

### RESULTS

Weather related information for Project sites is publicly available.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide weather related information on publicly available websites for all active Project sites.

## Project Certificate Condition No. 6

Category	Meteorology and Climate - Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall provide the results of any emissions calculations conducted to determine the level of sulphur dioxide (SO <sub>2</sub> ) emissions, nitrogen oxide (NO <sub>x</sub> ) emissions and greenhouse gases generated by the Project using fuel consumption or other relevant criteria as a basis.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland used guidance documents provided by Environment and Climate Change Canada (ECCC, 2016; ECCC, 2017) and the Intergovernmental Panel on Climate Change (IPCC, 2006) along with published emission factors to estimate the Project's annual GHG, SO<sub>2</sub> and NO<sub>x</sub> emissions. Annual emissions were calculated based on on-site fuel consumption and waste management at the Project.

Baffinland continues to report annual emissions to ECCC through the National Pollutant Release Inventory (NPRI) and GHG reporting programs.

### RESULTS

Baffinland's 2017 annual emissions for GHGs, SO<sub>2</sub> and NO<sub>x</sub> are presented in Table 4.5.

**Table 4.5 Calculated 2017 Project Gaseous Emissions**

Gaseous Emission	Units	Calculated Emissions
GHG	t-CO <sub>2</sub> eq	160,000
SO <sub>2</sub>	t	10
NO <sub>x</sub>	t (NO <sub>2</sub> )	2,750

### TRENDS

Gaseous emissions have increased in relation to the increase in fuel consumption, as expected.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

#### 4.6.2 Air Quality (PC Conditions 7 through 12)

Six (6) PC conditions relate to the potential impacts of the Project on air quality, including calculations of total Project emissions from fuel consumption and gaseous monitoring.

##### *Stakeholder Feedback*

Air quality has not been a significant focus of stakeholder concern, with the exception of dust. During review of the FEIS and FEIS Addendum, communities and regulators alike focused on dust, including dustfall and potential impacts to soil, vegetation and forage to caribou. The focus of stakeholder feedback on dustfall and potential impacts on soil, vegetation and wildlife, along with several years of exceedances of the predicted threshold levels for dustfall presented in the FEIS, has prompted Baffinland to implement additional dust mitigation measures described in the updates to PC Conditions 10 and 58c. Concern about dust was expressed several times during 2017 consultation activities, mostly in relation to the Phase 2 Expansion Project Proposal, but also in regard to current operations (Appendix B).

##### *Monitoring Activities*

Table 4.6 provides a summary of air quality effects, monitoring completed in 2017, and an evaluation of impacts relative to the predictions presented in the FEIS and FEIS Addendum.

**Table 4.6 Air Quality Impact Evaluation**

Component	Effect	Monitoring Program	Impact Evaluation
Incineration of combustible non-hazardous wastes	Release of air contaminants, including particulate matter (PM), carbon monoxide (CO), mercury, dioxins, furans	Incinerator stack testing; not undertaken in 2017	Air quality limits should be met under normal operating conditions and appropriate use of incinerators
Release of air contaminants from mobile and stationary equipment due to fuel combustion	Increased concentrations of total suspended particulate (TSP), sulphur dioxide (SO <sub>2</sub> ), nitrogen dioxide (NO <sub>2</sub> ), CO and potential acidic input (PAI)	Continuous NO <sub>2</sub> and SO <sub>2</sub> monitoring was conducted at Milne Port from March to December, and at the Mine Site in November and December. SO <sub>2</sub> levels at both sites were low and did not exceed the 1-hour or 24-hour limits. NO <sub>2</sub> levels at both sites did not exceed the 1-hour or 24-hour limits.	2017 monitoring was below Nunavut air quality standards, and within FEIS predictions
Earthworks, mining, hauling, stockpiling and transfer of ore	Ore handling and transport, including wheel entrainment from haulage of ore	Dustfall in 2017 was less than in 2016 at most year-round sampling locations (EDI, 2018). <b>Mine Site</b> - Annual dustfall levels were within predicted threshold levels. <b>Milne Port</b> - Annual dustfall exceeded predicted threshold levels at all but one site. Elevated dustfall in November and December have been attributed to the ore stackers operating under high wind conditions (Appendix D). <b>Tote Road</b> - Dustfall within 30 m and 1,000 m on either side of the road centreline dustfall was higher than the predicted threshold levels. Traffic on the Tote Road was higher than any previous year.	Dustfall levels were generally within FEIS predictions at the Mine Site, but exceeded FEIS predictions at Milne Port and along the Tote Road

Baffinland continues to investigate how to better mitigate dust onsite, and plans to update the Air Quality and Noise Management Plan in 2018. Baffinland continues, as scheduled, to evaluate and report on dust emissions through its approved dust monitoring program at the Mine Site, Port Site and Tote Road. Baffinland has worked diligently towards decreasing dust generated by wheel entrainment across the Project Sites, specifically reducing dust generation from ground surfaces by applying water and/or chemical suppressants such as calcium chloride to road surfaces and site layouts during summer conditions. The Company's effort with respect to the application of dust suppressants on the Tote Road are documented in the 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018).

Measures implemented to mitigate downwind dust of the Ore Pad were implemented in spring 2017 by removing dust impacted snow from areas of accumulation, including snow drifts near waterbodies and the beach west of the ship loader; this snow removal program will continue for 2018. The Crushers at the Mine Site were installed with engineered dust shrouds on the main surge bins to reduce windblown dust as well as hoods at the out flow areas (see Photo Essay in Appendix D).

A snow fence trial was conducted at the Ore and Crusher Pads to determine effectiveness of capturing windblown ore dust snow, however varying wind directions confounded results. Research towards various dust control binding agents for crusher pads and roads continue.

#### *Path Forward*

In 2018, Baffinland will continue its monitoring programs of gaseous emissions and dustfall. The company will also continue to evaluate opportunities to reduce dustfall on the Project. Reporting on each PC condition related to air quality is presented in the next several pages. Dustfall monitoring is described in more detail in Section 4.5.8 (PC Condition No. 58, Item c).

## Project Certificate Condition No. 7

Category	Air Quality - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall update its Air Quality and Noise Abatement Management Plan to provide for continuous monitoring at land-based monitoring stations designed to capture operations phase ship-generated SO <sub>2</sub> and NO <sub>2</sub> emissions at Steensby Port and Milne Port. Continuous monitoring is to be carried out through several shipping seasons at each port as required to determine that emissions are at acceptable levels.
Relevant Baffinland Commitment	57, 61, 62
Reporting Requirement	The updated plan shall be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2016d)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Continuous ambient air quality monitoring equipment was set up at Milne Port and the Mine Site to monitor sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) levels at Project sites in 2014. Continuous ambient air quality monitoring commenced in November 2014 and continued throughout 2015. Monitoring throughout 2015 concluded that all results were well below the Ambient Air Quality Standards (AAQS) set out by the Government of Nunavut (2011), resulting in the discontinuation of the monitoring program in 2016. To ensure compliance with Project Certificate Condition No. 7 and collect additional data over multiple shipping seasons, the monitoring program resumed at Milne Port in March 2017 and at the Mine Site in November 2017, and is currently ongoing.

The Air Quality and Noise Abatement Management Plan was last updated in March 2016. The updated plan was provided in the 2015 NIRB Annual Report.

### RESULTS

The 2017 air quality monitoring results can be summarized as follows:

- SO<sub>2</sub> levels at both sites were low and did not exceed the 1-hour or 24-hour limits; and
- NO<sub>2</sub> levels at both sites did not exceed the 1-hour or 24-hour limits.

At Milne Port:

- Maximum SO<sub>2</sub> levels were approximately 3% of the 1-hour AAQS and 4% of the 24-hour AAQS;
- Maximum NO<sub>2</sub> levels were approximately 50% of the 1-hour AAQS and 47% of the 24-hour AAQS;



- NO<sub>2</sub> levels peaked during the cold winter months (September to December) and were significantly lower during the warmer months (April to August); and
- The annual 2017 arithmetic mean at Milne Port was 9 ppb for NO<sub>2</sub> and 0.3 ppb for SO<sub>2</sub>, which represents 28% of the NO<sub>2</sub> annual standard and 3% of the SO<sub>2</sub> annual standard.

At the Mine Site:

- Maximum SO<sub>2</sub> levels were approximately 2% of the 1-hour AAQS and 3% of the 24-hour AAQS;
- Maximum NO<sub>2</sub> levels recorded at the Mine Site in 2017 were approximately 58% of the 1-hour AAQS and 64% of the 24-hour AAQS; and
- Due to the limited amount of validated data collected at the Mine Site in 2017, arithmetic means for both SO<sub>2</sub> and NO<sub>2</sub> are not available.

### **TRENDS**

Monitoring results to date indicate that SO<sub>2</sub> and NO<sub>x</sub> levels at both Milne Port and the Mine Site remain well below the AAQS. Trends can be established once more data has been collected.

### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor SO<sub>2</sub> and NO<sub>x</sub> levels at Milne Port and the Mine Site during 2018. Emissions will be monitored to ensure that maximum values remain below the AAQS. Following a number of shipping seasons, the data will be evaluated to determine what future actions and/or further monitoring are warranted.

Air quality monitoring at Steensby Port will be implemented when the Port is developed and shipping activities commence.

## Project Certificate Condition No. 8

Category	Air Quality - Greenhouse Gas Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall demonstrate through monitoring of air quality at the mine site and at the Steensby Inlet and Milne Inlet port sites that SO <sub>2</sub> and NO <sub>2</sub> emissions remain within predicted levels and, where applicable, within limits established by all applicable guidelines and regulations. In cases where exceedances are manifested, the Proponent shall provide an explanation for the exceedance, a description of planned mitigation, and shall conduct additional monitoring to evaluate the effectiveness of mitigative measures.
Relevant Baffinland Commitment	61
Reporting Requirement	To be included in the Proponent's annual reporting to the NIRB.
Status	In-Compliance
Stakeholder Review	None
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2016d)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Continuous ambient air quality monitoring equipment was set up at Milne Port and the Mine Site to monitor sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) levels at Project sites in 2014. Continuous ambient air quality monitoring commenced in November 2014 and continued throughout 2015. Monitoring throughout 2015 concluded that all results were well below the Ambient Air Quality Standards (AAQS) set out by the Government of Nunavut (2011), resulting in the discontinuation of the monitoring program in 2016. To ensure compliance with Project Certificate Condition No. 7 and collect additional data over multiple shipping seasons, the monitoring program resumed at Milne Port in March 2017 and at the Mine Site in November 2017, and is currently ongoing.

### RESULTS

The 2017 air quality monitoring results can be summarized as follows:

- SO<sub>2</sub> levels at both sites were low and did not exceed the 1-hour or 24-hour limits; and
- NO<sub>2</sub> levels at both sites did not exceed the 1-hour or 24-hour limits.

At Milne Port:

- Maximum SO<sub>2</sub> levels were approximately 3% of the 1-hour AAQS and 4% of the 24-hour AAQS;
- Maximum NO<sub>2</sub> levels were approximately 50% of the 1-hour AAQS and 47% of the 24-hour AAQS;
- NO<sub>2</sub> levels peaked during the cold winter months (September to December) and were significantly lower during the warmer months (April to August); and
- The annual 2017 arithmetic mean at Milne Port was 9 ppb for NO<sub>2</sub> and 0.3 ppb for SO<sub>2</sub>, which represents 28% of the NO<sub>2</sub> annual standard and 3% of the SO<sub>2</sub> annual standard.

At the Mine Site:

- Maximum SO<sub>2</sub> levels were approximately 2% of the 1-hour AAQS and 3% of the 24-hour AAQS;
- Maximum NO<sub>2</sub> levels recorded at the Mine Site in 2017 were approximately 58% of the 1-hour AAQS and 64% of the 24-hour AAQS; and
- Due to the limited amount of validated data collected at the Mine Site in 2017, arithmetic means for both SO<sub>2</sub> and NO<sub>2</sub> are not available.

#### **TRENDS**

Monitoring results to date indicate that SO<sub>2</sub> and NO<sub>x</sub> levels at both Milne Port and the Mine Site remain well below the AAQS. Trends can be established once more data has been collected.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor SO<sub>2</sub> and NO<sub>x</sub> levels at Milne Port and the Mine Site during 2018. Emissions will be monitored to ensure that maximum values remain below the AAQS. Following a number of shipping seasons, the data will be evaluated to determine what future actions and/or further monitoring are warranted.

Air quality monitoring at Steensby Port will be implemented when the Port is developed and shipping activities commence.

## Project Certificate Condition No. 9

Category	Air Quality - Greenhouse Gas Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall provide calculations of greenhouse gas emissions generated by activities at the Steensby Inlet and Milne Inlet port sites and other Project sources including aircraft associated with the Project. Calculations shall take into consideration, fuel consumption as measured by Baffinland's purchase and use as well as the fuel use of its contractors and sub-contractors.
Relevant Baffinland Commitment	57
Reporting Requirement	To be included in the Proponent's annual reporting to the NIRB.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland used guidance documents provided by Environment and Climate Change Canada (ECCC, 2016; ECCC, 2017) and the Intergovernmental Panel on Climate Change (IPCC, 2006) along with published emission factors to estimate the Project's annual GHG emissions. Annual emissions were calculated based on on-site fuel consumption and waste management at the Project.

Baffinland continues to report annual emissions to ECCC through the National Pollutant Release Inventory (NPRI) and GHG reporting programs.

### RESULTS

Baffinland's 2017 annual emissions for GHGs are presented in Table 4.7.

**Table 4.7 Calculated 2017 Project Greenhouse Gas Emissions**

Gaseous Emission	Units	Calculated Emissions
GHG	t-CO <sub>2</sub> eq	160,000

### TRENDS

Gaseous emissions have increased in relation to the increase in fuel consumption, as expected.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 10

Category	Air Quality - Dust Management and Monitoring Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to air quality from dust dispersion.
Term or Condition	<p>The Proponent shall update its Dust Management and Monitoring Plan to address and/or include the following additional items:</p> <ul style="list-style-type: none"> <li>• Outline the specific plans for monitoring dust along the first few kilometres of the rail corridor leaving the Mary River mine site.</li> <li>• Identify the specific adaptive management measures to be considered should monitoring indicate that dust deposition from trains transporting along the rail route is greater than initially predicted.</li> <li>• Outline specific plans for monitoring dustfall at intervals along and in the vicinity of the Milne Inlet Tote Road to determine the amount and extent of dustfall.</li> <li>• Identify the specific adaptive management measures to be considered if monitoring indicates that dust deposition from traffic on the Milne Inlet Tote Road is greater than initially predicted.</li> </ul>
Relevant Baffinland Commitment	2, 57
Reporting Requirement	To be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Nunavut Impact Review Board, Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Environment and Climate Change Canada
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2016d) Roads Management Plan (Baffinland, 2016e) Dust Mitigation Action Plan (Golder, 2016b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Dust Management and Monitoring was incorporated into the Air Quality and Noise Abatement Management Plan and the Roads Management Plan (Attachment A, Dust Management Protocol) prior to the start of construction.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

A Dust Mitigation Action Plan (Plan) was developed in 2016 to identify specific measures to be implemented to reduce dust emissions (Golder, 2016b). Implementation of the Plan in 2017 included the installation of shrouding on Project ore crushers,

installation of snow fences downwind of the crusher ore stockpiles located at the Mine Site and the continued use of water and calcium chloride as dust suppressants on Project roadways and pads. The Roads Management Plan and Air Quality and Noise Abatement Management Plan will be updated in 2018 to provide further clarity on the adaptive management measures to be considered if elevated dustfall deposition is observed at the Project.

## Project Certificate Condition No. 11

Category	Air Quality - Incineration Management Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to air quality from incineration activities.
Term or Condition	The Proponent shall develop and implement an Incineration Management Plan that takes into consideration the recommendations provided in Environment Canada's Technical Document for Batch Waste Incineration (2010).
Relevant Baffinland Commitment	57
Reporting Requirement	Updated Incineration Management Plan to be provided to the NIRB at least 60 days prior to the commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2016d) Waste Management Plan (Baffinland, 2017h) Incinerator Operation Procedure (see Waste Management Plan)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

An Incineration Management Plan is presented in Section 3.5 of the Waste Management Plan. Environment Canada's Technical Document for Batch Waste Incineration (ECCC, 2010) was considered during the development of the Incineration Management Plan, and meets the recommendations outlined by ECCC.

### RESULTS

Baffinland adheres to the six-step process for batch waste incineration as outlined in the Environment Canada's Technical Document (ECCC, 2010), including conducting periodic waste steam audits and documenting waste sorting for the dual chamber incinerators, which are installed at both the mine site and port site as per expected waste generation.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 12

Category	Air Quality - Incineration
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to air quality from incineration activities.
Term or Condition	Prior to commencing any incineration of on-site Project wastes, the Proponent shall conduct at least one stack test immediately following the commissioning of each temporary and permanent incinerator.
Relevant Baffinland Commitment	N/A
Reporting Requirement	Stack test results to be reported to the NIRB and Environment Canada annually as required.
Status	In-Compliance
Stakeholder Review	Environment and Climate Change Canada, Nunavut Impact Review Board
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2016d) Waste Management Plan (Baffinland, 2017h)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

No new temporary or permanent incinerators were commissioned in 2017. Stack testing was conducted on the incinerators when commissioned in 2013, as required by PC Condition No. 12. As part of ongoing operations, Baffinland does conduct periodic monitoring of the dual chamber incinerator operation data. This data can be utilised to determine if the incinerators are operating to original specifications. Data includes operational temperature data, burn cycle times, and bottom residual ash composition results. In addition, Baffinland will conduct routine stack tests for dioxins, furans and mercury every five years following commissioning to confirm the above monitoring.

### RESULTS

Stack testing was performed in 2013 when the dual chamber incinerators were commissioned. Subsequent stack testing has not been carried out.

### TRENDS

Baffinland has noted that the residual bottom ash generated by the dual chamber incineration process rarely exceeds the guidelines outlined in the Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste Facilities (GN, 2011). Any exceedances are reported in the 2017 QIA/NWB Annual Report for Operations (Baffinland, 2018b). These results are indicative that the Incinerator is operating as commissioned.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to document and monitor the incinerator operational and residual bottom ash data to identify changes in operational effectiveness from original commissioning.



### 4.6.3 Noise & Vibration (PC Conditions 13 through 15)

Five (5) PC conditions (including 13, 14, 14a, 14b and 15) relate to the potential impacts of the Project on noise and vibration.

#### *Stakeholder Feedback*

Stakeholders have expressed concerns regarding noise and vibration focused on effects to fish, inclusive of underwater noise and vibration impacts to fish and marine mammals. Impacts of noise and vibration have not been a focus of external stakeholder concern. Concern over noise and vibration levels have been expressed by some workers at the Project site in the context of sleeping at the accommodation facilities. Baffinland made a number of improvements to improve noise levels near the accommodation facilities in 2017 (see PC Condition No. 14). Noise was raised as a concern during 2018 community meetings, in relation to the Milne Port Weatherhaven™ camp (Appendix B).

#### *Monitoring Activities*

Monitoring of noise and vibration was conducted within the accommodation building at each Project site during the summer (June 2017), but equipment malfunction and availability prevented winter measurements from being collected (PC Condition No. 14). Table 4.8 provides a summary of noise effects monitored in 2017, and an evaluation of impacts relative to the predictions presented in the FEIS and FEIS Addendum.

**Table 4.8 Noise and Vibration Impact Evaluation**

<b>Component</b>	<b>Effects</b>	<b>Monitoring Program</b>	<b>Impact Evaluation</b>
Ambient Noise and Vibration	Disturbance of sleeping workers, affecting worker health and safety	Indoor noise and vibration levels were measured in the summer of 2017. Average noise levels exceeded WHO guidelines slightly at Milne Port, but were below guidelines at the Mine Site. Vibration levels were low.	Effect exceeded FEIS predictions at Milne Port
Underwater Vibration Levels	Increased vibration levels affecting fish in nearby watercourses	No Project interactions to monitor in 2017; no explosives used near watercourses in 2017.	N/A

#### *Path Forward*

Baffinland is developing a quality assurance / quality control (QA/QC) program in its monitoring of noise and vibration, to ensure that good quality data is collected in 2018 and onward.

In 2018, Baffinland expects to construct the floating freight dock described and assessed in the FEIS. Underwater noise effects near or in water will be monitored for compliance with applicable thresholds. Reporting on each PC condition is provided in the pages that follow.

## Project Certificate Condition No. 13

Category	Noise and Vibration - Use of Explosives
Responsible Parties	The Proponent, Fisheries and Oceans Canada
Project Phase(s)	Construction
Objective	To determine appropriate protection of fish and aquatic life in the Arctic.
Term or Condition	The Proponent is encouraged to work with Fisheries and Oceans Canada at the regulatory phase and to take a precautionary approach when selecting the overpressure threshold to be applied to explosives use for the protection of fish and aquatic life.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board, Qikiqtani Inuit Association
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f) Environmental Protection Plan (Baffinland, 2016g) Quarry Blasting Operations Management Plan (Baffinland, 2013b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP) states that work requiring the use of explosives (blasting) in or near water bodies shall be carried-out in accordance with Fisheries and Oceans Canada guidance (Wright and Hopky, 1998), in order to mitigate possible effects on fish habitat and fish health. Blasting at the Project is conducted in accordance with Baffinland's Quarry Blasting Operations Management Plan and Environmental Protection Plan (EPP).

The aforementioned plans described above mitigate the possibility of an explosive to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swimbladder of a fish.

### RESULTS

Not applicable. No blasting occurred in 2017 within the required setback distances detailed in the DFO guidance document (Wright and Hopky, 1998).

### TRENDS

Not applicable. No blasting has occurred at the Project within the required setback distances of fish habitat, as stipulated by the aforementioned DFO guidance document.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 14

Category	Noise and Vibration - Noise and Vibration Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate noise and vibration at Project sites, especially living areas.
Term or Condition	The Proponent shall conduct noise and vibration monitoring at Project accommodations sites located at the Mary River mine site, Steensby Inlet Port site, and Milne Inlet Port site. Sampling shall be undertaken during the summer and winter months during all phases of Project development.
Relevant BIM Commitment	32
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	Partially-compliant
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Noise and vibration monitoring at the Mine Site and Milne Port accommodations is scheduled annually by Baffinland Health and Safety staff. Monitoring uses a sound meter with microphone and a vibration pad with meter set-up in different rooms and wings of accommodation buildings at both sites. The noise equipment used by Baffinland runs continuously for two 12-hour periods (the vibration equipment runs for two 10-hour periods) in each room with calibration of the instruments occurring before and after use as well as between the periods. Monitoring is conducted once per summer and once per winter season. Noise or vibration concerns brought forth by employees are taken seriously and addressed on an as needed basis.

### RESULTS

In 2017, adaptive management was employed to reduce noise and vibration near accommodation complexes:

- Quiet work hours were implemented;
- Operation of equipment was limited in the vicinity of accommodation complexes, where practicable; and
- The Mine Site helicopter landing zone was relocated further away from the accommodations complexes during the morning and evening hours of the day.

In June 2017, one room at the Mine Site and one room at the Port site were tested for noise and vibration. During this time, noise monitoring was conducted in each room for two 12-hour periods representing the day and night shifts worked at the sites with vibration monitoring conducted in each room for 10 hours during the day and night. The results of the 2017 noise and vibration monitoring are presented in Tables 4.9 and 4.10.

Due to equipment malfunctions and availability that were not resolved before the end of 2017, scheduled winter noise and vibration monitoring was unable to be conducted in 2017.

**Table 4.9 2017 Noise Monitoring Results**

Location	n	Minimum Noise Level (dBA)	Average Noise Level (dBA)	Maximum Noise Level (dBA)
<i>Summer Monitoring (June 2017)</i>				
Mine Site	1	27.2	28.1	74.4
Milne Port	2	28.1	42.6	75.4

Average noise levels presented were time weighed over 12-hours for comparison to the environmental noise guidelines such as the Ontario Ministry of the Environment (2013) Environmental Noise Guideline for Stationary and Transportation Sources. The Ontario guideline specifies indoor sound level limits for sleeping quarters affected by road traffic of 45 dBA ( $L_{eq}$ ) during daytime (07:00 to 23:00) and 40 dBA ( $L_{eq}$ ) during night time (23:00 to 0:700). Averaged sound levels at the Mine Site (28.1 dBA) were well below these limits, whereas averaged sound levels at Milne Port (42.6 dBA) were between the daytime and nighttime sleeping sound levels published by the Ontario Ministry of the Environment. Further Health Canada (2012) considers that sounds with levels below 70 dBA pose no known risk of hearing loss, no matter how long the noise is heard.

Vibration data was collected for 10 hours and then averaged over 8 hours (Table 4.10). In most cases, vibrations in the rooms were too low to register on the equipment.

**Table 4.10 2017 Vibration Monitoring Results**

Location	Vibration Level ( $m/s^2$ )			
	Mine Site		Port Site	
Shift	Day	Night	Day	Night
A(8) X-axis ( $m/s^2$ )	0.04	0.00	0.00	0.00
A(8) Y-axis ( $m/s^2$ )	0.04	0.00	0.00	0.01
A(8) Z-axis ( $m/s^2$ )	0.49	0.00	0.00	0.00

## TRENDS

Based upon the single monitoring event, the average noise level inside the Milne Port accommodation building in 2017 was similar to average noise level recorded in 2015 (41.7 dBA) and below the average noise level recorded in 2016 (50.3 dBA). Average noise levels at the Mine Site in 2017 were lower than the two previous years (34.8 and 30.6 dBA in 2015 and 2016, respectively).

Vibration levels in both 2015 and 2016 were generally too low to register on the equipment. A slightly higher value of 0.49  $m/s^2$  was recorded at the Mine Site in 2017.

## RECOMMENDATIONS / LESSONS LEARNED

An important lesson learned during 2017 noise and vibration monitoring was to review monitoring results shortly after collection to ensure quality data is collected. This will allow the Company to repeat sampling or repair monitoring instrumentation if required. In 2018, Baffinland will develop and execute additional QA/QC measures to its noise and vibration monitoring program to ensure testing is completed. This will include conducting five (5) samples at the Mine site and five (5) samples at Port site, twice per calendar year (summer and winter).

The new Mine Site accommodations complex is also scheduled to be completed in 2018, which is anticipated to further reduce employee concerns related to noise and vibration. Baffinland is optimistic that by the end of 2018, we will be able to provide the data necessary to demonstrate that noise and vibrations at the accommodations complex is not adversely affecting our employees and contractors. Should the data identify a need for noise or vibration reduction efforts, a plan will be formulated to address these concerns in consultation with stakeholders.

## Project Certificate Condition No. 14 (a)

Category	Noise and Vibration - Noise and Vibration Adaptive Management
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate potential impacts of noise to marine wildlife during project construction.
Term or Condition	The Proponent, through coordination with the MEWG as may be appropriate, shall demonstrate appropriate adaptive management for construction activities at Milne Inlet that have the potential to disrupt marine mammal species, including pile driving and ore dock construction, are undertaken.
Relevant BIM Commitment	32
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016h)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

The Shipping and Marine Wildlife Management Plan identifies mitigation and adaptive management measures to protect marine mammals for the construction phase (blasting and drilling measures were for Steensby Inlet only, pile driving for Milne Inlet only, and measures for dredging and vessel traffic near dock sites were applicable to both sites).

### RESULTS

Not applicable in 2017 as there was no active construction in the marine environment.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Prior to any future construction in the marine environment, Baffinland will review the adaptive management approaches identified in the SMWMP.

## Project Certificate Condition No. 14 (b)

Category	Noise and Vibration- Noise and Vibration Adaptive Management
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To mitigate potential impacts of noise to wildlife and people during project operations.
Term or Condition	The Proponent, through coordination with the TEWG as may be appropriate, shall demonstrate appropriate adaptive management for project activities during operations which have the potential to produce noise and sensory disturbance to wildlife and other users of project areas.
Relevant BIM Commitment	32
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 TEWG Meeting Records
Ref. Document Link	Appendix C2

### METHODS

Baffinland has procedures to minimize the impact of noise to people including regular maintenance of equipment to reduce unnecessary noise levels and the implementation of noise reduction rules in and around living quarters. Baffinland also developed an Idling Policy in October 2017 to reduce unnecessary vehicle/equipment idling as a means of reducing air pollution and contributing to a healthier work environment. Noise and vibration monitoring for worker health and safety has been conducted by the Baffinland Health and Safety Department. If unacceptable levels are observed, specific adaptive management measures are taken.

Monitoring and adaptive management measures for Project activities to reduce noise and sensory disturbance to wildlife has also been discussed with the TEWG for further feedback and recommendations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Noise levels are monitored in relation to worker health and safety, therefore mitigation measures to reduce noise and sensory disturbance are implemented with respect to human safety. Baffinland will continue to monitor noise levels in relation to human health and safety and implement adaptive measures as required.

## Project Certificate Condition No. 15

Category	Noise and Vibration - Noise and Vibration Monitoring
Responsible Parties	The Proponent, Qikiqtani Inuit Association, local Hamlet organizations
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enhance public safety when travelling around the Project area.
Term or Condition	The Proponent shall collaborate to the extent possible with the Qikiqtani Inuit Association and local Hamlet organizations when undertaking consultation with all affected communities regarding railway, tote road and marine shipping operations. During these consultations, it is recommended that the Proponent provide information including video, audio, and photographic representation as well as any other aids (i.e. models) that may enhance the general public's understanding of railway, tote road and marine shipping operations, as well as all safety considerations for members of the public who may be travelling around the project area.
Relevant BIM Commitment	32
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland continues to work with local Hamlet organizations and the Qikiqtani Inuit Association (QIA) regarding safety considerations for travel and interaction with the Project for those travelling in the area. In support of this, the QIA established the Mary River Community Group (which includes representatives from Baffinland, the Mittimatalik Hunters and Trappers Organization (MHTO) and the local Hamlet). In addition, the QIA and the MHTO are members of the Marine and Terrestrial Environment Working Groups.

Further, Baffinland continues to provide information related to the Project on the Baffinland corporate website including:

- Video of operations; and
- Ship tracks.

In addition to regular engagement with the QIA, Baffinland also held several meetings with local community organizations during 2017. These meetings are listed in Table 4.11.

### RESULTS

Not applicable.

### TRENDS

Not applicable.



**Table 4.11 Community Meetings in 2017**

Community	Stakeholder Group	Date	Topic
Arctic Bay	Hamlet of Arctic Bay	May 31 2017	Phase 2 Expansion Project Proposal
	Ikajutit HTO	May 31 2017	Phase 2 Expansion Project Proposal
	Community residents	April 3-7 2017	Career and Training Information Tour
Clyde River	Hamlet of Clyde River	May 29 2017	Phase 2 Expansion Project Proposal
	Clyde River HTO	May 29 2017	Phase 2 Expansion Project Proposal
	Community residents	April 3-7 2017	Career and Training Information Tour
Hall Beach	Hamlet of Hall Beach	June 2 2017	Phase 2 Expansion Project Proposal
	Hall Beach HTO	June 2 2017	Phase 2 Expansion Project Proposal
	Community residents	April 3-7 2017	Career and Training Information Tour
Igloolik	Hamlet of Igloolik	June 1 2017	Phase 2 Expansion Project Proposal
	Igloolik Hunters and Trappers Assoc.	June 1 2017	Phase 2 Expansion Project Proposal
	Community residents	April 3-7 2017	Career and Training Information Tour
Iqaluit	Iqaluit Business Community	January 16 2017	Procurement and Contracting Workshop
Pond Inlet	Mittimatalik HTO	June 12 2017	Marine Environmental Monitoring meeting
	Hamlet of Pond Inlet	May 30 2017	Phase 2 Expansion Project Proposal
	Mittimatalik HTO	May 30 2017	Phase 2 Expansion Project Proposal
	Community residents	April 3-7 2017	Career and Training Information Tour
	Pond Inlet Business Community	January 18-19, 2017	Procurement and Contracting Workshops

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with the QIA and local Hamlet organization through the working groups and/or other venues to enhance the general public's understanding of the Project.

#### 4.6.4 Hydrology and Hydrogeology (PC Conditions 16 through 19)

Four (4) PC conditions relate to the potential effects of the Project on hydrology and hydrogeology. These conditions relate to aspects of the project that are regulated under Baffinland’s Type A Water Licence (for mining) and Type B Water Licence (for mineral exploration).

##### *Stakeholder Feedback*

The Nunavut Water Board (NWB) is the primary stakeholder regulating water use and waste disposal through its issuance of water licences. The QIA is also a key stakeholder; substantial effects to the quantity, quality, or flow of water through Inuit Owned Land is subject to a Water Compensation Agreement between Baffinland and the QIA, pursuant to Article 20 of the Nunavut Agreement (INAC and Nunavut Tunngavik, 2010). Water diversions have the potential to impact fish and fish habitat, and Fisheries and Oceans Canada administers the fish and fish habitat sections of the *Fisheries Act*. Effects to water quantity have not been raised in 2017 consultation activities (Appendix B).

##### *Monitoring Activities*

Hydrology monitoring is undertaken by recording water use and reporting this information to the NWB under the water licence, and by operating six long-term seasonal hydrometric stations. Visual monitoring is conducted of water conveyance structures, including bridges and culverts.

The mining footprint remains small relative to the fully developed project, and hence water diversions associated with the open pit and waste rock stockpile are minor.

The Type A Water Licence specifies water withdrawal limits. Under the authorization of the Type A Water Licence, freshwater was withdrawn during 2017 to sustain three key activities at the Project: potable water supply (domestic), dust suppression, and for miscellaneous (industrial) uses. During 2017, daily water volume withdrawal limits, stipulated in the Type A Water Licence, for domestic, industrial and dust suppression purposes were not exceeded at approved Project water sources, with the exception of four (4) dust suppression water sources along the Tote Road during summer months: Km 97 (Tom River), Km 80 bridge (near Muriel Lake), Km 63 bridge and Camp Lake.

Table 4.12 provides an evaluation of the Project’s impacts on hydrology and hydrogeology based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.12 Hydrology and Hydrogeology Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Water Usage	Water usage exceeding thresholds and affecting the aquatic environment	Measure/monitor and report water usage in accordance with water licence limits	Water usage within water licence limits except at four dust suppression water sources. Effects within FEIS predictions
Water Diversions	Reductions or increases in water flow due to diversions	None; this is primarily a function of the growing Project footprint, particularly the open pit and waste rock stockpile	Minor; within FEIS predictions

##### *Path Forward*

Baffinland will continue to implement its Tote Road Earthworks Execution Plan (TREETP) in 2018, will continue to operate its long-term hydrometric network, and will monitor and report water use to the NWB under the company’s water licences.

## Project Certificate Condition No. 16

Category	Hydrology and Hydrogeology - Water Infrastructure
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To provide assurance that the potential impacts to flow and quantity of water in the Project area are minimized.
Term or Condition	The Proponent shall ensure that the water related infrastructure or facilities that are designed and constructed, including the modification of culverts, diversion of watercourses, and diversion of runoff into watercourses along the railway, access roads, port sites, the Milne Inlet Tote Road, and other areas of the Project site, are consistent with those proposed in the FEIS and FEIS Addendum in terms of type, location, and scope and that the requirements of all relevant regulatory authorities are satisfied advance of constructing those facilities.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Indigenous and Northern Affairs Canada (INAC), Qikiqtani Inuit Association (QIA), Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB)
Reference	Final Environmental Impact Statement (FEIS; Baffinland, 2012) FEIS Addendum - Early Revenue Phase (Baffinland, 2013a)
Ref. Document Link	N/A

### METHODS

Baffinland ensures that the water related infrastructure or facilities are consistent with those proposed in the FEIS and FEIS Addendum.

### RESULTS

During 2017, the following work was completed on water related infrastructure and facilities:

Assembly and installation of the sewage and potable water treatment plants associated with the new Mine Site Accommodations Complex included:

- Construction of surface water diversion ditches around the new Milne Port Camp Pad;
- Construction of perimeter ditches for the expansion of the Mine Site Crusher Pad;
- Construction of containment ditching and sumps downstream of the Waste Rock Facility;
- Maintenance to surface water management infrastructure along Milne Inlet Tote Road (i.e. culvert replacements); and
- Continued troubleshooting and commissioning of the Mine Site Truck Wash Facility.

The applicable regulatory approvals were obtained for the construction of the facilities and infrastructure listed above, with the exception of the ditching and sumps constructed downstream of the Waste Rock Facility.

Ditching and sumps constructed down-gradient of the Waste Rock Facility (WRF) were an emergency response measure taken by Baffinland to contain the uncontrolled seepage discovered at the WRF in late August 2017. Updates outlining the actions taken to address the seepage, including the construction of the ditches and sumps, were provided by Baffinland to relevant regulators and stakeholders.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Water related infrastructure and facilities constructed to date are generally consistent with those proposed in the FEIS and FEIS Addendum in terms of type, location, and scope.

## Project Certificate Condition No. 17

Category	Hydrology and Hydrogeology - Effluent Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to water bodies from effluent.
Term or Condition	The Proponent shall develop and implement effective measures to ensure that effluent from project-related facilities and/or activities, including sewage treatment plants, ore stockpiles, and mine pit, satisfies all discharge criteria requirement established by the relevant regulatory agencies prior to being discharged into the receiving environment.
Relevant Baffinland Commitment	6
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Non-Compliant
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Qikiqtani Inuit Association, Nunavut Impact Review Board, Environment and Climate Change Canada
Reference	Relevant Management Plans: Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2018e) Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f) Metal Mining Effluent Regulations (MMER) Emergency Response Plan (MMER ERP; Baffinland, 2018f) Phase 1 Waste Rock Management Plan (Baffinland, 2018a) Sedimentation Mitigation Action Plan (Golder, 2016a) Dust Mitigation Action Plan (Golder, 2016b) Tote Road Earthworks Execution Plan and Design Report (TREETP; Golder, 2017a) Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2017e) Relevant 2017 Monitoring Reports: 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b) Freshet 2017 Biweekly Report No. 1 (Baffinland, 2017c) Freshet 2017 Monitoring Report No. 2 (Baffinland, 2018g) 2017 MMER Annual Report (Baffinland, 2018h)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Wastewater/effluent management practices and procedures are outlined in Baffinland's Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP) and the Metal Mining Effluent Regulations Emergency Response Plan (MMER ERP). Surface water monitoring, management practices and procedures are outlined in Baffinland's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP).

Water quality discharge criteria (discharge criteria) for effluent generated by the Project is stipulated in Baffinland's Type A Water Licence issued by the Nunavut Water Board, and Schedules 4 and 5 of the MMER (Minister of Justice, 2017).

Prior to discharge, wastewater (treated sewage, treated contact water, etc.) is sampled to ensure the wastewater's water quality meets the applicable discharge criteria stipulated in the Type A Water Licence. Wastewater that meets the applicable discharge criteria is discharged to the receiving environment. Water samples are routinely taken during wastewater discharges to ensure the water quality remains in compliance with applicable discharge criteria. In the event that water quality sampling during a discharge indicates that the water quality is no longer in compliance with the applicable discharge criteria, the discharge of the non-compliant wastewater is stopped.

Wastewater that does not meet the applicable discharge criteria is treated on-site using approved treatment processes (sewage treatment plants, mobile oily water treatment systems, etc.) and is not discharged to the receiving environment until it has been confirmed by water quality analysis that the treated wastewater meets the applicable discharge criteria.

All wastewater sampling at the Mary River Project is conducted in accordance with Baffinland's Sampling Program - Quality Assurance and Quality Control Plan.

As required by Baffinland's Type A Water Licence, volumes and water quality analysis of wastewater discharged to the receiving environment are reported to regulators (INAC, NWB) on a monthly and annual basis. As a requirement of MMER, volume and water quality results for discharges from the surface water management ponds associated with the Crusher Facility and Waste Rock Facility (WRF) at the Mine Site are reported to ECCC on a quarterly and annual basis.

## RESULTS

Discharges at the Project in 2017 that did not comply with the applicable discharge criteria outlined in the Type A Water Licence and the MMER mainly involved elevated TSS concentrations in surface water flows during freshet and pH and TSS exceedances at the WRF surface water management pond (WRF pond) in August and September 2017.

During freshet 2017 (approx. May 15 to June 30), several TSS exceedances at locations monitored under the Type A Water Licence and unauthorized releases of sediment were reported to ECCC, INAC, NWB and the NT-NU Spill Line, and are documented in NT-NU Spill Reports 17-161, 17-162, 17-178, 17-209, 17-214 and 17-217. Further analysis and discussion of the sediment releases and TSS exceedances reported by Baffinland during freshet 2017, including mitigative and corrective actions taken and planned to address sedimentation concerns at the Project, is provided in the 2017 Freshet Monitoring Reports, appended to the 2017 QIA and NWB Annual Report for Operations.

During August 2017, the pH of runoff collected in the WRF pond dropped below the pH discharge limits outlined in the MMER. Observations indicated the decrease in pH may have been the result of potential acid rock drainage (ARD). The pond was subsequently batch treated with sodium carbonate in mid-August 2017 to increase the pH within the permissible range for discharge. Although the batch treatment was initially successful in raising the pH of runoff contained with the pond, subsequent active discharges from the pond during late August and September resulted in several exceedances of the MMER and Type A Water Licence discharge criteria for pH and total suspended solids (TSS). Exceedances for the non-compliant discharges were reported to the relevant regulators and are documented in NT-NU Spill Reports 17-289, 17-312, 17-328 and 17-361.

During an on-site INAC and ECCC inspection in late August, uncontrolled seepage originating from the toe of the pond's berm was observed that had not been previously identified in routine internal inspections and annual third party geotechnical or regulator inspections. The seepage was reported by Baffinland to relevant regulators and is documented in NT-NU Spill Report 17-312. Investigations into the origin of the seepage are ongoing. As a result of the concerns identified at the WRF, INAC issued

an Inspector's Direction to Baffinland on September 5, 2017. On September 7, 2017 and September 13, 2017, the QIA and ECCC, respectively, notified Baffinland that both parties had initiated investigations into the 2017 events at the WRF.

Exceedances for Type A Water Licence monitoring locations were reported to the NWB, INAC and the QIA during 2017 in the monthly monitoring reports required by the Type A Water Licence. A full discussion of 2017 non-compliant discharges under the Type A Water Licence for the Project is provided in Baffinland's 2017 QIA and NWB Annual Report for Operations, submitted to the QIA and NWB on March 31, 2018 as a requirement of the Type A Water Licence and Commercial Lease.

Similarly, exceedances and non-compliant discharges under the MMER have been reported to ECCC via the NT-NU Spill Line and online MMER quarterly reporting system and are fully discussed in the 2017 MMER Annual Report.

### **TRENDS**

Overall, the frequency and nature of incidents involving the discharge of effluent to the receiving environment that exceeds the applicable discharge criteria have remained low and incidental since the start of operations in 2014.

### **RECOMMENDATIONS / LESSONS LEARNED**

In response to the non-compliant discharges from the WRF, Baffinland has taken multiple corrective actions to prevent additional non-compliant discharges from the WRF and retained Golder Associates Ltd. (Golder) to determine the appropriate corrective actions required to address the seepage observed at the WRF in 2017 and investigate the potential for ARD and develop mitigation measures, as required. Preliminary mitigation measures planned for 2018 include the mobilization of a water treatment system to manage potential non-compliant waters in the WRF pond during 2018. Refer to the 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b) for further details on the concerns identified at the WRF in 2017 and the corrective actions taken and planned.

To improve the water quality of surface water drainage at the Project during freshet, Baffinland continues to implement the corrective actions and improvements outlined in the Sedimentation and Dust Mitigation Action Plans (Golder, 2016a,b) and Tote Road Earthworks Execution Plan (TREETP; Golder, 2017a).

Baffinland continues to update the Project's management plans and implement additional control measures to ensure discharges to the receiving environment are in compliance with applicable water quality discharge criteria.

## Project Certificate Condition No. 18

Category	Hydrology and Hydrogeology - Pit Lake Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enhance predictions for mine site closure conditions.
Term or Condition	The Proponent shall carry out continued analyses over time to confirm and update, accordingly, the approximate fill time for the mine pit lake identified in the FEIS.
Relevant Baffinland Commitment	42
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Indigenous and Northern Affairs Canada, Nunavut Water Board, Qikiqtani Inuit Association, Nunavut Impact Review Board
Reference	Interim Closure and Reclamation Plan (Baffinland, 2016i)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

The latest revision of the Interim Closure and Reclamation Plan (ICRP; Baffinland, 2016i) discusses the estimated fill time for the mine pit lake.

### RESULTS

Current mining activity has not yet created a pit at Deposit No. 1 so there is no additional information available to update the estimated fill time.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will update the estimated mine pit lake fill time in the ICRP as additional information becomes available.



## Project Certificate Condition No. 19

Category	Hydrology and Hydrogeology - Water Infrastructure Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to natural water flow.
Term or Condition	The Proponent shall ensure that it develops and implements adequate monitoring and maintenance procedures to ensure that the culverts and other conduits that may be prone to blockage do not significantly hinder or alter the natural flow of water from areas associated with the proposed mine. In addition, the Proponent shall monitor, document and report the withdrawal rates for water removed and utilized for all domestic and industrial purposes.
Relevant Baffinland Commitment	57
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Fisheries and Oceans Canada
Reference	Fish Habitat Monitoring - 2017 Annual Report - Early Revenue Phase - Tote Road Upgrades (Baffinland, 2017d) Freshet 2017 Biweekly Report No. 1 (Baffinland, 2017c) Freshet 2017 Monitoring Report No. 2 (Baffinland, 2018g) Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f) Roads Management Plan (Baffinland, 2016e) 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

As a requirement of Baffinland's Fisheries Authorization for the Milne Inlet Tote Road (DFO, 2007), an annual report summarizing the monitoring results of fish bearing water crossings (i.e. culverts, bridges) along the Tote Road is submitted to the Department of Fisheries and Oceans Canada (DFO) each year. Monitoring results include observations from an annual inspection of fish bearing water crossing along the Tote Road, conducted each year by a qualified fisheries biologist, and water quality monitoring data collected at select water crossings along the Tote Road.

In addition, routine monitoring of crossings along the Tote Road and at Project Sites, routine inspections are conducted throughout the year by road maintenance and environmental monitoring personnel to ensure crossings are not obstructed and are working as designed. As a requirement of the Type A Water Licence, water quality monitoring stations have been established downstream of Project areas, including water crossings at the Mine Site and Milne Port, as part of the Project's Surveillance Network Program (SNP). Water quality monitoring results collected under the SNP are compared to criteria included in the Type A Water Licence and are reported to the NWB, INAC and QIA on a monthly and annual basis.

In 2017, Baffinland continued its Mine Site Freshet Monitoring Program that was initiated in 2016, and initiated a new Tote Road Freshet Monitoring Program to monitor TSS concentrations of surface water drainage near Project infrastructure during freshet (May 15 to June 30). Water quality monitoring results from these freshet water quality monitoring programs are provided in the 2017 Freshet Monitoring Reports submitted to INAC, NWB, ECCC and the QIA in 2017 and early 2018 (Baffinland, 2017c and 2018g).

Baffinland is in the process of updating the Project's Surface Water and Aquatic Ecosystem Management Plan to provide clarity on the water quality monitoring programs conducted at the Project. Furthermore, the Project's Roads Management Plan is currently being revised to provide further detail on the Project's maintenance and monitoring procedures for water crossings (i.e. culverts, bridges).

Baffinland is also required as a condition of the Type A Water Licence to monitor, document and report the daily withdrawal volumes for water removed and utilized for Project domestic and industrial purposes. This information is submitted to INAC, NWB and QIA on a monthly and annual basis.

### **RESULTS**

Results from the water quality monitoring conducted under the Type A Water Licence and the water crossing assessments conducted in 2017 are presented and fully discussed in the 2017 QIA and NWB Annual Report for Operations. The 2017 monitoring results of water crossings and water related infrastructure at Project sites and the Tote Road will be used to further prioritize and sequence the upgrades proposed in the Tote Road Earthworks Execution Plan (TREETP) and additional surface water management improvements as deemed required.

During 2017, water withdrawal rates from approved water sources did not exceed the limits stipulated in Baffinland's Type A and B Water Licences. Water volumes withdrawn from approved water sources under the Type A and B Water Licences during 2017 are presented in the 2017 QIA AND NWB Annual Report for Operations (Baffinland, 2018b) and the 2017 QIA AND NWB Annual Report for Exploration and Geotechnical Drilling Activities (Baffinland, 2018d), respectively.

### **TRENDS**

Not applicable.

### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor water infrastructure to ensure the natural flow of surface water around the Project is not significantly hindered or altered.

#### 4.6.5 Groundwater & Surface Water (PC Conditions 20 through 30)

Eleven (11) PC conditions relate to the potential impacts of the Project on groundwater and surface water. There is overlap in the scope of these PC conditions with PC Conditions 16 to 19 for hydrology and hydrogeology. Several of the conditions require the development of management plans. These conditions also overlap with aspects of the Project that are regulated under Baffinland's Type A Water Licence (for mining) and Type B Water Licence (for mineral exploration). PC Conditions 29 and 30 require Baffinland to submit construction designs, as-built drawings and site-specific management plans to the relevant regulatory agency, as required under Part D of the Type A Water Licence.

##### *Stakeholder Feedback*

As described in Section 4.5.4 (Hydrology and Hydrogeology), the NWB is the primary stakeholder regulating water use and waste disposal through its issuance of water licences. The QIA is also a key stakeholder; the QIA and Baffinland have a Water Compensation Agreement should the Project substantially affect the flow or quality of water through IOL. ECCC is a key regulator administering the section of the *Fisheries Act* regarding the prohibition on the release of deleterious substances to fish-bearing waters. Groundwater is limited to minor seepage through the active layer during the brief snow-free period. Surface water quality, however, is a key resource to Inuit and to regulatory agencies, and it is among the most closely regulated aspects of the environment through effluent monitoring and an aquatic effects monitoring program under the Project's water licences. Community members have expressed concern regarding the potential for dust to impact water quality in local streams (Appendix B).

##### *Monitoring Activities*

Monitoring activities undertaken in relation to groundwater and surface water include:

- Sampling and testing of various effluents prior to discharge to the environment in accordance with Part F of the Type A Water Licence; and
- Monitoring of water and sediment quality under the Aquatic Effects Monitoring Plan (AEMP; Baffinland, 2015a), which is a required monitoring plan under Part I of the Type A Water Licence.

Table 4.13 provides an evaluation of the Project's impacts on groundwater and surface water, based on monitoring activities completed in 2016, relative to predictions presented in the FEIS and FEIS Addendum.

##### *Path Forward*

Baffinland will continue to implement its TREP in 2018, will continue to operate its long-term hydrometric network, and will monitor effluents and receiving waters in accordance with the Proponent's water licences and AEMP.

**Table 4.13 Groundwater and Surface Water Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Groundwater Quality	Adverse seepage from project areas (landfill, landfarm, waste rock stockpile) affecting groundwater quality	A groundwater monitoring pilot program was initiated at the landfill in 2017. There are no established groundwater quality criteria in Nunavut. Future monitoring will seek to establish trends.	N/A
Surface Water Quality	Releases of TSS or other changes in water quality due to point-source discharges (i.e., stormwater and sewage effluents)	Effluents are monitored prior to discharge; the receiving aquatic environment is monitored in accordance with the AEMP	Elevated TSS concentrations detected downstream of Project infrastructure and water crossings during freshet; within FEIS predictions. Elevated TSS and non-compliant pH effluent was discharged from the Waste Rock Facility; this exceeded FEIS predictions. The AEMP detected elevated concentrations of ammonia, nitrate and sulphate in the receiving tributary of the Mary River. No adverse effects to phytoplankton, benthic invertebrates or arctic char were detected in the Mary River or Mary Lake. Therefore, the effect of the exceedances was minimal.
	Releases of TSS or other changes in water quality due to non-point source releases (i.e., erosion and sedimentation)	Runoff from ground disturbance areas (construction areas, quarries) are monitored for TSS; site is inspected visually for evidence of erosion and sedimentation, with follow-up sampling if required	TSS exceedances occurred at the Mine and along the Tote Road. ECCC issued a Direction under the Fisheries Act, which Baffinland implemented satisfactorily. Erosion and sedimentation impacts exceeded FEIS predictions.
	Releases of TSS or other changes in water quality due to airborne emissions	Visual observations and sampling of runoff water quality noted excessive ore dust running off into Sheardown and Camp Lakes at the Mine Site	Ore dust runoff exceeded FEIS predictions at these locations

## Project Certificate Condition No. 20

Category	Groundwater/Surface Waters - Explosives
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure that the effects associated with the manufacturing, storage, transportation and use of explosives do not negatively impact the areas surrounding the Project.
Term or Condition	The Proponent shall monitor the effects of explosives residue and related by-products from project-related blasting activities as well as develop and implement effective preventative and/or mitigation measures, including treatment, if necessary, to ensure that the effects associated with the manufacturing, storage, transportation and use of explosives do not negatively impact the Project and surrounding areas.
Relevant Baffinland Commitment	57, 65
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Environment and Climate Change Canada
Reference	2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b) Aquatic Effects Monitoring Plan (Baffinland, 2015a) Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2017e)
Ref. Document Link	Management plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Surface water runoff downstream of Project mining areas and quarries is monitored as prescribed in the Type A Water Licence, with water quality results reported to the NWB, QIA and INAC on a monthly and annual basis. Sampling methods are described in Baffinland's Sampling Program - Quality Assurance and Quality Control Plan (QA/QC Plan; Baffinland, 2017e), which is an approved plan under the Type A Water Licence.

In addition, the Aquatic Effects Monitoring Plan (AEMP; Baffinland, 2015a), a follow-up monitoring program identified in Baffinland's FEIS and prescribed by the Baffinland's Type A Water Licence, monitors the receiving aquatic environment downstream of Project activities at the Mine Site.

### RESULTS

During 2017, surface water runoff downstream of active quarries and mining areas were monitored for water quality parameters as outlined in the Type A Water Licence, including parameters related to explosives residue, such as ammonia and nitrate. Although select water samples collected downstream of active quarries and mining areas showed elevated ammonia and nitrate levels in comparison to baseline concentrations, nearly all samples were below the established Canadian Council of Ministers of the Environment (CCME) water quality guidelines for ammonia and nitrate (CCME, 2010; CCME, 2012). All acute toxicity water samples collected in 2017 downstream of Project quarries and mining areas, with the exception of the Waste

Rock Facility, were demonstrated to be acutely non-lethal. A complete discussion of the 2017 water quality monitoring results collected under the Type A Water Licence is provided in the 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b).

Monitoring under the AEMP in 2017 included the Core Receiving Environment Monitoring Program (CREMP), a key component of the AEMP used to detect Project-related changes in water quality, sediment quality, phytoplankton (chlorophyll a), benthic invertebrate community metrics, and arctic char (*Salvelinus alpinus*) fish populations in lakes and streams near the Mine Site. Evidence of Project-related change was observed in Camp Lake and Sheardown Lake systems. Each of these waterbodies showed changes in AEMP monitoring parameters and metrics in 2017. AEMP water quality monitoring of mine-exposed tributaries flowing into Camp Lake and Sheardown Lake showed elevated concentrations of nitrate in 2017, however in each case, nitrate concentrations were well below the established AEMP water quality guideline for nitrate (13 mg/L) and no adverse effects to phytoplankton, benthic invertebrates or arctic charr were indicated. The 2017 AEMP reports, including a complete analysis and discussion of the 2017 CREMP results, are provided in the 2017 QIA and NWB Annual Report for Operations.

### **TRENDS**

Overall, 2017 monitoring results of surface water runoff and aquatic environments downstream of Project mining areas and quarries were generally consistent with monitoring results observed in 2016.

### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor surface water runoff and aquatic environments downstream of Project mining areas and quarries as outlined in the Type A Water Licence and the AEMP.

## Project Certificate Condition No. 21

Category	Groundwater/Surface Waters - Aquatic Effects Monitoring Plan and dustfall monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To mitigate potential impacts to surface and ground waters.
Term or Condition	<p>The Proponent shall ensure that the scope of the Aquatic Effects Monitoring Plan (AEMP) includes, at a minimum:</p> <ul style="list-style-type: none"> <li>a) Monitoring of non-point sources of discharge, selection of appropriate reference sites, measures to ensure the collection of adequate baseline data and the mechanisms proposed to monitor and treat runoff, and sample sediments</li> <li>b) Measures for dustfall monitoring designed as follows:                             <ul style="list-style-type: none"> <li>i. To establish a pre-trucking baseline and collect data during Project operation for comparison</li> <li>ii. To facilitate comparison with existing guidelines and potentially with thresholds to be established using studies of Arctic char egg survival and/or other studies recommended by the Terrestrial Environment Working Group (TEWG)</li> <li>iii. To assess the seasonal deposition (rates, quantities) and chemical composition of dust entering aquatic systems along representative distance transects at right angles to the Tote Road and radiating outward from Milne Port and the Mine Site.</li> </ul> </li> </ul>
Relevant Baffinland Commitment	2
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board, Indigenous and Northern Affairs Canada, Nunavut Water Board, Qikiqtani Inuit Association
Reference	Aquatic Effects Monitoring Plan (Baffinland, 2015a) 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b) 2017 Mary River Project Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	Management plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

The Aquatic Effects Monitoring Plan (AEMP) was submitted to the NWB on June 27, 2014 as required by the Type A Water Licence and was subsequently accepted by the NWB. The AEMP was updated to reflect Amendment No. 1 of the Type A Water Licence and resubmitted on October 31, 2015 and approved by the NWB.

The AEMP has been structured to serve as an overarching 'umbrella' that conceptually provides an opportunity to integrate results of individual but related aquatic monitoring programs including water and sediment quality, dustfall monitoring and freshwater biota and fish health.

As a component study of the AEMP, the Core Receiving Environment Monitoring Program (CREMP) evaluates potential mine-related influences on water quality, sediment quality, and/or biota (including phytoplankton, benthic invertebrates and/or fish) within aquatic environments near the Mine Site. Water and sediment quality monitoring programs, incorporating benchmarks derived from the Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (CWQG-PAL), established by the Canadian Council of Ministers of the Environment (CCME), and baseline data, are performed on receiving aquatic environments near the Mine Site, including the Camp Lake, Sheardown Lake, Mary Lake Systems as well as Reference Lake 3 and various reference tributaries.

A Lake Sedimentation Monitoring Program is also performed annually under the AEMP and monitors dust and sediment deposition rates in Sheardown Lake NW to evaluate potential mine-related influences on biota (e.g. fish larvae hatching success). Annual monitoring reports for the CREMP and Lake Sedimentation Monitoring Program further discuss the methods used and annual monitoring results and are provided as appendices to the Qikiqtani Inuit Association (QIA) and Nunavut Water Board (NWB) Annual Reports, required under Baffinland's Type A Water Licence and Commercial Lease with the QIA.

As a component study of the AEMP, a dustfall monitoring program is performed annually with sampling stations established at the Mine Site, Milne Port, along the Tote Road and at reference sites located at various distances from Project operations.

The three (3) main objectives of the dustfall monitoring program are as follows:

1. To quantify the extent, magnitude and composition of dustfall generated by Project activities;
2. To determine seasonal variations in dustfall at all sampling locations; and
3. To determine if annual changes in dustfall at sampling locations exceed identified thresholds associated with isopleth dispersion models and assessments performed in the Final Environmental Impact Statement (FEIS).

Results collected under the dustfall monitoring program are provided on an annual basis to NIRB and other relevant regulatory agencies and stakeholders in the Terrestrial Environment Annual Monitoring Report.

## RESULTS

The results of the aforementioned CREMP and Lake Sedimentation Monitoring programs are supplied annually as appendices to the QIA AND NWB Annual Reports, as required by the Commercial Lease with the QIA and the Type A Water Licence. Evidence of potential Project-related influences in water quality and sediment deposition were observed in the Camp Lake and Sheardown Lake systems, but prominent mine-related effects to biota were restricted to a single tributary within the Sheardown Lake system. Each of these waterbodies showed changes in AEMP monitoring parameters and metrics in 2017. The results of the above Dustfall Monitoring Program are presented annually in the Terrestrial Environment Annual Monitoring Report.

## TRENDS

Overall, 2017 monitoring results of surface water runoff and sediment in receiving aquatic environments downstream of Project mining areas were generally consistent with monitoring results observed in 2016. In general, 2017 dustfall monitoring results were lower compared to 2016, with exception of select stations.



**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with appropriate stakeholders and regulatory agencies to identify required revisions to the AEMP and associated environmental monitoring programs. Baffinland submitted Revision 2 of the AEMP in April 2016 to the NWB and continues to work with the appropriate stakeholders and regulatory agencies to finalize the revision. In November 2017, Baffinland chaired a freshwater workshop in Iqaluit, Nunavut to further discuss and justify the proposed changes to the CREMP outlined in Revision 2 of AEMP. Attending participants of the freshwater workshop included the NWB, QIA, INAC, GN and ECCC. Baffinland plans on incorporating points of discussion from the freshwater workshop and resubmitting Revision 2 of the AEMP to the NWB for final review and approval in 2018. Baffinland will provide Revision 2 of the AEMP to the NIRB following its approval.

## Project Certificate Condition No. 22

Category	Groundwater/Surface Waters - Sediment and Erosion Management Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To develop appropriate sediment and erosion controls to prevent impacts to surface waters.
Term or Condition	The Proponent shall develop a detailed Sediment and Erosion Management Plan to prevent and/or mitigate sediment loading into surface water within the Project area.
Relevant Baffinland Commitment	57
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board, Qikiqtani Inuit Association
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

The Sediment and Erosion Management Plan is incorporated into Baffinland's Surface Water and Aquatic Ecosystem Management Plan, which was prepared prior to construction.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 23

Category	Groundwater / Surface Waters - Groundwater Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to groundwater quality.
Term or Condition	The Proponent shall develop and implement a Groundwater Monitoring and Management Plan to monitor, prevent and/or mitigate the potential effects of the Project on groundwater within the Project area.
Relevant Baffinland Commitment	57
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	Partially-Compliant
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	2017 QIA AND NWB Annual Report for Operations (Baffinland, 2018b) Surface Water and Aquatic Ecosystem Management Plan –(Baffinland, 2016f)
Ref. Document Link	Management plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

A groundwater monitoring program, involving the installation of shallow groundwater wells downstream of Project infrastructure, is discussed in Baffinland’s Surface Water and Aquatic Ecosystem Management Plan, approved by the Nunavut Water Board (NWB).

A pilot groundwater monitoring program was conducted in September 2017 to confirm program feasibility and involved establishing shallow groundwater wells up-gradient and down-gradient of the Mine Site Non-Hazardous Waste Landfill (Landfill Facility) using drive point piezometers. Groundwater wells were established to the depth of permafrost (approx. 1 - 1.5 metres) and water samples were collected at well locations where groundwater was detected. The methodology for the 2017 groundwater monitoring program is detailed in the 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b).

### RESULTS

During the 2017 pilot program near the Landfill, groundwater was detected and sampled at three (3) monitoring wells down-gradient and one (1) monitoring well located up-gradient of the Landfill Facility. Due to the limited data set collected to date for groundwater chemistry, further groundwater monitoring is required to gain a better understanding of natural groundwater chemistry at Project sites.

### TRENDS

Groundwater monitoring at the Project commenced in 2017. As additional monitoring is conducted in future years, Baffinland will be able to better characterize natural groundwater chemistry at Project sites and identify any trends, including potential impacts from Project activities or infrastructure.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland plans to run the groundwater monitoring program in 2018 using a methodology consistent with the 2017 pilot program. The 2018 groundwater monitoring program will establish groundwater wells near Project infrastructure with a focus on the Landfill Facility at the Mine Site. Additional data is required to determine the feasibility and utility of groundwater monitoring in arctic conditions. Following the 2018 year, Baffinland will provide further recommendations.

## Project Certificate Condition No. 24

Category	Groundwater/Surface Waters - Effluent Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to groundwater and surface waters from effluent discharge.
Term or Condition	The Proponent shall monitor as required the relevant parameters of the effluent generated from Project activities and facilities and shall carry out treatment if necessary to ensure that discharge conditions are met at all times.
Relevant Baffinland Commitment	6
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Non-Compliant
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Qikiqtani Inuit Association, Nunavut Impact Review Board
Reference	Fresh Water Supply, Sewage and Wastewater Management Plan (Baffinland, 2018e) Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f) 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b) Sampling Program - Quality Assurance / Quality Control (QA/QC) Plan (Baffinland, 2017e) Metal Mining Effluent Regulations Emergency Response Plan (MMER ERP; Baffinland, 2018f).
Ref. Document Link	Management plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Wastewater/effluent management practices and procedures are outlined in Baffinland's Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP) and Metal Mining Effluent Regulations Emergency Response Plan (MMER ERP). Surface water monitoring, management practices and procedures are outlined in Baffinland's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP).

Water quality discharge criteria (discharge criteria) for effluent generated by the Project is stipulated in Baffinland's Type A Water Licence issued by the NWB and the MMER issued by ECCC.

Prior to discharge, wastewater (treated sewage, treated contact water, etc.) is sampled to ensure the wastewater's water quality meets the applicable discharge criteria stipulated in the Type A Water Licence and MMER. Wastewater that meets the applicable discharge criteria is discharged to the receiving environment. Water samples are routinely taken during wastewater discharges to ensure the water quality remains in compliance with applicable discharge criteria. In the event that water quality sampling during a discharge indicates that the water quality is no longer in compliance with the applicable discharge criteria, the discharge of the non-compliant wastewater is stopped.

Wastewater that does not meet the applicable discharge criteria is treated onsite using approved treatment processes (sewage treatment plants, mobile oily water treatment systems, etc.) and is not discharged to the receiving environment until it has been confirmed by water quality analysis that the treated wastewater meets the applicable discharge criteria.

All wastewater sampling at the Mary River Project is conducted in accordance with Baffinland's Sampling Program - Quality Assurance and Quality Control Plan.

As required by Baffinland's Type A Water Licence, volumes and water quality analysis of wastewater discharged to the receiving environment are reported to regulators (INAC, NWB) on a monthly and annual basis. As a requirement of MMER, volume and water quality results for discharges from the surface water management ponds associated with the Crusher Facility and Waste Rock Facility (WRF) at the Mine Site are reported to ECCC on a quarterly and annual basis.

## RESULTS

Discharges at the Project in 2017 that did not comply with the applicable discharge criteria outlined in the Type A Water Licence and the MMER mainly involved elevated TSS concentrations in surface water flows during freshet and pH and TSS exceedances at the WRF surface water management pond (WRF pond) in August and September 2017.

During freshet 2017 (approx. May 15 to June 30), several TSS exceedances at locations monitored under the Type A Water Licence and unauthorized releases of sediment were reported to ECCC, INAC, NWB and the NT-NU Spill Line, and are documented in NT-NU Spill Reports 17-161, 17-162, 17-178, 17-209, 17-214 and 17-217. Further analysis and discussion of the sediment releases and TSS exceedances reported by Baffinland during freshet 2017, including mitigative and corrective actions taken and planned to address sedimentation concerns at the Project, is provided in the 2017 Freshet Monitoring Reports, appended to the 2017 QIA and NWB Annual Report for Operations.

During August 2017, the pH of runoff collected in the WRF pond dropped below the pH discharge limits outlined in the MMER. Observations indicated the decrease in pH may have been the result of potential acid rock drainage (ARD). The pond was subsequently batch treated with sodium carbonate in mid-August 2017 to increase the pH within the permissible range for discharge. Although the batch treatment was initially successful in raising the pH of runoff contained with the pond, subsequent active discharges from the pond during late August and September resulted in several exceedances of the MMER and Type A Water Licence discharge criteria for pH and total suspended solids (TSS). Exceedances for the non-compliant discharges were reported to the relevant regulators and are documented in NT-NU Spill Reports 17-289, 17-312, 17-328 and 17-361.

During an on-site INAC and ECCC inspection in late August, uncontrolled seepage originating from the toe of the pond's berm was observed that had not been previously identified in routine internal inspections and annual third party geotechnical or regulator inspections. The seepage was reported by Baffinland to relevant regulators and is documented in NT-NU Spill Report 17-312. Investigations into the origin of the seepage are ongoing. As a result of the concerns identified at the WRF, INAC issued an Inspector's Direction to Baffinland on September 5, 2017. On September 7, 2017 and September 13, 2017, the QIA and ECCC, respectively, notified Baffinland that both parties had initiated investigations into the 2017 events at the WRF.

Exceedances for Type A Water Licence monitoring locations were reported to the NWB, INAC and the QIA during 2017 in the monthly monitoring reports required by the Type A Water Licence. A full discussion of 2017 non-compliant discharges under the Type A Water Licence for the Project is provided in Baffinland's 2017 QIA and NWB Annual Report for Operations, submitted to the QIA and NWB on March 31, 2018 as a requirement of the Type A Water Licence and Commercial Lease.

Similarly, exceedances and non-compliant discharges under the MMER have been reported to ECCC via the NT-NU Spill Line and online MMER quarterly reporting system and are fully discussed in the 2017 MMER Annual Report.

## TRENDS

Overall, the frequency and nature of incidents involving the discharge of effluent to the receiving environment that exceeds the applicable discharge criteria have remained low and incidental since the start of operations in 2014.

**RECOMMENDATIONS / LESSONS LEARNED**

In response to the non-compliant discharges from the WRF, Baffinland has taken multiple corrective actions to prevent additional non-compliant discharges from the WRF and retained Golder Associates (Golder) to determine the appropriate corrective actions required to address the seepage observed at the WRF in 2017 and investigate the potential for ARD and develop mitigation measures, as required. Preliminary mitigation measures planned for 2018 include the mobilization of a water treatment system to manage potential non-compliant waters in the WRF pond during 2018. Refer to the 2017 QIA and NWB Annual Report for Operations for further details on the concerns identified at the WRF in 2017 and the corrective actions taken and planned.

To improve the water quality of surface water drainage at the Project during freshet, Baffinland continues to implement the corrective actions and improvements outlined in the Sedimentation and Dust Mitigation Action Plans and Tote Road Earthworks Execution Plan (TREEP).

Baffinland continues to update the Project's management plans and implement additional control measures to ensure discharges to the receiving environment are in compliance with applicable water quality discharge criteria.

## Project Certificate Condition No. 25

Category	Landforms - Additional Geotechnical Investigations
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to sensitive landforms.
Term or Condition	The Proponent shall undertake the additional geotechnical investigations to identify sensitive landforms, modify engineering design for Project infrastructure, develop and implement preventative and/or mitigation and monitoring measures to minimize the impacts of the Project's activities and infrastructure on sensitive landforms.
Relevant Baffinland Commitment	N/A
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Qikiqtani Inuit Association
Reference	Borrow Source Management Plan – Kilometre 97 (Baffinland, 2014c) 2017 QIA and NWB Annual Report for Exploration and Geotechnical Drilling Activities (Baffinland, 2018d) 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b)
Ref. Document Link	Management plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

In 2017, Barry H. Martin, P. Eng., Consulting Engineer, completed two (2) geotechnical inspections of the following Project facilities and infrastructure:

- Active Quarries (Q1, QMR2);
- Bulk Fuel and Waste Storage Facilities;
- Sedimentation Ponds and associated Surface Water Drainage Infrastructure;
- Polishing and Waste Stabilization Ponds (PWSPs); and
- Select Water Crossings and Areas along the Tote Road.

The inspections took place from August 1<sup>st</sup> to 10<sup>th</sup>, 2017 and September 27<sup>th</sup> to October 3<sup>rd</sup>, 2017. The inspections were carried out in accordance with the guidelines set out in the Canadian Dam Association's Dam Safety Guidelines 2007.

The inspections primarily focused on the following aspects:

- The structures were inspected for conformance with the design basis as presented in "as constructed" and "as-built" drawings (provided in the first and subsequent reports);
- The structures were specifically inspected for settlement, cracking, and seepage through the berms;



- The areas around the structures were examined for evidence of seepage;
- Quarry walls were reviewed for relative stability; and
- New structures under construction were reviewed for conformity with design drawings.

In addition, geotechnical investigations continued to be conducted at Project sites and along the length of the proposed north railway between the Mine Site and Milne Port, to support engineering studies for future Project infrastructure.

## RESULTS

Results from the geotechnical inspections at the Mine Site indicate there has been little to no erosion from wind or rain and the dykes constructed of the sand/gravel soil for fuel and waste storage facilities have remained stable at slopes of 3:1 and 4:1. As noted in previous years, there are minor signs of settlement appearing at PSWP's 1, 2 and 3. The settlements are not differential settlements of the dykes but are minor overall settlements of the total structures with respect to the surrounding area. These settlements appear within the one (1) metre ( $\pm$ ) active layer above the permafrost and are of little concern as the PWSP's are temporary structures and the settlements have no effect on the dyke stability.

The 2017 geotechnical inspections reports, along with Baffinland's plans to address any identified concerns, are included in Appendix G.

Details of the geotechnical investigations (e.g. drilling) completed in 2017 are discussed in the 2017 QIA and NWB Annual Report for Exploration and Geotechnical Drilling Activities (Baffinland, 2018d).

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Results from geotechnical investigations conducted in 2017 will be used to support the design of future Project infrastructure.

As identified in previous years, Project's activities have led to localized permafrost degradation along the Tote Road. In 2018, to address permafrost degradation at the Km 97 Borrow Source, Baffinland plans to continue implementing the borrow source's progressive reclamation and rehabilitation plan outlined in Appendix B of the borrow source's approved management plan titled Borrow Source Management Plan – Kilometre 97 (Baffinland, 2014c).

## Project Certificate Condition No. 26

Category	Landforms and Soils - Erosion Management Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To develop appropriate measures for preventing destabilization and erosion.
Term or Condition	The Proponent shall develop and implement a comprehensive erosion management plan to prevent or minimize the effects of destabilization and erosion that may occur due to the Project's construction and operation.
Relevant Baffinland Commitment	57
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Qikiqtani Inuit Association, Fisheries and Oceans Canada, Environment and Climate Change Canada
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f) Environmental Protection Plan (Baffinland, 2016g)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

A comprehensive erosion management plan is included in the Surface Water and Aquatic Ecosystem Management Plan, which is approved by the NWB under the Type A Water Licence.

Specific sediment and erosion control measures and procedures used at the Project are also discussed within the Project's Environmental Protection Plan:

- Section 2.3 Land Disturbance;
- Section 2.9 Sediment and Erosion Control;
- Section 2.18 Road Construction and Borrow Development;
- Section 2.19 Tote Road Watercourse Crossing Installation;
- Section 2.25 Quarry and Borrow Pit Operation; and
- Section 2.27 Excavations and Foundations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 27

Category	Landforms, Geology and Geomorphology - Natural Aesthetics
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to natural aesthetics.
Term or Condition	The Proponent shall include within its public consultation report information related to the sentiments expressed by affected communities about the impacts that changes to the topography and landscape have had on the aesthetic value of the Project area.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	The Communities of: Artic Bay, Clyde River, Hall Beach, Igloolik and Pond Inlet
Reference	2017 Community Meeting Notes
Ref. Document Link	Appendix B

### METHODS

In the spring of 2017, Baffinland held public meetings within the five (5) North Baffin communities. These public meetings provide an important opportunity for Baffinland to share information with the Communities related to current operations, the results of ongoing environmental monitoring programs and future planning to support the development of the Project. The Public Meetings were held on the following dates:

- Arctic Bay - May 31, 2017;
- Clyde River - May 29, 2017;
- Hall Beach - June 2, 2017;
- Igloolik - June 1, 2017; and
- Pond Inlet - May 30, 2017.

The Public Meetings also serve as an opportunity for Baffinland to obtain feedback from community members on the Project. This includes discussions of their ongoing concerns, interests in participating in the benefits related to the Project and any changes they may have seen in the landscape as a result of the Project.

### RESULTS

Public consultation did not reveal any significant concerns from affected communities about the impacts that changes to the topography and landscape have had on the aesthetic value of the Project area. Other comments about changes to the land and sea were focused on ensuring the effects of the Project were being monitored and mitigated, and concerns with potential Project related effects on land use (hunting and harvesting).

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to track and report on comments made regarding the aesthetic value of the Project area.

## Project Certificate Condition No. 28

Category	Landforms, Geology and Geomorphology - Permafrost
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure that permafrost integrity is maintained.
Term or Condition	The Proponent shall monitor the effects of the Project on the permafrost along the railway and all other Project affected areas and must implement effective preventative measures to ensure that the integrity of the permafrost is maintained.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Complaint
Stakeholder Review	Environment Climate Change Canada, Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board.
Reference	Annual Geotechnical Inspections (Martin, 2017a,b) Environmental Protection Plan (Baffinland, 2016g) Tote Road Earthworks Execution Plan and Design Report (Golder, 2017a)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

Biannual geotechnical inspections are completed by Barry H. Martin, P.Eng., as required by the Nunavut Water Board (NWB) Licence No. 2AM-MRY 1325 for the following on-site engineered facilities at the Mine and Port:

- Pit walls;
- Quarries;
- Landfills;
- Land farms;
- Bulk fuel storage facilities;
- Sediment ponds;
- Collection ponds; and
- Polishing and waste stabilization ponds.

Inspections in 2017 took place between August 1-10 and September 2 to October 3, 2017 in accordance with the requirements for two biannual inspections to be carried out within the open water shipping season at the Mine Site and Milne Port. The inspection reports are provided to regulators for review and comment. Inspections are carried out in accordance with the Canadian Dam Association (CDA) *Dam Safety Guidelines* (CDA, 2007). The reports are included in Appendix E.

The inspections focus on the following aspects of the facilities:

- Conformance with design basis as presented in as-constructed and as-built drawings;
- Evidence of settlement, cracking, and seepage through berms;

- Examination of seepage around structures; and
- Observations of the relative stability of pit and quarry walls.

The north railway will form a part of the biannual inspections once it is constructed.

## RESULTS

The biannual geotechnical inspections indicated that the Mary River Polishing/Waste Stabilization Ponds (PWSPs) 1, 2 and 3 were noted to be experiencing minor overall settlements of the structures with respect to the surrounding area. The minor settlement is restricted to the berms.

Upon recommendations from 2016 geotechnical inspection, the Milne Port Ore Stockpile Sedimentation Ponds were repaired to recommendations to retain structural integrity and mitigate permafrost degradation. The inlets were reconstructed and possible water infiltration addressed.

During a scheduled inspection with INAC and ECCC, it was noted that there was seepage potentially coming from the Waste Rock Sedimentation pond at the Mine. Baffinland has retained third party expertise, to develop a plan to be actioned in 2018 to mitigate the identified issues and restore the integrity of the Pond addressing potential resultant permafrost degradation.

On inspection, the Nunavut Impact Review Board also noted potential terrain instability at the waste water effluent outflow. Baffinland incorporated a review of this terrain into the 2017 geotechnical inspection program which noted minor settlement due to naturally occurring processes. Baffinland will address stability concerns through addition of aggregate and rip rap at strategic locations.

Specific permafrost degradation areas adjacent to the Tote Road and Borrow locations were targeted during 2017 through general road maintenance programs and through the continuance of Tote Road Earth Works Execution Plan, an addendum to Baffinland's *Fisheries Act* Direction Completion Report (2016). Unstable and slumping slopes adjacent to the Tote Road were targeted and remediated with armour stone and trial erosion mitigation products, i.e. Concrete Cloth.

## TRENDS

As identified in previous years, project's activities have led to localized permafrost degradation issues along the Tote Road and Mine Haul Road. Baffinland continues to monitor, research strategies and remediate identified locations as required.

## RECOMMENDATIONS / LESSONS LEARNED

Project designs and the placement of infrastructure consider sensitive landforms and permafrost. Issued for construction drawings are submitted to the NWB in accordance with Water License No. 2AM-MRY 1325. Baffinland continues to have a third-party conduct biannual geotechnical inspections.

To address historic localized permafrost degradation issues along the Tote Road and Mine Haul Road, Baffinland has retained third-party consultants to assess, develop and prioritize preventative and mitigation measures to minimize the impacts of the Project's activities and infrastructure on landforms along the Tote Road and Mine Haul Road. This work is reflected in Baffinland's 2018 Work Plan (Baffinland, 2018c) and captured in a Tote Road Earthworks Execution Plan (TREP; Golder, 2017a) scheduled for continuance in 2018.

## Project Certificate Condition No. 29

Category	Landforms, Geology and Geomorphology - Design Plans
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To confirm constructed components meet design as assessed.
Term or Condition	The Proponent shall provide to the respective regulatory authorities, for review and acceptance, for-construction engineering design and drawings, specifications and engineering analysis to support design in advance for constructing those facilities. Once project facilities are constructed, the Proponent shall provide copies of the as-built drawings and design to the appropriate regulatory authorities.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board (NWB), Nunavut Impact Review Board (NIRB), Indigenous and Northern Affairs Canada (INAC), Qikiqtani Inuit Association (QIA)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

As required by the Type A Water Licence and Commercial Lease, several engineering submissions were provided to regulatory agencies and stakeholders throughout 2017, including Issued-for-Construction (IFC) and As-Built Drawings as well as Construction Summary Reports. A summary of submissions is provided in Table 4.14.

**Table 4.14 Submissions Provided to Regulatory Agencies and Stakeholders**

Date of Submission	Regulatory Agencies and Stakeholders	Content
March 31 2017	NWB, QIA	Construction Summary Report - Mine Site Waste Rock Sedimentation Pond and Drainage Ditch
April 24 2017	NWB	IFC Drawings and Design Specifications - Modification Request No. 1 - 2017 Mine Site Crusher Pad Expansion
June 21 2017	NWB, INAC, QIA	IFC Drawings and Design Specifications - Modification Request No. 3a - Milne Port Accommodations Camp Pad and Proposed Surface Water Diversion System
June 23 2017	NWB, INAC, QIA	IFC Drawings and Design Specifications - Revised Modification Request No. 3a - Milne Port Accommodations Camp Pad and Proposed Surface Water Diversion System
July 12 2017	NWB, NIRB, INAC, QIA	IFC Drawings and Design Specifications - Modification Request No. 2 - Milne Inlet Fuel Storage Facility Capacity Increase
July 19 2017	NWB, NIRB, INAC, QIA	IFC Drawings and Design Specifications - Modification Request No. 3 - Milne Port Accommodations Camp Upgrade
July 26 2017	NWB, INAC, QIA	IFC Drawings and Design Specifications - Modification Request No. 4 - Mine Site Accommodations Upgrade
August 10 2017	NWB, NIRB, INAC, QIA	Supplementary Information: STP Engineering Drawings and Specifications - Modification Request No. 3 - Milne Port Accommodations Camp Upgrade
August 11 2017	NIRB	IFC Drawings and Design Specifications - Modification Request No. 2 - Milne Inlet Fuel Storage Facility Capacity Increase
August 22 2017	NWB, NIRB, INAC, QIA	IFC Drawings and Design Specifications - Revised Modification Request No. 2 - Milne Inlet Fuel Storage Facility Capacity Increase
August 24 2017	NIRB	IFC Drawings and Design Specifications - Modification Request No. 4 - Mine Site Accommodations Upgrade (Request for Project Certificate Review)
September 27 2017	NWB, NIRB, INAC, QIA	IFC Drawings and Design Specifications - Modification Request No. 5 - Mine Site Crusher Pad Sedimentation Pond Expansion
November 6 2017	NWB, NIRB, INAC, QIA	IFC Drawings and Design Specifications - Modification Request No. 6 - Tote Road Upgrades, Milne Port Increased Fuel Storage, and Milne Port Accommodations Camp

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to provide the appropriate regulatory agencies and stakeholders, for review and acceptance, design and engineering documentation, drawings and construction reports for current and future Project infrastructure.



## Project Certificate Condition No. 30

Category	Landforms, Geology and Geomorphology - Quarries
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide oversight on quarry design and management.
Term or Condition	The Proponent shall develop site-specific quarry operation and management plans in advance of the development of any potential quarry site or borrow pit.
Relevant Baffinland Commitment	65
Reporting Requirement	Plans to be provided to the NIRB for review and comment at least 30 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA), Nunavut Water Board (NWB)
Reference	QMR2 Quarry Management Plan (Baffinland, 2017f) Q1 Quarry Management Plan (Baffinland, 2017g)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Site-specific management plans for quarries and borrow sources have been developed and delivered to the relevant regulators and stakeholders prior to development.

### RESULTS

During 2017, revised quarry management plans for the Q1 Quarry at Milne Port and QMR2 Quarry at the Mine Site were submitted by Baffinland and approved by the QIA. Revisions made to the quarry management plans during 2017 focused on updating each quarry's proposed quarry design and development footprint.

### TRENDS

None

### RECOMMENDATIONS / LESSONS LEARNED

Further site-specific management plans for quarries and borrow sources will be developed as required and communicated to the relevant regulators and stakeholders prior to development.

#### 4.6.6 Vegetation (PC Conditions 31 through 40)

Ten (10) PC conditions relate to the potential impacts of the Project on vegetation. Several of the conditions require the development of vegetation monitoring plans within the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP).

##### *Stakeholder Feedback*

Key stakeholders that have expressed concern regarding vegetation have included the QIA, ECCC and the Government of Nunavut (GN). Issues related to vegetation have included a desire to minimize the overall footprint of the Project, concerns over potential introduction of invasive terrestrial vegetation species and the potential for ore dust deposited on vegetation and soil to be taken up by plants, potentially affecting foraging wildlife such as caribou. Additionally, despite the climatic challenges to revegetation at closure, stakeholders have expressed an interest in revegetation being incorporated into reclamation plans. Responses to these issues are reflected in PC Conditions 31 through 40. Effects to vegetation have not been raised in 2017 consultation activities (Appendix B).

##### *Monitoring Activities*

Baffinland's vegetation monitoring programs include the following

- Vegetation abundance monitoring;
- Vegetation and soil base metal sampling;
- Exotic invasive plant species monitoring program;
- Monitoring of natural revegetation in disturbed areas; and
- Dustfall monitoring.

Not all of these programs involve annual sampling, and trends may become apparent only after many years of monitoring. In 2017, metals in soil and lichen were resampled at two (2) sites where metal concentrations in soil and lichen had been reported above the threshold in 2016. Metal concentrations in soil and lichen samples at sites L-71 and L-91 were below CCME and relevant thresholds provided in the literature, suggesting that 2016 sample analysis may have been elevated due to either analytical or field collection outliers. Baseline metal concentrations across all 2012 to 2016 vegetation and soil base metals monitoring sites are below Project-specific thresholds.

Table 4.15 provides an evaluation of the Project's impacts on vegetation, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.15 Vegetation Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Vegetation Health	Ore dust emissions result in an increase in concentrations of contaminants of potential concern in soils and vegetation	Metals analysis of soil and vegetation; all results within expected range, following resampling of two stations confirmed in 2017 to be outliers. Insufficient data exists for trend analyses	Within FEIS predictions
Vegetation Abundance	Dustfall results in changes in species composition and vegetation abundance	Monitoring has not indicated differences in ground cover or canopy cover with distance from the project	Within FEIS predictions
Invasive Species	Invasive species introduction to North Baffin Island	Monitoring is conducted every 5 years (i.e., 2014 and again in 2019)	N/A

*Path Forward*

In accordance with the TEMMP, the next round of vegetation monitoring will be undertaken in 2019. Baffinland is considering repeating the program in 2018 based on recommendations from the QIA and will base this decision on the evaluation of the 2017 dataset as well as forthcoming discussions with the TEWG.

## Project Certificate Condition No. 31

Category	Vegetation - Construction and Operations
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To minimize impacts to vegetation.
Term or Condition	The Proponent shall ensure that Project activities are planned and conducted in such a way as to minimize the Project footprint.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Environmental Protection Plan (Baffinland, 2016g) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	Management plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's Project design philosophy focuses on minimizing earthworks, re-using existing facilities, and using pre-assembled infrastructures to minimize construction activities in the Project area. Design activities undertaken to minimize the Project footprint include:

- Using pre-cast concrete where feasible including the use of integrated module foundations;
- Using pre-assembled material packages, such as building wall and roof panels, ground conveyors, elevated conveyors, conveyor bents, fuel tanks etc.;
- Using complete multi discipline modules such as screen building modules, crushing building modules, powerhouse modules, transfer stations, etc.;
- Purchasing fully-assembled yard and mobile mining equipment offsite such as the stacker, reclaimers, ship loader, loader, mine haul truck, etc.;
- Conducting Environmental Protection Plan training, which outlines the importance of minimizing disturbed land at the Project and the process that must be followed prior to construction on non-disturbed land; and
- Ensuring appropriate approvals are met with applicable stakeholders and land lease agreement.

### RESULTS

To-date, Baffinland has completed all required construction activities for the Project within the Project Development Area (PDA). Baffinland also restricts any overland movement of equipment or personnel that are required to operate to existing site roads and laydowns. Any unauthorized land disturbance or deviation from the PDA is reported as an incident and is investigated. Any overburden that is removed from an area to be disturbed is stockpiled for the remediation of the area.

**TRENDS**

Baffinland has completed all construction within the PDA. In general, any physical disturbance to plant cover likely results in the loss of plants in the immediate area. During the construction activities, direct habitat loss occurred primarily due to surface disturbance including compaction, burial, and removal. During the operations phase, vegetation loss occurs mainly as ore extraction expands within Deposit No. 1, laydowns are constructed for material storage and as quarries expand to support ongoing maintenance.

**RECOMMENDATIONS / LESSONS LEARNED**

Long term vegetation and dustfall surveys will continue to be monitored and used for analysis to determine if vegetation is being impacted by the development footprint of construction and operations infrastructure and activities.

## Project Certificate Condition No. 32

Category	Vegetation - Construction and Operations
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent introduction of invasive species.
Term or Condition	The Proponent shall ensure that equipment and supplies brought to the Project sites are clean and free of soils that could contain plant seeds not naturally occurring in the area. Vehicle tires and treads in particular must be inspected prior to initial use in Project areas.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

1. All equipment and supplies are to be inspected by Supplier's prior to being offloaded at Baffinland's Milne Port. All service agreements and contracts sent to suppliers were updated in the beginning of 2017 to include a clause "All equipment delivered to site must be free and clear of soils that may contain seeds of invasive species."
2. Baffinland continues to monitor and regulate employees seeking to bring plants (e.g. office plants) to site. Vegetation surveys were conducted in 2017 to monitor for invasive species.
3. Baffinland is currently in the process of creating a standard operating Procedure to mitigate risk associated with introduction of invasive species to the Project Site.

### RESULTS

Terrestrial vegetation surveys conducted in 2017 concluded that no invasive species were introduced in the Project area as a result of Project activities.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

A Baffinland Standard Operating Procedure for Invasive Species is in the process of being developed. The operating procedure will outline mitigation measures to be taken to reduce the potential for introducing invasive species at the Project.

## Project Certificate Condition No. 33

Category	Vegetation - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To facilitate monitoring.
Term or Condition	The Proponent shall include relevant Monitoring and Management Plans within its Environmental Management System, Terrestrial Environment Management and Monitoring Plan (TEMMP).
Relevant Baffinland Commitments	57
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

The TEMMP includes vegetation monitoring consisting of the following components: vegetation abundance and composition, vegetation health, culturally-valued vegetation, exotic invasive vegetation and natural revegetation and dustfall. The TEMMP is updated on a regular basis to reflect adjustments to programs to reflect analytical results, statistical power analysis, and input provided on programs by the TEWG and annual review by the Nunavut Impact Review Board.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Regularly updating mitigation and monitoring plans to reflect regulator and TEWG feedback has been invaluable in addressing regular analytical results, evolving methods, and adapting to further understanding of the potential Project-related effects.

## Project Certificate Condition No. 34

Category	Vegetation - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	<ol style="list-style-type: none"> <li>1. Monitor metals concentrations in both soils and vegetation, particularly caribou forage (i.e., lichen) at varying distances from the PDA to compare metal concentrations in soil and vegetation between near (impacted) and far (control) sites.</li> <li>2. Determine if metal concentrations in soil and vegetation exceed CCME and relevant available threshold levels provided in the literature.</li> </ol>
Term or Condition	The Proponent shall conduct soil sampling to determine metal levels of soils in areas with berry-producing plants near any of the potential development areas, prior to commencing operations.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

The vegetation and soil base metals monitoring program began in 2014 prior to commencing operations, and considers three (3) Project components (Milne Port, Tote Road, Mine Site) at varying distances from the Project Development Area (PDA; 0 to 100 m; 101 to 1000 m; >1000 m). Soil and lichen samples are collected every three (3) to five (5) years, typically between late July to early August. Samples are analyzed for total metal concentrations to assess the relationship of metals in soil and lichen with distance from the PDA. A subset of total metals, referred to as contaminants of potential concern (CoPC), are selected for analysis and typically includes arsenic, cadmium, copper, lead, selenium and zinc. The CoPCs are compared to Project-specific thresholds. In 2017, two (2) sites were resampled where metal concentrations in soil and lichen were reported above the threshold during 2016 sampling. Site L-71 was resampled for lead in lichen within 100 m of Tote Road and Site L-91 was resampled for copper in soil within 100 m of Milne Port.

### RESULTS

Metal concentrations in soil and lichen samples at sites L-71 and L-91 were below CCME and relevant thresholds provided in the literature, suggesting that 2016 sample analysis may have been elevated due to either analytical or field collection outliers. Baseline metal concentrations across all 2012 to 2016 vegetation and soil base metals monitoring sites are below Project-specific thresholds.



**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland is considering repeating the program in 2018 based on recommendations from the QIA and will base this decision on the evaluation of the 2017 data set as well as forthcoming discussions with the TEWG.

## Project Certificate Condition No. 35

Category	Vegetation - Monitoring
Responsible Parties	The Proponent, local Hunters and Trappers Organizations
Project Phase(s)	Construction and Operations
Objective	To determine baseline metal levels in foraging caribou.
Term or Condition	The Proponent shall undertake monitoring of baseline metal levels in organ tissue from caribou harvested within the local study area, prior to commencing operations. The Proponent is strongly encouraged to coordinate with local Hunters and Trappers Organizations regarding procurement of harvested caribou organs.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

Not applicable.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

The North Baffin caribou herd is at low numbers and there are few to no caribou being harvested, particularly by harvesters that travel through the Mary River Project site, from which to collect samples.

At the November 17, 2015 TEWG Meeting No. 7, Baffinland asked if the Government of Nunavut (GN) would like Baffinland to distribute sample kits to hunters coming through the site. The GN's response was that no kits were available to send to site.

A suitable sampling protocol has yet to be developed in coordination with the GN and the local HTOs.

## Project Certificate Condition No. 36

Category	Vegetation - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	Measure percent plant cover and plant group composition of available caribou forage within the RSA to track potential changes at varying distances from the edge of the PDA through long-term monitoring.
Term or Condition	The Proponent shall establish an ongoing monitoring program for vegetation species used as caribou forage (such as lichens) near Project development areas, prior to commencing operations.
Relevant Baffinland Commitments	67
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

A monitoring program for caribou forage focused on lichen abundance at sites close to and away from the Mine Site, Milne Port and the Tote Road was established in 2014. To align with other vegetation monitoring requirements, lichen monitoring was included in the broader vegetation abundance program.

The vegetation abundance monitoring program includes 15 transects, 66 sites, and 151 plots. Six transects radiate out from the Mine Site, five transects from the Tote Road, and four transects from Milne Port. In addition, six control (reference) sites were established within the regional study area (RSA), approximately 20 km from the Project footprint. Along each transect, sample sites are located at 30, 100, 750, and 1,200 m from the Project Development Area (PDA). Each sample site consists of one (1) open plot and one (1) closed plot. Vegetation within each plot is sampled for percent plant cover by plant group using the point quadrat method. The plant groups selected for the study include deciduous shrubs, evergreen shrubs, forbs, graminoids, moss, lichen, and standing dead litter. Data are analyzed for total percent ground cover, total percent canopy cover, and percent cover by plant group to determine the relationship to distance from the PDA, while accounting for the potential effect of herbivory. 2017 is the first year that vegetation abundance data were analyzed among years including data from 2014, 2016, and 2017.

### RESULTS

There is no evidence of changes in vegetation abundance in the Project area from 2014 to 2017 as a result of the Project.

- Total ground cover was 94.5% (CI = 92.5– 96.1) in 2014, 91.5% (CI = 88.8– 93.6) in 2016, and 90.2% (CI = 87.3– 92.6) in 2017. Average ground cover in closed plots was 91.4% (CI = 88.6– 93.6) and open plots was 93.1% (CI = 90.9– 94.8). Across years there was no evidence of an interaction between year and distance class ( $p = 0.32$ ) or a main effect of year ( $p = 0.75$ ). There was no three-way interaction between year, distance, and treatment ( $p = 0.93$ ). In the ground cover layer, there were small differences in percent plant cover of plant groups. Moss and lichen cover declined between 2014 and 2016/2017, while ground litter increased during the same period.

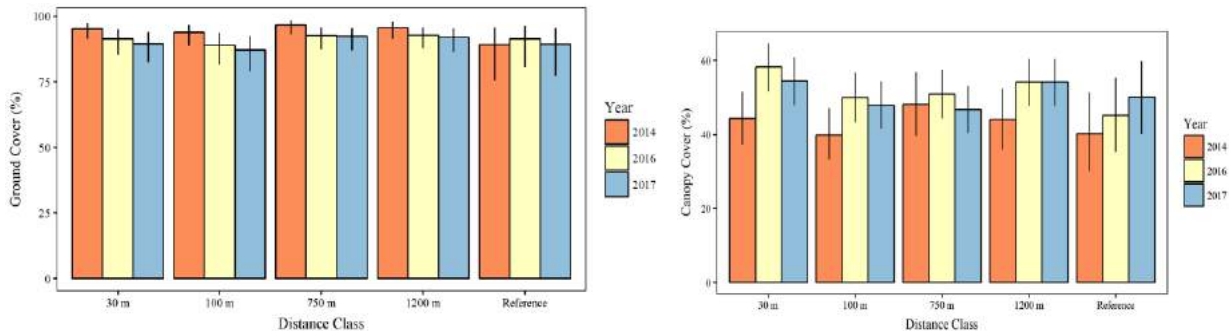
- Total canopy cover was 43.3% (CI = 39.5– 47.1) in 2014, 51.7% (CI = 48.3– 55.0) in 2016, and 50.6% (CI = 47.4– 53.9) in 2017. There was no support for a main effect of distance class on total canopy cover ( $p = 0.43$ ). There was no evidence for a main effect of treatment on total canopy cover ( $p = 0.33$ ) or for interactions between treatment and distance or year (all  $p > 0.17$ ). Changes in total percent canopy cover were driven by differences in percent plant cover of plant groups. In the canopy cover layer there was an increase in the amount of standing dead litter and a simultaneous decrease in graminoids cover over the same period; however, differences were small in magnitude and showed no consistent pattern in relation to distance from Project infrastructure.

As a result, there is no evidence to support a Project-related effect.

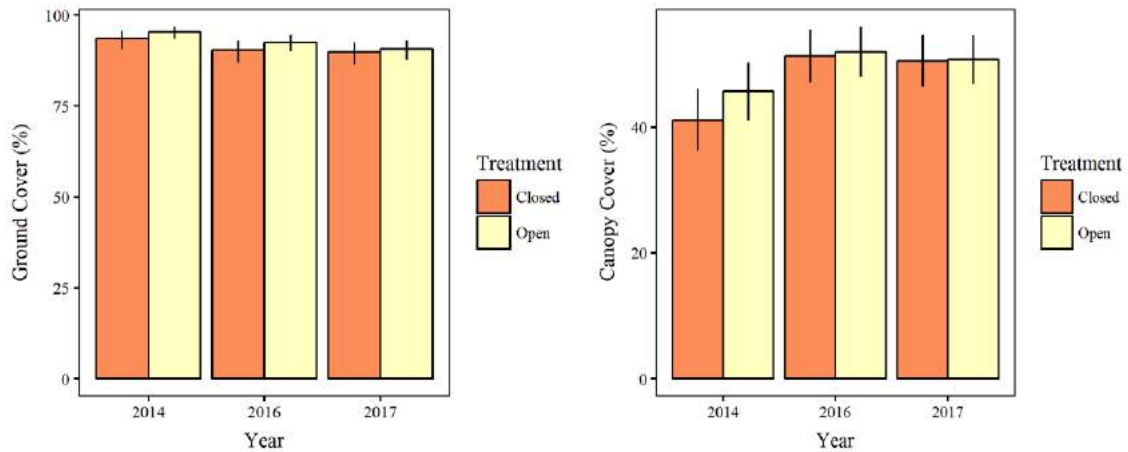
**TRENDS**

Trends are presented on Figures 4.2 to 4.4, and can be summarized as follows:

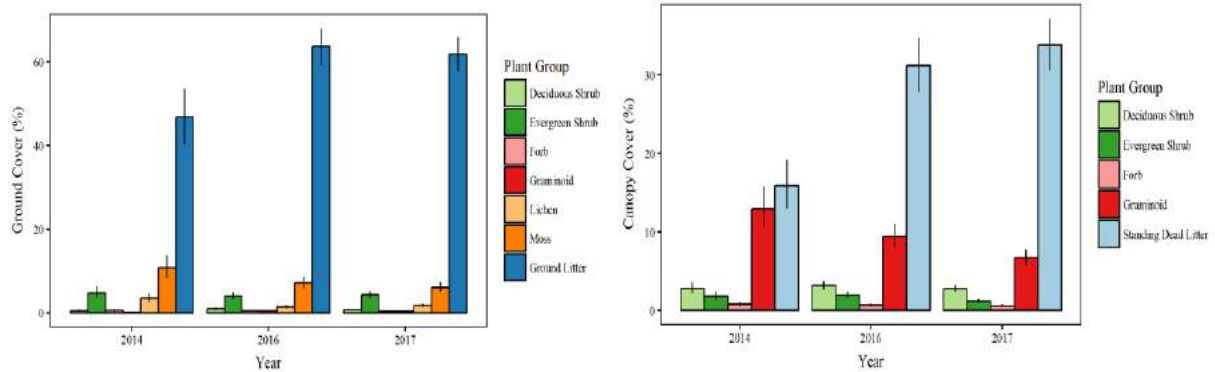
- There is annual variation in vegetation abundance in the Project area, but there is no evidence of changes in vegetation abundance as a result of a Project effect. Differences in total ground cover, total canopy cover, and cover between open and closed plots among years were small in magnitude and showed no consistent pattern in relation to distance from Project infrastructure; therefore, differences have been attributed to natural variation among years rather than a Project-related effect.
- There is annual variation in the cover of some plant groups in the Project area. These differences were found across all plots; therefore, the variation is attributed to natural variation in plant group cover and there is no evidence to support a Project-related effect in the first three (3) years of monitoring.



**Figure 4.2 Total Ground Cover and Total Canopy Cover by Distance Class and Year**



**Figure 4.3 Total Ground Cover and Total Canopy Cover by Treatment and Year**



**Figure 4.4 Ground Cover and Canopy Cover by Plant Group and Year**

The 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) provides further details.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue monitoring at all 15 transects and 66 sites as part of the vegetation abundance monitoring program and in accordance with the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j).

## Project Certificate Condition No. 37

Category	Vegetation - Monitoring
Responsible Parties	The Proponent, Government of Nunavut Department of Environment
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent establishment of invasive species.
Term or Condition	The Proponent shall incorporate protocols for monitoring for the potential introduction of invasive vegetation species (e.g. surveys of plant populations in previously disturbed areas) into its Terrestrial Environment and Monitoring Plan. Any introductions of non-indigenous plant species must be promptly reported to the Government of Nunavut Department of Environment.
Relevant Baffinland Commitments	43, 68
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2014 Terrestrial Environment Annual Monitoring Report (EDI, 2015) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Exotic invasive vegetation monitoring is focused on surveying previously disturbed areas within and adjacent to the Project footprint. Presence/absence sampling is used to search for exotic invasive vegetation where invasive plants could be found (i.e., disturbance areas along buildings, infrastructure and road ditches). Each of the three focal areas (the Mine Site, Milne Inlet, and Tote Road) is surveyed on foot, with some sections surveyed in a vehicle at slow speeds along the Tote Road. The TEMMP specifies that the monitoring of exotic invasive vegetation will take place every five years.

### RESULTS

Not applicable in 2017 as surveys were not conducted.

### TRENDS

A trend analysis is not applicable at this time as there has only been one round of data collection. Trend analyses will be completed when more data are collected and analyzed and as appropriate.

### RECOMMENDATIONS / LESSONS LEARNED

Continue monitoring in 2019 as part of the exotic invasive vegetation and natural regeneration program and in accordance with the TEMMP (Baffinland, 2016j).

## Project Certificate Condition No. 38

Category	Vegetation - Adaptive Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to vegetation abundance, diversity, and health.
Term or Condition	The Proponent shall review, on an annual basis, all monitoring information and the vegetation mitigation and management plans developed under its Environmental Management System, Terrestrial Environment and Monitoring Plan (TEMMP) and adjust such plans as may be required to effectively prevent or reduce the potential for significant adverse project effects on vegetation abundance, diversity and health.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

#### *Vegetation Abundance*

The vegetation abundance monitoring program includes 15 transects radiating out from the Mine Site (six transects), Tote Road (five transects) and Milne Inlet (four transects). In addition, six (6) control (reference) sites were established within the regional study area (RSA), approximately 20 km from the Project footprint. Along each transect, sample sites are located at 30, 100, 750 and 1,200 m from the Project Development Area (PDA). Each sample site consists of one (1) open plot and one (1) closed plot. Vegetation within each plot is sampled for percent plant cover by plant group using the point quadrat method. The plant groups selected for this study include deciduous shrubs, evergreen shrubs, forbs, graminoids, moss, lichen, and standing dead litter. Data are analyzed for total percent ground cover, total percent canopy cover, and percent cover by plant group to determine the relationship to distance from the PDA, while accounting for the potential effect of herbivory. 2017 is the first year data were assessed among years for differences in percent plant cover and plant group composition.

#### *Vegetation and Soil Base Metals*

The vegetation and soil base metals monitoring program considers three (3) Project components (Milne Port, Tote Road, Mine Site) at varying distances from the PDA (0 to 100 m; 101 to 1000 m; > 1000 m). Soil and lichen samples are typically collected between late July to early August. Samples are analyzed for total metal concentrations to assess the relationship of metals in soil and lichen with distance from the PDA. A subset of total metals referred to as contaminants of potential concern (CoPC) were selected for the analysis including arsenic, cadmium, copper, lead, selenium, and zinc. These CoPC are compared to Project specific thresholds. In 2017, two (2) sites were resampled where metal concentrations in soil and lichen were reported above the threshold during 2016 sampling. Site L-71 was resampled for lead in lichen within 100 m of Tote Road and Site L-91 was re-sampled for copper in soil within 100 m of Milne Port.

### *Exotic Invasive Vegetation and Natural Regeneration*

Exotic invasive vegetation monitoring is focused on surveying previously disturbed areas within and adjacent to the Project footprint. Presence/absence sampling is used to search for exotic invasive vegetation where invasive plants could be found (i.e., disturbance areas along buildings, infrastructure and road ditches). Each of the three (3) focal areas (the Mine Site, Milne Inlet and Tote Road) are surveyed on foot, with some sections surveyed in a vehicle at slow speeds along the Tote Road.

## **RESULTS**

### *Vegetation Abundance*

- There is no evidence of changes in vegetation abundance in the Project area from 2014 to 2017 as a result of the Project.
- Total ground cover was 94.5% (CI = 92.5– 96.1) in 2014, 91.5% (CI = 88.8– 93.6) in 2016, and 90.2% (CI = 87.3– 92.6) in 2017. Average ground cover in closed plots was 91.4% (CI = 88.6– 93.6) and open plots was 93.1% (CI = 90.9– 94.8). There was no evidence of an interaction between year and distance class ( $p = 0.32$ ) or a main effect of year ( $p = 0.75$ ). There was no three-way interaction between year, distance, and treatment ( $p = 0.93$ ). In the ground cover layer, there were small differences in percent plant cover of plant groups. Moss and lichen cover declined between 2014 and 2016/2017, while ground litter increased during the same period.
- Total canopy cover was 43.3% (CI = 39.5– 47.1) in 2014, 51.7% (CI = 48.3– 55.0) in 2016, and 50.6% (CI = 47.4– 53.9) in 2017. There was no support for a main effect of distance class on total canopy cover ( $p = 0.43$ ). There was no evidence for a main effect of treatment on total canopy cover ( $p = 0.33$ ) or for interactions between treatment and distance or year (all  $p > 0.17$ ). Changes in total percent canopy cover were driven by differences in percent plant cover of plant groups. In the canopy cover layer there was an increase in the amount of standing dead litter and a simultaneous decrease in graminoids cover over the same period; however, differences were small in magnitude and showed no consistent pattern in relation to distance from Project infrastructure. As a result, there is no evidence to support a Project-related effect.

### *Vegetation and Soil Base Metals*

- Metal concentrations in soil and lichen samples at sites L-71 and L-91 were below CCME and relevant thresholds provided in the literature.
- Baseline metal concentrations across all 2012 to 2016 vegetation and soil base metals monitoring sites are below Project thresholds.

### *Exotic Invasive Vegetation and Natural Regeneration*

- Exotic invasive vegetation and natural regeneration monitoring was conducted once from August 1–3, 2014. No exotic invasive plant species were found within the Project footprint and adjacent areas.

## **TRENDS**

### *Vegetation Abundance*

- There is annual variation in vegetation abundance in the Project area, but there is no evidence of changes in vegetation abundance as a result of the Project. Differences in total ground cover, total canopy cover, and cover between open and closed plots among years were small in magnitude and showed no consistent pattern in relation to distance from Project infrastructure; therefore, differences are attributed to natural variation among years rather than a Project-related effect.



- There is annual variation in the cover of some plant groups in the Project area. These differences were found across all plots; therefore, the variation is attributed to natural variation in plant group cover and there is no evidence to support a Project related effect in the first three years of monitoring.
- For information related to general trends, please refer to PC Condition No. 36 and the 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018).

**RECOMMENDATIONS / LESSONS LEARNED**

Continue vegetation program monitoring in accordance with the TEMMP and guidance provided by the TEWG.

## Project Certificate Condition No. 39

Category	Vegetation - Reclamation and Revegetation
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent erosion and promote progressive revegetation of disturbed areas.
Term or Condition	The Proponent shall develop a progressive revegetation program for disturbed areas that are no longer required for operations, such program to incorporate measures for the use of test plots, reseeding and replanting of native plants as necessary. It is further recommended that this program be directly associated with the management plans for erosion control established for the Project.
Relevant Baffinland Commitment	39
Reporting Requirement	To be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board
Reference	Interim Closure and Reclamation Plan (ICRP; Baffinland, 2016i)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

As described in the ICRP, a Reclamation Research program is proposed to identify best practices for promoting natural revegetation that will inform the progressive revegetation program for disturbed areas that are no longer required for operations. Due to limited research conducted to date for mines in the Canadian Arctic, research will focus on the development of methods to successfully achieve sustainable vegetation cover that meets the desired land use for the Project sites post-closure, in the shortest duration possible. These sites include gravel roads, gravel pads, waste rock stockpiles, and waste dumps. The objective of this reclamation research program is to identify methods to successfully achieve a sustainable vegetation cover, and the ability of a vegetation cover to enhance physical stability and/or achieve the desired aesthetic conditions for the Project site at closure.

Specific objectives of the reclamation research program are:

- To determine which substrates are most effective for plant establishment and growth;
- To determine which groups and individual native plant species are able to establish and survive on a variety of substrates;
- To determine the duration groups and individual native plant species are able to establish and survive on a variety of substrates; and
- To evaluate the potential for native plant species to egress from site of introduction to adjacent areas.

### RESULTS

Disturbed areas associated with Project development are still utilised to date with the exception of a few containment berms and infrastructure pads that have been decommissioned and repurposed for other Project activities.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Because it is too early to establish experimental reclamation plots within the Project footprint, Baffinland will, in 2018, conduct a detailed desktop study of reclamation efforts, successes and lessons learned in Arctic Canada. This will build on earlier preliminary studies, and will focus on the utility of reclamation practices establishing native vegetation in a reasonable time frame during progressive reclamation and post-closure. The review will include work completed at other Arctic sites, including mine, municipality, and contaminated site (e.g., DEW line site) reclamation and remediation.

## Project Certificate Condition No. 40

Category	Vegetation - Reclamation and Revegetation
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent erosion and promote progressive revegetation of disturbed areas.
Term or Condition	The Proponent shall include revegetation strategies in its Site Reclamation Plan that support progressive reclamation and that promote natural revegetation and recovery of disturbed areas compatible with the surrounding natural environment.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	QIA
Reference	Interim Closure and Reclamation Plan (ICRP; Baffinland, 2016i)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

As described in the ICRP, a Reclamation Research program is proposed (under QIA review in 2017) to identify best practices for promoting natural revegetation that will inform the progressive revegetation program for disturbed areas that are no longer required for operations. Due to limited research conducted to date for mines in the Canadian Arctic, research will focus on the development of methods to successfully achieve sustainable vegetation cover that meets the desired land use for the Project sites post-closure in the shortest duration possible. These sites include gravel roads, gravel pads, waste rock, stockpiles, and waste dumps. The objective of the Reclamation Research Program is to identify methods to successfully achieve a sustainable vegetation cover, and the ability of a vegetation cover to enhance physical stability and/or achieve the desired aesthetic conditions for the Project site at closure.

Specific objectives of the Reclamation Research Program are:

- To determine which substrates are most effective for plant establishment and growth;
- To determine which groups and individual native plant species are able to establish and survive on a variety of substrates;
- To determine the duration groups and individual native plant species are able to establish and survive on a variety of substrates; and
- To evaluate the potential for native plant species to egress from site of introduction to adjacent areas.

### RESULTS

Not applicable for 2017.

### TRENDS

A Reclamation Research Program was proposed by Baffinland to identify best practices for promoting natural re-vegetation that will inform the progressive revegetation program for disturbed areas that are no longer required for operations. This program is currently under QIA review.

## RECOMMENDATIONS / LESSONS LEARNED

Studies and/or observations of natural re-vegetation, such as colonization potential of vegetation species to disturbed areas, will be undertaken as part of ongoing terrestrial monitoring and future reclamation research programs.

In 2016, Baffinland conducted a review of baseline data collection results applicable to re-vegetation. Findings indicated that approximately 20 plots were established historically on the old road surface or adjacent to it, in sites disturbed in the past. These sites were surveyed in the past to contribute to the knowledge of natural succession and the plant species that can become re-established without intervention. Findings include:

- Natural re-vegetation in this general environment is slow, but not as slow as expected. Based on observations on an old silver mine near the Doris North Project in the Kitikmeot Region, researchers expected little re-vegetation in the Mary River study area thirty years after use, but were surprised to find that considerable re-vegetation had occurred along the old tote road, particularly in damp areas. The difference is that much of the area traversed by the tote road is on sandy soils, whereas the Roberts Bay Silver Mine is located mostly on fractured gravels.
- Colonization of dry areas along the old roads, paths, and campsite areas is occurring slowly, so slowly as to be almost immeasurable in the time since the disturbance.
- Plant communities around the old mining camp near Sheardown Lake have been slightly affected by the addition of nutrients, and are, as expected, richer than normal, with more lush growth and more species of grasses and forbs.
- This colonization (around the old camp) may be on the wane, due to depletion of nutrients and lack of enrichment in the ensuing years.

There are plenty of local species that can be utilized for reclamation; it is neither necessary nor advisable to obtain plant stocks for reclamation from elsewhere. Use local/regional plant stocks and seed sources for any re-vegetation being done on the Mary River Project.

#### 4.6.7 Freshwater Environment (PC Conditions 41 through 48a)

Nine (9) PC conditions (includes 48 and 48a) relate to the potential impacts of the Project on the freshwater environment, focused on fish and other freshwater biota. Several of the conditions recommend environmental protection measures, such as setbacks from watercourses and meeting blasting thresholds, or relate to meeting discharge requirements for effluents and runoff (the latter is evaluated in Section 3.4.5).

##### *Stakeholder Feedback*

The Fisheries and Oceans Canada administers the fish and fish habitat sections of the *Fisheries Act*, and is therefore the primary stakeholder with respect to freshwater biota. The Nunavut Water Board also regulates in-water structures such as bridges and culverts. The QIA also provided valuable feedback in the freshwater biota component of previous environmental reviews. Freshwater biota has not been a key concern for local communities, as the Project does not interact with freshwater bodies containing anadromous (sea run) Arctic char. For most stakeholders, the use of explosives near or in fish-bearing waters was a key area of concern. Effects to fish and freshwater biota have not been raised in 2017 consultation activities (Appendix B).

##### *Monitoring Activities*

Monitoring activities undertaken in relation to the freshwater environment include:

- Monitoring of fish habitat offsetting measures associated with the 2007 Authorization under the Fisheries Act for crossings along the tote road (DFO, 2007);
- Monitoring of different trophic levels of the freshwater environment (benthics, fish) as part of the AEMP; and
- Monitoring of sedimentation rates in Sheardown Lake to evaluate the potential for dust from the project to affect incubating fish eggs.

##### **Tote Road Fish Use Assessments**

Related to the fish habitat offsetting measures associated with the Tote Road authorization, the following works and monitoring was conducted (Baffinland, 2017d):

- Two remaining sea container crossings were removed in early 2017;
- All compensation works remain successful (including fish use of the rustic fishway installed at BG-30);
- There was no in-stream construction work in 2017 during periods of flow that required turbidity monitoring;
- Fish use assessments in 2017 were conducted at all fish-bearing sites along the Tote Road;
- There were no fish passage or habitat issues observed at 23 of the 39 fish-bearing crossings assessed;
- An absence of fish in BG-50 downstream was unexpected. Juvenile char typically congregated in the downstream scour pool. Causes of their absence in 2017 are unknown but it is suspected to be a result of a perched culvert, though perhaps more fish were using the left branch of the river with the bridge crossing and unobstructed access to upstream habitat; and
- Issues with fish passage and/or habitat were observed at 12 crossings at the time of the survey in early July 2017. Three of these involved some form of physical obstruction to fish passage (e.g., instream silt fence, cobble piles at the upstream and/or downstream end of culverts) that was removed during, or shortly after, completion of the July survey. Perching of culverts was noted at five crossings and, in some instances (e.g., BG-50), prevented the passage by fish although the crossing at the left branch of the river allows passage. Several of these crossings showed greater perching (i.e., increase in vertical drop at downstream and/or upstream end of the culvert) than in previous years. The remaining four crossings with passage issues had damaged culverts that were blocking, or had the potential to block, fish passage. Crossings with

damaged or perched culverts were targeted by the TREP to improve all fish passage and any erosion and sedimentation issues. Ten crossings were actively worked on in 2017 and work is planned to continue in 2018.

**Freshwater Biota Monitoring Under the AEMP**

The results of monitoring in 2017 under the Type A Water Licence’s SNP as well as the AEMP is described in Section 4.5.5. Related to fish and fish habitat, monitoring under the AEMP determined that:

- Camp Lake System - No adverse effects to phytoplankton, benthic invertebrates or Arctic char were indicated at mine-exposed areas of the Camp Lake system in 2017;
- Sheardown Lake System - Sheardown Lake Tributary 12 presented differences in benthic invertebrate community structure that could be definitively linked to a mine-related influence. At this tributary, changes in the benthic invertebrate community assemblage relative to reference conditions and baseline studies appeared to be related to potential flow reduction and/or sedimentation. No adverse effects to phytoplankton, benthic invertebrates or Arctic char were indicated at mine-exposed areas of Sheardown Lake tributaries 1 and 9, Sheardown Lake NW, or Sheardown Lake SE in 2017; and
- Mary River/Mary Lake system - No adverse effects to phytoplankton, benthic invertebrates or Arctic char were indicated at mine-exposed areas of the Mary River, or Mary Lake in 2017.

**Lake Sedimentation Monitoring**

The principal conclusions of 2016 - 2017 lake sedimentation monitoring study in Sheardown Lake NW are as follows:

- Sheardown Lake NW sedimentation rates were significantly higher in the 2016-2017 ice cover period than during the mine baseline (2013-2014) and early operational (2014-2015) ice-cover periods, but are within the range observed among Canadian arctic lakes uninfluenced by anthropogenic activities;
- Sediment accumulation thickness estimated for the 2016–2017 Arctic char egg incubation/larval pre-emergence period at Sheardown Lake NW was well below the threshold effect level of 1 mm of sediment deposition based on estimates derived using SDLT1 dry bulk density; and
- These results were corroborated by the continued occurrence of relatively high numbers and significantly greater size and growth of Arctic char young-of-the-year at Sheardown Lake NW than at a comparable reference lake in August 2017.

Table 4.16 provides an evaluation of the Project’s impacts on the freshwater environment, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.16 Freshwater Environment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Freshwater Biota	Culvert replacements or extensions; sea container crossings were removed	Monitoring undertaken in accordance with the 2007 authorization under the <i>Fisheries Act</i> . All compensation works are effective. The last two sea container crossings were removed in early 2017.	Within FEIS predictions
	Culvert perching	Perching of five culverts were identified in 2017, with the degree of perching worse than previous years. These are targeted to be addressed in 2018.	Exceeds FEIS predictions
	Water withdrawals from lakes affecting nearshore fish habitat	Water withdrawals were within water licence limits	Within FEIS predictions
	Fish impingements at camp and dust suppression water takes	No monitoring; appropriate screens are used on all intakes	Within FEIS predictions

*Path Forward*

Baffinland plans to continue the implementation of surface water improvements outlined in the TREP during 2018 to address outstanding fish passage concerns at water crossings identified during in the 2017 assessments.



## Project Certificate Condition No. 41

Category	Freshwater Aquatic Environment - Setbacks
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts of runoff into freshwater aquatic habitat.
Term or Condition	Unless otherwise approved by regulatory authorities, the Proponent shall maintain a minimum 100-metre naturally-vegetated buffer between the high-water mark of any fish-bearing water bodies and any permanent quarries with potential for acid rock drainage or metal leaching.
Relevant Baffinland Commitment	64, 65
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Borrow Pit and Quarry Management Plan (Baffinland, 2014d) Q1 Quarry Management Plan (Baffinland, 2017g) QMR2 Quarry Management Plan (Baffinland, 2017f)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

An important aspect of planning during the EIS process was assessing the suitability of quarry material. Baffinland will avoid using quarry material that has the potential for generating Acid Rock Drainage (ARD) or Metal Leaching. Geotechnical investigations have been or will be carried out at the proposed sites, and ARD sources are being avoided. Testing was completed in 2010 by AMEC to determine the potential for acid rock drainage or metal leaching in proposed quarries that are now in operation. Section 3.1 Planning and Design of the Borrow Pit and Quarry Management Plan outlines the procedure described above. Additionally, Baffinland maintains specific quarry management plans that outline testing requirements to identify potential acid rock drainage material encountered during quarry operation and maintains appropriate buffers to fish bearing waters.

### RESULTS

No new quarries were developed in 2017. Existing quarries maintained the 100 metre buffer from the high water mark to any fish bearing water bodies. Construction activities increased in 2017, resulting in the requirement to expand certain existing quarries at the Project. Appropriate review approvals were reviewed and implemented with the QIA. Analyses for ARD indicators of quarried material were performed as per specific approved quarry management plans to ensure no potential acid generating material was used during construction activities.

### TRENDS

No quarries with the potential for ARD have been used to-date at the Project.

**RECOMMENDATIONS / LESSONS LEARNED**

New quarry developments will continue to be tested for ARD and metal leaching using the protocol for the Assessment for the Potential for Acid Rock Drainage (Borrow Pit and Quarry Management Plan, Appendix 2). The development of quarries with potential for acid rock drainage or metal leaching are not planned for the Project.

## Project Certificate Condition No. 42

Category	Freshwater Aquatic Environment - Setbacks
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts of runoff into freshwater aquatic habitat.
Term or Condition	The Proponent shall maintain minimum a 30-metre naturally-vegetated buffer between the mining operation and adjacent water bodies.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Non-Compliant
Stakeholder Review	Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Surface Water and Aquatic Ecosystems Management Plan (Baffinland, 2016f) Environmental Protection Plan (EPP; Baffinland, 2016g) Terrestrial Environmental Management and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland continues to perform bi-weekly inspections to ensure all Project-related operations are at a distance greater than 30 metres from any water body. If infractions are discovered, responsible departments for development areas are actioned to remove materials or infrastructure, and to reclaim the developed area. New proposed development areas must be approved by the Baffinland Site Environment Department to ensure the area has a setback of 30 metres from the high water mark of natural water bodies. Consultants preparing design drawings for new infrastructure are also made aware of the requirement. Baffinland conducts annual training on the EPP for superintendents and managers, and orientation training on the EPP for new contractors. The presentation provides an overview of key Project activities and the required natural vegetation buffers to any waterbodies.

### RESULTS

During internal inspections in 2017, instances of development within 30 m of a water body were discovered and responsible departments were actioned to address these issues. Baffinland Site Environment Department followed up with further inspections to ensure that infrastructure was relocated or material was reclaimed. In 2017 an incident did occur in Milne Port, when a construction pad was built over top of a non-fish bearing stream during winter months, when the stream was not readily evident. This resulted in a directive from Indigenous and Northern Affairs Canada. Baffinland took immediate action and demobilised the contractor from site. Upon review, a mitigation strategy was developed and a new ditching system was constructed to convey the stream around the pad after the appropriate approvals were received from the Nunavut Water Board.

**TRENDS**

With the exception of the non-compliance pad in Milne Port, Project operations have maintained the 30-m buffer between water bodies in previous years and the condition continues to be enforced.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland personnel continue to monitor all new Project developments to ensure the 30-m buffer condition is adhered to. Baffinland will ensure all requirements and mitigation measures are clearly communicated to Projects contractors.

## Project Certificate Condition No. 43

Category	Freshwater Aquatic Environment - Drainage
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts of runoff into freshwater aquatic habitat.
Term or Condition	Prior to the start of construction, the Proponent must submit a Site Drainage and Silt Control Plan to the appropriate regulatory authorities for approval.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Qikiqtani Inuit Association
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Drainage plans for Project sites and silt/sediment control measures used at the Project are outlined in the Surface Water and Aquatic Ecosystem Management Plan.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

The SWAEMP will continue to be followed and enforced at the Project.

## Project Certificate Condition No. 44

Category	Freshwater Aquatic Environment - Explosives
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts of explosives on freshwater aquatic habitat.
Term or Condition	The Proponent shall meet or exceed the guidelines set by Fisheries and Oceans Canada for blasting thresholds and implement practical and effective measures to ensure that residue and by-products of blasting do not negatively affect fish and fish habitat.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (D.G. Wright and G.E. Hopky, 1998)
Ref. Document Link	

### METHODS

Not applicable.

### RESULTS

No blasting occurred in 2017 within the required setback distances detailed in the DFO guidance document titled "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky, 1998).

### TRENDS

Not applicable. To date, no blasting has occurred within the required setback distances at the Project.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 45

Category	Freshwater Aquatic Environment - General
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to freshwater aquatic habitat.
Term or Condition	The Proponent shall adhere to the No-Net-Loss principle at all phases of the project to prevent or mitigate direct or indirect fish and fish habitat losses.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada
Reference	Fisheries Authorization No. NU-06-0084 (For Tote Road Crossings; DFO, 2007) Fisheries Authorization No. 14-HCAA-00525 (For Ore Dock; DFO, 2014) 2017 Milne Ore Dock Fish Offset Monitoring Report (Golder, 2017b) Fish Habitat Monitoring - 2017 Annual Report Early Revenue Phase – Tote Road Upgrades (Baffinland, 2017d)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

The two above-referenced Authorizations under the *Fisheries Act* are the regulatory instruments by which Baffinland can demonstrate that it has adhered to the no-net-loss principle. Annual monitoring of habitat off-setting works is undertaken, as described below.

### RESULTS

#### Milne Inlet Tote Road Crossings (Fisheries Authorization No. NU-06-0084)

##### *Status of Tote Road Watercourse Crossings*

As of November 30, 2008, all authorized HADD water crossings were installed. Remedial work up to August 2009 at the habitat compensation sites was substantially completed, and by October 2011 additional habitat compensation investigations and access structure installation were complete at select crossings. In 2012, new culverts were installed at two HADD crossings (BG-04 and BG-32) and habitat compensation works were completed at BG-30. No additional work was completed in 2013 due to pending potential upgrades to large portions of the Tote Road as part of the Early Revenue Phase of the Project. In 2013/14, free-span bridges were installed at four (4) water crossings (CV-128, BG-50, CV-217, CV-223) to replace the sea container bridges originally installed in 2008 to facilitate the Bulk Sample Program. By early 2017, all sea container bridges had been decommissioned and removed.

### *Fish Use Assessments at Select Tote Road Water Crossings*

Fish use assessments in 2017 were conducted at all fish-bearing sites, including those where Early Revenue Phase (ERP) upgrades had been completed by early July and those where potential future upgrades are planned for the future. The 2017 Annual Report submitted to DFO (Baffinland, 2017d) summarizes assessments conducted in 2017, provides recommendations for future monitoring and outlines follow up and corrective actions to be implemented in the future to address identified concerns.

In summary, two fish-bearing streams (CV-115 and CV-057) providing marginal habitat were dry or nearly dry in 2017 and did not contain fish at the time of the survey in early July. Two additional crossings (CV-176 and BG-50) were wetted, but fish were not captured or observed. Fish were captured or observed at all remaining known fish-bearing crossings in 2017. There were no fish passage or habitat issues observed at 23 of the 39 fish-bearing crossings assessed. Fish were captured upstream of the culverts and there were no velocity or physical obstructions at the 23 crossings.

Issues with fish passage and/or habitat were observed at 12 crossings at the time of the survey in early July 2017. Three of these involved some form of physical obstruction to fish passage (e.g. instream silt fence, cobble piles at the upstream and/or downstream end of culverts) that were removed during, or shortly after, completion of the July 2017 survey.

Perching of culverts was noted at five (5) crossings and in one case, BG-50, prevented the passage of fish; although the crossing at the left branch of the river associated with BG-50 continues to allow unimpeded fish passage. Several of the five (5) perched crossings showed greater perching (i.e., increase in vertical drop at downstream and/or upstream end of the culvert) than in previous years. The remaining four (4) crossings with passage issues had damaged culverts that were blocking, or had the potential to block, fish passage.

Fish use assessments conducted in 2017 verified that all previous compensation works remain successful. This includes fish use of the rustic fishway installed at BG-30. It is expected that there will be a reduction in the original HADD footprint size at crossings where bridges replaced sea containers and some change to the footprint size at crossings where new culverts are being installed and others replaced. Following completion of ERP upgrades and any additional works as recommended by the TREP, HADD and compensation will be revisited to determine if sufficient compensation remains or if additional works will be required.

Further discussion of the 2017 fish use assessments, status of compensation works completed along the Tote Road to date and corrective actions taken and planned to address identified fish passage concerns is provided in Baffinland (2017d).

### **Ore Dock Fisheries Authorization No. 14-HCAA-00525**

Under the *Fisheries Act* Authorization issued for the Milne Port Ore Dock (Ore Dock), Baffinland is required to undertake monitoring and reporting of the structural stability and biological utilization of offsetting measures at the Ore Dock. The third year of monitoring the effectiveness of the fish offset was conducted in August 2017 and consisted of:

- Underwater video surveys (drop camera) of the offset habitat to determine the integrity of the coarse rock material and identify any slumping or deterioration of the materials;
- Retrieval of artificial and natural substrate settlement baskets in the vicinity of the ore dock to evaluate colonization of benthic invertebrates (encrusting epifauna) and larval fish; and
- Underwater video surveys to demonstrate the association of fish with the rock substrate.

Underwater video collected along the transects on the east and west side of the ore dock, as well as at the 12 drop camera sampling stations, was analyzed to identify changes in the structural integrity of the armour stone placed during construction of the Ore Dock. Methods used during the 2015 and 2016 video surveys were replicated; however, some areas near the caisson



that were previously surveyed in 2016 could not be accessed due to the presence of berthed ore carrier vessels and ore loading operations. Habitat offset areas that could not be accessed in 2017 will be prioritized for surveying as part of the 2018 monitoring efforts. Overall, 2017 video surveys show no evidence of movement or slumping of the armour stone. The placement of the armour stone was unaltered and functioning as constructed. Transects surveyed along the seafloor adjacent to the ore dock showed no evidence of loose or stray rocks in the sediment.

Settlement baskets deployed in 2016 by Sikumiut Environmental Management Ltd. (SEM) were retrieved in September 2017 and examined for signs of colonization by encrusting epifauna. The cobble substrate in the settlement baskets exhibited limited evidence of colonization with no organisms were available for processing or taxonomic analysis. Although the majority of the rocks were bare, several rocks showed limited colonization by a white encrusting epifauna which could not be taxonomically identified. Previous surveys conducted by SEM indicate that the process for biological colonization was expected to be slow (occurring over several years). As such, the baskets were redeployed for recovery in 2018. Similar observations were reported by SEM in 2015 for settlement baskets deployed in 2014, in which inadequate epifaunal growth was available on settlement substrate for taxonomic analysis after one year of deployment. The baskets were retrieved again in 2016 at which point colonization was sufficient for sample collection.

It should be noted that a large number of euphasid shrimp were observed during video transects around the ore dock in 2017. A variety of other invertebrates including urchins, barnacles, krill, brittle stars, shrimp, and calcareous tube worms were also observed on the armour stone during the video surveys. The presence and general abundance of invertebrates on the armour stone suggests that offset habitat provides more suitable habitat for benthic invertebrates than the settlement baskets.

Underwater video collected along transects on the east and west sides of the ore dock, as well as at the 12 drop camera sampling stations, was analyzed to document the association of fish with the armour stone substrate. The video resulted in a total of three adult cod observed swimming above or hiding within the rock substrate. The cod appear to be using the rock armouring habitat for both cover and foraging. One cod, observed on the eastern side of the Ore Dock, was identified as an adult Greenland cod (*Gadus ogac*). Three unidentified adult sculpins were also observed occupying the armour stone substrate as a means of shelter and/or cover.

## TRENDS

As noted in previous years, habitat compensation works completed along the Tote Road to date remain successful.

Submerged substrate associated with the Milne Port Ore Dock continues to be colonized by marine biota, including vegetation, benthic invertebrates and fish.

## RECOMMENDATIONS / LESSONS LEARNED

Fish use assessments conducted in 2017 verified that all previous compensation works at the Project remain successful. Fish use assessments at Project water crossings will be continued in 2018 as part of the Project's fish habitat monitoring program. Baffinland plans to continue the implementation of surface water improvements outlined in the TREEP during 2018 to address outstanding fish passage concerns at water crossings identified during in the 2017 assessments. Following completion of ERP upgrades and any additional works as recommended by the TREEP, HADD and habitat compensation along the Tote Road will be revisited to determine if sufficient compensation remains or if additional works will be required.

Moreover, based on monitoring results collected to date, rock armouring installed around the perimeter of the Milne Port Ore Dock is serving as functional habitat for benthic invertebrates and fish species in Milne Inlet, and colonization of the rock substrate by algae and aquatic vegetation is occurring and providing a food source for benthic invertebrates and fish. As such, the results of monitoring indicate that the offsetting habitat to date has been successful and contingency measures are not required at this time.

## Project Certificate Condition No. 46

Category	Freshwater Aquatic Environment - Drainage
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to freshwater aquatic habitat.
Term or Condition	The Proponent shall ensure that runoff from fuel storage and maintenance facility areas, sewage and wastewater other facilities responsible for generating liquid effluent and runoff meet discharge requirements.
Relevant Baffinland Commitment	64
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Qikiqtani Inuit Association
Reference	Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2018e) Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f) MMER Emergency Response Plan (MMER ERP; Baffinland, 2018f) Phase 1 Waste Rock Management Plan (Baffinland, 2018a) Sedimentation Mitigation Action Plan (Golder, 2016a) Dust Mitigation Action Plan (Golder, 2016b) Tote Road Earthworks Execution Plan and Design Report (TREETP; Golder, 2017a) 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b) Freshet 2017 Biweekly Report No. 1 (Baffinland, 2017c) Freshet 2017 Monitoring Report No. 2 (Baffinland, 2018g) 2017 MMER Annual Report (Baffinland, 2018h) Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2017e)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's Type A Water Licence specifies water quality discharge criteria and monitoring requirements for the various sources of Project effluent and surface water runoff downstream of Project operations and construction areas. The MMER also provides relevant water quality discharge criteria for surface water management ponds associated with the Crusher Facility and Waste Rock Facility (WRF) located at the Mine Site.

Monitoring results collected under Type A Water Licence are reported to the NWB and QIA on a monthly and annual basis. Similarly, monitoring results under the MMER are reported to ECCC on a quarterly and annual basis.

Collection of water samples is undertaken following the sampling methods described in Baffinland's Quality Assurance / Quality Control (QA/QC) Plan, approved by the NWB under the Type A Water Licence.

## RESULTS

Discharges at the Project in 2017 that did not comply with the applicable discharge criteria outlined in the Type A Water Licence and the MMER mainly involved elevated TSS concentrations in surface water flows during freshet and pH and TSS exceedances at the WRF surface water management pond (WRF pond) in August and September 2017.

During freshet 2017 (approx. May 15 to June 30), several TSS exceedances at locations monitored under the Type A Water Licence and unauthorized releases of sediment were reported to ECCC, INAC, NWB and the NT-NU Spill Line, and are documented in NT-NU Spill Reports 17-161, 17-162, 17-178, 17-209, 17-214 and 17-217. Further analysis and discussion of the sediment releases and TSS exceedances reported by Baffinland during freshet 2017, including mitigative and corrective actions taken and planned to address sedimentation concerns at the Project, is provided in the 2017 Freshet Monitoring Reports, appended to the 2017 QIA and NWB Annual Report for Operations.

During August 2017, the pH of runoff collected in the WRF pond dropped below the pH discharge limits outlined in the MMER. Observations indicated the decrease in pH may have been the result of potential acid rock drainage (ARD). The pond was subsequently batch treated with sodium carbonate in mid-August 2017 to increase the pH within the permissible range for discharge. Although the batch treatment was initially successful in raising the pH of runoff contained with the pond, subsequent active discharges from the pond during late August and September resulted in several exceedances of the MMER and Type A Water Licence discharge criteria for pH and total suspended solids (TSS). Exceedances for the non-compliant discharges were reported to the relevant regulators and are documented in NT-NU Spill Reports 17-289, 17-312, 17-328 and 17-361.

During an on-site INAC and ECCC inspection in late August, uncontrolled seepage originating from the toe of the pond's berm was observed that had not been previously identified in routine internal inspections and annual third party geotechnical or regulator inspections. The seepage was reported by Baffinland to relevant regulators and is documented in NT-NU Spill Report 17-312. Investigations into the origin of the seepage are ongoing. As a result of the concerns identified at the WRF, INAC issued an Inspector's Direction to Baffinland on September 5, 2017. On September 7, 2017 and September 13, 2017, the QIA and ECCC, respectively, notified Baffinland that both parties had initiated investigations into the 2017 events at the WRF.

Exceedances for Type A Water Licence monitoring locations were reported to the NWB, INAC and the QIA during 2017 in the monthly monitoring reports required by the Type A Water Licence. A full discussion of 2017 non-compliant discharges under the Type A Water Licence for the Project is provided in Baffinland's 2017 QIA and NWB Annual Report for Operations, submitted to the QIA and NWB on March 31, 2018 as a requirement of the Type A Water Licence and Commercial Lease.

Similarly, exceedances and non-compliant discharges under the MMER have been reported to ECCC via the NT-NU Spill Line and online MMER quarterly reporting system and are fully discussed in the 2017 MMER Annual Report.

## TRENDS

Overall, the frequency and nature of incidents involving the discharge of effluent to the receiving environment that exceeds the applicable discharge criteria have remained low and incidental since the start of operations in 2014.

## RECOMMENDATIONS / LESSONS LEARNED

In response to the non-compliant discharges from the WRF, Baffinland has taken multiple corrective actions to prevent additional non-compliant discharges from the WRF and retained Golder Associates (Golder) to determine the appropriate corrective actions required to address the seepage observed at the WRF in 2017 and investigate the potential for ARD and develop mitigation measures, as required. Preliminary mitigation measures planned for 2018 include the mobilization of a water treatment system to manage potential non-compliant waters in the WRF pond during 2018. Refer to the 2017 QIA and

NWB Annual Report for Operations (Baffinland, 2018b) for further details on the concerns identified at the WRF in 2017 and the corrective actions taken and planned.

To improve the water quality of surface water drainage at the Project during freshet, Baffinland continues to implement the corrective actions and improvements outlined in the Sedimentation and Dust Mitigation Action Plans and Tote Road Earthworks Execution Plan (Golder, 2016a, 2016b and 2017a).

Baffinland continues to update the Project's management plans and implement additional control measures to ensure discharges to the receiving environment are in compliance with applicable water quality discharge criteria.

## Project Certificate Condition No. 47

Category	Freshwater Aquatic Environment - Watercourses
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent blockages or restrictions to fish passage.
Term or Condition	The Proponent shall ensure that all Project infrastructure in watercourses are designed and constructed in such a manner that they do not unduly prevent and limit the movement of water in fish bearing streams and rivers.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Nunavut Water Board (NWB), Indigenous and Northern Affairs Canada (INAC), Qikiqtani Inuit Association (QIA), Fisheries and Oceans Canada (DFO)
Reference	Fish Habitat No Net Loss and Monitoring Plan (Knight Piésold, 2007) Fish Habitat Monitoring - 2017 Annual Report - Early Revenue Phase - Tote Road Upgrades (Baffinland, 2017d) Tote Road Earthworks Execution Plan and Design Report (TREETP; Golder, 2017a)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

A fish habitat monitoring plan was developed to ensure that all measures and works specified in the Fish Habitat No Net Loss and Monitoring Plan (Knight Piésold, 2007), as well as the *Fisheries Act* Authorization and amendments, have been implemented and are functioning as intended. In 2017, monitoring was conducted at fish-bearing water crossings along the Tote Road. The emphasis of the 2017 monitoring program was to assess the presence of fish, habitat quality, and fish passage success at all fish-bearing water crossings and identify any potential impacts from upgrades or general road maintenance.

### RESULTS

Fish use assessments in 2017 were conducted at all fish-bearing water crossings, including those where Early Revenue Phase (ERP) upgrades had been completed by early July and those where potential future upgrades may proceed (Baffinland, 2017d).

In summary, two fish-bearing streams (CV-115 and CV-057) providing marginal habitat were dry or nearly dry in 2017 and did not contain fish at the time of the survey in early July. Two additional crossings (CV-176 and BG-50) were wetted, but fish were not captured or observed. Fish were captured or observed at all remaining known fish-bearing crossings in 2017. There were no fish passage or habitat issues observed at 23 of the 39 fish-bearing crossings assessed. Fish were captured upstream of the culverts and there were no velocity or physical obstructions at these crossings.

Issues with fish passage and/or habitat were observed at 12 crossings at the time of the survey in early July 2017. Three (3) of these involved some form of physical obstruction to fish passage (e.g. instream silt fence, cobble piles at the upstream and/or downstream end of culverts) that was removed during, or shortly after, completion of the July survey.

Perching of culverts was noted at five (5) crossings and in one case, BG-50, prevented the passage of fish; although the crossing at the left branch of the river associated with BG-50 continues to allow unimpeded fish passage. Several of the five (5) perched crossings showed greater perching (i.e., increase in vertical drop at downstream and/or upstream end of the culvert) than in previous years. The remaining four (4) crossings with passage issues had damaged culverts that were blocking, or had the potential to block, fish passage.

All fish habitat compensation works remain successful, including the fish use of the rustic fishway installed at BG-30.

#### **TRENDS**

As in previous years, several damaged and perched culverts at fish-bearing water crossings were identified in 2017. During the 2017 fish use assessment, several water crossings along the Tote Road with historical fish passage concerns were observed to have deteriorated further since 2016 (e.g. BG-50, etc.).

#### **RECOMMENDATIONS / LESSONS LEARNED**

Fish use assessments at Project water crossings will be continued in 2018 as part of the fish habitat monitoring program and will include an assessment of improvements to fish passage as a result of ongoing upgrades and improvements.

Baffinland continues to address water crossings with sedimentation and fish passage concerns through the implementation of the TREEP (Golder, 2017a). The TREEP was developed in 2016 to improve the surface water management infrastructure along the Tote Road and includes the repair and/or replacement of several culverts along the Tote Road. Ten (10) water crossing, identified in previous fish use assessments and highlighted in the TREEP, were upgraded or repaired in 2017. Further improvements to Project water crossings and surface water management infrastructure are planned in 2018.

## Project Certificate Condition No. 48

Category	Freshwater Aquatic Environment - Explosives
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Fisheries and Oceans Canada
Project Phase(s)	Construction, Operations
Objective	To mitigate impacts to freshwater aquatic habitat.
Term or Condition	The Proponent shall engage with Fisheries and Oceans Canada and the Qikiqtani Inuit Association in exploring possible Project specific thresholds for blasting that would exceed the requirements of Fisheries and Oceans Canada's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (D.G. Wright and G.E. Hopky, 1998).
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998)
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

No blasting occurred in 2017 within the required setback distances detailed in the DFO guidance document titled "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky, 1998).

### TRENDS

Not applicable. To date, no blasting has occurred within the required setback distances at the Project.

### RECOMMENDATIONS / LESSONS LEARNED

To date there has been no requirement to undertake blasting in or near water, and as such, there has been no requirement to discuss blasting near water with Fisheries and Oceans Canada and the Qikiqtani Inuit Association. Baffinland will discuss Project specific blasting thresholds with the appropriate parties if required in the future.



## Project Certificate Condition No. 48(a)

Category	Freshwater Aquatic Environment - Arctic char
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To determine presence and health of arctic char in freshwater aquatic habitat.
Term or Condition	The Proponent shall develop plans to conduct additional surveys for the presence of arctic char in freshwater bodies and ongoing monitoring of arctic char health where applicable, within watersheds proximal to the mine, tote road and Milne Inlet Port project development areas, including but not limited to, Phillips Creek, Tugaat and Qurluktuk. The Proponent shall consult with the MHTO regarding the design, timing, and location of proposed surveys and ongoing monitoring.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA), Indigenous and Northern Affairs Canada (INAC), Nunavut Impact Review Board (NIRB), Fisheries and Oceans Canada (DFO)
Reference	Fish Habitat Monitoring - 2017 Annual Report - Early Revenue Phase - Tote Road Upgrades (Baffinland, 2017d) 2017 QIA and NWB Annual Report for Operations (Baffinland, 2018b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

In addition to the annual fish use assessments completed near Project water crossings, as discussed in Project Certificate Condition No. 47, Baffinland conducts annual fish population assessments for Arctic char in Mary Lake, Camp Lake, Sheardown Lake and Reference Lake 3 near the Mine Site as part of the Project's Core Receiving Environment Monitoring Program (CREMP). The CREMP is an aquatic monitoring program conducted annually that focuses on evaluating mine-related influences on water quality, sediment quality and/or biota (including phytoplankton, benthic invertebrates and or/ fish), including Arctic char, within aquatic environments located near the Mine Site. Under the CREMP, condition of Arctic char fish populations within monitored lakes are assessed using a non-lethal sampling program that involves capturing and assessing 100 Young-of-Year (YOY) Arctic char from nearshore lake habitat via electrofishing and 100 adult Arctic char from littoral/profundal lake habitat via gill netting in each monitored lake.

Moreover, an Environmental Effects Monitoring (EEM) program, as required by the MMER, was conducted in 2017 along the Mary River and Mary River Tributary F. The EEM involved assessing the Mary River Tributary F for presence of fish via electrofishing and included a non-lethal sampling program at two (2) areas (reference and exposure) along the Mary River downstream of mining operations.

### RESULTS

As documented in the 2017 CREMP Monitoring Report, monitoring data collected to date suggest no adverse mine-related effects on Arctic char populations within monitored lakes under the CREMP. The 2017 CREMP Monitoring Report, which provides a complete analysis and discussion of 2017 monitoring results, is provided as an appendix to the 2017 QIA and NWB Annual Report for Operations.

As discussed in the 2017 EEM Report titled “Mary River Project Phase 1 – Environmental Effects Monitoring (2017) Interpretive Report”, the EEM fish population survey conducted in the Mary River during August 2017 indicated no substantial differences in community species composition between the effluent-exposed and reference areas, but potentially higher abundance of fish at the effluent-exposed area due to natural habitat factors.

Moreover, during the EEM monitoring program, no fish were observed along the entire length of Mary River Tributary-F in August 2017. The absence of fish in Mary River Tributary F is believed to reflect the combination of complete freezing over during the winter, a relatively higher stream gradient, and the presence of natural in-stream barriers near the tributary and Mary River confluence. For a full discussion of results, refer to the Mary River Project Phase 1 - Environmental Effects Monitoring Report (2017) Interpretive Report, appended to the 2017 QIA and NWB Annual Report for Operations.

#### **TRENDS**

No adverse mine-related effects on Arctic char populations within monitored lakes under the CREMP have been observed to date. Similar to previous years (2015, 2016), low numbers of Arctic char were captured in the littoral/profundal habitat of Reference Lake 3 in 2017 suggesting a lower fish abundance than the other monitored lakes (e.g. Mary Lake, Camp Lake, Sheardown Lake).

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland plans to continue the monitoring programs described above to assess the condition of Arctic char populations within the Project area.

#### 4.6.8 Terrestrial Environment (PC Conditions 49 through 64)

Sixteen (16) PC conditions relate to the potential impacts of the Project on the terrestrial environment, focusing primarily on caribou, carnivores, and terrestrial wildlife habitat. The importance of Baffinland support to regional wildlife monitoring and management initiatives was stressed by the NIRB, the GN and other parties.

##### *Stakeholder Feedback*

Caribou has been and continues to be one of the primary focusses of stakeholder concern with respect to the terrestrial environment. The TEWG is a stakeholder body that Baffinland interacts with regarding caribou and other components of the terrestrial environment.

During the environmental review process for the FEIS and FEIS addendum, the potential for sensory disturbance on caribou resulting from the Project was a key issue. Concerns were related to potential sensory disturbance and the potential for mortalities due to collisions with trains on the south railway and truck traffic along the Milne Inlet Tote Road. Communities were initially very concerned that the railway would interrupt the typical northward movement of caribou into the North Baffin Region, though through the review process the communities seemed to become more comfortable with the idea that the caribou would acclimatize to the railway over time. Another concern was that caribou are particularly sensitive to disturbance at their current state of low abundance within their natural population cycle. Effects to terrestrial wildlife, and in particular the low number of caribou in the area, continue to be expressed in 2017 consultation activities (Appendix B).

##### *Monitoring*

Baffinland completes a number of monitoring programs on the terrestrial environment, many of which are conducted in collaboration with government agencies. Baffinland is increasing its focus on inclusion of community based monitoring into all aspects of the programs. The TEWG members, consisting of government agencies, technical experts and community representatives, provide recommendations and guidance on Baffinland’s terrestrial monitoring programs. The TEWG provides review and comment on the terrestrial environment annual monitoring report, and updates to the monitoring program. Two in-person meetings and two teleconferences are held annually to review the trends and results of all programs and to provide advice to Baffinland regarding future monitoring.

Table 4.17 provides an evaluation of the Project’s impacts on the terrestrial environment, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.17 Terrestrial Environment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Habitat Loss	Direct habitat loss due to the Project footprint, and indirect habitat loss due to sensory disturbances	Height of Land monitoring; snow track and snow bank monitoring; incidental observations; GN regional aerial surveys. Regional numbers appear very low.	Within FEIS predictions
Restriction of Movement	Project infrastructure and the tote road act as a barrier to the movement of caribou		
Mortality	Mortality resulting from vehicle collisions or project-induced hunting	Incidental observations; biologists and other staff on-site: no mortalities observed	Within FEIS predictions

Effects of the Project on the terrestrial environment are within FEIS predictions.

*Path Forward*

Baffinland will remain vigilant about the mitigation and monitoring activities that are in place to minimize any potential effects of the Project on the terrestrial environment and wildlife resources. Baffinland will continue to seek input and review monitoring results trends from technical members of the TEWG and with other interested stakeholders. Reporting on each PC condition follows.

## Project Certificate Condition No. 49

Category	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 Environment Working Group ("TEWG") which will act as an advisory group in connection with mitigation measures for the protection of the terrestrial environment and in connection 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.
Relevant BIM Commitment	46, 47, 49, 50
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 TEWG Meeting Records
Ref. Document Link	Appendix C2

### METHODS

Baffinland established the TEWG in 2013. Members of the TEWG include representatives from: Environment and Climate Change Canada, Qikiqtani Inuit Association, Government of Nunavut, Makivik Corporation and Baffinland with technical experts as required. The Mittimatalik Hunters and Trappers Organization joined the group in 2016. WWF-Canada also participates as an observer to the TEWG.

The meetings are structured to enable participants to have the opportunity to provide input on monitoring program implementation and follow-up at the conclusion of the field programs prior to finalization of reports. The group receives presentations on the implementation of field programs and the subsequent results in order to prioritize monitoring plans and suggest measures for mitigation where required. The groups are also established to provide a platform for the discussion of collaborative research opportunities between parties and to identify monitoring programs suited for community based monitoring and Inuit participation.

The group meets in-person twice annually and also hosts two interim teleconferences per year.

Draft technical annual reports and other documentation are provided to the group in advance of meetings and an ongoing basis to allow for review, comment and advice to be provided by all members. Baffinland and their technical experts take into consideration comments received by the working group in the finalization of documents and planning of monitoring programs. The 2017 Terrestrial Environmental Effects Monitoring Report (EDI, 2018) was distributed to the TEWG for review and comment two (2) weeks prior to the November 29 and 30, 2017 TEWG meeting.

## RESULTS

In 2017, the TEWG held meetings on March 16, May 4, October 3 and November 29 and 30, 2017.

The TEWG provides a valuable forum for ongoing Project communication and reporting between Baffinland and other interested parties. The TEWG also serves as an advisory group to provide recommendations on appropriate management approaches related to the Project.

The TEWG has guided the development of the Terrestrial Environment Effects Monitoring Plan (TEEMP; Baffinland, 2016j). The program is reviewed annually and adjustments are made to the monitoring program as needed following guidance from the group.

The TEWG reviews the annual terrestrial environment monitoring report and provides comments to Baffinland for consideration in the final version.

## TRENDS

The TEWG has successfully developed a robust terrestrial monitoring program that is reviewed and adjusted on an annual basis.

## RECOMMENDATIONS / LESSONS LEARNED

In 2018, Baffinland will work with the TEWG and NIRB to finalize revisions to the TEWG's Terms of Reference. Baffinland will continue to work with the TEWG to review and guide monitoring programs on an annual basis and develop mitigation measures or action plans as and when needed.

Baffinland, with support from the QIA and other members of the TEWG, has put a strong emphasis on continuing existing and developing more diverse community-based monitoring initiatives.

## Project Certificate Condition No. 50

Category	Terrestrial Wildlife and Habitat - General
Responsible Parties	The Proponent and other Parties as appropriate
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure appropriate and responsive adaptive management.
Term or Condition	The Proponent shall continue to develop and implement Project-specific monitoring for the terrestrial environment, and will demonstrate appropriate refinements to design, incorporation of analytical methods and elaboration of methodologies. The monitoring plan shall contain clear thresholds to allow for the assessment of long-term trends and cumulative effects where project interactions are identified. Coordination and cooperation will be required where data collection, analysis and interpretation, or responsibility for mitigation and management requires the efforts of multiple parties (e.g., government, Qikiqtani Inuit Association, communities).
Relevant Baffinland Commitments	40, 70
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

The TEMMP outlines Baffinland's monitoring programs for terrestrial wildlife and habitat. The plan has been revised based on guidance and recommendations provided by the TEWG and NIRB over the past several years. The TEMMP also includes applicable thresholds for the assessment of long-term trends.

The TEMMP is supplemented by Baffinland's contributions to information gathered from region-wide monitoring for caribou conducted by the Government of Nunavut, as well as PRISM plot surveys and seabird research conducted by Environment and Climate Change Canada.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Updates to the TEMMP are developed on an as-needed basis. The updates are based on statistical analysis of data and adjustments necessary to improve robustness of survey design and methods. The TEMMP updates are based on annual monitoring data review, and discussion with technical experts who participate in the TEWG.

## Project Certificate Condition No. 51

Category	Terrestrial Wildlife and Habitat - General
Responsible Parties	The Proponent and/or TWEG
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To promote coordination of monitoring efforts.
Term or Condition	The Proponent, either directly or as part of the TEWG, shall consider and, where appropriate, cooperate with relevant regional and/or community-based monitoring initiatives that raise issues or produce information pertinent to mitigating project-induced impacts. The Proponent shall give special consideration for supporting regional studies of population health and harvest programs for North Baffin caribou which help address areas of uncertainty for Project impact predictions.
Relevant Baffinland Commitments	58
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Baffinland has provided financial and logistical support for the Government of Nunavut's (GN's) North Baffin Island caribou survey research on a number of occasions since 2009. In 2017, Baffinland provided support for the North Baffin Island spring and fall caribou population surveys, in the form of supplying the field team with helicopter access, fuel and accommodations. Baffinland will continue to provide support for future GN caribou surveys, as relevant, to enhance Baffinland's understanding of potential Project-related effects and regional knowledge about wildlife distribution and abundance. To Baffinland's knowledge, based on discussion in the TEWG, there are currently no community-based monitoring initiatives relevant to the terrestrial environment.

### RESULTS

Not applicable.

### TRENDS

Not applicable.



**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to support the GN's regional caribou surveys, as appropriate. In 2016, the Mittimatalik Hunters and Trappers Organization became a member of the TEWG. Baffinland is open to and continues to encourage opportunities for community-based monitoring initiatives.

## Project Certificate Condition No. 52

Category	Terrestrial Wildlife and Habitat - Caribou
Responsible Parties	The Proponent, TEWG
Project Phase(s)	Construction
Objective	To ensure best practices are used for caribou protection.
Term or Condition	Within 3 months of issuance of the Project Certificate, the Proponent shall initiate design, and develop the timeline to test and implement means of deterring caribou from pits and other hazardous areas. A review of best practices and techniques will be undertaken at other Northern mines where interactions with caribou occur. Considerations should include temporary ribbon placement, Inuksuks, or fencing and subsequent monitoring for effectiveness. These activities shall be reported back to the Terrestrial Environment Working Group.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister; results to be reported back to the Terrestrial Environment Working Group.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

The issue of caribou protection measures was discussed with the TEWG in December 2013, and a number of protection measures were considered including Inuksuks, electric fences, wildlife fencing and berms.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland requires all employees to adhere to a stop work policy when wildlife is present, which reduces hazardous conditions.

Currently, caribou populations are low and no sightings of caribou have been made at the Project sites. Baffinland will continue to monitor for caribou and, in conjunction with the TEWG, identify appropriate caribou deterrents from hazardous areas when required.

## Project Certificate Condition No. 53

Category	Terrestrial Wildlife and Habitat - Caribou
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to caribou from Project-related traffic.
Term or Condition	<p>The Proponent shall demonstrate consideration for the following:</p> <ul style="list-style-type: none"> <li>a. Steps taken to prevent caribou mortality and injury as a result of train and vehicular traffic, including operational measures meant to maximize the potential for safe traffic relative to operations on the railway, Milne Inlet Tote Road and associated access roads.                             <ul style="list-style-type: none"> <li>i. Specific measures intended to address the reduced effectiveness of visual protocols for the Milne Inlet Tote Road and access roads/trails during times of darkness and low visibility must be included.</li> </ul> </li> <li>b. Monitoring and mitigation measures at points where the railway, roads, trails and flight paths pass through caribou calving areas, particularly during caribou calving times. The details of these monitoring and mitigation measures shall be developed in conjunction with the Terrestrial Environment Working Group.</li> <li>c. Evaluation of the effectiveness of proposed caribou crossings over the railway, Milne Inlet Tote Road and access roads as well as the appropriate number.</li> <li>d. Development of a surveillance system along the railway corridor to identify the presence of caribou in proximity to the train tracks and operational protocols for the train to avoid collisions and enable caribou to cross the train tracks unimpeded.</li> <li>e. Protocols for documentation and reporting of all caribou collisions and mortalities, as well as mechanisms for adaptive management responses designed to prevent further such interactions.</li> </ul>
Relevant Baffinland Commitments	15, 71, 73
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	<ul style="list-style-type: none"> <li>a. In-Compliance</li> <li>b. In-Compliance</li> <li>c. In-Compliance</li> <li>d. Not Applicable</li> <li>e. In-Compliance</li> </ul>
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Appendix C2

## METHODS

### *a. Prevention of Caribou Mortality and Injury as a Result of Vehicular Traffic*

- The Caribou Decision Tree presented in the TEMMP directs truck driver responses when caribou are near or crossing the Tote Road;
- Snow bank heights are managed throughout the winter season to decrease potential barriers to caribou movement across the Tote Road, and are monitored once annually; and
- Snow track surveys are used to monitor caribou interaction with the Tote Road to determine if they cross it or deflect their paths of movement, and are conducted once annually.

Refer to TEMMP (Sections 3.3.3 and 4.5.2, and Figure 3-2) for detailed methods.

### *b. Monitoring and Mitigation Measures*

Twenty-four Height-of-Land (HOL) stations are visited at least once during the caribou calving period annually.

Each site is visited for a minimum of 20 minutes, and the landscape is scanned for caribou presence using binoculars and spotting scope to detect and record caribou and their proximity to Project infrastructure. If caribou are observed, a detailed survey would commence tracking caribou behaviour and interaction with Project infrastructure and vehicles. Additional monitoring occurs when trained biologists are on-site throughout the year.

These methods are identified in the TEMMP (Sections 3.3.3 and 4.5). Note that a railway has not been constructed at this time and as such, is not a concern for terrestrial wildlife and habitats.

### *c. Evaluation of Effectiveness of Caribou Crossings*

Snow track surveys collect data on caribou response to Project activities based on patterns of movement observed. The surveys are typically conducted by driving slowly (30 km/hr) from the Mine Site to Milne Port on the Tote Road. When wildlife tracks are observed, surveyors stop and walk to the tracks to confirm species and then follow the tracks towards and away from the road to observe behaviour, habitat use and possible divergence of travel paths. When tracks were near or intersect the Tote Road, surveyors would record the location, species that produced the tracks, number of sets of tracks counted (i.e., group size), travel path in relation to the road (e.g., deflected, travelled along, or crossing the Tote Road) and the height of the snow bank measured at either the crossing point, or likely point of deflection.

In 2017, the snow track survey was conducted differently than in previous years due to an abundance of high snowbanks (>1 m) observed along the Tote Road, which would have made it difficult or impossible to see potential tracks beyond the banks from the truck. Instead of driving slowly along the Tote Road and looking for tracks from the vehicle, the survey team stopped at every kilometer marker and got out of the truck to look for tracks behind the snow banks. In areas where snowbank heights were <1 m, surveyors still got out of the truck to look for tracks in order to maintain consistent methods at all survey points. Some additional stops were made between kilometer markers if tracks were observed, or if snowbanks appeared to be >2 m in height.

These details are included in the TEMMP (Sections 3.3.3 and 4.5.2), and the revised 2017 survey details are included in the 2017 Terrestrial Environment Annual Monitoring Report (Section 4.1.1; EDI, 2018). Due to low embankments and existing low profile road conditions, there were no caribou crossings proposed for the Tote Road. Monitoring to date has focused on managing snow bank heights to minimize barriers to movement.

*d. Surveillance System*

Not applicable in 2017 as the railway has not yet been constructed. The TEMMP (Section 3.3.3), which includes avoiding collisions with caribou will include an updated surveillance system once the railway becomes a viable option.

*e. Documentation and Reporting*

The TEMMP (Section 3.3.4) details the protocol for documenting and reporting caribou collisions and mortalities. Although caribou numbers are very low and the risks of having a vehicle-caribou collision are low, ongoing mitigation such as use of the Caribou Decision Tree are occurring to prevent caribou mortalities.

## RESULTS

*a. Prevention of Caribou Mortality and Injury as a Result of Vehicular Traffic*

- Caribou numbers are low at this time and therefore interactions with the Tote Road and vehicles have not occurred;
- Continued snow bank height management to ensure barrier-free movement of caribou; and
- Snow tracking surveys have not yet observed caribou tracks due to very low caribou numbers.

*b. Monitoring and Mitigation Measures*

- A total of 13 hours and nine minutes of survey effort was conducted during the calving period in 2017;
- No caribou were detected on the landscape in 2017; and
- Details of previous surveys back-to 2013 are provided in the previous annual reports.

*c. Evaluation of Effectiveness of Caribou Crossings*

Results are inconclusive at this point, as no caribou have been detected on-site since 2013; however, ongoing management of snowbank heights and providing escape routes, and monitoring wildlife responses continue.

*d. Surveillance System*

Not applicable in 2017 as the railway was not constructed.

*e. Documentation and Reporting*

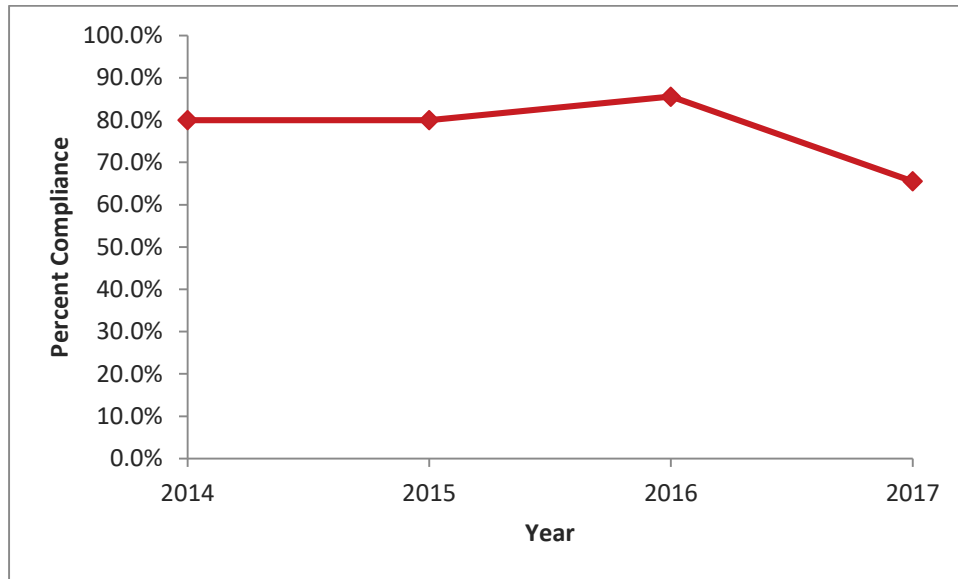
All documentation and reporting protocols have been developed. Neither collisions nor mortality occurred in 2017.

## TRENDS

*a. Prevention of Caribou Mortality and Injury as a Result of Vehicular Traffic*

Caribou interactions with the Tote Road and vehicles have not occurred; however, training on how to use the Caribou Decision Tree, snow bank height management and snow tracking surveys continue.

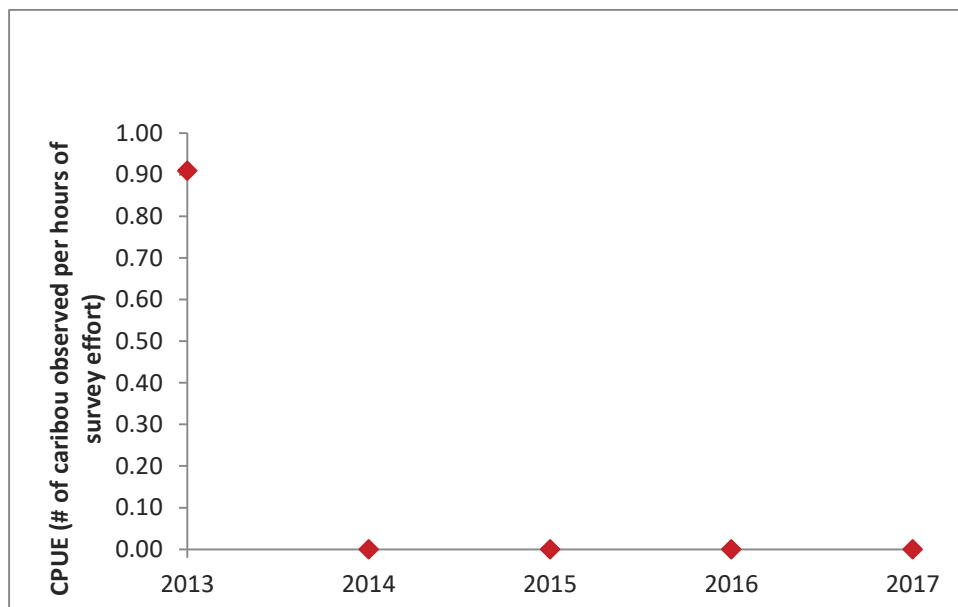
Annual monitoring of snow bank heights along the Tote Road since 2014 indicates a rate of compliance between 65-85% (Figure 4.5).



**Figure 4.5 Snow Bank Height Compliance Monitoring Results on the Tote Road**

*b. Monitoring and Mitigation Measures*

Based on caribou observed per hours of survey effort, there was a drop in caribou observations from 2013, when the surveys began, to present (Figure 4.6). These data reflect the regional low caribou numbers of the North Baffin Island herd, and there is no indication of a Project-related effect.



**Figure 4.6 Caribou Observations from Height of Land Surveys**

c. Evaluation of Effectiveness of Caribou Crossings

No caribou or wolf tracks have been detected during snow tracking surveys along the Tote Road since surveys began in 2014. However, Arctic fox and hare tracks were observed during all survey years (Figure 4.7). There is no indication of a Project-related effect on caribou movement through the Project site.

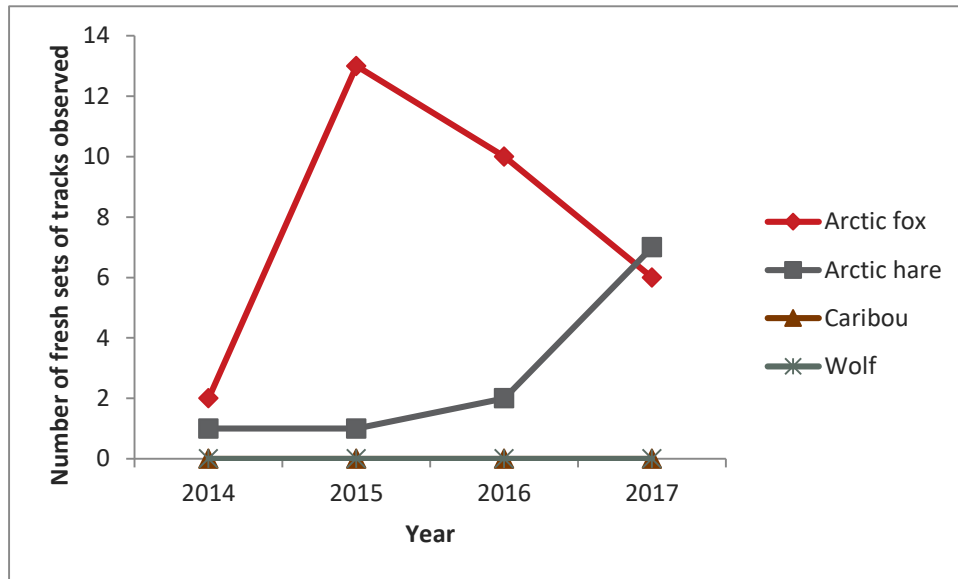


Figure 4.7 Snow Tracking Survey Trends

**RECOMMENDATIONS / LESSONS LEARNED**

Snow bank height surveys, height of land surveys and snow track surveys will continue on an annual basis. Once caribou numbers start increasing and their presence is identified on or near the Tote Road, the Caribou Decision Tree will be reviewed; seasonal migrations of caribou and their interaction with the Tote Road will be considered; and snow bank height monitoring and snow track surveys will occur more often by on-site staff.

## Project Certificate Condition No. 54

Category	Terrestrial Wildlife and Habitat - Caribou
Responsible Parties	The Proponent
Project Phase(s)	Construction - within six (6) months of issuance of Project Certificate
Objective	To Update the Terrestrial Environmental Management and Monitoring Plan
Term or Condition	<p>The Proponent shall provide an updated Terrestrial Environmental Management and Monitoring Plan which shall include, but not be limited to the following:</p> <ol style="list-style-type: none"> <li>a. Details of the methods and rationale for conducting monitoring prior to the commencement of construction;</li> <li>b. Monitoring for caribou presence and behavior during railway and Tote Road construction;</li> <li>c. Description and justification of statistical design or other means of determining effect and proposed analyses to support the conclusions drawn from monitoring impacts of the mine and related infrastructure on wildlife;</li> <li>d. Details of monitoring and mitigation activities, which should be established in collaboration with the Terrestrial Environment Working Group and are expected to include:                     <ol style="list-style-type: none"> <li>i. Dustfall (fugitive and Total Suspended Particulates), that addresses methods to reduce risk to caribou forage from dustfall;</li> <li>ii. Snow track surveys during construction and the use of video-surveillance to improve the predictability of caribou exposure to the railway and Tote Road. Using the result of this information, an early warning system for caribou on the railway and Tote Road shall be developed for operation.</li> </ol> </li> <li>e. Details of monitoring thresholds related to level of mitigation and management; and</li> <li>f. Details of a comprehensive hunter harvest survey to determine the effect on caribou populations and potential effects on caribou behaviour resulting from increased human access caused by upgrades to the Milne Inlet tote road (and any other roads if they are shifted from private to public use) and increase local knowledge of the mine site, including establishing pre-construction baseline harvesting data.</li> </ol>
Relevant Baffinland Commitments	N/A
Reporting Requirement	Plan to be submitted to the NIRB and the TEWG within 6 months of issuance of a Project Certificate.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Nunavut Impact Review Board
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

The Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) addresses PC Condition No. 54. The plan is reviewed and updated as needed on an annual basis. In regards to 54c, the programs are revised based on statistical analyses of annual data, as reported in the annual reports.

### RESULTS

Not applicable.



**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

In regards to PC Condition No. 54f, Baffinland continues to monitor human use of the Project site. There is no legal obligation for users to report harvest to on-site personnel. Due to previous responses of harvesters from reported caribou sightings on the Project site, Baffinland has changed reporting of caribou sightings as confidential to the on-site environment staff. The challenges associated with Baffinland addressing PC Condition No. 54f, and no legal mandate to monitor harvest, have been discussed at various TEWG meetings. The caribou harvest is now managed on a quota/tag system, and the harvest in the region is monitored by the Government of Nunavut.

## Project Certificate Condition No. 55

Category	Terrestrial Wildlife and Habitat - Wolves
Responsible Parties	The Proponent, Government of Nunavut Department of Environment
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate potential impacts to wolves.
Term or Condition	<p>The Proponent shall develop an adaptive management plan applicable to wolves and wolf habitat in collaboration with the Government of Nunavut- Department of Environment (GN-DOE) to ensure compliance with the <i>Nunavut Wildlife Act</i>. Consideration must be given to the following:</p> <ol style="list-style-type: none"> <li>Monitoring for active wolf dens within a 10 km radius from the mine site, under the direction and prior approval of the GN DOE, and reporting the results through NIRB's Annual Reports on terrestrial wildlife in the Potential Development Area (PDA);</li> <li>Estimating the available (glacio-fluvial materials) esker habitat within the Regional Study Area/PDA and identifying such habitat as ecologically sensitive;</li> <li>Developing "wolf indices" for presence/abundance of wolves (by conducting studies) to set a baseline pre-construction baseline; and</li> <li>Ensuring that wolf monitoring is capable of determining the relative abundance and distribution of wolves in the Project Development Area over time.</li> </ol>
Relevant Baffinland Commitments	57, 74
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Not Applicable.

### RESULTS

Not Applicable.

### TRENDS

Not Applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

As a result of low caribou numbers, wolf numbers in the region have also declined. Wolf monitoring programs will be re-initiated when wolves and/or caribou are observed near site on a consistent and regular basis (e.g. based on trends observed from the Height of Land monitoring data, or incidental monitoring data), or on observations of local harvesters and as reported to Baffinland or the TEWG. Monitoring of carnivore dens will continue to be discussed within the TEWG based on discussions within the group and when deemed necessary, Baffinland will re-initiate carnivore den monitoring.

## Project Certificate Condition No. 56

Category	Terrestrial Wildlife and Habitat - Wildlife Habitat
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure progressive reclamation of disturbed wildlife habitat.
Term or Condition	The Proponent shall develop a strategy for the recovery of terrestrial wildlife habitat in a progressive manner that is consistent with the <i>Nunavut Wildlife Act</i> . Overall, this will require the integration of a decision-making process and the identification of mitigation responses to cumulative impacts on caribou survival, breeding propensity, and population dynamics.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada
Reference	Interim Closure and Reclamation Plan (Baffinland, 2016i)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

As described in Baffinland's Interim Closure and Reclamation Plan, although a large portion of the land within the Project Development Area will be actively used during the Construction and Operation phases of the Project, and where practical, areas that are no longer needed to carry out Project activities will be progressively reclaimed. The overall intent of the proposed progressive rehabilitation strategy is to return Project sites and affected areas to viable and, wherever practicable, self-sustaining ecosystems/habitat that are compatible with a healthy environment and with human activities in as minimal a duration as reasonably practical. The progressive rehabilitation strategy described in the Interim Closure and Reclamation Plan is expected to be technically and economically feasible and reflect Project closure principles.

### RESULTS

Not Applicable.

### TRENDS

Not Applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland is currently planning for the establishment of a Mine Closure Working Group to provide an opportunity for local communities, QIA, and other interested parties to discuss closure planning. Once established, the working group will contribute to the integration of a decision-making process and the identification of mitigation responses to cumulative impacts on caribou survival, breeding propensity, and population dynamics in the strategy for progressive reclamation and closure. The experience gained and lessons learned from the closure of the Nanisivik and Polaris mine sites, which are located in a similar climate zone, will be used, where applicable, as a benchmark for the progressive rehabilitation of disturbed Project areas.

## Project Certificate Condition No. 57

Category	Terrestrial Wildlife and Habitat - Reporting
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate and monitor for impacts to wildlife.
Term or Condition	<p>The Proponent shall report annually regarding its terrestrial environment monitoring efforts, with inclusion of the following information:</p> <ol style="list-style-type: none"> <li>a. Description of all updates to terrestrial ecosystem baseline data;</li> <li>b. A description of the involvement of Inuit in the monitoring program;</li> <li>c. An explanation of the annual results relative to the scale of the natural variability of Valued Ecosystem Components in the region, as described in the baseline report;</li> <li>d. A detailed presentation and analysis of the distribution relative to mine structures and activities for caribou and other terrestrial mammals observed during the surveys and incidental sightings;</li> <li>e. Results of the annual monitoring program, including field methodologies and statistical approaches used to support conclusions drawn;</li> <li>f. A summary of the chronology and level of mine activities (such as vehicle frequency and type);</li> <li>g. An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries;</li> <li>h. A discussion of any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program.</li> </ol>
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS AND RESULTS

- a. Updates and descriptions of all baseline data are recorded annually in the terrestrial environment annual monitoring reports.
- b. Inuit monitors are involved in all terrestrial environment annual monitoring programs conducted by Baffinland's consultant. This has included participation in snow track surveys, height of land surveys, and vegetation monitoring.

- c. Where relevant, the terrestrial environment annual monitoring report discusses near-site wildlife observations in relation to available knowledge about regional populations. Bird monitoring survey data that derived density estimates was compared to regionally-available density estimates. The lack of caribou and wolf observations near site were confirmed to reflect low numbers reported throughout the North Baffin Island region by the Government of Nunavut.
- d. Project Certificate Condition No. 57(d) is addressed in the terrestrial environment annual monitoring reports through reporting of results of height-of-land surveys, snow tracking surveys, incidental observation logs, wildlife mortalities log, and reference to regional conditions from other publications and documents.
- e. All results of the monitoring programs, including methodologies and approach to statistics are included in the terrestrial environment annual monitoring reports.
- f. The 2017 Terrestrial Environment Annual Monitoring Report summarizes mine traffic activity as a correlate to dustfall measures. All non-haul vehicle traffic on the Tote Road is recorded by Baffinland security. This type of vehicle traffic includes road maintenance mobile equipment, mechanical maintenance/fueling trucks, pick-up trucks, etc. The number of trucks hauling ore on the Tote Road each day is tracked by Mine Operations Dispatch.

There was an average number of 196 ore haul transits per day (Figure 4.8). The only month where the number of ore transits decreased was May, when the average number of ore haul transits decreased to 116 transits/day (58 ore loads); ore transits began to decrease mid-May and remained low until the first week of June. This decrease is noted each year and coincides with spring melt conditions which result in road closures for haul trucks. Other non-haul truck traffic had an annual average of 32.3 vehicle transits per day, with the highest number of transits occurring in September.

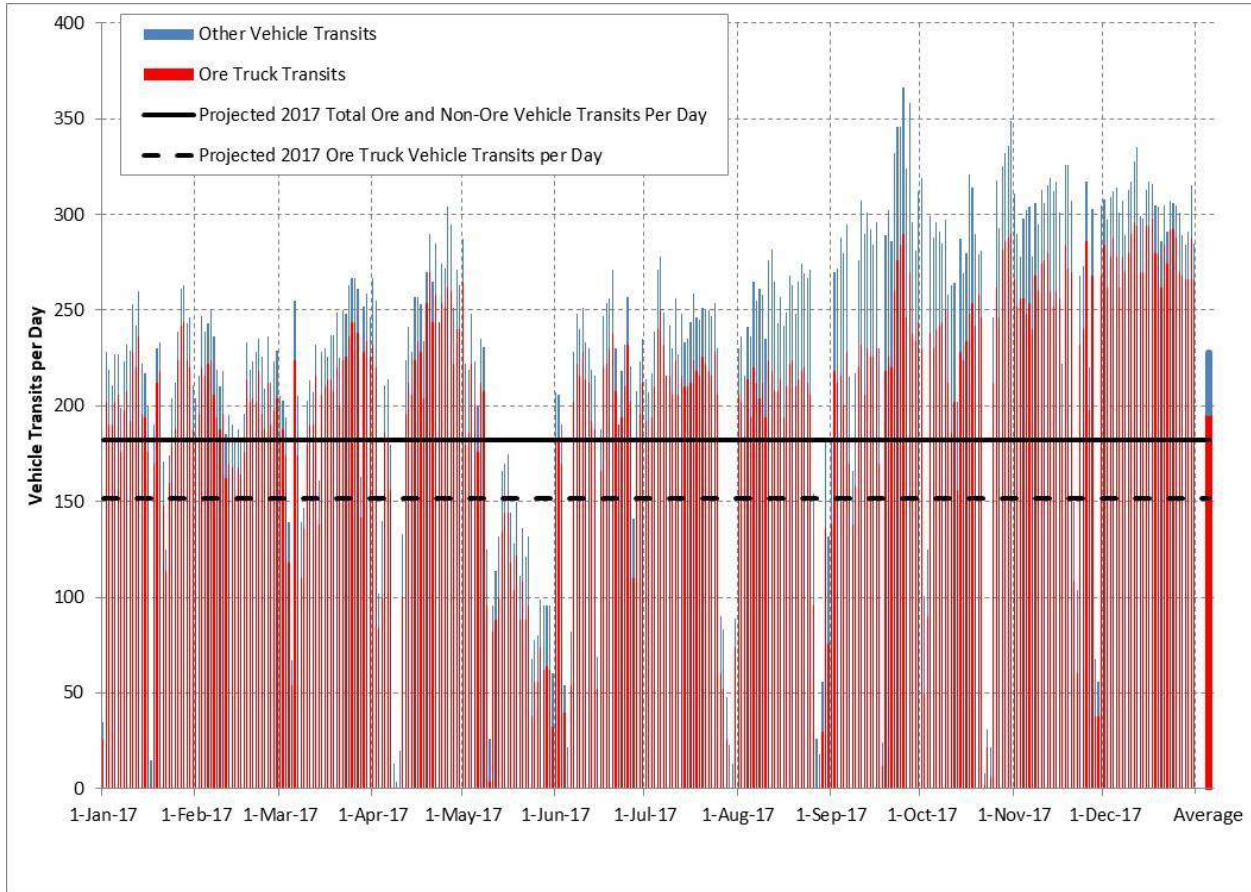
- g. Since 2014, Project Certificate Condition No. 57(g) has been addressed in the terrestrial environment annual monitoring report under the dustfall monitoring program, as part of the section that addresses overview of weather conditions.

Annual weather data is recorded by Baffinland from on-site meteorological stations at Mary River, Milne Inlet, and Steensby Port. Baffinland established an on-site meteorological station at Mary River Camp in June 2005 and at Milne and Steensby Inlet in June 2006, which represents the only available long-term data for the Project. Environment Canada operated a climate station at Mary River from 1963-1965; however, the station only recorded measurements during the summer months. This data is included in the terrestrial environment annual monitoring report where relevant. Parameters measured include air temperature, precipitation as rainfall, wind speed and wind direction. Weather data, provided by Baffinland has been assessed annually since 2014 and is included in the annual reports submitted to NIRB. Currently, weather assessments as part of the annual report do not include Steensby Port, given that this component of the Project is not currently active.

On average, air temperatures at the Mine Site and Milne Port in 2017 were somewhat cooler during the summer and warmer during the winter relative to baseline conditions, 2005–2010. Air temperatures recorded by Environment Canada at the Mine Site meteorological station from 1963–1965 were cooler during the summer months than 2017 air temperatures. There were fewer days of rainfall and less rain in 2017 at Milne Inlet relative to baseline conditions, while the number of rainfall days and total rainfall at the Mine Site was somewhat average compared to baseline conditions (2005-2010). Total rainfall recorded annually from 1963–1965 by Environment Canada at the Mine Site meteorological station was lower than the 2017 total. Wind direction in 2017 at Milne Port and the Mine Site was mostly consistent with baseline wind direction data. Wind data has not recorded at the Environment Canada Mine Site meteorological station since 1963–1965.

Generally, snow melt occurs in late June and frost-free conditions last until late August. In 2017, the onset of snow melt began around mid to late June where temperatures were consistently above zero. Following the onset of snow melt, air temperatures rose and the amount of daylight increased triggering plant growth and green-up.

- h. The TEMMP addresses Project Certificate Condition No. 57(h). All versions of the TEMMP have been included in the revision table contained within this document. Ongoing updates and changes to monitoring programs are also discussed in the terrestrial environment annual monitoring reports. This PC Condition is seemingly identical to PC Condition No. 58(e).



**Figure 4.8 Daily Vehicle Transits on the Tote Road in 2017**

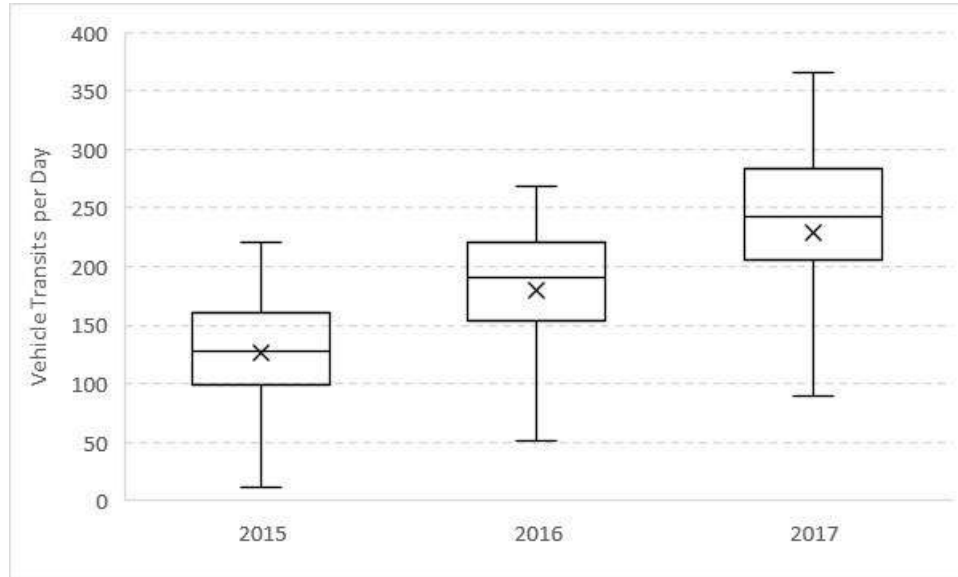
**NOTES:**

- 1. Includes both full ore trucks (red) and all other vehicle transits (blue).
- 2. The projected maximum number of vehicle passes per day on the Tote Road and the projected number of Ore Haul Truck per day on the Tote Road are also shown.

**TRENDS**

- a. No trends reported.
- b. No trends reported.
- c. No trends reported. Wolf and caribou observations on site follow the trends of regional observations; very low numbers. The low bird densities near site reflect low densities in the North Baffin Island region.
- d. No trends reported.

- e. No trends reported.
- f. The annual mean ore haul transits and non-haul transits per day increased between 2015 and 2017 (Figure 4.9).
- g. No trends reported.
- h. No trends reported.



**Figure 4.9 Trends in Vehicle Transits on the Tote Road (2015 to 2017)**

**NOTES:**

1. Includes ore haul traffic and other traffic combined.
2. The 'x' in the centre of each box marks the annual mean value, the box displays median, 25th and 75th quartiles, and the whiskers represent the minimum and maximum values.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue monitoring traffic along the Tote Road in 2018 in accordance with the TEMMP.

The definition of snow-melt and green-up will be discussed with the TEWG and Baffinland will determine the best method to collect this data, beginning in 2018.



## Project Certificate Condition No. 58

Category	Terrestrial Wildlife and Habitat - Reporting
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate and monitor for impacts to wildlife.
Term or Condition	<p>Within its annual report to the NIRB, the Proponent shall incorporate a review section which includes:</p> <ol style="list-style-type: none"> <li>An examination for trends in the measured natural variability of Valued Ecosystem Components in the region relative to the baseline reporting;</li> <li>A detailed analysis of wildlife responses to operations with emphasis on calving and post-calving caribou behaviour and displacements (if any), and caribou responses to and crossing of the railway, the Milne Inlet Tote Road and associated access roads/trails;</li> <li>A description of the extent of dustfall based on measured levels of dustfall (fugitive and finer particles such as TSP) on lichens and blueberries, and ash content of caribou fecal pellets;</li> <li>A demonstration and description of how the monitoring results, including the railway, road traffic, air traffic and dustfall contribute to cumulative effects of the project;</li> <li>Any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program;</li> <li>Any updates to information regarding caribou migration trails. Maps of caribou migration trails, primarily obtained through any new collar and snow tracking data, shall be updated (at least annually) in consultation with the Qikiqtani Inuit Association and affected communities, and shall be circulated as new information becomes available.</li> </ol>
Relevant Baffinland Commitments	60
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j)
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS AND RESULTS

- Baffinland does not currently conduct any regional terrestrial environmental monitoring programs, but does contribute to and support regional environmental monitoring programs by conducted by the Government of Nunavut and Environment and Climate Change Canada, the results of which are discussed at TEWG meetings. There are no known reports of regional trends that can be used to address Part (a).
- Part (b) is addressed in the terrestrial environment annual monitoring program annually through height-of-land surveys, snow bank height management and monitoring, and snow track surveys. However, caribou displacement has not yet been observed on-site as caribou numbers are low in the North Baffin Region.

- c. Part (c) is addressed through dustfall sampling. In 2017, there were a total of 33 dustfall sample sites including: nine (9) dustfall samplers located at the Mine Site; six (6) dustfall samplers located at Milne Port; sixteen dustfall samplers divided between two (2) sites along the Tote Road (the North site and South site); and two (2) reference dustfall samplers are located 14 km southwest of the Tote Road.

Dustfall sampling is conducted year-round; however, the winter sampling program is limited to a subset of the sampling sites (16 out of 33 in the 2017 season) because access to remote sites is restricted and unsafe during the winter months. Data analysis investigates differences between near, far and reference sites, seasonal differences, and calculates total annual deposition.

Annual dustfall at the Mine Site sample locations currently falls within predicted levels; however, 2017 annual dust is less than was observed in 2016, except at DF-M-01, which was affected by crusher activities in late November/early December 2017 resulting in higher than expected dustfall.

Dustfall at Milne Port exceeded predicted threshold levels at all sites except at DF-P-07. The highest dustfall was noted at DF-P-01 and DF-P-05.

Dustfall associated with the Tote Road at both the north and south crossing indicated a similar trend: Within 30 m and one (1) kilometre on either side of the road centreline dustfall showed an increase over the predicted threshold amount, however outside the one (1) kilometre range the dustfall deposition rates decreased to just at or below laboratory detection limits, which is analogous to background conditions.

At most year-round sampling locations throughout the Project area, dustfall in 2017 was less than in 2016; DF-M-01 and DF-RN-04 are the exceptions where it has increased. This decrease may be due to increased effectiveness of dust suppression activities including the application of water and calcium chloride, particularly along the Tote Road.

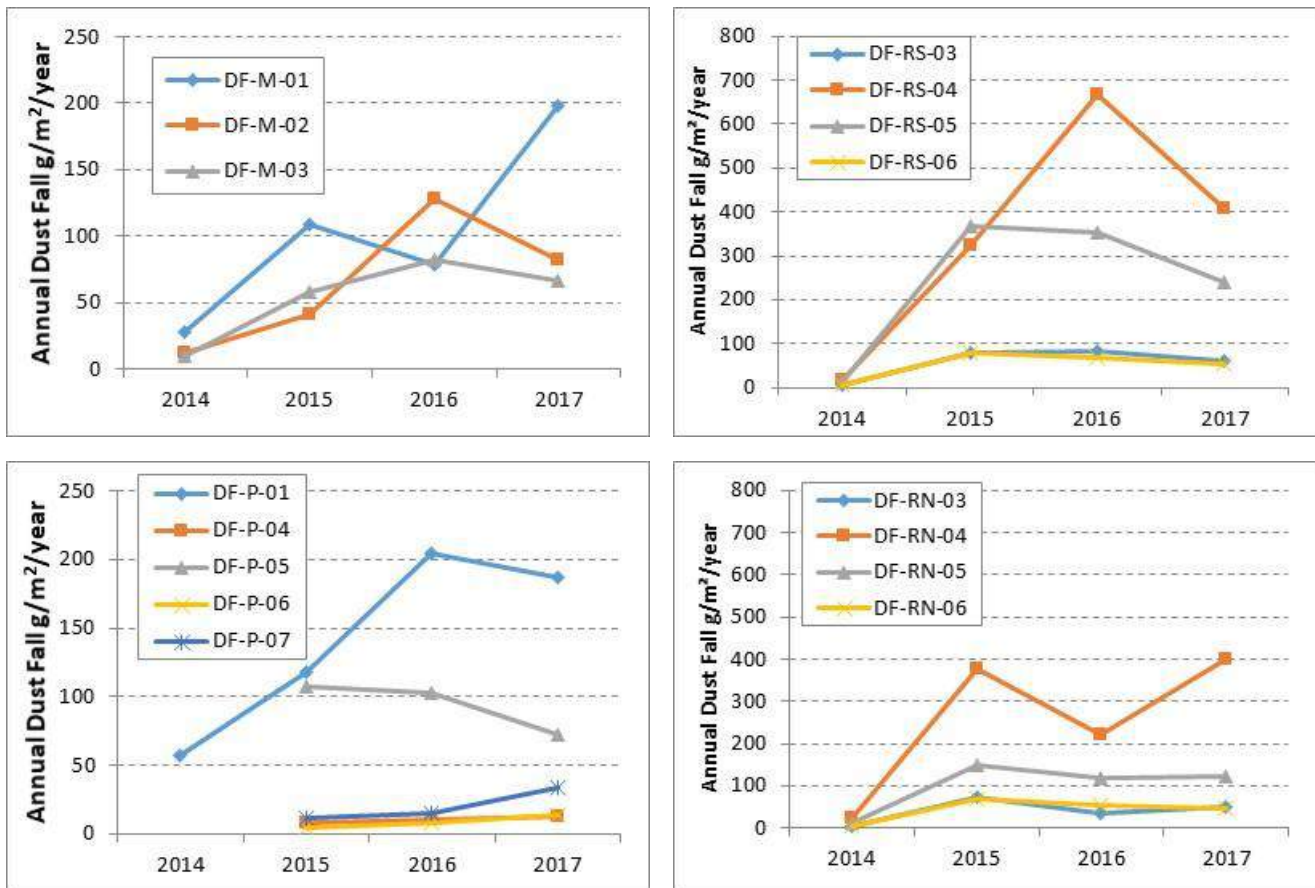
The vegetation and soil base metals monitoring program began in 2014 prior to commencing operations, and considers three (3) Project components (Milne Port, Tote Road, Mine Site) at varying distances from the Project Development Area (PDA; 0 to 100 m; 101 to 1000 m; >1000 m). Soil and lichen samples are collected every three (3) to five (5) years, typically between late July to early August. Samples are analyzed for total metal concentrations to assess the relationship of metals in soil and lichen with distance from the PDA. A subset of total metals, referred to as contaminants of potential concern (CoPC), are selected for analysis and typically includes arsenic, cadmium, copper, lead, selenium and zinc. The CoPCs are compared to Project-specific thresholds. In 2017, two (2) sites were resampled where metal concentrations in soil and lichen were reported above the threshold during 2016 sampling. Site L-71 was resampled for lead in lichen within 100 m of Tote Road and Site L-91 was resampled for copper in soil within 100 m of Milne Port.

- d. Part (d) is addressed through the annual reporting of the size of the Project footprint, dustfall, road traffic and helicopter overflights.
- e. Part (e) is addressed by the TEMMP. Ongoing updates and changes to monitoring programs are also discussed in the terrestrial environment annual monitoring reports. This Project condition is seemingly identical to Part (h).
- f. Part (f): There is no new information on caribou migration trails since the data collection was summarized for the FEIS baseline report completed in 2012. Since construction started on the Project there have been no new collar data collected, and no new caribou tracks have been observed. These results are reviewed with the TEWG, within which the QIA participates. Affected communities were consulted in November 2015 and April 2016 to gather contemporary knowledge about caribou movement in the Project area. Mapping of likely caribou movement areas adds to the growing local knowledge database that has been used to assess for and mitigate potential effects to caribou.

**TRENDS**

In general, dustfall across the Project area increased from 2014 through 2016 as mine production increased. Dustfall between 2016 and 2017 showed a levelling off in most sites, except DF-M-01, which was affected by crusher activities in late November/early December 2017 resulting in higher than expected dustfall. Trends at each Project site are summarized below and are presented on Figure 4.10.

- **Mine Site (DF-M Stations)** - Dustfall monitoring sites DF-M-02 and DF-M-03 saw a decrease in dustfall in 2017 compared with 2016, however, dustfall at site DF-M-01 indicated a steep increase from 2016.
- **Milne Port (DF-P Stations)** - Dustfall monitoring sites DF-P-01 and DF-P-05 indicated a decrease in dustfall in 2017 when compared to 2016. Very slight increases or no change was noted at DF-P-04, -06 and -07.
- **Tote Road North (DF-RN Stations)** - Dustfall monitoring station DF-RS-04 indicated an increase in dustfall in 2017 compared with 2016. All other sites at the Tote Road North crossing transect indicated a negligible change in dustfall in 2017 compared with 2016.
- **Tote Road South (DF-RS Stations)** - Dustfall monitoring sites all indicated a decrease in dustfall in 2017 compared with 2016, particularly at sites DF-RS-04 and -05, which are closest to the road centreline. This decrease was likely associated with effective dust suppression activities along this section of the Tote Road.



**Figure 4.10 Annual Dustfall Trends (2014 to 2017)**

During 2017, two groups of caribou were observed by local Inuit hunters around Bylot Island and in the valley northeast of the Tote Road by the km 60 pull-out; however, no caribou were seen within the PDA, or identified during the Height-of-Land surveys. Caribou have not been observed in the Project Development Area (PDA) between 2013 and 2017. This information has been confirmed through collaboration with the Government of Nunavut – Department of Environment vis-à-vis their seasonal / bi-annual caribou aerial surveys and through Inuit Qaujimagatuqangit received at workshops held in November 2015 and April 2016.

#### **RECOMMENDATIONS / LESSONS LEARNED**

The following recommendations relate to dustfall:

- Continue monitoring dustfall in 2018 in accordance with the TEMMP;
- Investigate the possibility of actually measuring “dust” (e.g. TSP) on plants, as opposed to measures of metals alone (suggestion from the TEWG);
- Continue ongoing efforts to increase dust suppression activities in all Project areas including the Mine Site, Milne Port, and the Tote Road; and
- Investigate new methods of transportation that will generate less dustfall.

The annual reporting of the size of the Project footprint, dustfall, road traffic and helicopter overflights are measures of the Project’s contribution to the potential cumulative effects in the North Baffin Region. The Project footprint contributes to a loss of habitat in the North Baffin Region. Dustfall, road and air traffic have not yet been revealed to have created a Project-related measurable effect on any valued ecosystem components.

## Project Certificate Condition No. 59

Category	Terrestrial Wildlife and Habitat – Aircraft Disturbances
Responsible Parties	The Proponent
Project Phase(s)	Construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate aircraft disturbance to wildlife and Inuit harvesting.
Term or Condition	The Proponent shall ensure that aircraft maintain, whenever possible(except for specified operational purposes such as drill moves, take offs and landings), and subject to pilot discretion regarding aircraft and human safety, a cruising altitude of at least 610 metres during point to point travel when in areas likely to have migratory birds, and 1,000 metres vertical and 1,500 metres horizontal distance from observed concentrations of migratory birds (or as otherwise prescribed by the Terrestrial Environment Working Group) and use flight corridors to avoid areas of significant wildlife importance. The Proponent, in collaboration with the Terrestrial Environment Working Group shall develop a program or specific measures to ensure that employees and subcontractors providing aircraft services to the Project are respectful of wildlife and Inuit harvesting that may occur in and around project areas.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	Partially-Compliant
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

In consultation with the TEWG, Baffinland implemented a requirement for all helicopter pilots to complete a flight log to track flight data, reason for flight and explanation for lower flight altitudes, when required.

Canadian Helicopters provided flight log data and daily pilot timesheets (with flight details) from June 1 to September 31, 2017 for analysis. Baffinland also provided pilots with GPS coordinates for flight height allowance areas. Point data representing vertices along helicopter flight paths were provided and a Digital Elevation Model (DEM) was used to estimate ground level elevation values above sea level. The provided point elevation data was used to calculate the helicopter altitude above ground level. To find the actual elevation above ground level in metres, the metres above sea level (masl) from the DEM was subtracted from the masl from the helicopter data, resulting in a helicopter's approximate metres above ground level (magl) at each logged point.

Data were split into two categories: 1) those data within the snow goose area in July and August 2017 in relation to 1,100 magl elevation requirement and 2) those data within and outside the snow goose area in all months (2017) in relation to 650 magl. The data sets were then analyzed separately to assess specific flight height allowances using the different areas and elevation values. The flight height data was also cross-referenced with pilot logs from daily timesheets, and any flight data with justifications for flying at lower elevations than required was considered to be compliant. Based on this analysis, flight data was organized into the following six categories:

1. Those data within the snow goose area in July and August, where the 1,100 magl elevation requirement was achieved (compliant);
2. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant);
3. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant);
4. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was achieved (compliant);
5. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant); and
6. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant).

## RESULTS

There is a discrepancy between Project Condition 59 and 71, suggesting that minimum flight height should be 610 magl in all areas, and Project Condition 71 prescribes a minimum flight height of 650 magl. Considering that most, if not all, areas where Baffinland operated in June through September were likely to have migratory birds, the default minimum altitude for the analysis was 650 magl (during point to point travel).

There were no identified “observed concentrations of migratory birds”, nor areas specifically prescribed by the TEWG to avoid for migratory birds excluding the snow goose area in 2017. For transects flown within the snow goose area during the moulting season, compliance was 95%, and compliance within and outside the snow goose area in all months (2017) was 76%.

2017 was the first year that flight height data were cross-referenced with pilot logs from daily timesheets. For analytical purposes, non-compliant flight height data points were converted to represent compliance with Project Condition guidelines in cases where the pilot’s discretionary rationale for deviating from flight heights was provided on daily timesheets. If a data point was originally non-compliant and no explanation was given, then the point remained non-compliant. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years, as it provided explanations for transits flown lower than the elevation requirements. Some examples given to explain low-level flights included the following:

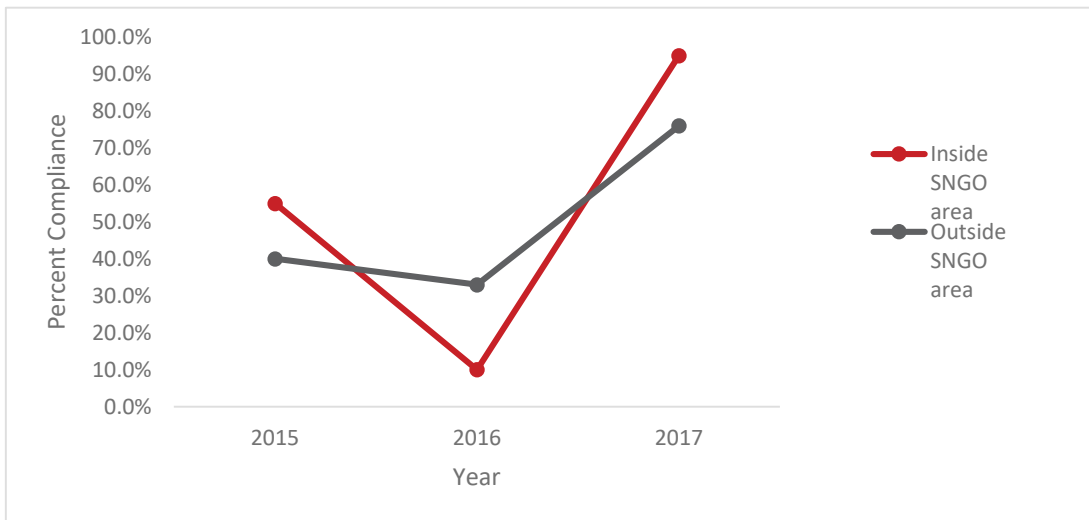
- Weather;
- Slinging;
- Staking;
- Surveys;

- Drop off/pick up;
- Demobilization;
- Sampling; and
- Evacuations.

This additional analysis showed that when considering rationale provided by pilots for low-level flying, most helicopter flights that would initially be considered non-compliant were ultimately considered compliant. For example, of all the compliant transits within the snow goose area during the moulting season, only 1% were  $\geq 1,100$  magl, and the other 99% were  $< 1,100$  magl with reasons given by pilots. Similarly, when looking at all compliant transits within and outside the snow goose area in all months, only 6% were  $\geq 650$  magl, and the other 94% were  $< 650$  magl with reasons given by pilots. Drop offs and pick ups were stated as the most common reason for flying below the elevation requirements both inside and outside the snow goose area, followed by slinging, surveying and weather.

**TRENDS**

Helicopter flight height compliance inside the goose area during moulting period was considerably higher in 2017 (95%) than in 2015 (55%) and 2016 (10%) (Figure 4.11). This increase was largely due to an additional analysis performed in 2017, which considered justifications provided by pilots for many of the transits flown below the elevation requirements. For analytical purposes, non-compliant data points were converted to represent compliance with Project Conditions in cases where reasonable explanations were provided on daily timesheets. If a data point was originally non-compliant and no explanation was given, then the point remained non-compliant. Helicopter flight height compliance within and outside the goose area in all months was higher in 2017 (76%) than in 2015 (40%) and 2016 (33%), which was also largely due to the additional analysis performed in 2017, as stated above (Figure 4.11).



**Figure 4.11 % Compliance of Flights Inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in All Months (2015 - 2017)**

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with their helicopter provider to improve flight height compliance by continuing to communicate elevation requirements and improving documentation of reasons for not meeting the requirements.

## Project Certificate Condition No. 60

Category	Terrestrial Wildlife and Habitat - Explosives
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to wildlife from explosives.
Term or Condition	Prior to construction, the Proponent shall develop a detailed blasting program to minimize the effects of blasting on terrestrial wildlife that includes, but is not limited to the restriction of blasting when migrating caribou, sensitive local carnivores or birds may be negatively affected.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	N/A
Reference	Borrow Pit and Quarry Management Plan (Baffinland, 2014d) Environmental Protection Plan (Baffinland, 2016g)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland submitted a Borrow Pit and Quarry Management Plan to the Nunavut Water Board in late 2013/early 2014. That plan accompanied a broader Environmental Protection Plan that included the requirement to scan for and report wildlife presence on a wildlife sightings log and that blasting not occur if wildlife is present and could be harmed by the activity.

### RESULTS

No wildlife has been knowingly harmed or disturbed by blasting activities during construction.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 61

Category	Terrestrial Wildlife and Habitat - Operations (General)
Responsible Parties	The Proponent, TEWG
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate Project impacts to wildlife.
Term or Condition	Whenever practical and not causing a human safety issue, a stop work policy shall be implemented when wildlife in the area may be endangered by the work being carried out. An operational definition of 'endangered' shall be provided by the Terrestrial Environment Working Group.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (Baffinland, 2016g) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

The Environmental Protection Plan outlines the 'stop work' when wildlife is in the area policy.

### RESULTS

Whenever practical and not causing a human safety issue, a stop work policy shall be implemented when wildlife in the area may be endangered (at risk of immediate injury or death) by work being conducted.

The term "endangered" was defined by the TEWG as at risk of physical injury or death.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 62

Category	Terrestrial Wildlife and Habitat - Operations (General)
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent increased harvesting pressure on wildlife.
Term or Condition	The Proponent shall prohibit project employees from transporting firearms to site and from operating firearms in project areas for the purpose of wildlife harvesting.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Weapons on Site Policy (Baffinland, 2013c) Hunting and Harvesting Policy (Baffinland, 2013d)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

In 2013, Baffinland implemented its Weapons on Site Policy which prohibits employees from transporting firearms to site. Site orientation includes cultural awareness and goes over the policies outlined in the Hunting and Fishing (Harvesting) Policy. The policy states that no employee or contractor will be permitted to hunt or fish (harvest) on lands leased to Baffinland. Baffinland does not interfere with rights of public hunting or fishing near or within the Project Development Area. All visitors and visitor activities are tracked through a human use log, provided in the terrestrial annual monitoring reports.

### RESULTS

No incidences of Project personnel hunting or fishing within lands leased to Baffinland occurred in 2017, while 24 visitors were logged in the visitor's log (human use log).

### TRENDS

Over past years no Project personnel have participated in hunting or fishing on the Project Development Area unless approved by scientific permit and have not interfered with public rights to fish or hunt in or near the Project Development Area.

### RECOMMENDATIONS / LESSONS LEARNED

The Weapons on Site Policy has been successful in eliminating firearms from the workplace. Baffinland continues to monitor and implement the policy banning all employees and contractors from hunting and fishing within the Project Development Area.

## Project Certificate Condition No. 63

Category	Terrestrial Wildlife and Habitat - Public Engagement
Responsible Parties	The Proponent, local Hunters and Trappers Organizations
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To keep communities up to date with Project operations.
Term or Condition	The Proponent shall liaise with local Hunters and Trappers Organizations in advance of carrying out terrestrial wildlife surveys. At a minimum, The Proponent shall also meet annually in person with Hunters and Trappers Organizations to discuss wildlife monitoring and mitigation plans and address community concerns regarding wildlife interactions. The Proponent may be required to facilitate these meetings through payment of honoraria and meeting costs.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG) and with local Hunter and Trappers Organizations (HTOs)
Reference	2017 Community Engagement Records, 2017 TEWG Meeting Records
Ref. Document Link	Appendix B, Appendix C2

### METHODS

The Mittimatalik Inlet Hunters' and Trappers' Organization (MHTO) became a member of the TEWG in 2016. The TEWG meets twice in-person annually or more often as required via conference call. Baffinland facilitates these meetings through the provision of honoraria and meeting costs for MHTO members' participation.

In addition to the MHTO's participation in the Working Groups, Baffinland also met with other local HTOs throughout the year to provide an update on the Project and the Phase 2 Proposal. These meetings are listed in Table 4.18.

**Table 4.18 2017 Meetings with Local HTOs**

Hunter and Trapper Organization	Date
Clyde River Hunters and Trappers Organization	May 29 2017
Ikajutit Hunters and Trappers Organization	May 31 2017
Mittimatalik Hunters and Trappers Organization (MHTO)	May 30 2017
Mittimatalik Hunters and Trappers Organization (MHTO)	June 12-13 2017
Iglolik Hunters and Trappers Organization	June 1 2017
Hall Beach Hunters and Trappers Organization	June 2 2017

### RESULTS

Wildlife monitoring and mitigation programs and wildlife surveys are reviewed at the TEWG meetings. In addition, draft annual monitoring reports are provided to TEWG members for review and comment prior to finalization and for input into the following years monitoring programs.

The 2017 monitoring for mammals included a number of surveys designed to enhance baseline data and monitor the effects of construction activities on caribou. Specific surveys included:

- Snow track surveys;
- Snow bank height monitoring;
- Height of land caribou surveys; and
- Incidental observations and wildlife log.

The 2017 surveys were conducted in partnership with the MHTO to incorporate Inuit Qaujimagatuqangit (IQ) into the surveys. MHTO member Elijah Panipakoocho participated in all survey programs and provided valuable input on survey methods, primarily for the height of land caribou survey program.

#### **TRENDS**

Not applicable.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with the MHTO at TEWG meetings and other meetings organized between Baffinland and the local HTOs.

## Project Certificate Condition No. 64

Category	Terrestrial Wildlife and Habitat - Waste Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent human-carnivore interactions.
Term or Condition	<p>The Proponent shall ensure that its Environment Protection Plan incorporates waste management provisions to prevent carnivores from being attracted to the Project site(s). Consideration must be given to the following measures:</p> <ol style="list-style-type: none"> <li>Installation of an incinerator beside the kitchen that will help to keep the food waste management process simple and will minimize the opportunity for human error (i.e. storage of garbage outside, hauling in a truck (odours remain in truck), hauling some distance to a landfill site, incomplete combustion at landfill, fencing of landfill, etc.)</li> <li>Installation of solid carnivore-proof skirting on all kitchen and accommodation buildings (i.e., heavy-duty steel mesh that would drop down from the edge of the buildings/trailers and buried about a half meter into the ground to prevent animals from digging under the skirting).</li> </ol>
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Environment Climate Change Canada, Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board.
Reference	Environmental Protection Plan (Baffinland, 2016g) Waste Management Plan (Baffinland, 2017h) 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Waste management buildings are situated at both the Mine and Port sites. The waste management building house a dual chamber incinerator designed for optimal incineration of approved specific wastes, including food wastes. Design constraints at the Project site limited the ability to situate the Waste Management Building(s) directly beside complex kitchens, however Baffinland employs procedures in order to minimize animal attractants and interaction of carnivores with food or food wastes as described in the Environmental Protection Plan (EPP) and the Waste Management Plan (which includes the Incinerator Operation Procedure as an appendix). Employees are trained on animal attractant policies upon arrival at Site and during annual Environmental Protection Plan training.

The specific measures implemented to mitigate attractants and animal interactions include double bagging food and food wastes with storage in closed top bins, and or sealed c-cans and are promptly removed for incineration inside the enclosed Waste Management Building(s). Food wastes are incinerated under stipulated conditions, and ash is visually inspected and tested under applicable Nunavut guidelines for landfilling. Ash deposited in the designated landfill is promptly covered with a layer of material to mitigate animal attraction and landfill fencing on specific areas of the landfill perimeter is used to reduce access. Metal Skirting has also been installed on kitchen and accommodation buildings on the Project site to prevent carnivores accessing under buildings.

## **RESULTS**

Both the Environmental Protection Plan and Waste Management Plan incorporate carnivore interaction and attractant mitigation measures and policies, which continued to be implemented in 2017. Food and food wastes were stored as designated by the aforementioned plans, incinerated in the waste management buildings and ash promptly disposed of and covered in the designated landfill.

Carnivore interactions have been minimized but still do occur due to Non-Conformance issues related to the waste sorting guidelines. Arctic fox site habituation proved to be a challenge even while mitigating animal attractants on site. One instance of a rabid fox was documented in January 22, 2017, and the risks associated with rabid animals were discussed subsequently with the Government of Nunavut Wildlife Officer. Animal interactions are documented and discussed in the 2017 Terrestrial Environment Annual Monitoring Report.

Metal Skirting on accommodation and kitchen complexes continued to be repaired and maintained in 2017; metal skirting will also need to be installed on the new approved camp complex at the Mine Site.

## **TRENDS**

Carnivore and/or Arctic Fox interactions have gradually increased over the life of the Project. Various factors could be contributing to the trend, including the habituation of Arctic Fox in the Project Development Area. Incineration, animal attractant mitigation measures and metal skirting installation continue to be implemented. The presence of rabies in the local arctic fox population will continue to be monitored to ensure potential safety issues with employees are mitigated and managed.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to mitigate wildlife interactions at the Project area by training, enforcing, and monitoring waste management practices and guidelines. All management and supervisors attend mandatory Environment Protection Plan training, which is then passed on to all employees. Included in the EPP are wolf, polar bear, fox, and caribou protection measures and waste management guidelines that are continually updated and implemented. Incineration and proper waste sorting are the most prominent deterrents used. Wildlife attractants such as food scraps and human waste are sorted and sealed in animal proof containers and incinerated on site. Posted around each site are waste sorting guidelines that clearly define where food and other attractants should be placed. Other deterrents used is metal skirting to minimize wildlife entry under buildings. Wire skirting is used under the main camps at both sites to ensure no wildlife such as foxes or hares den underneath. Feeding of wildlife is strictly prohibited and noncompliance is dealt with accordingly.

4.6.9 Birds (PC Conditions 65 through 75)

Eleven (11) PC conditions focus on potential impacts of the Project on birds. Most of these conditions relate to the implementation of mitigation measures within the TEMMP to protect birds in consultation with relevant organizations. Baffinland is also required to report on the amount of terrestrial habitat loss annually.

*Stakeholder Feedback*

The Canadian Wildlife Service (CWS) of Environment and Climate Change Canada (ECCC) have legislated responsibility for migratory birds, under the *Migratory Birds Convention Act* and associated regulations. The Government of Nunavut (GN) is responsible for species at risk within Nunavut, pursuant to the *Wildlife Act* (GN, 2005). During the course of the Project reviews, the focus was understandably on bird species at risk. Both agencies participate in the TEWG, and as such, Baffinland engages with these agencies bi-annually on the mitigation and monitoring of Project effects on birds through the TEWG. Effects to birds were not raised in 2017 consultation activities (Appendix B).

*Monitoring*

Baffinland’s bird monitoring program includes the following:

- Pre-clearing nest surveys;
- Communication tower surveys;
- Staging waterfowl surveys;
- Cliff-nesting raptor occupancy and productivity surveys; and
- Roadside waterfowl surveys.

The CWS also conducts annual seabird monitoring programs on behalf of Baffinland.

To the extent that Project impacts on the terrestrial environment can be evaluated, the effects of the Project appear to be within FEIS predictions. Table 4.19 provides a summary of the main activities in 2017 in relation to the birds, and an impact evaluation in comparison to the predictions outlines in the FEIS and FEIS Addendum.

**Table 4.19 Birds Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Bird Indicator Species/Species at Risk	Destruction of nests due to development in expanded project footprint	Pre-clearing nest surveys are conducted at the locations this was applicable; no nests were identified within the new disturbance area	Effect did not occur
	Habitat loss: direct habitat loss due to the Project footprint; and indirect habitat loss due to sensory disturbances	Staging waterfowl surveys; cliff-nesting raptor occupancy and productivity survey; cliff-nesting raptor nest site management and effects monitoring. No evidence of a relationship between distance from the road/PDA and the number of birds observed. No effect on cliff-nesting raptor nest occupancy rates since 2011.	Effect negligible
	Influences on health	Distance to disturbance analysis suggests there is no negative effect on monitored raptor nesting. Helicopter flight height compliance inside the goose area during moulting period was high in 2017, at 95%.	Effect did not occur
	Mortality	No bird mortalities were observed through incidental observations and communication tower surveys	Effect did not occur

*Path Forward*

Baffinland will remain vigilant about the mitigation and monitoring activities that are in place to protect birds including bird species at risk. Baffinland will continue to seek input and review monitoring results trends from technical members of the TEWG. Reporting on each PC condition follows.



## Project Certificate Condition No. 65

Category	Birds - Awareness
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent disturbance to birds and bird habitat.
Term or Condition	The Proponent shall ensure all employees working at project sites receive awareness training regarding the importance of avoiding known nests and nesting areas and large concentrations of foraging and moulting birds.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (EPP; Baffinland, 2016g) 2017 TEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Supervisory training is delivered by the Baffinland Site Environment Department on a semi-annual basis to ensure all employees are aware of the importance of avoiding nesting areas and large concentrations of foraging and moulting birds.

Section 2.13 (Bird Protection Measures) of the EPP is the relevant document that deals with Bird Awareness training delivered to employees.

In 2017, on-site training of Bird Nest Surveys was performed by EDI to the Baffinland Site Environment Department.

Baffinland endeavours to perform construction activities outside of the bird nesting season. If construction activity is required in undisturbed areas during bird nesting seasons (e.g. between May 31 and August 31), Active migratory bird nest surveys are conducted in accordance with the *Migratory Birds Convention Act, 1994*. The results of these surveys are provided to the TEWG for review on a yearly basis.

### RESULTS

In 2017, Baffinland continued to monitor all new construction activities around the new camp and laydown areas. A total of 10.47 hectares were surveyed between June 2 and August 23, 2017. No disturbance or destruction of migratory bird nests or their young were recorded.

**TRENDS**

Baffinland Site Environment Department employees have continued to receive annual training on performing bird surveys through its consultant, EDI. Baffinland Site Environment Department employees have also continued to raise awareness of all Baffinland employees and contractors on the importance of preventing the disturbance of all wildlife and habitats at all Project sites through EPP training.

**RECOMMENDATIONS / LESSONS LEARNED**

Minimize disturbance (clearing) or other industrial activities in previously undisturbed areas during the nesting season between May 31 and August 31.

## Project Certificate Condition No. 66

Category	Birds - Species at Risk
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to sensitive bird species.
Term or Condition	If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance on the basis of the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.
Relevant Baffinland Commitments	75
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Baffinland concentrates new ground disturbance outside of the breeding bird season and conducts active migratory bird nest surveys in areas that are disturbed in the breeding season, prior to disturbance. Surveys were conducted using the rope-drag method, which is recommended by CWS. Surveys are conducted with a minimum of three observers by walking slowly through the area with the rope drag, looking for nests and birds displaying nesting behaviour. When bird nests are found, Baffinland establishes clear zones of avoidance on the basis of the species-specific nest setback distances are included in the TEMMP (Table 3-1).

### RESULTS

No species at risk nests or eggs have been encountered during Project activities.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to avoid species at risk nests and eggs when encountered by following guidelines for setback distances.

## Project Certificate Condition No. 67

Category	Birds - Species at Risk
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to sensitive bird species.
Term or Condition	The Proponent shall ensure that the mitigation and monitoring strategies developed for Species at Risk are updated as necessary to maintain consistency with any applicable status reports, recovery strategies, action plans and management plans that may become available during the duration of the Project.
Relevant Baffinland Commitments	75
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Environment and Climate Change Canada (ECCC)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

ECCC provides input to the development of mitigation and monitoring strategies for Species at Risk via participation in the TEWG. Section 3 of the TEMMP speaks to mitigation and monitoring strategies relevant to all wildlife that could interact with the Project, including species at risk.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to coordinate with ECCC through the TEWG to address mitigation and monitoring strategies related to species at risk.

## Project Certificate Condition No. 68

Category	Birds - Project Infrastructure
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent potential injuries to birds.
Term or Condition	The Proponent shall ensure flashing red, red strobe or white strobe lights and guy-wire deterrents are used on communications towers established for the Project. Consideration should also be given to reducing lighting when possible in areas where it may serve as an attractant to birds or other wildlife.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Environment and Climate Change Canada (ECCC), Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Through discussions with ECCC, Baffinland installed reflectors on guy wires at the communication towers established for the Project. It was determined that strobe lights were not a relevant mitigation measure as the majority of birds are in the area during the summer when there is 24 hours of light. Consideration has been given to reducing lighting where possible and it does not present any risks to operating the Project safely.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Strobe lights were found to not be a relevant mitigation measure because birds are mostly present during the period of 24 hours of sunlight. Baffinland will maintain the reflectors installed on the guy wires of the communication towers for the Project.

## Project Certificate Condition No. 69

Category	Birds - Construction/Clearing Activities
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent nesting by birds in active Project areas.
Term or Condition	Prior to bird migrations and commencement of nesting, the Proponent shall identify and install nesting deterrents (e.g. flagging) to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities taking place during the nesting season.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j)
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland prepared a bird deterrence review that was discussed at the TEWG meeting May 21, 2013. There was no feedback from the group on what would prove practical solutions prior to the 2014 construction season. Although active nest surveys were completed, deterrents were not erected. There were no apparent nesting attempts by birds in the cleared areas.

### RESULTS

No deterrents have been used.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

In 2017, approximately 162,915 m<sup>2</sup> of land was disturbed for Project infrastructure. Of the approximate areas cleared, 36% of the work was done outside of the breeding bird window. During the breeding bird window, approximately 103,473 m<sup>2</sup> of land was cleared while 141,917 m<sup>2</sup> was surveyed through active migratory bird nest surveys. Given that the areas cleared during the breeding season are managed by active migratory bird nest surveys prior to disturbance, deterrents have not been required. Avoidance has been the primary method used to prevent disturbances to nesting birds. No recommendations have been made by the TEWG that an alternative method would be more successful.

## Project Certificate Condition No. 70

Category	Birds - Construction/Clearing Activities
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to birds and nesting areas.
Term or Condition	The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan, until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j)
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Active migratory bird nest surveys are conducted in areas that are scheduled for clearing disturbance during the breeding bird season. When bird nests are found, Baffinland establishes clear zones of avoidance on the basis of the species-specific nest setback distances are included in Table 3-1 of the TEEMP (Baffinland, 2016j).

### RESULTS

No bird nests were located in 2017.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to avoid new ground disturbance during the nesting season where possible and continue to conduct Active Migratory Bird Nest Surveys throughout the breeding bird season in areas that need to be cleared.

## Project Certificate Condition No. 71

Category	Birds - Flight Altitude Requirements
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate aircraft disturbance to birds.
Term or Condition	<p>Subject to safety requirements, the Proponent shall require all project related aircraft to maintain a cruising altitude of at least:</p> <ul style="list-style-type: none"> <li>• 650 m during point to point travel when in areas likely to have migratory birds;</li> <li>• 1100 m vertical and 1500 m horizontal distance from observed concentrations of migratory birds; and</li> <li>• 1100 m over the area identified as a key site for moulting snow geese during the moulting period (July-August), and if maintaining this altitude is not possible, maintain a lateral distance of at least at least 1500 m from the boundary of this site.</li> </ul>
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	Partially-Compliant
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018); Terrestrial Environment Mitigation and Monitoring Plan, BAF-PH1-830-P16-0027, Rev 3.3 (EDI 2017)
Ref. Document Link	<p>Monitoring Reports available at:  <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a></p> <p>Management Plans available at:  <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a></p>

### METHODS

In consultation with the Terrestrial Environment Working Group (TEWG), Baffinland implemented a requirement for all helicopter pilots to complete a flight log to track flight data, reason for flight and explanation for lower flight altitudes, when required.

Canadian Helicopters provided flight log data and daily pilot timesheets (with flight details) from June 1 to September 31, 2017 for analysis. Baffinland also provided pilots with GPS coordinates for flight height allowance areas. Point data representing vertices along helicopter flight paths were provided and a Digital Elevation Model (DEM) was used to estimate ground level elevation values above sea level. The provided point elevation data was used to calculate the helicopter altitude above ground level. To find the actual elevation above ground level in metres, the metres above sea level (masl) from the DEM was subtracted from the masl from the helicopter data, resulting in a helicopter's approximate metres above ground level (magl) at each logged point.

Data were split into two categories: 1) those data within the snow goose area in July and August, 2017 in relation to 1,100 magl elevation requirement and 2) those data within and outside the snow goose area in all months (2017) in relation to 650 magl. The data sets were then analyzed separately to assess specific flight height allowances using the different areas and elevation values. The flight height data was also cross-referenced with pilot logs from daily timesheets, and any flight data with



justifications for flying at lower elevations than required was considered to be compliant. Based on this analysis, flight data was organized into the following six categories:

1. Those data within the snow goose area in July and August, where the 1,100 magl elevation requirement was achieved (compliant);
2. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant);
3. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant);
4. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was achieved (compliant);
5. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant); and
6. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant).

## RESULTS

There is a discrepancy between Project Condition 59 and 71, suggesting that minimum flight height should be 610 magl in all areas, and Project Condition 71 prescribes a minimum flight height of 650 magl. Considering that most, if not all, areas where Baffinland operated in June through September were likely to have migratory birds, the default minimum altitude for the analysis was 650 magl (during point to point travel).

There were no identified “observed concentrations of migratory birds”, nor areas specifically prescribed by the TEWG to avoid for migratory birds excluding the snow goose area in 2017. For transects flown within the snow goose area during the moulting season, compliance was 95%, and compliance within and outside the snow goose area in all months (2017) was 76%.

2017 was the first year that flight height data were cross-referenced with pilot logs from daily timesheets. For analytical purposes, non-compliant flight height data points were converted to represent compliance with Project Condition guidelines in cases where the pilot’s discretionary rationale for deviating from flight heights was provided on daily timesheets. If a data point was originally non-compliant and no explanation was given, then the point remained non-compliant. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years, as it provided explanations for transits flown lower than the elevation requirements. Some examples given to explain low-level flights included the following:

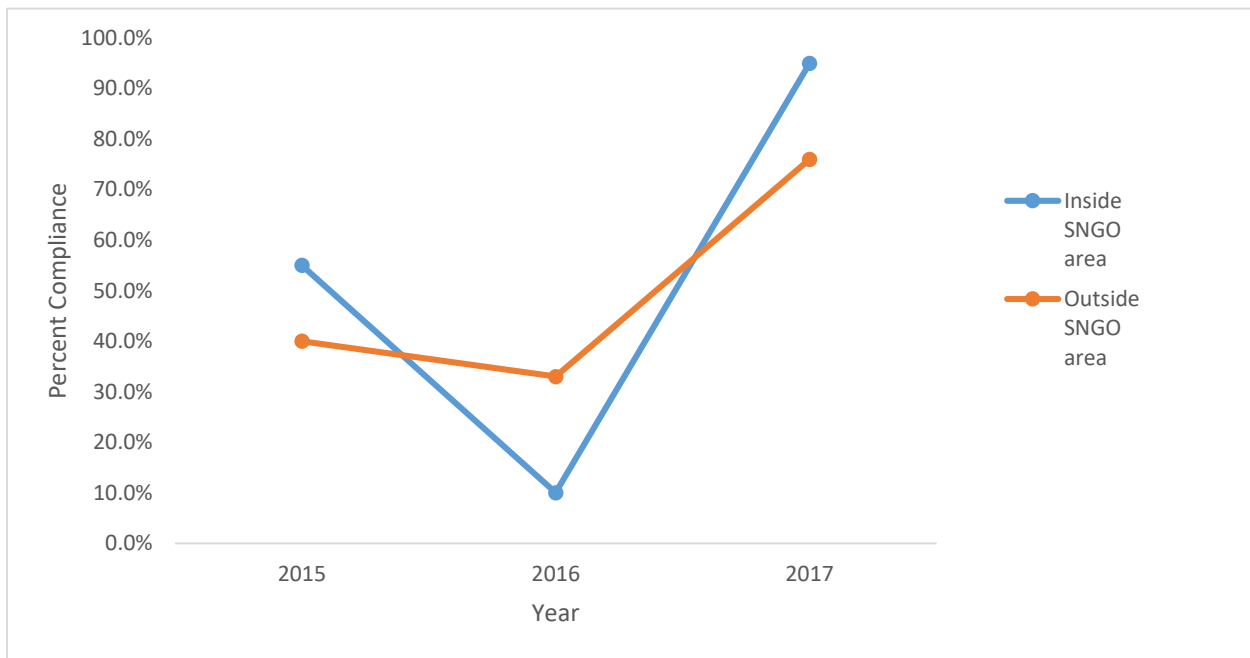
- Weather;
- Slinging;
- Staking;
- Surveys;
- Drop off/pick up;
- Demobilization;
- Sampling; and
- Evacuations.

This additional analysis showed that when considering rationale provided by pilots for low-level flying, most helicopter flights that would initially be considered non-compliant were ultimately considered compliant. For example, of all the compliant transits within the snow goose area during the moulting season, only 1% were  $\geq 1,100$  magl, and the other 99%

were < 1,100 magl with reasons given by pilots. Similarly, when looking at all compliant transits within and outside the snow goose area in all months, only 6% were ≥ 650 magl, and the other 94% were < 650 magl with reasons given by pilots. Drop offs and pick ups were stated as the most common reason for flying below the elevation requirements both inside and outside the snow goose area, followed by slinging, surveying and weather.

**TRENDS**

Helicopter flight height compliance inside the goose area during moulting period was considerably higher in 2017 (95%) than in 2015 (55%) and 2016 (10%) (Figure 4.12). This increase was largely due to an additional analysis performed in 2017, which considered justifications provided by pilots for many of the transits flown below the elevation requirements. For analytical purposes, non-compliant data points were converted to represent compliance with Project Conditions in cases where reasonable explanations were provided on daily timesheets. If a data point was originally non-compliant and no explanation was given, then the point remained non-compliant. Helicopter flight height compliance within and outside the goose area in all months was higher in 2017 (76%) than in 2015 (40%) and 2016 (33%), which was also largely due to the additional analysis performed in 2017, as stated above (Figure 4.12).



**Figure 4.12** Percent compliance for Flights inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in all Months from 2015 - 2017

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with their helicopter provider to improve flight height compliance by continuing to communicate elevation requirements and improving documentation of reasons for not meeting the requirements.

## Project Certificate Condition No. 72

Category	Birds - Flight Altitude Requirements
Responsible Parties	The Proponent, Transport Canada
Project Phase(s)	Construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate aircraft disturbance to birds.
Term or Condition	The Proponent shall ensure that pilots are informed of minimum cruising altitude guidelines and that a daily log or record of flight paths and cruising altitudes of aircraft within all Project Areas is maintained and made available for regulatory authorities such as Transport Canada to monitor adherence and to follow up on complaints.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Impact Review Board, Transport Canada, Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (Baffinland, 2016g) 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) 2017 TEWG Meeting Records
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

In 2017, Project personnel directed pilots to be aware of the potential disturbance to wildlife and the potential disturbance to local users (Inuit Hunters) moving through the Project Area as stated in Section 2.8 Aircraft Flights of the Environmental Protection Plan (EPP). Using the software Skytracker, flight paths are recorded and flight height requirements are included in all aviation contracts. Pilots are made aware of these requirements in ‘toolbox’ talks given at the beginning of each season and daily toolbox talks are held within each department. In addition, flight height compliance was incorporated into the helicopter contract Baffinland holds with Canadian Helicopters. Random audits of flight-logs were also completed throughout the season to help ensure compliance with requirements.

### RESULTS

Between the beginning of June and end of September 2017, a compliance rate of 73% was achieved

Non-compliance events were primarily due to weather conditions, movement of equipment and personnel, or safety concerns of the pilots during flight. Required monitoring programs that required low-level surveys also precluded the ability to comply with this Condition.

## TRENDS

Helicopter flight height compliance inside the goose area during moulting period was considerably higher in 2017 (95%) than in 2015 (55%) and 2016 (10%). This increase was largely due to the additional analysis performed in 2017, which considered justifications provided by pilots for many of the transits flown below the elevation requirements. For analytical purposes, non-compliant data points were converted to represent compliance with Project Conditions in cases where reasonable explanations rationale were provided on daily timesheets. If a data point was originally non-compliant and no explanation was given, then the point remained non-compliant.

Helicopter flight height compliance within and outside the goose area in all months was higher in 2017 (76%) than in 2015 (40%) and 2016 (33%), which was also largely due to the additional analysis performed in 2017.

## RECOMMENDATIONS / LESSONS LEARNED

2017 was the first year that flight height data were cross-referenced with pilot logs from daily timesheets. For analytical purposes, non-compliant flight height data points were converted to represent compliance with Project Conditions in cases where the pilot's discretionary rationale for deviating from flight heights was provided by on daily timesheets. If a data point was originally non-compliant and no explanation was given, then the point remained non-compliant. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years, as it provided explanations for transits flown lower than the elevation requirements.

This additional analysis showed that when considering rationale provided by pilots for low-level flying, the majority of originally non-compliant helicopter flights were ultimately considered compliant. For example, of all the compliant transits within the snow goose area during the moulting season, only 1% were  $\geq 1,100$  magl, and the other 99% were  $< 1,100$  magl with reasons given by pilots. Similarly, when looking at all compliant transits within and outside the snow goose area in all months, only 6% were  $\geq 650$  magl, and the other 94% were  $< 650$  magl with reasons given by pilots. Drop offs and pick ups were stated as the most common reason for flying below the elevation requirements both inside and outside the snow goose area, followed by slinging, surveying and weather.

## Project Certificate Condition No. 73

Category	Birds
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor Project-related effects on migratory birds.
Term or Condition	The Proponent shall develop detailed and robust mitigation and monitoring plans for migratory birds, reflecting input from relevant agencies, the Qikiqtani Inuit Organization and communities as part of the Terrestrial Environment Working Group and to the extent applicable the Marine Environment Working Group.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Marine Environment Working Group (MEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Management Plan available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Report available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Since 2011, Baffinland has continued to monitor cliff nesting raptor site occupancy and productivity. This is an established monitoring program with the statistical power and design robustness to detect nesting raptor response to disturbances associated with the Project. That program has evolved since 2012 to accommodate statistical data requirements, and is described in the TEMMP and terrestrial environment annual monitoring reports.

Since 2012, Baffinland has provided financial support to Environment and Climate Change Canada's (ECCC's) breeding bird PRISM plot surveys and seabird research programs in the region. The ongoing research results of those programs are reported separately by ECCC's National Research Centre. These programs continued in 2017.

Since the start of the construction phase, Baffinland has conducted active migratory birds nest surveys for areas of planned disturbance. Pre-clearing nest surveys were conducted by Baffinland Site Environment Department staff over the 2017 nesting season. In early June at the beginning of pre-clearing surveys. Baffinland Site Environment Department staff have been trained on methods to conduct nest searching surveys as well as identification of common species found in the area. In compliance with Canadian Wildlife Service (CWS) input provided in 2015 at the TEWG meeting, Baffinland acquired two rope drags (for Mary River and Milne sites) to use during preclearing surveys to increase the likelihood of nest/nesting adult detection. Rope drags were constructed following the template provided by CWS (Rausch, 2015). More detail on the active migratory bird nest surveys can be found in the 2017 Terrestrial Environment Annual Monitoring Report.

**RESULTS**

active migratory bird nest surveys are conducted in areas that need to be cleared and/or disturbed during the breeding bird season. No bird nests were located during any active migratory bird nest surveys in 2017.

The cliff-nesting raptor surveys continue on an annual basis. Annual results have shown that near-site (disturbed sites) are occupied and produce as many chicks and those far from (undisturbed) sites.

**TRENDS**

The cliff-nesting raptor monitoring, which has been conducted consistently since 2011 has shown that peregrine falcons have not shown a response to the Project. Occupancy and productivity at nest sites near the Project are similar to those at further distances.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to support breeding bird PRISM plot survey efforts on a schedule conducive to ECCC's efforts in the Baffin region.

When clearing cannot be avoided within the breeding bird season, Baffinland will continue with active migratory bird nest surveys and implement no-disturbance buffers until the adults and chicks have left the area. Baffinland will continue with the cliff nesting raptor program until results determine that no further surveying is required.

## Project Certificate Condition No. 74

Category	Birds - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To develop appropriate mitigation and monitoring of impacts to birds.
Term or Condition	The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Management System, Terrestrial Environment Mitigation and Monitoring Plan prior to construction. The key indicators for follow up monitoring under this plan will include peregrine falcon, gyrfalcon, common and king eider, red knot, seabird migration and wintering, and songbird and shorebird diversity.
Relevant Baffinland Commitments	57, 77
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI 2018) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016j) 2017 TEWG Meeting Records
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

#### Peregrine falcon, rough-legged hawk, and gyrfalcon (baseline studies and ongoing monitoring since 2011):

- Known nest sites are surveyed annually. As part of these surveys, crews also attempt to locate new nest sites in suitable areas. All nesting sites are categorized into distance bins from Project infrastructure to assess the potential effects of disturbance.
- Spring occupancy surveys (indicates number of pairs that attempt to breed) and summer productivity surveys (to measure nesting success by counting the number of young that reach fledging age) are used to collect demographic information on raptor populations.

#### Common and king eider as well as shorebird diversity:

- Shoreline Surveys (2012 and 2013)
  - Shoreline surveys were conducted to detect which species were present in the area, locations of nests, and their proximity to shoreline to assess potential effects of ship wakes. Surveys consisted of beach sweeps scanning for birds, bird activity, and potential nest sites. All shore types were surveyed regardless of perceived shorebird and waterbird nesting potential.

- In 2012, 104 kilometres of shoreline along Steensby Inlet were surveyed. Surveys were conducted north of the proposed Steensby Port area, the port area itself, and south of the port to the mainland area adjacent the islets at the mouth of Steensby Inlet.
- In 2013, 135 kilometres of shoreline along Milne Inlet were surveyed.

**Songbird and shorebird diversity:**

- Baseline bird surveys were conducted from 2006–2008, resulting in 32 species being identified in the area.
- PRISM Plot Surveys (2012 and 2013)
  - In 2012 and 2013, 80 and 13 (respectively), 300 m x 400 m PRISM plots were selected and surveyed. A total of 93 plots (11.2 km<sup>2</sup>) were surveyed in the two years.
  - PRISM surveys were conducted using two or three crew members walking along north-south transects with a 25-meter spacing. Average survey intensity was 51 minutes per plot.
  - Each plot was ground-truthed and classified as having either good, medium or poor suitability based on the classification methods used for PRISM plots. Good plots are those containing greater than 50% of wetland habitat types; poor plots were those containing greater than 50% of sparsely vegetated uplands, barren areas, and bare gravel; and medium plots were those habitats containing a mix of vegetated uplands, heaths, and drier grasslands.
- Bird Encounter Transects (2013)
  - Bird encounter transects were conducted to monitor Project effects on tundra breeding songbirds and shorebirds.
  - Conducted 45 transects extending 1.5 km perpendicular from the Project Development Area. Transects were divided into 100 m segments and all birds seen or heard along a segment were recorded.

**Red knot:**

- Red Knot, a species at risk, were identified as a species that may be found on site and observers were aware of their potential presence during all surveys. Specific Red Knot surveys were conducted in 2014 & 2015 along Phillips Creek and the shoreline around Milne Port.

**Seabird migration and wintering:**

- Staging Waterfowl and Waterbird Surveys at Milne Inlet (2015)
  - Staging surveys were conducted to determine species composition, abundance and use of river mouths by staging waterfowl and waterbirds.
  - Phillips Creek and Tugaat River are close to the proposed routes of ice breaker vessels and were chosen as investigation sites, while Robertson River was selected as a control site since no ice breaking activity was proposed nearby.
  - Staging surveys involved three observers at each site using binoculars and spotting scopes to scan the water and nearby upland sites for birds and other wildlife.

**RESULTS****Peregrine falcon, rough-legged hawk, and gyrfalcon:**

- Arctic Raptors Inc. conducted raptor surveys in 2011 and 2012 as part of the Project's terrestrial baseline surveys and have conducted annual raptor monitoring surveys since 2013. Results are reported in detail in the Annual Monitoring Reports.
- In 2017, site occupancy, brood size, and nest success were monitored for all known nest sites located within 10 km from the PDA (the Raptor Monitoring Area). Areas with high nest-site suitability for cliff-nesting raptors located between known nest sites were also surveyed.



- A total of 166 nesting sites have been detected in the Raptor Monitoring Area including five new nesting sites in 2017.
- Of these, 63 sites were occupied by raptors in 2017; 50 by peregrine falcon, five by rough-legged hawk, two by gyrfalcon, and six by common raven.

**Common and king eider as well as shorebird diversity:**

- Steensby Inlet Shoreline Surveys (2012)
  - A total of 40 nests were found, representing six species (Canada goose, semipalmated plover, herring gull, American pipit, lapland longspur, and snow bunting)
  - No colonies of waterfowl or other birds were observed during the surveys, on ferrying flights, or in transit between transects
  - Numerous other bird species were documented but none displayed nesting behaviour within the shoreline study area.
- Milne Inlet Shoreline Surveys (2013)
  - Two nesting colonies - one glaucous gull, the other mixed glaucous and Thayer's gulls were located. Outside of the nesting colonies, nest densities were lower than those observed at Steensby Inlet in 2012. One site with two potential eider nests from the previous year was located. No active eider or other seabird nests were located.
  - A total of 1,016 birds, representing 23 different species were observed during the survey. The most common species included long-tailed duck, king eider, and glaucous gull.

**Songbird and shorebird diversity:**

- PRISM Plot Surveys
  - In 2012, 80 rapid PRISM plots were completed and a total of 507 individual birds from 13 different species were observed
  - In 2013, 13 rapid PRISM plots were completed in the northern sections of the RSA and a total of 90 individual birds from 7 different species were observed
  - Similar species composition and densities were detected in the 2012 and 2013 surveys
  - Shorebird densities were relatively low compared to those observed at other nearby study sites
- Bird Encounter Transects
  - Observed a total of 424 birds and a total of 18 species
  - No evidence of a relationship between distance from the road/PDA and the number of birds was detected
- Power analysis based on 2013 results indicated that songbird and shorebird densities were low and that any monitoring program would be unlikely to detect an effect of disturbance; discussion with the TEWG and CWS concluded that effects monitoring for tundra breeding birds could be discontinued but that Baffinland would commit to completing 20 PRISM plots every five years as a contribution to regional monitoring efforts.

**Red knot:**

- Red Knot were not detected during these surveys, but biologists and Baffinland Site Environment Department continue to be aware of their potential presence while on site; and
- Red Knot were observed incidentally by Wayne Renaud in 2007 at Camp Lake, Mary River.

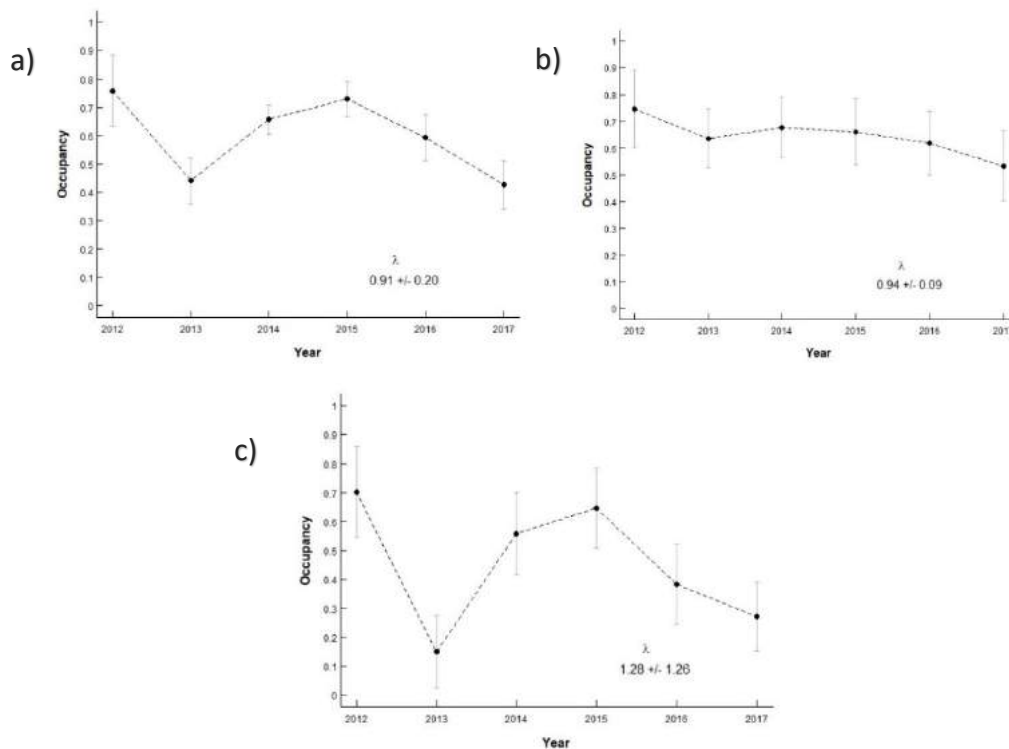
**Seabird migration and wintering:**

- Staging waterfowl surveys:
  - Fifteen staging waterfowl surveys were completed at three sites between June 10 and 15, 2015
  - A total 411 individuals of 20 different bird species were observed
  - All species observed had previously been documented within the RSA

- Species diversity and abundance were greatest at the Phillips Creek site with 15 species and lowest at the Tugaat River mouth with 11 species.

**TRENDS**

Although annual variation in productivity for peregrine falcons and rough-legged hawks is apparent (Figure 4.13), it is most likely representative of natural variability associated with variation in prey availability and weather rather than due to any influence of disturbance (Figure 4.13 and Table 4.20). For rough-legged hawks, occupancy appears to be cyclical (approximately 4-year oscillation), and strongly suggest that occupancy (and therefore count of nestlings) is associated with the natural lemming cycle, which is also known to cycle approximately every four (4) years. Occupancy of potential nesting sites by gyrfalcon in the Raptor Monitoring Area (RMA) have been too low to monitor annual trends. On the basis of the analysis to account for distance to disturbance and distance to nearest neighbour individually, and as an interaction, it appears that there is no negative effect of these factors on occupancy (i.e., estimates  $\pm$  standard errors of  $\lambda$  overlap with 1.0) or reproductive success (i.e.,  $p$  values  $> 0.05$ ) for both species. Future monitoring will continue to focus on multiple nesting territory visits annually.



**NOTES:**

1. Annual Estimates include  $\pm$  standard errors.
2. Raptor guild (a), peregrine falcon (b), and rough-legged hawk (c) within the Raptor Monitoring Area.

**Figure 4.13 Annual Estimates of Raptor Nesting Territory (2012 to 2017)**

**Table 4.20 Summary Statistics for Raptor Survey Effort and Detections at Known Raptor Nesting Sites within the RMA (2011 to 2017)**

Variable		Year						
		2011	2012	2013	2014	2015	2016	2017
Effort	Total nesting sites known annually	96	106	107	126	158	161	166
	New sites found annually	0	10	1	19	32	3	5
	Count of sites checked	87	106	89	124	148	141	166
	% known sites checked	91%	100%	83%	98%	94%	88%	100%
	Count of checked sites occupied	56	72	30	77	99	70	63
	% checked sites occupied	64%	68%	34%	62%	67%	50%	38%
	Count of sites checked twice annually	4	71	59	97	127	106	166
Detections <sup>1</sup>	Count of sites no raptors detected	31	34	59	47	49	71	103
	Count of sites PEFA detected	27	26	29	43	50	48	50
	Count of sites RLHA detected	26	44	1	31	47	18	5
	Count of sites GYRF detected	3	0	0	1	1	2	2
	Count of sites CORA detected	0	1	0	1	0	1	6
	Count of sites GLGU detected	0	1	0	0	1	1	0
	Count of sites SNOW detected	0	0	0	1	0	0	0

**NOTES:**

1. Peregrine falcon (PEFA), rough-legged hawk (RLHA), gyrfalcon (GYRF), common raven (CORA), glaucous gull (GLGU), snowy owl (SNOW).

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue the monitoring programs as described in the TEMMP and will continue to collect opportunistic information when qualified biologists are on site. Monitoring to date has found that bird densities of most species are not sufficient to monitor project effects (i.e., songbirds, shorebirds, eiders, red knot, and gyrfalcon). To date, trend analysis has only been conducted for cliff-nesting raptors. Baffinland will continue to support marine bird research (thick-billed murre, common eider) conducted by ECCC in the northern (Cape Graham Moore) and southern shipping routes (Digges Sound, East Bay, and Hudson Strait).

## Project Certificate Condition No. 75

Category	Birds - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assess the extent of terrestrial habitat loss.
Term or Condition	The Proponent's monitoring program shall assess and report, on annual basis, the extent of terrestrial habitat loss due to the Project to verify impact predictions and provide updated estimates of the total project footprint.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be provided within the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (Baffinland, 2016g) 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) 2017 TEWG Meeting Records
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Appendix C2

### METHODS

Prior to construction on undisturbed land, the appropriate approvals must be obtained and construction plans must adhere to the Environment Protection Plan. Land that was cleared and disturbed for construction activities was tracked and reported on in the 2017 Terrestrial Environment Annual Monitoring Report.

Pre-clearing nest surveys were done prior to any disturbance of habitat to ensure no bird nests were located in areas where any clearing or new area disturbance was scheduled. Baffinland used a rope drag, as recommended by Canadian Wildlife Services (CWS) in the fall 2014 TEWG meeting, to increase likelihood of detecting secretive and less likely to be flushed bird nests in areas scheduled for development. On-site training by qualified EDI personnel was completed in 2017 as well. Methods, results, and discussion of active migratory bird nest searches and the corresponding extent of terrestrial habitat loss are reported annually in the terrestrial environment annual monitoring report.

### RESULTS

Baffinland has completed all construction within the Potential Development Area (PDA) and the current Project footprint is smaller than what was assessed in the FEIS, which assumed the entire PDA would be disturbed. During 2017, an additional 162,915 m<sup>2</sup> was disturbed within the PDA (Table 4.21).

## TRENDS

Planning for disturbances are scheduled as much as practical to the periods preceding and succeeding the active migratory bird nesting period of May 31 to August 31. Baffinland also restricts any overland movement of equipment or personnel which are required to operate to existing site roads and laydowns, to minimize the overall Project footprint; any unauthorized land disturbance or deviation from the PDA is reported as an incident and is investigated.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor terrestrial habitat loss due to disturbance and maintain the limits of the Project Development Area and restrict overland movement and traffic to existing roads, pads, and walkways.

**Table 4.21 Marginal Increase in the Disturbed Area in 2017**

Project	Approx. Area Disturbed (m <sup>2</sup> )
Road Widening	530
MPCP	41096
Crusher. Welding ship expansion, north end of crusher pond	4964
Area between laydown and stream, east of the Port Site Complex	290
RHS of tote road, just past KM100 dip	600
Burrow Pit @ KM97	1000
Area south of the PSC, site pad to south of the manmade ditch, landscape soil piles from ditching with patches of veg.	1514
Between maintenance and crusher pad. Grassy/rock area. Mine site.	4964
W13 as proposed as Hatch laydown sketch. North batch plant south ore pad	5500
2007-08 laydown. Small expansion of already existing area.	15000
South of Warehouse, between the road and sea can, bisected diagonally by a pond	3046
W14	Confirmed Survey, no Data
2A	21595
MS Camp Pad (MSCP)	40000
2B	2500
2B	2500
South of Warehouse, between the road and sea can, bisected diagonally by a pond	9085
MS Camp Pad (MSCP)	4701
Nuna Shop	2000
Ore Handling Tire Shop	2030
<b>Total (m<sup>2</sup>)</b>	<b>162,915</b>

#### 4.6.10 Marine Environment (PC Conditions 76 through 98)

Twenty-four (24) PC conditions relate to the potential impacts of the Project on the marine environment, excluding marine mammals (Section 4.5.11). These conditions encompass the development of a comprehensive environmental effects monitoring program and the establishment of the Marine Environment Working Group (MEWG).

##### *Stakeholder Feedback*

The marine environment has been a key focus of stakeholder interest and concern. This includes marine mammals (discussed in Section 4.5.11) as well as marine biota, the effects of ballast water discharge, and the risk of fuel spills (discussed below). A key community concern in both Pond Inlet and Igloolik during the Environmental review period of the FEIS and FEIS addendum was the potential for the Project to impact the fisheries resources at both Steensby Inlet and Milne Inlet. Key stakeholders focused on the marine environment include local communities, the Mittimatalik Hunters and Trappers Organization, the QIA, and agencies with jurisdictional responsibility for the marine environment: DFO, ECCC, Transport Canada and the Canadian Coast Guard. Baffinland continues to engage these groups through the Marine Environment Working Group and by providing other reporting or Project updates, as necessary. Effects to the marine environment from ore dust has been raised as a concern in 2017 consultation activities (Appendix B).

##### *Monitoring*

Marine biota and the physical environment (water and sediment quality) is subject to a marine environmental effects monitoring (EEM) program, which includes the following components:

- **Benthic Habitat** - Underwater videography to characterize benthic habitat substrate type/class and detect changes over time.
- **Sediment** - Sampling sediment for particle size analysis (to detect changes in sediment composition) the presence of hydrocarbons, and iron concentrations as a function of distance from the ore dock.
- **Water Quality** - Sampling measuring total suspended solids, salinity, temperature, pH, metals, nutrients and hydrocarbon concentrations over time.
- **Epibenthic Community** - Underwater videography to enumerate benthic epifauna and compare changes over time.
- **Fish** - Opportunistic sampling of contaminants in fish flesh of both sculpin species and Arctic char.
- **Aquatic Invasive Species (AIS)** - Sampling for the presence/absence of aquatic organisms (zooplankton, benthic infauna, benthic infauna, macroflora, encrusting epifauna, fish).
- **Ballast Water Monitoring** - Monitoring of salinity levels in ballast water to verify exchange of ballast in accordance with Ballast Water Management Regulations.

Table 4.22 provides an evaluation of the Project's impacts on the marine environment, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

To the extent that Project impacts on the marine environment can be evaluated, the effects of the Project are within FEIS predictions.

**Table 4.22 Marine Environment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Water and Sediment Quality	Changes in water and sediment quality due to prop wash, ballast water discharge, and ore dust deposition	The marine EEM program did not detect any meaningful changes in water quality. Metal concentrations in sediment samples collected in 2017 generally correlated with sediment physical composition.	Effect within FEIS predictions
	Changes in water and sediment quality due to sewage effluent discharge	Weekly monitoring of effluent as required by water licence. Monitoring results complied with all water licence limits	Effect within FEIS predictions
	Accidental fuel spill from marine shipping of fuel and other supplies	Inspections and visual monitoring during ship to land fuel transfers and sealift deliveries. No accidents or malfunctions occurred that had the potential for effects.	Effect did not occur
Marine Habitat	Disruption and loss of marine coastal habitat due to dock structure	There is considerable evidence of use of the offsetting area by all trophic levels	Effect within FEIS predictions
Marine Biota	Potential changes to marine biota from the introduction of aquatic invasive species due to shipping (ballast water discharges, etc.)	None of the macroflora, benthic epifauna, or fish taxa observed during the AIS surveys in 2017 were identified to be invasive	Effect within FEIS predictions

#### *Path Forward*

Baffinland will remain vigilant about the mitigation and monitoring activities that are in place to protect the marine environment. Baffinland will continue to seek input and review monitoring results trends from technical members of the MEWG. Reporting on each PC condition follows.

## Project Certificate Condition No. 76

Category	Marine Environment - General
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate potential impacts to the marine environment.
Term or Condition	The Proponent shall develop a comprehensive Environmental Effects Monitoring Program to address concerns and identify potential impacts of the Project on the marine environment.
Relevant BIM Commitment	40, 51, 84, 85, 79
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Marine Environmental Effects Monitoring Program (MEEMP; Baffinland, 2016k) Shipping and Marine Wildlife Management Plan (Baffinland, 2016h) Aquatic Invasive Species (AIS) Monitoring Program (Sikumiut Environmental Management Ltd., 2016) 2017 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2018a)
Ref. Document Link	Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a> Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

A Marine Ecological Effects Monitoring Program (MEEMP), presented as Appendix H of the Shipping and Marine Wildlife Management Plan, was developed in 2015 following completion of marine biological baseline studies in Milne Port during 2013 and 2014. The MEEMP includes monitoring of marine water and sediment quality, marine infauna, epifauna / epiflora, and fish and fish habitat. The MEEMP sampling design is based on EEM guidance from Environment Canada (2012), and includes statistical approaches to detecting potential project-induced impacts on the marine environment.

An Aquatic Invasive Species (AIS) monitoring program was also developed in 2015 as part of the MEEMP to enhance baseline data and to provide early warning of AIS introductions in the Project area. Biophysical sampling for the AIS program targeted lower trophic levels, including zooplankton, benthic infauna, epifauna and fish.

The 2017 MEEMP study design and data collection methodology followed the same approach as 2016 to provide technical continuity and repeatability of the program and to allow for inter-annual comparisons of the multi-year dataset (2013 to 2017). Detailed information on study design and sampling methodology are available in Golder (2018b).

The 2017 AIS monitoring program study design and data collection methods followed the same approach as 2016, but the program was expanded to include sampling sites near Ragged Island to capture potential AIS at existing anchorage locations in this area. The 2017 MEEMP and AIS monitoring programs were undertaken at Milne Port and in Milne Inlet in 2017 (August 4 to September 13) by a five-person field team comprised of marine biologists, local Inuit field technicians, and a local Inuit vessel operator and boat assistant from Pond Inlet, NU.



## RESULTS

No species recorded during AIS sampling were identified as invasive to the Arctic region. One species of benthic invertebrate collected in infauna samples in Milne Port in both 2017 and 2013, a tube-dwelling amphipod, *Monocorophium insidiosum*, is listed as “invasive” in the global database of invasive species. The best available literature is currently inconclusive as to whether this species is invasive to the northeastern Atlantic or if its occurrence in Milne Inlet falls within the northern range of its natural geographic distribution. Further, this species was identified during surveys in 2013, prior to the initiation of operational iron ore shipping, which suggests that Project shipping activities were not the initial vector of its arrival in Milne Port.

Detailed results of both programs are presented in Golder (2018b).

## TRENDS

The MEEMP study design, data collection methodology and results are reviewed yearly with the MEWG. Recommendations from the MEWG assist in refinements to the program and enhancement of associated mitigation measures.

## RECOMMENDATIONS / LESSONS LEARNED

Annual MEEMP results will continue to be presented to the MEWG on an annual basis, and adjustments to the program will be made as needed.

## Project Certificate Condition No. 77

Category	Marine Environment - Working Group
Responsible Parties	The Proponent, Environment Canada, Fisheries and Oceans Canada, the Government of Nunavut, the Qikiqtani Inuit Association 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, Fisheries and Oceans Canada, Parks Canada, the Government of Nunavut, the Qikiqtani Inuit Association, the Mittimatalik Hunters and Trappers Organization, 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.
Relevant BIM Commitment	46, 49, 51
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Baffinland established a MEWG in 2013. Members include representatives from: Environment and Climate Change Canada, Department of Fisheries and Oceans Canada, Qikiqtani Inuit Association, Government of Nunavut, Parks Canada, Makivik and Baffinland, with technical experts as required. The Mittimatalik Hunters and Trappers Organization joined the group in 2016. The World Wildlife Fund-Canada and Oceans North also participate as observers.

The meetings are structured to enable participants to have the opportunity to provide input on monitoring program implementation and follow-up at the conclusion of the field programs prior to finalization of reports. The group receives presentations on the implementation of field programs and the subsequent results in order to prioritize monitoring plans and suggest measures for mitigation where required. The groups are also established to provide a platform for the discussion of collaborative research opportunities between parties and to identify monitoring programs suited for community based monitoring and Inuit participation.

The group meets in-person twice annually and also hosts two interim teleconferences per year.

Draft technical annual reports and other documentation are provided to the group in advance of meetings and an ongoing basis to allow for review, comment and advice to be provided by all members. Baffinland and their technical experts take into consideration comments received by the working group in the finalization of documents and planning of monitoring programs. The 2017 Terrestrial Environmental Effects Monitoring Report was distributed to the TEWG for review and comment two (2) weeks prior to the November 30, 2017 MEWG meeting.

## **RESULTS**

The MEWG provides a valuable forum for ongoing Project communication and reporting between Baffinland and other interested parties. The MEWG also serves as an advisory group to provide recommendations on appropriate management approaches related to the Project.

The MEWG has guided the development of the Marine Environment Effects Monitoring Program (MEEMP), and also reviews and provides comments on other draft marine environment monitoring reports.

In 2017, the MEWG held meetings on March 15, May 3, September 13 and November 29 and 30, 2017.

## **TRENDS**

The MEWG has successfully provided valued input into the Baffinland annual marine monitoring programs.

## **RECOMMENDATIONS / LESSONS LEARNED**

In 2018, Baffinland will work the MEWG and NIRB to finalize revisions to the Terms of Reference. Baffinland will continue to work with the MEWG to review and guide marine monitoring programs for the Project on an annual basis and develop mitigation measures or action plans as and when needed.

Baffinland, with support from the QIA and other members of the MEWG has put a strong emphasis on continuing existing programs and developing more diverse community-based monitoring programs.

## Project Certificate Condition No. 78

Category	Marine Environment - Ice Breaking and Shipping
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To obtain accurate and current ice information.
Term or Condition	The Proponent shall update the baseline information for land fast ice using a long-term dataset (28 years), and with information on inter-annual variation. The analysis for pack and landfast ice shall be updated annually using annual sea ice data (floe size, cover, concentration) and synthesized and reported in the most appropriate management plan.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	In-Compliance
Stakeholder Review	N/A
Reference	ENFOTEC, 2015. Ice Conditions and Ship Access to the Milne Inlet Port Site - Mary River Iron Ore Project - Final Report
Ref. Document Link	N/A

### METHODS

A 2011 ice study by ENFOTEC was included in the Final Environmental Impact Statement, Appendix 3G. This ice study report is updated periodically to incorporate new information on ice conditions and ship access to the Milne Inlet port with a focus on planning for open water shipping by tracking dates for ice break up and re-freeze. The most recent update was provided in 2015 (ENFOTEC, 2015).

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

The Ice condition study for Milne Inlet will be updated periodically as new data becomes available. The ice condition study for Steensby Inlet will be updated prior to the construction and operation of the Steensby Port.

## Project Certificate Condition No. 79

Category	Marine Environment - Ice Breaking and Shipping
Responsible Parties	The Proponent, Canadian Hydrographic Services
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assist in the development of nautical charts for Canadian waters.
Term or Condition	The Proponent shall provide the Canadian Hydrographic Services with bathymetric data and other relevant information collected in support of Project shipping where possible, to assist in the development of nautical charts for Canadian waters.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Canadian Hydrographic Service (CHS)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland entered into a collaborative cost-sharing agreement with Canadian Hydrographic Service (CHS) for their nautical charting program. The CHS also collected additional detailed bathymetry around the ore dock in 2016.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 80

Category	Marine Environment - Ice Breaking and Shipping
Responsible Parties	The Proponent, Canadian Hydrographic Services
Project Phase(s)	Construction
Objective	To identify areas of risk along the shipping route.
Term or Condition	Prior to commercial shipping of iron ore, the Proponent shall conduct a detailed risk assessment for Project-related shipping accidents, noting areas along the ship tracks where vessels may be particularly vulnerable to environmental conditions such as sea ice, and any seasonal differences in risk. This assessment shall inform mitigation and adaptive management plans.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Canadian Hydrographic Service (CHS)
Reference	N/A
Ref. Document Link	N/A

### METHODS

This risk assessment will be conducted prior to ice breaking from Steensby Port.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 81

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate potential shoreline effects from shipping.
Term or Condition	The Proponent shall reassess the potential for ship wake impacts to cause coastal change following any further changes to the proposed shipping routes.
Relevant BIM Commitment	84
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016h)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Ship wake effects on shorelines were assessed in the FEIS and the FEIS Addendum for the Early Revenue Phase (Baffinland, 2012 and 2013a), and it was concluded that no measurable changes would occur. There have been no changes to the shipping route since this assessment.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland anticipates that this PC Condition will be equally applicable to its Phase 2 Expansion Proposal. As such, Baffinland has undertaken ship wake and propeller wash modelling reflective of Phase 2 shipping operations. A Ship Wake and Propeller Wash Modelling Report for Phase 2 operations is currently in preparation and will be included as a Technical Support Document (TSD) in Baffinland's FEIS Addendum Application for the Phase 2 Expansion Project Proposal. Should the Phase 2 proposal not proceed, this condition will be re-evaluated if changes to the current shipping routes are proposed.

## Project Certificate Condition No. 82

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To mitigate potential shoreline effects from shipping.
Term or Condition	The Proponent is strongly encouraged to have its ore carriers subjected to sea trials to measure wake characteristics at various vessel speeds and distances from the vessel.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland understands that the intent of this condition was to address concerns related to potential erosional effects of ship wakes from purpose-built Baffinland ore carriers on shorelines along the southern shipping route. In this case, the same carriers would be conducting repeated voyages and wake effects could be compared to modeling predictions made in the FEIS (Baffinland, 2012). During the Early Revenue Phase (ERP) of the Project, ore is shipped via the northern shipping route out of Milne Port using commercially contracted vessels. Sea trials to measure wake characteristics of the commercial vessels were not conducted for the ERP because there is less concern related to the wake effects along the northern shipping route.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will review the requirement for wake characteristics when purpose-built ore carriers are commissioned for the southern shipping route.



## Project Certificate Condition No. 83

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	All phases
Objective	To provide data on tide levels and storm surges.
Term or Condition	The Proponent shall install tidal gauges at Steensby and Milne Port to monitor sea levels and storm surges.
Relevant BIM Commitment	N/A
Reporting Requirement	The Proponent shall summarize and supply these monitoring results to NIRB in the annual Project report.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	Milne Port Tide Gauge Data Collection – 2017 Ice Free Season (Golder, 2018b)
Ref. Document Link	N/A

### METHODS

Milne Port: In 2014, tide data was collected using a tidal gauge installed at Milne Port (ASL Environmental Sciences 2015). The data retrieved at that time was used to support oceanography and ballast water dispersion modelling for the Project. Following completion of the modelling exercise, the gauge was removed and was not re-installed at Milne Port in 2015 or 2016. As such, no tidal data were collected or are available from Milne Port for the 2015 or 2016 reporting periods. Following the Nunavut Impact Review Board's (NIRB) review of the 2016 Annual Report, NIRB requested that Baffinland recommence the monitoring of sea levels and storm surges at Milne Inlet in 2017 to support trend analysis, highlighting in their recommendation that that trends related to sea levels and storm surges from the Milne Inlet area cannot be predicted based on the data available for 2014 only. Further, NIRB also reiterated that the submission of the annual monitoring data is required to clarify whether implementation of additional mitigation measures is necessary to ensure that impacts of climate change on Project infrastructure, including Milne port facilities, are adequately minimized and mitigated.

In response to NIRB recommendations and pursuant to PC Condition No. 01 and No. 83 of the Project Certificate, Baffinland re-installed a tide gauge system at Milne Port and resumed tidal monitoring on-site during the 2017 open-water season. Tide monitoring instrumentation consisted of an RBRconcerto CTD (RBR) sensor programmed to continuously measure pressure, temperature, and conductivity between 20 July and 17 October. Conductivity and pressure were respectively converted to salinity (practical scale PSU) and depth (m). The instrument was mounted on a ladder located on the west end of the existing ore dock. The ladder provided a stable mounting point that could be reinstalled each year at the same location and position as part of standard port operations. A steel plate at the top of the ladder was surveyed with a Real Time Kinematic Global Positioning System (RTK GPS) survey instrument. The elevation and position of the top plate of the ladder was surveyed using five survey points and the average elevation of the five points has been used to reference the position of the tide gauge to the Canadian Geodetic Vertical Datum (CGVD) and local Chart Datum (CD). The standard deviation of the 5-point measurements was 0.020 m.

Steensby Port: No tidal gauge systems were installed at Steensby Port in 2017, as that component of the Project is currently inactive.

## RESULTS

Milne Port: A continuous time-series of water level, temperature, and conductivity data was collected from 20 July to 17 October 2017. A brief summary is provided below:

Water level data recorded at Milne Port indicate typical fluctuations resulting from tidal forcing and good agreement with tidal constituents derived from previous measurements. During the measurement period, a total of six (6) neap-spring tidal cycles were observed. Temperature and salinity time-series data indicate a stratified water column present from July through early September. Low magnitude oscillations of temperature and salinity occurring in phase with the tidal cycle indicate smaller internal wave events driven by spring-neap tidal variations. Observed fluctuations in temperature and salinity occurring out of phase with the tidal cycle indicate either:

- 1) the presence of internal waves that are likely driven by wind events, with mixing occurring over some portion of the water column in the direct vicinity of Milne Port; or
- 2) the presence of local discharges of ballast water from ships using the port while loading ore.

A more detailed analysis of wind, tidal constituents, water column temperature and salinity, and timing of ballast water discharge events in 2017 would be required to provide a more in-depth interpretation. The agreement in the time series of conductivity and specific conductivity indicate the validity of the salinity measurements, and the convergence of the two profiles in late October represent a fully mixed water column.

Steensby Port: No activities took place at Steensby Port during 2017.

## TRENDS

Trends cannot be currently evaluated based on data available only from 2014 and 2017, and without collection of long-term site-specific geodetic elevation data.

## RECOMMENDATIONS / LESSONS LEARNED

Milne Port: The tide gauge system will be re-deployed at Milne Port in the summer of 2018, with the intention of continuing annual monitoring of relative sea levels and storm surges at the site. A tide gauge monitoring plan has been included in Golder (2018b), which provides guidelines for annual management and maintenance of the tide gauge station such to develop a long-term record of water levels at Milne Port during the open-water season. Tide gauge measurements are currently limited to the ice free season, typically mid-July to late October. To support a future trends analysis of local relative sea level at the site, collection of site-specific geodetic elevation data would be required to account for the relative uplift / subsidence of the land surface. Additionally, site-specific measurements of wind and barometric pressure would be required to conduct a more in-depth tidal analysis in relation to ballast water discharges.

Steensby Port: The measurement of sea level and storm surges at Steensby Port will be re-evaluated when activities are renewed at Steensby Port.

## Project Certificate Condition No. 83(a)

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To identify potential for and conduct monitoring to identify effects of sediment redistribution associated with construction and operation of the Milne Port.
Term or Condition	The Proponent shall conduct hydrodynamic modelling in the Milne Inlet Port area to determine the potential impacts arising from disturbance to sediments including re-suspension and subsequent transport and deposition of sediment. The modelling results shall be used to update the marine water and sediment quality monitoring and mitigation program to include activities associated with the construction and operation of the Milne Inlet Port. The monitoring program shall include an ongoing assessment of the potential introduction of metals that bio-accumulate in the marine food chain.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2017 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2018a)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Hydrodynamic modelling<sup>2</sup> for Milne Port was not undertaken to predict potential changes in local current, wave and sediment transport regimes due to the installation of the ore dock and associated marine infrastructure at Milne Port.

In the FEIS (Baffinland, 2012) and the FEIS Addendum for the ERP (Baffinland 2013a), it was predicted that no measurable changes were anticipated to occur (e.g., installation of the ore dock will have minimal effect on local sediment transport and that Project operations were not likely to result in significant adverse effects on water or sediment quality). These impact predictions were used to inform the MEEMP sampling design (2014 through to 2017) including the selection of sample locations and analytical parameters.

Baffinland's monitoring efforts at Milne Port include an ongoing assessment of potential Project-related introductions of metals to the marine environment that would have the potential to bio-accumulate in the marine food chain. The 2017 MEEMP (Year 4 of the Program) included marine water and sediment quality sampling, as well as various levels of biological sampling including fish tissue collection for analysis of metals (body burden). Monitoring sites for marine water quality were located offshore of the effluent discharge in a radial gradient design with increasing distance in three directions from the discharge point. The monitoring program was designed to monitor for potential changes to water quality due to site drainage discharge (including iron ore stockpile run-off) to the marine environment at Milne Port. Five distinct sampling events

<sup>2</sup> Hydrodynamic modeling is a tool that uses numerical (computational) methods to describe hydrodynamic processes (e.g. currents and water levels) in space and time using known physical process drivers and inputs, such as tidal, wind and freshwater/saltwater effects.

were completed in August and September of 2017. Water quality samples were analyzed for general parameters, nutrients, metals and hydrocarbons, with screening against CCME Water Quality Guidelines (WQG) where applicable.

The sampling design for the 2017 sediment program was based on a radial gradient pattern originating at the Milne ore dock. The dock represents the potential point source of contaminants (e.g., ore dust, hydrocarbon deposition) and physical perturbations (sediment re-suspension and transportation). The radial pattern is designed to detect potential Project-related effects based on a gradient of key components with numerical indicators (e.g., percent fines and metal concentrations in sediment) with increasing distance from the point source (ore dock and effluent discharge). The statistical design was based on repeated measures (RM) distance regression analyses with each station re-sampled annually. From the point source, stations are established along the distance gradient which allows for physical, chemical and biological changes to be assessed spatially. Analysis of covariance (ANCOVA) was applied to baseline and monitoring data to compare gradients in the regression line to determine if monitoring results are significantly different than baseline conditions.

Sediment samples were collected along four transects extending in a radial pattern from the Milne ore dock. Along the East and West transects, sediment sampling stations were located along the 15-m depth contour at approximately 0 m, 250 m, 500 m, 1,000 m, and 1,500 m from the existing ore dock. Along the Coastal Transect, sampling stations were located at the same 15-m depth contour at approximately 500 m, 1,000 m, 2,000 m, and 4,000 m from the East Transect. Along the North Transect, sampling stations were located at approximately 0 m, 250 m, 500 m, 1,000 m, and 2,000 m from the existing ore dock and depths ranging from 37 m to 100 m. Three replicate samples were collected from each sampling station. Sediment samples were analyzed for particle size composition, organic content and concentrations of metals and hydrocarbons. These concentrations were compared to Canadian Council of Ministers of the Environment (CCME) Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Level (PEL) guidelines for sediment.

Environmental Effects Monitoring (EEM) studies also included fish population surveys. Incidental fish mortalities during the surveys were retained for analysis of metal concentrations in tissue (body burden).

## RESULTS

Detailed results from marine water and sediment quality sampling and fish toxicological analyses are presented in Golder (2018b), with a brief summary provided below.

All water quality samples collected in 2017 were below CCME Water Quality Guidelines (WQG) for all sampling parameters. One sample collected on 10 September 2017 at the Source (shallow-water station closest to effluent discharge) showed moderately elevated levels of TSS, turbidity, aluminum and iron (relative to the other three sampling stations located offshore). This sample was collected during a storm event when heavy wave action was observed to be stirring up nearshore sediment at the sampling site. The higher concentrations of TSS, turbidity, and metals observed in this one sample were assumed to be reflective of sediment re-suspension in the water column, and not related to effluent discharge. PAHs were below the detection limit for all water samples collected during all sampling events in 2015, 2016 and 2017. Naphthalene was also below the CCME WQG for all samples in 2017 (note: naphthalene was not tested for in 2015 or 2016).

For sediment samples collected in 2017, particle size (grain size) composition varied between sampling stations and between transects. Sediment samples collected along the West and East transects consisted predominantly of gravel and sand, particularly at stations closest to the ore dock. Sediment samples collected along the Coastal and North Transects had higher proportions of finer classes (silt and clay). On the North Transect, differences in particle size composition were correlated with water depth, with higher proportion of fines (silt and clay) found in deeper areas. 2017 sampling results for particle size composition were consistent with those from previous years (2014 to 2016).

Metal concentrations in sediment samples collected in 2017 generally correlated with sediment physical composition. Some metals were found in low levels: concentrations of tin were below the DL (2 mg/kg) in all samples; bismuth and silver were detected only in one sample; and antimony and selenium were found in less than 50% of the samples. When detected, metal concentrations were, in general, higher in areas with higher proportion of fines. For instance, aluminum and iron concentrations were highest (14,700 mg/kg and 28,900 mg/kg respectively) in one sample from the Coastal Transect where the highest proportion of fines (77%) was found. The lowest concentrations of aluminum and iron (797 mg/kg and 1,970 mg/kg respectively) as well as of other metals were found at the station where the lowest proportion of fines (1%) was found. 2017 sampling results for metals were consistent with results from previous years (2014 to 2016). Arsenic concentrations in sediment samples collected in 2017 exceeded CCME ISQG (7.24 mg/kg) at three stations (in one of three samples at each station) but did not exceed CCME PEL (41.6 mg/kg) at any station. The highest arsenic concentration was 10.3 mg/kg. Arsenic concentrations exceeding CCME ISQG were also recorded during previous surveys in 2014 to 2016. High arsenic concentrations in local sediment are thought to be naturally-occurring, as arsenic is not a component of ore processing or related Project activities. No other metal exceedances of CCME ISQG or PEL were recorded in 2017.

Volatile organic compounds, F1 - F4 hydrocarbons, and PAHs were below detection limits in all sediment samples collected in 2017 (i.e., no exceedances of CCME ISQG or PEL).

ANCOVA results indicated notable changes in sediment conditions (per cent fines, iron concentration) between years, particularly on the West and East transects. However, it is unclear as to whether these changes are indicative of Project-related effects. For example, on the West Transect, no inter-annual differences were observed in percent fines or iron concentrations at sampling stations located near the dock. However, percent fines were shown to increase significantly at the far-field sampling stations (500 m, 1,000 m, and 1,500 m) from 2014 to 2017 (although measurements in 2015 and 2016 were not significantly different from either 2014 or 2017). Iron concentrations at the far-field sampling stations (500 m, 1,000 m, and 1,500 m) on the West Transect were also shown to increase significantly from 2015 to 2017 (although measurements in 2017 were not significantly different than 2014 and 2016). Changes in sediment conditions observed on the West Transect could be associated with alluvial depositions from Philips Creek. On the East Transect, percent fines and iron concentrations measured at the nearfield (dock) and 500 m stations were shown to decrease significantly in consecutive years from 2014 to 2016, and increase significantly from 2016 to 2017. No notable changes were observed at the 1,000 m or 1,500 m stations on the East Transect. On the North Transect, iron concentrations measured at the 500 m station increased significantly from 2015 to 2017. No other notable changes in sediment conditions (per cent fines or iron concentration) between years were observed on the North Transect.

Tissue samples were analyzed for fish body burden data both pre-Project/baseline (2010 and 2013) and during operations (2015 onwards). The numbers of fish collected for tissue sampling varied between surveys, depending on the number of incidental mortalities during fish capture. Samples were taken mostly from Arctic char, as it was the most abundant species caught in the gill nets. Apart from Arctic Char, two fourhorn sculpin and one Arctic staghorn sculpin were used for tissue sample collection in 2013. No tissue samples were collected in 2014 since incidental fish mortality did not occur during the survey.

Metals in Arctic char tissue samples were primarily below detectable limits, with the exception of arsenic, cadmium, chromium, copper, iron, mercury, and zinc. Concentrations of these metals in fish tissue were generally consistent throughout ongoing sampling conducted from 2010 to 2017. None of the samples exceeded Health Canada's guideline for mercury in fish tissue for human consumption of 0.5 mg/kg.

## TRENDS

No clear long-term trends were established in sediment accumulation or iron concentrations. Additional years of monitoring will contribute to ongoing trend analysis.

## RECOMMENDATIONS / LESSONS LEARNED

With respect to hydrodynamic modelling, Baffinland anticipates that PC Condition 83(a) will be equally applicable to its Phase 2 Proposal. As such, Baffinland has retained Golder Associates to undertake a hydrodynamic modelling assessment of incremental and relative change on near-shore currents, waves, and sediment transport in Milne Inlet associated with the construction and operation of a second ore dock and associated marine infrastructure under the Phase 2 Proposal.

Should the Phase 2 proposal not proceed, Baffinland will continue to implement the MEEMP to evaluate FEIS predictions. Specific recommendations to the MEEMP are provided below.

### *MEEMP*

All tested parameters for water samples collected in 2017 were below CCME water quality guidelines (thresholds for the protection of aquatic health). Concentrations of iron and aluminum were above detection limits; however, these parameters do not have established limits in the federal guidelines. Temporal and spatial variability was generally low between the water samples collected during 2017. Water quality sampling is recommended to continue in 2018 to confirm effluent discharges from the Project site are in compliance with applicable water quality guidelines and to support ongoing trend analysis.

Sediment sampling is recommended to continue in 2018 to evaluate if temporal trends identified in the 2014-2017 sediment data continue in the same direction and to assess whether identified changes are a result of the Project.

Body burden analysis is recommended to continue for incidental fish mortalities. Both Sculpin and Arctic Char are recommended species for body burden analysis.

As the MEEMP evolves and additional data become available for analyses, the design and approach to analyses can be continuously revisited to optimize the statistical power for interpreting change. Other approaches to interpreting the statistical relationships beyond linear regression could also be explored. For example, a quadratic or logarithmic equation might be a better option for evaluating data trends.

## Project Certificate Condition No. 84

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent sediment redistribution along the shipping route
Term or Condition	The Proponent shall update its sediment redistribution modeling once ship design has been completed and sampling should be undertaken to validate the model and to inform sampling sites and the monitoring plan.
Relevant BIM Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	Not Applicable
Stakeholder Review	None
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable - Baffinland understands that the intent of this condition was to address concerns related to potential ship-induced sediment redistribution from propeller wash and ship wake effects for shipping operations in Steensby Port and along the southern shipping corridor. No sediment dispersion (i.e., hydrodynamic) modelling was completed for Milne Port or along the northern shipping corridor.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland understands that the intent of this condition was to address concerns related to potential ship-induced sediment redistribution from propeller wash and ship wake effects for shipping operations in Steensby Port and along the southern shipping corridor. A monitoring plan to verify predictions of sediment redistribution resulting from propeller wash and ship wakes in shallow locations along the shipping route will be completed when ore carriers are commissioned for the southern shipping route.

Baffinland anticipates that this PC Condition will be equally applicable to its Phase 2 Proposal. As such, Baffinland has undertaken ship wake and propeller wash modelling reflective of Phase 2 shipping operations. A Ship Wake and Propeller Wash Modelling Report for Phase 2 operations is currently in preparation and will be included as a Technical Support Document (TSD) in Baffinland's FEIS Addendum Application for the Phase 2 Proposal.

## Project Certificate Condition No. 85

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent sediment redistribution along the shipping route
Term or Condition	The Proponent shall develop a monitoring plan to verify its impact predictions associated with sediment redistribution resulting from propeller wash in shallow water locations along the shipping route. If monitoring detects negative impacts from sediment redistribution, additional mitigation measures will need to be developed and implemented.
Relevant BIM Commitment	84
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	Not Applicable
Stakeholder Review	None
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland understands that the intent of this condition was to address concerns related to potential ship and/or tug propeller wash effects in shallow-water areas along the southern shipping route. A monitoring plan to verify predictions of sediment redistribution resulting from propeller wash in shallow locations along the shipping route will be completed when ore carriers are commissioned for the southern shipping route.



## Project Certificate Condition No. 86

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To update ballast water discharge impact predictions.
Term or Condition	Prior to commercial shipping of iron ore, the Proponent shall use more detailed bathymetry collected from Steensby Inlet and Milne Inlet to model the anticipated ballast water discharges from ore carriers. The results from this modeling shall be used to update ballast water discharge impact predictions and should account for density dependent flow and annual timescales over the project life. Additional sampling should also be undertaken to validate the model and to inform sampling sites and the monitoring plan.
Relevant BIM Commitment	85
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	ASL Environmental Sciences Inc., 2015; Coastal and Ocean Resources Inc., 2014 and 2016; Golder, 2018a; SEM 2015, 2016, 2017
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Ballast water dispersion modelling was undertaken in 2014 by Coastal and Ocean Resources Inc. (CORI) on behalf of Baffinland prior to the start of commercial shipping of iron ore at Milne Port. Ballast water dispersal pathways and concentrations in Milne Inlet were estimated using a regionally adapted version of the three-dimensional Regional Ocean Modeling System (ROMS). Oceanographic data collected in the model region, including Conductivity-Temperature-Depth (CTD) data, ocean current data (via deployment of Acoustic Doppler Current Profilers or ADCPs), hydrology data, atmospheric data, and bathymetric data, were used to determine basic ocean conditions and to prepare gridded fields for the initial and boundary conditions for the model. Forcing of the ROMS model for ice-free conditions was provided by an existing large-scale Canadian Arctic tidal model, NOAA reanalysis wind data, and river input. The model was validated using ADCP and CTD data collected in Milne Inlet in 2014. Modelling results were used to inform sampling sites for Baffinland's Aquatic Invasive Species (AIS) monitoring program which has been undertaken annually (each open water season) between 2014 and 2017.

Subsequent to development of the model, the following additional oceanographic and bathymetric data were collected in Milne Inlet:

- Additional oceanographic data (ocean currents and CTD measurements) were collected by CORI between 2014 and 2016 (ASL and CORI 2015; CORI 2016);
- Additional detailed bathymetry was collected by the Canadian Hydrographic Service (CHS) around the ore dock in 2016; and
- CTD data has been collected annually as part of the Marine Ecological Effects Monitoring Program (MEEMP) between 2014 and 2017 (SEM 2015, 2016, 2017; Golder, 2018a).

**RESULTS**

Detailed results of the 2014 ballast water dispersion modelling are presented in CORI (2014).

Supplementary oceanographic data collected post-modelling (2014 to present, as bulleted above) was not used to update or further validate the original dispersion model (CORI 2014). However, this data is presently being used to develop an updated ballast water dispersion model based on shipping operations proposed as part of Baffinland's Phase 2 Proposal.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Oceanographic and bathymetric data collected between 2014 and 2017 (as listed above) were used to develop an updated ballast water dispersion model reflective of Phase 2 shipping operations. Should the Phase 2 proposal not proceed, Baffinland will re-evaluate the need to update the 2014 ballast water dispersion model for current operations.

## Project Certificate Condition No. 87

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent invasive species introductions resulting from Project shipping
Term or Condition	The Proponent shall develop a detailed monitoring program at a number of sites over the long term to evaluate changes to marine habitat and organisms and to monitor for non-native introductions resulting from Project-related shipping. This program needs to be able to detect changes that may have biological consequences and should be initiated several years prior to any ballast water discharge into Steensby Inlet and Milne Inlet to collect sufficient baseline data and should continue over the life of the Project.
Relevant BIM Commitment	85
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2017 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2018a)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Aquatic invasive species (AIS) monitoring was undertaken in Milne Port and at Ragged Island in 2017 as part of the 2017 Marine Environmental Effects Monitoring Program (MEEMP) and AIS Program (Golder, 2018a). AIS surveys were designed to detect non-native species potentially introduced to Milne Inlet via ballast water discharges or hull biofouling. Surveys were based on a Before/After experimental design focusing on areas with the highest likelihood of marine invasion. Since ballast water releases occur in Milne Port, data collection was focused on the marine areas surrounding the Milne Port infrastructure. Additional locations adjacent to known vessel anchorages in Milne Inlet (i.e., Ragged Island) were also sampled as part of the AIS monitoring program.

AIS surveys were initially conducted in 2014 to supplement species inventory datasets for marine flora and fauna collected during baseline studies at Milne Port. AIS surveys conducted in 2015 and 2016 focused on detection of marine organisms not previously identified in Milne Port as primary indicators of invasion. Monitoring thresholds were implemented to establish protocols for evaluating taxonomic data to determine if mitigation measures need to be implemented. Depending on the species and the relative risk it poses to the native biological community, thresholds may consist of a single occurrence of an invasive species, or evidence that the species has become established in the area through reproduction and/or range expansion.

AIS sampling conducted in 2017 included zooplankton sampling, video surveys for macroflora and benthic epifauna, sampling for fish and mobile epifauna, and settlement surveys for encrusting epifauna.

Zooplankton samples were collected in deep water along each AIS transect in Milne Port using a combination of vertical hauls and oblique tows. Vertical hauls were conducted at a total of seven stations in Milne Port and four stations at Ragged Island. Oblique tows were conducted at a total of six stations in Milne Port. The number of samples collected in 2017 was increased from that of previous monitoring studies in an attempt to capture a larger portion of the zooplankton community and rarer species.

Benthic invertebrate samples were collected at three depth strata (3-15m, 15-25m, and 25-35m) from a total of fifteen stations in Milne Port and four stations at Ragged Island. The samples were collected using a Petite Ponar grab sampler with a surface grab area of 0.0225 m<sup>2</sup>, consistent with previous sample collection efforts conducted by SEM in 2014 through 2016.

Macroflora and benthic epifauna data were collected along a series of transects using underwater towed video. Surveys were conducted in the same areas sampled for benthic infauna and zooplankton. Following collection, a marine biologist post-processed the underwater video and identified all macrofloral and epifaunal organisms to the lowest possible taxonomic level. Only species presence was recorded (no enumeration was conducted since relative abundance of species was not of interest for the AIS analyses).

Fish and mobile epifauna were collected at various depths alongside the AIS transects using Fukui traps. In addition, fish collected in gill nets and Fukui traps deployed in other areas in Milne Port for the marine ecology component of the MEEMP were added to the AIS dataset.

Settlement baskets deployed in 2016 to allow for colonization by encrusting epifauna were recovered from the southwest corner of the ore dock in 2017. The baskets were placed along the rock armouring at the base of the ore dock for a continuous 12-month period. Baskets were tethered to the dock to allow for future retrieval and to limit displacement of the baskets from ice movement during the shoulder seasons. Upon recovery of the baskets in 2017, it was determined that the amount of colonization on the settlement baskets was insufficient for analysis, so no processing of the samples occurred. The settlement baskets were cleaned and re-deployed in the same location on the southwest corner of the existing ore dock. In addition to the settlement baskets, a string of five plastic pail lids were tied to the rope just above the baskets. The plastic lids will serve as an additional platform for encrusting epifauna to colonize. The plastic material was deemed to be a better surface than cobble to effectively remove colonized organisms without damaging them to allow for better taxonomic identification. The field crew also installed one string of additional settlement baskets on the northeast side of the ore dock in Milne Port and one string of settlement baskets at Ragged Island.

For all AIS sampling components, species lists developed in previous years of AIS monitoring were updated and examined for the presence of newly observed species. If any new species were found, they were examined to identify whether they were known to be invasive. All new species were compared against a global invasive species database as well as a known invasive species list within the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water.

## RESULTS

A total of 44 zooplankton taxa were identified in AIS sampling conducted in 2017 at Milne Port and Ragged Island, of which 13 were not observed during previous AIS monitoring or baseline surveys. None of the 44 zooplankton taxa were identified as invasive to the Arctic region. A literature review of known geographic distribution for each taxa confirmed that each newly observed taxa was either known to occur in the Arctic, or identified at a higher taxonomic level (e.g., genus, family, class), which contained species known to occur in the Arctic. It is possible that some specimens that could not be identified to species level from the samples collected in 2017, or those with poorly defined species ranges, could in fact be invasive or non-native to the Arctic region; however, the literature in the Arctic is limited for these species and not adequate enough to establish accurate species ranges.

A total of 236 benthic infaunal taxa were identified in AIS sampling conducted in 2017 at Milne Port and Ragged Island, of which 113 were not observed during previous AIS monitoring or baseline surveys. None of the 236 infaunal taxa was identified as invasive to the Arctic region. One species, a tube-dwelling amphipod (*Monocorophium insidiosum*), is listed as invasive in the global database of invasive species. This species was observed in Milne Port in 2013 and 2017 (in low abundance), and it remains unclear whether it is invasive to the northeastern Atlantic or if its occurrence in Milne Inlet falls within the northern range of its natural geographic distribution. This species is considered cryptogenic along the east coast of North America because dispersal by shipping may have happened before taxonomic recognition; it is not currently listed as an invasive species with potential to arrive by vessels to the Arctic according to the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al., 2014), as administered by Fisheries and Oceans Canada (DFO).

None of the macroflora, benthic epifauna, or fish taxa recorded during the 2017 AIS monitoring surveys were identified as invasive to the Arctic region.

### **TRENDS**

Four years of AIS monitoring has yielded a relatively large dataset of organisms observed in Milne Port, including two years of data following the initiation of iron ore shipping in Milne Inlet. To date, no species which can conclusively be identified as invasive have been identified. Additional years of monitoring will add to the current dataset and provide a baseline for determining whether changes are occurring as a result of Project shipping.

## Project Certificate Condition No. 88

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent invasive species introductions resulting from Project shipping.
Term or Condition	<p>Prior to commercial shipping of iron ore and in conjunction with the Marine Environment Working Group, the Proponent shall provide an updated risk analysis regarding ballast water discharge to assess the adequacy of treatment and implications on the receiving environment. This risk analysis shall consider, but not be limited to:</p> <ul style="list-style-type: none"> <li>a. Invasive species</li> <li>b. Seasonal oceanography</li> <li>c. Ballast water quality and quantity</li> <li>d. Receiving water quality; e. Residual physical, chemical, and/or biological effects</li> <li>e. Any risk assessment analysis regarding ballast water exchange and treatment efficacy in arctic waters</li> </ul>
Relevant BIM Commitment	85, 86
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Work Group (MEWG)
Reference	Risk Assessment for Potential Introduction of Aquatic Nonindigenous Species through Ballast Water Discharge at Milne Port (SEM, 2013) 2017 MEWG Meeting Record
Ref. Document Link	Appendix C1

### METHODS

A risk assessment for the potential introduction of aquatic nonindigenous species through ballast water discharges at Milne Port was completed in 2013 prior to the start of commercial shipping of iron ore at Milne Port. Detailed methodology for the semi-quantitative risk assessment is presented in SEM (2013), presented as Appendix 8B-4 of the FEIS Addendum (Baffinland, 2013a).

Currently, no ballast water treatment takes place on ore carriers contracted by Baffinland. All bulk carriers servicing Milne Port, including those for the 2017 shipping season, conduct mid-ocean ballast water exchange as required by federal Ballast Water Control and Management Regulations.

As described in the annual update for PC Condition No. 87, AIS surveys were conducted at Milne Port from 2014 to 2017, with expansion of the AIS monitoring program in 2017 to include additional sampling locations near established anchorages at Ragged Island.

In 2017, Baffinland supported a DFO national research program to evaluate the risks of non-native species introduction and develop efficient monitoring strategies for ships in heavily used ports in the Canadian Arctic. DFO collected subtidal and intertidal samples in Milne Inlet / Milne Port during the summer of 2017.

## RESULTS

The risk assessment undertaken in support of the ERP (SEM, 2013) determined that shipping operations under the ERP of the Project was unlikely to significantly increase the potential for species introduction as a consequence of ballast water discharges or ship hull fouling at Milne Port.

Four years of AIS monitoring (2014-2017) has yielded a relatively large dataset of organisms observed in Milne Port, including two years of data following the initiation of iron ore shipping in Milne Inlet. To date, no species which can conclusively be identified as invasive to the Arctic have been identified.

DFO presented preliminary results of the 2017 AIS collection program at the MEWG fall meeting (November 2017) and confirmed that no AIS were identified during their Milne Inlet sampling program and that the area of Pond Inlet is not showing as being at risk for the 30 marine species currently being examined by DFO as invasive species. Ice is anticipated to provide a buffer for invasive species in the Project area (Appendix C1).

## RECOMMENDATIONS / LESSONS LEARNED

Additional years of AIS monitoring will add to the current AIS dataset and provide a baseline for determining whether changes are occurring as a result of Project shipping which may have biological consequences for the marine habitat in Milne Inlet.

During the 2017 MEWG fall meeting it was discussed that the DFO program is not anticipated to occur again in Milne Inlet in 2018. DFO has shared with the MEWG that the use of eDNA sampling for AIS may have benefits to Baffinland by offering increased detectability of species than more traditional sampling methods.

## Project Certificate Condition No. 89

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine water quality resulting from ballast water exchange.
Term or Condition	The Proponent shall develop and implement an effective ballast water management program that may include the treatment and monitoring of ballast water discharges in a manner consistent with applicable regulations and/or exceed those regulations if they are determined to be ineffective for providing the desired and predicted results. The ballast water management program shall include, without limitation, a provision that requires ship owners to test their ballast water to confirm that it meets the salinity requirements of the applicable regulations prior to discharge at the Milne Port, and a requirement noting that the Proponent, in choosing shipping contractors will, whenever feasible, give preference to contractors that use ballast water treatment in addition to ballast water exchange.
Relevant BIM Commitment	57,87
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Transport Canada, Marine Environmental Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016h)  International Maritime Organization (IMO). 2017. Available at: International convention for the control and management of ships' ballast water and sediments (BWM). <a href="http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx">http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx</a> . Accessed on 14 September 2017.  Transport Canada. 2012. Discussion paper: <a href="http://meopar.ca/uploads/BWW_Doc_4_Discussion_Paper.pdf">Canadian implementation of the ballast water convention</a> . Available at: <a href="http://meopar.ca/uploads/BWW_Doc_4_Discussion_Paper.pdf">http://meopar.ca/uploads/BWW_Doc_4_Discussion_Paper.pdf</a> . Accessed November 2017.
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's ballast water management plan includes taking the appropriate steps to manage and monitor ship ballast water in a manner consistent with applicable regulations and guidelines, which includes sampling and measurements of ballast water prior to discharge. According to the Ballast Water Control and Management Regulations under the *Canada Shipping Act* (SOR/2011-237), all ships entering the Canadian Exclusive Economic Zone (EEZ) must exchange their ballast water in open seas, away from coastal waters (i.e., 200 nautical miles from land and in water at least 2,000 metres deep). Baffinland monitors salinity of ore carriers' ballast water prior to discharge to verify that it meets the regulation for salinity (at least 30 parts per thousand [ppt]).

All bulk carriers that loaded at Milne Port during the 2017 shipping season had their ship's log inspected to confirm mid-ocean ballast water exchange was conducted as required by Canada's Ballast Water Control and Management Regulations. Ballast



water salinity was measured in all bulk carriers servicing Milne Port. In these instances, a single ballast tank on the vessel was tested for salinity content using a YSI Model/Make to confirm that ballast water salinity was above 30 ‰ (parts per thousand), prior to being authorized by the port captain to discharge in Milne Port. This is consistent with mid-ocean exchange requirements for vessels conducting a transoceanic voyage (salinity of mid-Atlantic seawater, where open-water exchange takes place, is typically in the range of 34-35 ‰).

## RESULTS

Ballast water salinity was measured in all ore carriers (n=56) that called on Milne Port in 2017. Results are presented in Table 4.23. All measured salinity concentrations exceeded 30 ‰ (parts per thousand), which is consistent with the mid-ocean exchange requirements for vessels conducting a transoceanic voyage.

**Table 4.23 2017 Ship Ballast Water Salinity Test Results**

Vessel	Date	Salinity	Tank Tested
Nordic Odin Voy 1	02/08/2017	30%	4 starboard (stbd)
Nordic Olympic Voy 1	02/08/2017	31%	5/6 starboard
Sagar Samrat Voy 1	03/08/2017	33%	Cargo Hold 4
Nordic Oshima Voy 1	04/08/2017	30%	Cargo Hold 4
Nordic Orion Voy 1	05/08/2017	30%	4 starboard
Rio Tamara Voy 1	06/08/2017	30%	4 starboard
Nordic Oasis Voy 1	07/08/2017	35%	4 starboard
NS Energy Voy 1	09/08/2017	31%	3 starboard
Golden Ice Voy 1	10/08/2017	31%	3 starboard
Golden Diamond Voy 1	13/08/2017	32%	5 starboard
Golden Bull Voy 1	14/08/2017	30%	3 starboard
Golden Brilliant Voy 1	15/08/2017	30%	3 port
Golden Opal Voy 1	16/08/2017	30%	3 starboard
Nordic Odyssey Voy 1	18/08/2017	30%	4 starboard
Golden Opportunity Voy 1	20/08/2017	31%	3 starboard
NS Yakutia Voy 1	21/08/2017	35%	3 starboard
Arkadia Voy 1	23/08/2017	35%	5 starboard
Golden Strength Voy 1	24/08/2017	34%	3 starboard
Golden Ruby Voy 1	25/08/2017	30%	3 starboard
Golden Pearl Voy 1	26/08/2017	30%	3 starboard
Golden Saguenay Voy 1	27/08/2017	31%	3 starboard
Golden Amber Voy 1	28/08/2017	32%	3 starboard
Nordic Odin Voy 2	30/08/2017	31%	4 starboard
Nordic Olympic Voy 2	31/08/2017	30%	5/6 starboard
Sagar Samrat Voy 2	01/09/2017	31%	7 starboard
Nordic Oshima Voy 2	02/09/2017	30%	5/6 starboard
Nordic Oasis Voy 2	04/09/2017	31%	5/6 starboard
Nordic Odyssey Voy 2	05/09/2017	31%	4 starboard

Vessel	Date	Salinity	Tank Tested
AM Buchannon	06/09/2017	31%	4 starboard
Rio Tamara Voy 2	08/09/2017	40%	5/6 starboard
Golden Diamond Voy 2	11/09/2017	31%	5 starboard
Nordic Orion Voy 2	11/09/2017	31%	Cargo Hold 4
Golden Ice Voy 2	12/09/2017	31%	4 starboard
Golden Opal Voy 2	13/09/2017	31%	3 starboard
NS Energy Voy 2	15/09/2017	30%	4 starboard
NS Yakutia Voy 2	16/09/2017	30%	4 starboard
Golden Opportunity Voy 2	19/09/2017	31%	4 starboard
Golden Strength Voy 2	20/09/2017	30%	3 starboard
Golden Bull Voy 2	21/09/2017	31%	3 starboard
Golden Ruby Voy 2	23/09/2017	31%	4 starboard
Arkadia Voy 2	25/09/2017	31%	3 starboard
Golden Amber Voy 2	26/09/2017	31%	3 starboard
Golden Pearl Voy 2	27/09/2017	31%	3 starboard
Golden Saguenay Voy 2	28/09/2017	31%	3 starboard
Nordic Odin Voy 3	28/09/2017	31%	3 starboard
Nordic Olympic Voy 3	30/09/2017	30%	Aft Peak
Nordic Oshima Voy 3	01/10/2017	31%	Aft Peak
Golden Brilliant Voy 2	03/10/2017	31%	4 port
Nordic Oasis Voy 3	04/10/2017	31%	5/6 starboard
Sagar Samrat Voy 3	05/10/2017	32%	7 starboard
Nordic Orion Voy 3	06/10/2017	31%	Cargo Hold 4
Rio Tamara Voy 3	07/10/2017	30%	Cargo Hold 4
Golden Diamond Voy 3	10/10/2017	33%	3 starboard
Golden Opal Voy 3	12/10/2017	34%	3 starboard
NS Energy Voy 3	12/10/2017	33%	Aft Peak
Golden Ice Voy 3	14/10/2017	33%	3 starboard

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

As part of NIRB's review of the 2016 Annual Report, INAC commented (Recommendation #22) on the erroneous salinity data measured in ballast water of several ships that serviced Milne Port in 2016<sup>3</sup>, and questioned the validity of Baffinland's Quality Assurance Quality Control (QA/QC) procedures and practices for ballast water monitoring, as well as its conclusion regarding

<sup>3</sup> Some salinities measured at Milne Port in 2016 were unrealistically high and indicative of a measurement error. Salinities up to 62 ‰ were recorded, but the salinity of mid-Atlantic seawater (i.e., where exchanges were reported to have taken place) is typically in the range of 34-35 ‰. The higher than expected salinity results indicate a potential problem with the measuring technique or equipment that was assessed in 2017 to confirm that the ballast water testing procedure is effective and appropriate QA/QC measures were put in place.

its compliance with Condition 89. The Board requested that Baffinland improve QA/QC protocols for its ballast water sampling program in order to prevent erroneous data and to ensure that ballast water meets the salinity requirements of the applicable regulations prior to discharge at the Milne Port. It was also requested that Baffinland provide corrected results of its ballast water sampling, including details of how QA/QC methods would be improved upon and validated for subsequent sampling within 30 days' receipt of the Board's recommendations.

The higher than expected salinity results collected in 2016 were attributed to the measuring technique or equipment applied in the field, and the lack of a robust QA/QC system integrated into the overall ballast water sampling program, which would have been effective at identifying anomalous results in the field within an adequate time frame to allow for expedited corrective measures.

In order to resolve this issue in future ship-based ballast water sampling efforts, Baffinland will be purchasing new water quality instrumentation for the 2018 season that will meet industry-standard requirements for reliably measuring temperature and salinity/conductivity (plus purchase of a second identical unit for redundancy purposes). Further to this, Baffinland has retained Golder Associates Ltd. to develop a comprehensive, stand-alone Standard Operating Procedures (SOP) manual for Baffinland's ship-based ballast water sampling program. The SOP will include information on applicable legislation, program objectives, monitoring responsibilities, sampling equipment specifications, detailed technical procedures for sampling and sampling planning, comprehensive QA/QC procedures, and adaptive management measures for implementation during non-compliance events.

In 2018, Baffinland will update its Ballast Water Management Plan (within its Shipping and Marine Wildlife Management Plan) prior to the start of the 2018 shipping season to update reflect improvements to salinity sampling and testing methodologies and to clearly indicate the action to be taken in the event of a salinity reading that is lower or higher than the expected range. The Ballast Water Management Plan will also be updated to clearly indicate what actions will be taken if a vessel is found to contain ballast water that is non-compliant with federal regulations.

With Canada's ratification of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (IMO 2017) that entered into force on September 8, 2017 (IMO 2017), ships are now required to incorporate an on-board ballast water treatment system to meet D-2 performance standards and further reduce the potential for invasive species introductions. Newly built ships must now meet the D-2 standard, while the requirements for existing ships will be phased over a period up to five years (until renewal of each ship's International Oil Pollution Prevention Certificate [IOPPC]). Until then all ships will continue ballast water exchange outside the Canadian Exclusive Economic Zone (EEZ). Canadian regulations may impose more stringent requirements to meet both D-1 (mid-ocean ballast water exchange) and D-2 (ballast water treatment) standards of the Convention (Transport Canada 2012). Therefore, ore carriers arriving at Milne Port may still be required to conduct ballast water exchange outside the EEZ (e.g., North Atlantic Ocean or Labrador Sea) in addition to ballast treatment prior to discharge is authorized. Baffinland will update its Ballast Water Management Plan prior to the start of the 2018 shipping season to reflect this new legislation.

## Project Certificate Condition No. 90

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to marine water quality resulting from ballast water exchange.
Term or Condition	The Proponent shall incorporate into its Shipping and Marine Mammals Management Plan provisions to achieve compliance with the requirements under the International Convention for the Control and Management of Ship's Ballast Water and Sediment (2004) or its replacement and as implemented by the Canadian Ballast Water and Control Regulations as may be amended from time to time.
Relevant Commitment	BIM 57
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In Compliance
Stakeholder Review	Transport Canada, Marine Environment Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016h) Ballast Water Control and Management Regulations (SOR/2011-237). Government of Canada. Last amended in 2017-02-13. Available at: <a href="http://laws-lois.justice.gc.ca/eng/regulations/SOR-2011-237/">http://laws-lois.justice.gc.ca/eng/regulations/SOR-2011-237/</a> . Accessed on 14 February 2018.
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's ballast water management plan (Section 5.5.1 of the Shipping and Marine Wildlife Management Plan (SMWMP)) describes Baffinland's commitment and steps taken to verify that vessels calling at Milne Port meet the legal requirements around ballast water management, including IMO Ballast Water Convention Regulation D-1, and Section 6(1) of the Canadian Ballast Water Control and Management Regulations under the *Canada Shipping Act* (SOR/2011-237). This includes the inspection of ship logs to confirm mid-ocean ballast water exchange has occurred, and on-board testing of ballast water at Milne Port to verify that it meets the regulation for salinity (at least 30 ppt) prior to discharge.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

With Canada's ratification of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (IMO 2017) that entered into force on September 8, 2017, ships are now required to incorporate on-board ballast water treatment to meet D-2 performance standards. Newly built ships must immediately meet the D-2 standard, while requirements for existing ships will be phased over a period up to five years (until renewal of each ship's International Oil Pollution Prevention Certificate [IOPP]). Until then, all ships will continue ballast water exchange outside the Canadian

Exclusive Economic Zone (EEZ). Baffinland will update its Ballast Water Management Plan prior to the start of the 2018 shipping season to reflect this new legislation.

## Project Certificate Condition No. 91

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to marine water quality in Steensby Inlet and Milne Inlet.
Term or Condition	The Proponent shall develop a detailed monitoring plan for Steensby Inlet and Milne Inlet for fouling that complies with all applicable regulatory requirements and guidelines as issued by Transport Canada, and includes sampling areas on ships where antifouling treatment is not applied such as the areas where non-native species are most likely to occur.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	Non-Compliant
Stakeholder Review	Transport Canada, Marine Environmental Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016h) 2017 MEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C1

### METHODS

To date, no monitoring of biofouling on vessel hulls has taken place. Section 5.5.2 of the Shipping and Marine Wildlife Management Plan (SMWMP) outlines a method for collecting fouling organisms detected on vessels, incidental to a collection method for testing the anti-fouling paint of newly built vessels. Since Baffinland has not commissioned any purpose-built vessels for the Project, the originally proposed method has not been implemented.

To address PC Condition No. 91, the 2017 Marine Environmental Effects Monitoring (MEEMP) Program and Aquatic Invasive Species (AIS) Program was designed to include a SCUBA-based vessel hull biofouling survey of several Project vessels (i.e. ore carriers) while anchored in Milne Port. The biofouling survey was planned to focus on those areas of the hull where biofouling is most likely to occur (e.g., chain lockers, bulbous bow and stem, sea-chain grating, stern tube, rope guard, propeller nose cone and blades, rudder side, bottom, leading and trailing edges). Proposed data collection included underwater video documentation of the hull, as well as physical collection of fouling species for subsequent taxonomic identification. All samples collected were to be shipped to an accredited laboratory for taxonomic analysis. A 3-person WorkSafe BC-certified Golder Associates Ltd. (Golder) dive team was arranged to conduct the dive survey in accordance with federal and provincial occupational dive safety regulations.

As outlined in the update for PC Condition No. 87, AIS monitoring was undertaken in Milne Port and at Ragged Island in 2017 as part of the MEEMP. AIS surveys conducted as part of the MEEMP were designed to detect the potential introduction of non native species (primarily from ship ballast water releases but also from ship fouling). Monitoring was based on a Before/After experimental design focusing on areas with highest likelihood of invasion. Since the majority of ballast water exchange occurs in Milne Port, data collection was focused on the marine areas surrounding the Milne Port infrastructure. Additional locations adjacent to known vessel anchorage sites in Milne Inlet (i.e., Ragged Island) were also sampled as part of the AIS monitoring program.

## RESULTS

The dive sampling program, and associated dive safety planning, was reviewed and thoroughly prearranged with Baffinland Port site environmental staff and ship crew prior to the commencement of the program. Once on site at the Milne Port, the Work Safe BC-certified Golder dive team in conjunction with Baffinland staff and ship crews determined that the risk to the safety of the crew was extremely high. Lock out protocols could not be implemented to ensure the safety of the dive team. Given the high risk of injury or fatality, the biofouling dive survey was suspended for the 2017 year.

A total of 44 zooplankton taxa were identified in AIS sampling conducted in 2017 at Milne Port and Ragged Island, of which 13 were not observed during previous AIS monitoring or baseline surveys. None of the 44 zooplankton taxa were identified as invasive to the Arctic region. A literature review of known geographic distribution for each taxa confirmed that each newly observed taxa was either known to occur in the Arctic, or identified at a higher taxonomic level (e.g., genus, family, class), which contained species known to occur in the Arctic. It is possible that some specimens that could not be identified to species level from the samples collected in 2017, or those with poorly defined species ranges, could in fact be invasive or non-native to the Arctic region; however, the literature in the Arctic is limited for these species and not adequate enough to establish accurate species ranges.

A total of 236 benthic infaunal taxa were identified in AIS sampling conducted in 2017 at Milne Port and Ragged Island, of which 113 were not observed during previous AIS monitoring or baseline surveys. None of the 236 infaunal taxa were identified as invasive to the Arctic region. One species, a tube-dwelling amphipod (*Monocorophium insidiosum*), is listed as invasive in the global database of invasive species. This species was observed in Milne Port in 2013 and 2017 (in low abundance), and it remains unclear whether it is invasive to the northeastern Atlantic or if its occurrence in Milne Inlet falls within the northern range of its natural geographic distribution. This species is considered cryptogenic along the east coast of North America because dispersal by shipping may have happened before taxonomic recognition; it is not currently listed as an invasive species with potential to arrive by vessels to the Arctic according to the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water, as administered by Fisheries and Oceans Canada (DFO).

None of the macroflora, benthic epifauna, or fish taxa recorded during the 2017 AIS monitoring surveys were identified as invasive to the Arctic region.

## TRENDS

None of the macroflora, benthic epifauna, or fish taxa observed during the AIS surveys in 2017 were identified to be invasive.

## RECOMMENDATIONS / LESSONS LEARNED

Although AIS sampling of areas of the hull where biofouling is most likely to occur was not completed, the other components of the 2017 AIS MEEMP program did not identify any invasive macroflora, benthic epifauna, or fish taxa in close proximity to the ships, in Milne Port or at Ragged Island.

Due to unmanageable safety concerns and administrative restrictions, no dive program is proposed for 2018. Instead, an alternative monitoring tool for hull biofouling, such as underwater video mounted on a remotely operated underwater vehicle (ROV), is being considered for the 2018 summer program. This option will be further discussed with the MEWG during the spring 2018 meeting.

## Project Certificate Condition No. 92

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure adequate spill response capacity.
Term or Condition	The Proponent shall ensure that it maintains the necessary equipment and trained personnel to respond to all sizes of potential spills associated with the Project in a self-sufficient manner.
Relevant BIM Commitment	10, 108, 110
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Emergency Response Plan (Baffinland, 2017i) Spill Contingency Plan (Baffinland, 2017j) Oil Pollution Emergency Plan – Milne Inlet (Baffinland, 2017k) Spill at Sea Response Plan (Baffinland, 2015b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland has developed and maintained appropriate contingency plans to respond to spills on land, at the port, and at sea. The plans outline the equipment to be used in the event of a spill, as well as the roles and responsibilities and training necessary to maintain appropriately trained personnel. Oil Pollution Emergency Response training and spill response exercises are conducted annually. Timing of the training corresponds with ship-to-shore fuel transfer events at Milne Port. In 2017, training of Baffinland staff on its Oil Pollution Emergency Plan (OPEP) was conducted by spill response consultant Navenco Marine on August 03-08, 2017. The training encompassed classroom and hands-on spill response techniques including a mock exercise for potential port oil spills during ship-to-shore transfer. The training also included an audit inspection to confirm that Baffinland's spill response equipment and training requirements were in compliance with the OPEP and Transport Canada regulations for Baffinland's Class 1 Oil Handling Facility. General land-based spill response training is periodically reviewed with the Mine Rescue Team; however, this does not apply to the OPEP. Baffinland also maintains a contract with Oil Spill Response Ltd. (OSRL) for emergency response in the event of a marine spill.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Annual spill response training will be continued prior to the arrival of fuel vessels and unloading of fuels.



## Project Certificate Condition No. 93

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment at Steensby Inlet.
Term or Condition	Prior to construction, based on vessel selection and if so required, the Proponent shall reassess the risk analysis of using vessel-based fuel storage, including the potential environmental impacts of containment failure under a range of winter ice conditions, how a spill might spread and the impact of fuel if it does not volatilize to the atmosphere.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

The use of vessel-based fuel storage is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 94

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To promote public awareness of Project activities.
Term or Condition	The Proponent shall consult directly with affected communities regarding its plans for over-wintering of fuel in Steensby Inlet, with discussion topics to include descriptions of the duration of proposed activities, vessel type, spill preparedness and emergency response protocols, environmental impact predictions and answers to community member questions.
Relevant BIM Commitment	106
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Communities of Hall Beach and Igloolik
Reference	N/A
Ref. Document Link	N/A

### METHODS

Overwintering of fuel in Steensby Inlet is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

This condition will be re-visited if overwintering of fuel at Steensby Inlet is proposed.

## Project Certificate Condition No. 95

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent, Transport Canada
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment at Steensby Inlet.
Term or Condition	The Proponent shall meet or exceed all regulatory regulations and requirements as apply to the practice of overwintering a fuel vessel at Steensby Inlet, with reporting to the NIRB and Transport Canada.
Relevant BIM Commitment	8
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Overwintering of fuel in Steensby Inlet is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

This condition will be re-visited if overwintering of fuel in Steensby Inlet is proposed.

## Project Certificate Condition No. 96

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To ensure adequate oversight of Project activities is occurring.
Term or Condition	The Proponent will update the NIRB on the results of all compliance monitoring and site inspections undertaken by government agencies for the overwintering of a fuel vessel in Steensby Inlet.
Relevant BIM Commitment	8
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Overwintering of fuel in Steensby Inlet is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

This condition will be revisited if overwintering of fuel in Steensby Inlet is proposed.

## Project Certificate Condition No. 97

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment along the shipping route.
Term or Condition	<p>Prior to the commercial shipping of iron ore, the Proponent shall conduct fuel spill dispersion modeling that will, at a minimum, consider:</p> <ol style="list-style-type: none"> <li>a. Modeling of oil spills for both the Northern and Southern Shipping Routes, in representative locations, identified by the Proponent, in consultation with the Marine Environment Working Group along both Shipping Routes, and including:                             <ol style="list-style-type: none"> <li>i. Pinch points;</li> <li>ii. The approaches into Steensby Inlet and Milne Inlet;</li> <li>iii. Shallow water and shorelines; and,</li> <li>iv. Areas that have been identified as having high flows and/or high concentrations of marine mammals, marine fish or seabirds.</li> </ol> </li> <li>b. Open water and, where applicable, ice-covered conditions</li> <li>c. Spill volumes up to and including loss of a full tanker cargo</li> <li>d. Differences in the quantity and properties of each type of bulk fuel transported by vessels when they are at, or in transit to, the ports at Steensby Inlet and Milne Inlet</li> </ol>
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada Marine Safety. Canadian Coast Guard
Reference	Milne Inlet Spill Modelling Report Fuel Spill Modelling: Northern Shipping Route Open Water Season – Milne Inlet, Eclipse Sound, Pond Inlet (AMEC Foster Wheeler, 2015) Spill at Sea Response Plan (Baffinland, 2015b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Revised oil spill modelling was conducted for shipping from Milne Port in 2015. Leading up to this modelling, a fuel spill preparedness workshop was held in April 2014 with Transport Canada and the Canadian Coast Guard. This workshop established the following credible spill scenarios for modelling:

- For arctic diesel - two compartments of a double-hull, multi-compartment fuel tanker, which amounts to 4,000 m<sup>3</sup> (4 ML). The expected maximum size of the fuel tanker is 15 ML.
- For IFO - half of the IFO fuel remaining in the ship when sailing into Milne Inlet which amounts to 2,000 m<sup>3</sup> (2 ML) of IFO.

The spill assessment considered the open water season, and the month of September was selected as representative in terms of meteorological and oceanographic conditions. Five potential spill locations along the shipping route were selected considering community recommendations.

Two scenarios were modelled at each of the five locations using the software OST, which computes spill probability distributions to indicate geographical regions (e.g., Pond Inlet, Eclipse Sound, Navy Board Inlet and Milne Inlet) which might be affected as a result of a spill, how frequently and how soon.

In addition, 10 (two fuel types x five locations) simulations were run with a September 'P50' wind condition defined as the average wind speed conditions and the associated most frequent wind direction. Finally, a sensitivity run considering a full fuel tanker loss of 15 ML arctic diesel cargo at a location in Eclipse Sound was also prepared. For these scenarios, RPS ASA's OILMAP (RPS 2014) was used to provide additional estimation of spill weathering and fate. This includes slick characteristics, estimate of fuel concentrations in the surface layer, amounts evaporated and that have reached shore, and remaining amounts of fuel, and fuel and water (mousse) volume. The spill modelling completed in this study assumes no intervention, response or containment and that the slick is assumed to freely discharge (during a very short duration) from the damaged vessel.

The OILMAP oil spill model and response system introduced above was used to provide additional estimates of spilled fuel fate, in particular, slick characteristics and weathering. OILMAP calculates the evaporation, dispersion and remaining percentage for a given spill scenario where the user defines a fuel product type, weather conditions, properties of the receiving water, and the amount of fuel released.

The fate or weathering processes considered were evaporation, the conversion of liquid fuel into gaseous component, and natural dispersion, the breakup of a fuel slick into small droplets that are mixed into the sea by wave action. These are two important weathering processes that typically occur over the first five days following a spill and act to remove fuel from the sea surface. Fuel will also be brought to shore depending on the prevailing currents and winds at the time as well as the type and amount of fuel, and type of shoreline. Consideration of the amounts lost due to these processes yields an estimate of the remaining amount of fuel on the surface at any time. These are the key fates modeled and tracked by OILMAP. No containment or recovery of spilled fuel was assumed in the simulations.

## **RESULTS**

The modelling results were presented in a series of figures showing expected spill trajectories after 1 day and 5 days. The spill model informed the development of Baffinland's Spill at Sea Response Plan.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

There have been no changes to the shipping practices since the spill modelling was conducted, therefore no updates are required.

## Project Certificate Condition No. 98

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment along the shipping route.
Term or Condition	The Proponent shall incorporate the results of revised fuel spill dispersion modeling into its impact predictions for the marine environment and its spill response and emergency preparedness plans.
Relevant BIM Commitment	11, 106
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada Marine Safety, Canadian Coast Guard
Reference	Milne Inlet Spill Modelling Report Fuel Spill Modelling: Northern Shipping Route Open Water Season – Milne Inlet, Eclipse Sound, Pond Inlet (AMEC Foster Wheeler, 2015) Spill at Sea Response Plan (Baffinland, 2015b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

The revised fuel spill modelling completed in 2015 was used to revise Baffinland’s spill response and emergency preparedness plans, including the development of a Spill at Sea Response Plan.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

There have been no changes to the shipping practices since the spill modelling was conducted, therefore no updates are required.

#### 4.6.11 Marine Wildlife (PC Conditions 99 through 128)

Thirty-one (31) PC conditions (including 125 and 125a) relate to the potential effects of the Project on marine wildlife. These conditions require the collection of supplemental baseline data prior to the shipping of ore, provide direction on mitigation and monitoring programs to be included in Baffinland's Shipping and Marine Wildlife Management Plan (SMWMP), and identify shipping information to be communicated to potentially affected communities regarding shipping activities.

##### *Stakeholder Feedback*

Marine mammals have been and continue to be a key environmental issue with Baffinland's stakeholders. Stakeholders focused on the Project's potential effects to marine mammals includes local communities, the QIA, and agencies with jurisdictional responsibility for the marine environment: DFO, ECCC, Transport Canada and the Canadian Coast Guard. Baffinland continues to engage these groups through the MEWG and other regulatory reporting, as necessary. The communities expressed concerns during the FEIS and FEIS addendum environmental review process about potential impacts to marine mammals, mainly narwhal in Pond Inlet and walrus in Igloolik; community awareness of shipping activities; and the potential for the Project to impact potential fisheries resources in Steensby and Milne Inlets. Nunavik, represented by the Makivik Corporation, expressed concern over potential impacts of shipping on marine mammal populations in Hudson Strait. The potential effects of shipping on marine wildlife was expressed in 2017 consultation activities (Appendix B). Support for the continuation of the Bruce Head Narwhal Monitoring Study was also expressed.

##### *Monitoring*

Baffinland implements a number of marine mammal monitoring programs. In 2017, marine environment monitoring programs undertaken by Baffinland included the following:

- Marine Environmental Effects Monitoring Program (water, sediment, invertebrates and fish) around the ore dock;
- Aquatic invasive species (AIS) Monitoring Program;
- Ore Dock Marine Fisheries Habitat Offset Monitoring Program;
- Bruce Head Shore-based Monitoring Program; and
- Tremblay Sound Narwhal Tagging Program, in partnership with Fisheries and Oceans Canada (DFO).

Table 4.24 provides an evaluation of the Project's impacts on the marine environment, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

To the extent that Project impacts on marine mammals can be evaluated, the effects of the Project are within FEIS predictions.

##### *Path Forward*

Baffinland will remain vigilant about the mitigation and monitoring activities that are in place to protect marine mammals. Baffinland will continue to seek input and review monitoring results trends from technical members of the MEWG. Reporting on each PC condition follows.



**Table 4.24 Marine Mammals Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Ringed Seals, Bearded Seals, Walrus, Beluga Whales, Narwhal, Bowhead Whales, Polar Bear	Habitat change resulting from icebreaking and/or ice management	No project interactions to monitor in 2017	N/A
	Hearing impairment and/or damage caused by sound from construction activities	No in-water construction in 2017	N/A
	Disturbance caused by airborne and/or underwater sound from construction, shipping and aircraft	Bruce Head shore-based monitoring study, underwater sound monitoring. No significant change in relative abundance and distribution of marine wildlife noted.	Effects within FEIS predictions
Narwhal	Masking of environmental sounds caused by vessel and construction sound	Bruce Head shore-based monitoring study, underwater sound monitoring. No significant change in relative abundance and distribution of marine wildlife noted.	Effects within FEIS predictions
Bowhead Whales	Mortality from collisions with vessels and blasting during construction	Shipboard observers; no collisions were noted by shipboard observers or ship crew	Effects within FEIS predictions
Polar Bears	Mortality from human-bear interactions	Polar bear monitors look for polar bears entering camps and remote work areas. No polar bear incidents occurred in 2017.	Effects within FEIS predictions

## Project Certificate Condition No. 99

Category	Marine Environment - Supplemental Baseline Assessments
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction
Objective	To supplement baseline information and improve predictions for potential impacts to marine wildlife.
Term or Condition	<p>The Proponent, working with the Marine Environment Working Group, shall consider and identify priorities for conducting the following supplemental baseline assessments:</p> <ol style="list-style-type: none"> <li>a. Establish shipping season, inter-annual baseline in Steensby Inlet and Milne Inlet that enables effective monitoring of physical and chemical effects of ballast water releases, sewage outfall, and bottom scour by ship props, particularly downslope and downstream from the docks. This shall include the selection and identification of physical, chemical, and biological community/indicator components. The biological indicators shall include both pelagic and benthic species but with emphasis on relatively sedentary benthic species (e.g., sculpins).</li> <li>b. The collection of additional baseline data:                     <ol style="list-style-type: none"> <li>i. in Steensby Inlet on walrus, beluga, bearded seal anadromous Arctic Char abundance, distribution ecology and habitat use</li> <li>ii. In Milne Inlet on narwhal, bowhead and anadromous Arctic Char abundance, distribution ecology and habitat use</li> </ol> </li> <li>c. Enhance baseline data on marine wildlife (fish, invertebrates, birds, mammals, etc.) and to provide more details on species abundance and distribution found in the Project area. This shall include, but not be limited to the following:                     <ol style="list-style-type: none"> <li>i. Aerial surveys for basking ringed seals throughout the landfast ice of Steensby Inlet and at an appropriate control location</li> <li>ii. Shore-based observations of pre-Project narwhal and bowhead whale behavior in Milne Inlet that continues at an appropriate frequency throughout the Early Revenue Phase and for not less than three consecutive years</li> </ol> </li> <li>d. Enhance the baseline for affected freshwater systems, which includes control sites to detect Project-related changes before they cause significant harm.</li> </ol>
Relevant BIM Commitment	81
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2018a) 2017 MEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a> Appendix C1

**METHODS**

PC Condition No.99 applies to the construction phase of the Project and associated supplemental baseline assessments. In 2017, the Project is now in the Early Revenue Phase and supplemental baseline assessments are complete and were previously reported on.

A Marine Ecological Effects Monitoring Program (MEEMP) was developed following completion of the 2013 and 2014 marine biological baseline studies to test the predictions of the Final Environmental Impact Statement (FEIS) and monitor for Project induced effects. From 2015 to 2017, the MEEMP includes monitoring of marine water and sediment quality, marine infauna, epifauna / epiflora, and fish and fish habitat. The MEEMP sampling design is based on EEM guidance from Environment Canada (2012), and includes statistical approaches to detecting potential project-induced impacts on the marine environment. The 2017 MEEMP study design and data collection methodology followed the same approach as 2016 to provide technical continuity and repeatability of the program and to allow for inter-annual comparisons of the multi-year dataset (2013-2017). Detailed information on study design and sampling methodology are available in Golder (2018a). Refer to PC No. 83 and 113 for a more detailed description of the MEEMP and 2017 results.

An Aquatic Invasive Species (AIS) monitoring program was also developed in 2015 as part of the MEEMP to enhance baseline data and to provide early warning of AIS introductions in the Project area. Biophysical sampling for the AIS program targeted lower trophic levels, including zooplankton, benthic infauna, epifauna and fish. The AIS program has been completed from 2015 to 2017. The 2017 AIS monitoring program study design and data collection methods followed the same approach as 2016, but the program was expanded to include sampling sites near Ragged Island to capture potential AIS at existing anchorage locations in this area. Refer to PC No. 87 and 91 for a more detailed description of the AIS Program and results.

**RESULTS**

Not applicable.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Not applicable.

## Project Certificate Condition No. 100

Category	Marine Environment - Supplemental Baseline Assessments
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction
Objective	To supplement baseline information and improve predictions for potential impacts to marine wildlife.
Term or Condition	The Proponent shall update its Shipping and Marine Wildlife Management Plan, to include avoidance of polynyas and mitigation measures designed for potential fuel spills along the shipping lane during the winter months, with consideration for the impact of spilled fuel on marine mammals when they might be less mobile or able to avoid contact with spilt fuel or fumes.
Relevant BIM Commitment	57
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016h)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

There is currently no winter shipping or ice breaking occurring as part of the Mary River Project so there is no need to address fuel spills during winter months in the Shipping and Marine Wildlife Management Plan.

### RESULTS

Not applicable in 2017.

### TRENDS

Not applicable in 2017.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will update the Shipping and Marine Wildlife Management Plan prior to any winter shipping.

## Project Certificate Condition No. 101

Category	Marine Environment - Monitoring
Responsible Parties	The Proponent, Marine Environment Working Group Phil/Ainsley
Project Phase(s)	Construction and Operations
Objective	To monitor for potential impacts to marine wildlife and marine habitat.
Term or Condition	<p>The Proponent shall incorporate into the appropriate monitoring plans the following items:</p> <ol style="list-style-type: none"> <li>a. A monitoring program that focuses on walrus use of Steensby Inlet and their reaction to disturbance from construction activities, aircraft, and vessels;</li> <li>b. Efforts to involve Inuit in monitoring studies at all levels;</li> <li>c. Monitoring protocols that are responsive to Inuit concerns;</li> <li>d. Marine monitoring protocols are to consider the use of additional detecting devices to ensure adequate monitoring through changing seasonal conditions and daylight;</li> <li>e. Schedule for periodic aerial surveys as recommended by the Marine Environment Working Group;</li> <li>f. Periodic aerial surveys for basking ringed seals throughout the landfast ice of Steensby Inlet, and a suitable control location. Surveys shall be conducted at an appropriate frequency to detect change inter-annual variability;</li> <li>g. Shore-based observations of pre-Project narwhal behavior in Milne Inlet, that continues at an appropriate frequency throughout the Early Revenue Phase (not less than three years);</li> <li>h. Conduct landfast ice monitoring for the duration of the Project Operations phase, which will include:                     <ol style="list-style-type: none"> <li>i. The number of ship transits that are able to use the same track; and</li> <li>ii. The area of landfast ice disrupted annually by ship traffic; and</li> <li>iii. Monitoring strategy focused on assessing and mitigating interaction between humans and wildlife at the port site(s).</li> </ol> </li> </ol>
Relevant BIM Commitment	Not Applicable
Reporting Requirement	To be provided in the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG), Nunavut Impact Review Board
Reference	2016 Marine Mammal Aerial Photography Survey – Milne Inlet and Eclipse Sound (Golder, 2018c) 2017 Bruce Head Shore-based Monitoring Program (Golder, 2018d) 2017 MEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a> Appendix C1

### METHODS

- a. No activity took place at Steensby Port in 2017. This phase of the project is currently inactive.
- b. Inuit were actively involved in the planning and execution of the 2017 monitoring programs (MEEMP, AIS Monitoring Program, Habitat Offset Monitoring Program at Milne Port, Bruce Head Shore-based Monitoring Program, Tremblay Sound Narwhal Tagging Program). A training workshop was provided in Pond Inlet in late July 2017 for all Inuit participants in the

2017 Monitoring Programs. Practical technical training was also provided on-site for those participants successfully employed on the 2017 Monitoring Programs

As a follow-up to the 2017 field programs, Baffinland conducted face-to-face meetings in Pond Inlet with the Mittimatalik HTO (MHTO) (24 Nov 2017) as well as the 2017 Inuit program participants (25 Nov 2017) to provide a recap of the 2017 monitoring programs, to review and discuss preliminary monitoring results, and to solicit input on program design and program planning for the 2018 Monitoring Programs. Baffinland's monitoring programs strive to actively involve local participation and take into account community concerns as well as discussions with the MEWG, in which Inuit organizations actively participate, monitoring results are reviewed annually by MEWG members, and Inuit are employed by Baffinland to assist with the programs.

- c. Baffinland's ongoing development and refinement of monitoring programs and protocols takes into account input from local communities (e.g., concerns that are communicated through community workshops) as well as discussions with the MEWG, in which Inuit organizations actively participate. For example, the Qikiqtani Inuit Association (QIA) has been a member of MEWG since its inception and the MHTO joined MEWG in 2016.
- d. In 2017, several new monitoring tools (i.e., detecting devices) were incorporated into a new narwhal monitoring program that allowed for adequate monitoring of narwhal through changing seasonal and daylight conditions, as well as during periods when narwhal are not readily visible (because they are underwater). The 2017 Narwhal Tagging Program involved deploying remote sensing tags on the backs of narwhal to effectively track the animal's 3 dimensional movements, vocal behavior and surrounding acoustic environment over an extended time-series as the animals naturally moved through their summer foraging range in the North Baffin Island region. This provided insight into the animal's behavior over a continuous 24-h period, throughout changing environmental conditions and across a broad geographic range. The deployment of satellite-based location/dive tags on individual narwhal allowed for the tracking of narwhal spatial movement (horizontal and vertical) in relation to shipping events. The deployment of Acousonde (passive acoustic recorder) tags on individual narwhals allows for the evaluation of potential changes in narwhal behavior in relation to received levels of shipping noise, in comparison to their movements and behaviour when no shipping is present. Passive acoustic tags allow for a better understanding of what the whale is hearing (received sound levels) in its natural environment, while simultaneously recording information on 3-dimensional movement and vocal behavior of the tagged animal. In addition, information from these tags helps to refine the inherent errors associated with abundance/population estimates when using visual survey techniques (as it allows to correct for surface availability bias, related to the period when animals are unobservable because they are underwater). The 2017 Narwhal Tagging Program is a collaborative study with Fisheries and Oceans Canada.
- e. Baffinland entered into a data-sharing agreement with Fisheries and Oceans Canada (DFO) with respect to photographic aerial survey data collected by DFO during the 2016 open water season in Baffinland's primary study area for the Project. On behalf of Baffinland, Golder undertook an analysis of the aerial photographs collected over two survey days (August 15 and 21, 2016) and generated raw counts and mapping of narwhals and other marine mammals in the survey area. Narwhal abundance and density estimates were generated for both survey days using conventional distance analysis methodology. Detailed methodology for this analysis is presented in Golder (2018c).
- f. No activity took place at Steensby Inlet in 2017.
- g. Shore-based observations of narwhal behaviour took place in 2017, following protocols developed during similar monitoring that was conducted in 2013, 2014, 2015 and 2016. Survey methodology is presented in Golder (2018d)
- h. No ship transits took place during the landfast ice period in 2017. This phase of the Project is currently inactive.

**RESULTS**

- a. Not applicable in 2017.
- b. A total of 12 Inuit participants received program-specific training prior to their participation in the 2017 marine monitoring programs. The total amount of Inuit training hours in 2017 was 245 hours (including classroom and hands-on technical training). A total of 12 Inuit participants were employed for the 2017 monitoring programs. Nine of the 12 staff were employed through the MHTO in Pond Inlet, two were Inuarak Outfitting employees and one was a hire at Milne Port through Baffinland. The total amount of work hours for Inuit staff on the 2017 monitoring programs was 2,265 hours. The work positions filled by Inuit participants in 2017 included: marine mammal observers, polar bear monitors, narwhal tagging personnel, marine field sampling technicians, boat operators and boat assistants.
- c. The Bruce Head shore-based marine mammal monitoring program, which has been conducted each year since 2013, originated from a proposal by the QIA to develop a community-based monitoring protocol and has been operated with a team of up to 6 Inuit marine mammal observers and polar bear monitors each year.
- d. Not applicable in 2017.
- e. Detailed results of Golder's analysis of the 2016 DFO aerial survey data is presented in Golder (2017c). An overview of the results is presented in the tables below.

Narwhal density and abundance estimates for summer 2016 along the Northern Shipping Route are presented in Table 4.25 (for both survey days analyzed), including associated variation and confidence intervals (with availability correction applied). Table 4.26 provides a comparison of the 2016 results to previous surveys conducted in the Project area.

**Table 4.25 Estimates of Narwhal Density and Abundance on Northern Shipping Route (August 2016)**

Species - Season	% Coefficient of Variation	Density Estimate ( $\hat{D}$ )		Abundance Estimate ( $\hat{N}$ )	
		Value (# / km <sup>2</sup> )	95% Confidence Intervals	Value	95% Confidence Intervals
<b>August 15, 2016</b>					
Koluktoo Bay & Milne Inlet South	29.76	22.06	9.94-48.94	6,258	2,820-13,888
Milne Inlet North	54.04	1.187	0.239-5.88	832	168-4,123
Tremblay	8.32	17.99	14.06-23.02	2,820	2,204-3,609
Eclipse Sound East	97.52	7.402	0.0909-60.26	10,141	1,246-82,553
Eclipse Sound West	63.20	0.04213	0.0108-0.1651	42	11-166
<b>Total</b>	<b>56.58</b>	<b>5.962</b>	<b>3.72-26.96</b>	<b>20,093</b>	<b>6,449-104,339</b>
<b>August 21, 2016</b>					
Koluktoo Bay and Milne Inlet South	11.67	13.98	10.45-18.71	3,968	2,965-5,310
Milne Inlet North	49.17	5.334	0.761-37.41	3,739	533-26,220
Tremblay	10.30	30.82	23.45-40.50	4,832	3,677-6,350
Eclipse Sound East	95.18	0.02089	0.00294-0.149	41	6-292
Eclipse Sound West	24.21	0.3751	0.199-0.706	376	200-708
<b>Total</b>	<b>15.93</b>	<b>3.1521</b>	<b>1.76-5.64</b>	<b>12,955</b>	<b>7,245-23,166</b>

**Table 4.26 2016 Narwhal Density Estimates in Project Area Compared to Previous Survey Estimates**

Data Source	Data Collection		Uncorrected Density Estimate (# individuals / km <sup>2</sup> )				
	Year	Date	Koluktoo and Milne Inlet South <sup>1</sup>	Milne Inlet North	Tremblay Sound	Eclipse Sound West	Eclipse Sound East
DFO 2017	2016	August 15	6.94	0.38	5.66	0.013	2.33
DFO 2017	2016	August 21	4.40	1.68	9.69	0.12	0.066
LGL 2015a	2013	August 31	1.29/0	0	4.91	0.00	-
LGL 2015a	2013	September 1	22.82/0	1	4.64	0.01	-
LGL 2015b	2014	August 1-2	0/0	0.02	0	0.26	0.1
LGL 2015b	2014	August 3-4	0/0	0	0	0.34	0.54
LGL 2015b	2014	August 14-15	10.16/5.62	1.66	1.81	2.51	0
LGL 2015b	2014	August 16-17	1.52/0.27	2.27	0.16	0	0.01
LGL 2015b	2014	August 30-31	2.33/0.63	2.8	0.09	0	0
LGL 2015b	2014	September 1-2	21.28/0	11	6.39	0	0
LGL 2016	2015	1 Aug	2.21/1.90	0.6	0.91	0.04	0
LGL 2016	2015	16-17 Aug	0.87/0.20	1.23	2.61	0	0
LGL 2016	2015	31 Aug	4.93/0.89	0.14	18.26	0	0
LGL 2016, Photo graphic survey	2015	August	Not collected	Not available	Not available	Not collected	Not collected
Richard et al. 2010	2002	August	Not available	Not available	Not available	Not available	Not available
Doniol-Valcroze et al. 2015	2013	August	0.56	0.56	0.88	0.56/0.01	0.01

- f. Not applicable in 2017.
- g. Detailed results of the 2017 Bruce Head Shore-based Monitoring Program are presented in Golder (2018d).
- h. Not applicable in 2017.

#### TRENDS

- a. Not applicable in 2017.
- b. Inuit have been involved in monitoring studies at all levels since the inception of the program. The addition of the Pond Inlet HTO as members of the MEWG in 2016 has increased the participation of Inuit in this process.
- c. Inuit participation has increased over the duration of the monitoring program.
- d. Additional detecting devices (passive acoustic monitoring) were used in 2014 and 2015 but not in 2016 or 2017. Acoustic monitoring is being considered as an integrated component of the 2018 Bruce Head Monitoring Program.
- e. Not available at this time.
- f. Not applicable in 2017.



- g. The total numbers of narwhal counted in the area has not been shown to change with consecutive survey years (2014-2017) despite increasing vessel traffic over this period (as 2013 was a preliminary study of shorter duration it was not included in this analysis). Results of the analysis of narwhal relative abundance, distribution and behaviour indicated narwhals responded to ore carrier transits by exhibiting temporary and localized displacement and related changes in behaviour.
- h. Not applicable in 2017.

#### **RECOMMENDATIONS / LESSONS LEARNED**

- a. Not applicable in 2017.
- b. Marine monitoring programs will be reviewed with the MEWG in 2018 in consideration of increasing Inuit involvement if possible.
- c. Marine monitoring programs will be reviewed with the MEWG in 2018, with the intention of increasing responsiveness to Inuit concerns if possible.
- d. Marine monitoring programs will be reviewed in 2018, and discussed with the MEWG, and will consider the use of additional detecting devices.
- e. For the 2016 aerial survey data, Baffinland has implemented updated protocols for data analysis (e.g., use of distance analysis methods) as recommended in the third party review of the 2015 aerial survey.
- f. Not applicable in 2017.
- i. Shore-based monitoring from Bruce Head is an effective method for monitoring of narwhals and shipping. Recommended improvements to the program include comparison of the responses of narwhal to different vessel speeds, and integrating an acoustic monitoring component into the Monitoring Program to study potential vocal behavioral changes to shipping in concert with visual monitoring.
- j. Not applicable in 2017.

## Project Certificate Condition No. 102

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To promote public awareness of Project shipping activities for the general public.
Term or Condition	The Proponent shall ensure that routing of Project vessels is tracked and recorded for both the southern and northern shipping routes, with data made accessible in real time to communities in Nunavut and Nunavik.
Relevant BIM Commitment	30, 36
Reporting Requirement	To be provided in the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Baffinland Corporate Website – Ship Locations
Ref. Document Link	<a href="http://www.baffinland.com/mary-river-mine/location/?lang=en">http://www.baffinland.com/mary-river-mine/location/?lang=en</a>

### METHODS

Baffinland has contracted exactAIS<sup>®</sup>, a global vessel monitoring and tracking service based on AIS (Automatic Identification System) data from polar orbiting satellites to track and report on vessel movements. The vessel tracking information is available on Baffinland’s web site to allow communities to check on vessel coordinates, which direction the vessel is moving, and its destination. In addition, access to a tracking portal was provided to the QIA and Parks Canada in Pond Inlet.

The vessel locations plotted on the map are not “real-time”, but do provide regularly updated snap shot of vessel movement in the North Baffin region.

### RESULTS

Baffinland has made vessel routing accessible to the public.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland has found the use of exactAIS<sup>®</sup> to be beneficial in providing information related to ship routing to the public. Baffinland will continue to use this service.

## Project Certificate Condition No. 103

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor effectiveness of mitigation of shipping impacts to marine wildlife.
Term or Condition	<p>The Proponent shall report annually to the NIRB regarding project-related ship track and sea ice information, including:</p> <ol style="list-style-type: none"> <li>A record of all ship tracks taken along both shipping routes covering the entire shipping season;</li> <li>When employing ice-breaking, an overlay of ship tracks onto ice imagery to determine whether ships are effectively avoiding shore leads and polynyas;</li> <li>A comparison of recorded ship tracks to the expected nominal shipping route, and probable (if any) extent of year-round shipping during periods of ice cover and open-water;</li> <li>An assessment of the level of adherence to the nominal shipping route and the spatial extent of the shipping zone of influence; and</li> <li>When employing ice-breaking, marine bird and mammal species and number of individuals attracted to ship tracks in ice.</li> </ol>
Relevant BIM Commitment	Not applicable
Reporting Requirement	To be provided in the Annual Report to the NIRB
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board
Reference	N/A
Ref. Document Link	N/A

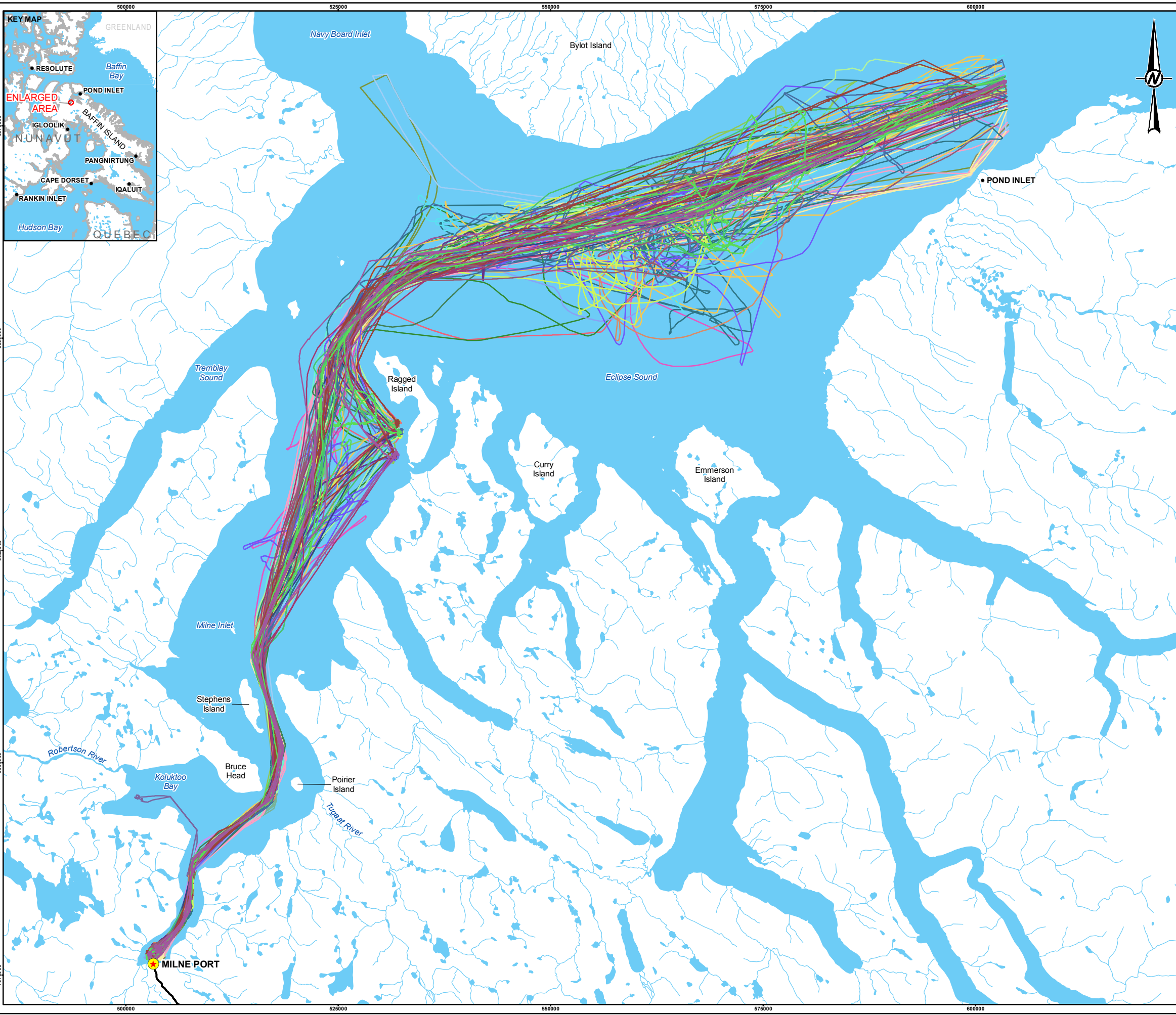
### METHODS

Project-related ship tracks and ship speeds along the Northern Shipping Route were recorded throughout the 2017 shipping season using an automatic ship tracking system (Automated Identification System or AIS), which tracks the movement of each ship using an onboard AIS transceiver with integrated Global Positioning System (GPS). Vessels fitted with AIS transceivers are tracked in the Project area by an AIS base station set up at Bruce Head; and when out of range of the base station, through a number of satellites fitted with AIS receivers. Information provided by AIS equipment includes the vessel's unique identification number, position, course, and speed. Baffinland has contracted exactAIS®, a global vessel monitoring and tracking service based on AIS data from polar orbiting satellites to track and report on vessel movements. The ship tracks are publicly accessible through the Baffinland website during the shipping season.

Shipping is currently restricted to the open water season (July-October), therefore items 'b' and 'e' are not currently applicable.

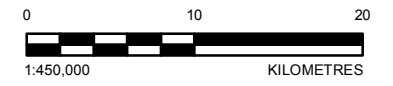
### RESULTS

The 2017 ship tracks are plotted in Figure 4.14. There were no significant deviations from the nominal shipping route in 2017 for ore carriers.



- LEGEND**
- COMMUNITY
  - ★ PROJECT SITE
  - MILNE INLET TOTE ROAD
  - WATERCOURSE
  - WATERBODY
- VESSEL NAME**
- AM BUCHANAN
  - AMAZONEBORG
  - ARKADIA
  - BBC VOLGA
  - CLAUDE A. DESGAGNES
  - DOLFJNGRACHT
  - GOLDEN AMBER
  - GOLDEN DIAMOND
  - GOLDEN ICE
  - GOLDEN OPAL
  - GOLDEN OPPORTUNITY
  - GOLDEN PEARL
  - GOLDEN RUBY
  - GOLDEN SAGUENAY
  - GOLDEN STRENGTH
  - M.V.GOLDEN BRILLIANT
  - M.V.GOLDEN BULL
  - MITIQ
  - NORDIC OASIS
  - NORDIC ODIN
  - NORDIC ODYSSEY
  - NORDIC OLYMPIC
  - NORDIC ORION
  - NORDIC OSHIMA
  - NS ENERGY
  - NS YAKUTIA
  - NUNALIK
  - RIO TAMARA
  - ROSAIRE A. DESGAGNES
  - SAGAR SAMRAT
  - SARAH DESGAGNES
  - SEDNA DESGAGNES

**DRAFT**



**REFERENCE(S)**  
 MILNE PORT INFRASTRUCTURE DATA BY HATCH, JANUARY 25, 2017, RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE MAY 19, 2017. HYDROGRAPHY, POPULATED PLACE, DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.  
 PROJECTION: UTM ZONE 17 DATUM: NAD 83

**CLIENT**  
 BAFFINLAND IRON MINES CORPORATION

**PROJECT**  
 MARY RIVER PROJECT

**TITLE**  
 ALL PROJECT-RELATED VESSEL TRANSITS THROUGH MILNE INLET FOR 2017

CONSULTANT	YYYY-MM-DD	2018-02-16
DESIGNED	PR	
PREPARED	AA	
REVIEWED	####	
APPROVED	####	

**PROJECT NO.** 1663724    **CONTROL** 10000    **REV.** A    **FIGURE** 4.14

PATH: I:\2018\1663724\Maping\10000\_1000\_1000\_Eig\_MilneInlet\_ShippingTraffic\_083724\_10000\_1000\_Eig\_MilneInlet\_ShippingTraffic\_Rev.mxd PRINTED ON: 2018-02-16 AT: 8:22:45 PM

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

**TRENDS**

No significant deviations from the nominal shipping route have occurred in the first three years of iron ore shipping (2015-2017).

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor ship tracks using the shore-based AIS station at Bruce Head and satellite-based ship tracking using the exactAIS<sup>®</sup> service.

## Project Certificate Condition No. 104

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To prevent impacts to marine wildlife from Project shipping activities.
Term or Condition	<p>Subject to safety considerations and the potential for conditions as determined by the crew of transiting vessels, to result in route deviations:</p> <ol style="list-style-type: none"> <li>The Proponent shall require, for shipping to/from Steensby Port, project vessels to maintain a route to the south of Mill Island to prevent disturbance to walrus and walrus habitat on the northern shore of Mill Island. Where project vessels are required to transit to the north of Mill Island owing to environmental or other conditions, an incident report is to be provided to the Marine Environment Working Group and the NIRB within 30 days, noting all wildlife sightings and interactions as recorded by shipboard monitors.</li> <li>The Proponent shall summarize all incidences of significant deviations from the nominal shipping routes for traffic to/from Milne Port and Steensby Port as presented in the FEIS and FEIS Addendum to the NIRB annually, with corresponding discussion regarding justification for deviations and any observed environmental impacts.</li> </ol>
Relevant BIM Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

- Shipping to/from the Steensby Port is not a currently active part of the Project, therefore 104a is not currently applicable.
- No significant deviations from nominal shipping routes to/from Milne Port were made in 2017.

### RESULTS

- Shipping to/from the Steensby Port is not a currently active part of the Project, therefore 104a is not currently applicable.
- The 2017 ship tracks are plotted in Figure 4.14 (see update for Condition No. 103). There were no significant deviations from the nominal shipping route in 2017.

### TRENDS

No significant deviations from the nominal shipping route occurred in the first three years of shipping (2015-2017).

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor ship tracks using the shore-based AIS station at Bruce Head and satellite-based ship tracking using the exactAIS<sup>®</sup> service.

## Project Certificate Condition No. 105

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine wildlife from Project shipping activities.
Term or Condition	<p>The Proponent shall ensure that measures to reduce the potential for interaction with marine mammals, particularly in Hudson Strait and Milne Inlet, are identified and implemented prior to commencement of shipping operations. These measures could include, but are not limited to:</p> <ol style="list-style-type: none"> <li>Changes in the frequency and timing (including periodic suspensions) of shipping during winter months in Hudson Strait and during the open water season in Milne Inlet, i.e., when interactions with marine mammals are likely to be the most problematic</li> <li>Reduced shipping speeds where ship-marine mammal interactions are most likely</li> <li>Identification of alternate shipping routes through Hudson Strait for use when conflicts between the proposed routes and marine mammals could arise. Repeated winter aerial survey results showing marine mammal distribution and densities in Hudson Strait would greatly assist in this task.</li> </ol>
Relevant BIM Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	Partially-Compliant
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	<p>Shipping and Marine Wildlife Management Plan (Baffinland, 2016h)</p> <p>2017 Bruce Head Shore-based Monitoring Program (Golder, 2018d)</p> <p>2017 MEWG Meeting Records</p>
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a> Appendix C1

### METHODS

- No activity took place at Steensby Port in 2017. This phase of the project is currently inactive. In Milne Inlet, interactions between narwhal and ships are monitored by the shore-based marine mammal monitoring program at Bruce Head, as well as through animal-borne remote sensing tags deployed on narwhal as part of the 2017 Narwhal Tagging Program.
- Baffinland's Shipping and Marine Wildlife Management Plan (SMWMP) identifies that "Project vessels will travel at a speed of 7-10 knots when transiting through Eclipse Sound and Milne Inlet" (page 25). Vessel speeds are tracked using AIS.
- Not applicable in 2017.

### RESULTS

- Data collected to date as part of the Bruce Head Monitoring Program does not indicate that changes to shipping frequency or timing (including periodic suspensions) are warranted. Detailed results of the 2017 Bruce Head Monitoring Program are presented in Golder (2018d). Data from the 2017 Narwhal Tagging Program are currently being analyzed. Findings will be presented in a technical report scheduled for distribution to the MEWGH in Q2 2018.

- b. Table 4.27 presents vessel speed information for all Project-related vessels calling at Milne Port in 2017. Ore carriers rarely exceeded 10 knots when transiting in Project area (i.e. along the Northern Shipping Route). The maximum recorded vessel speed for an ore carrier in 2017 was 13.1 knots (Nordic Olympic). Freight / fuel tankers were shown to regularly exceed 10 knots (ranging from 1 to 71% of their transit time). The maximum recorded vessel speed for a freight / fuel tanker in 2017 was 16.1 knots (Sedna Desgagnes). The proportional breakdown of vessel travel speed in the Project area during the 2017 shipping season is presented for all vessels combined (ore carriers vs. cargo/fuel) in Figure 4.15, and by each vessel in Figure 4.16.
- c. Not applicable in 2017.

#### TRENDS

- a. To date, results from five years of narwhal monitoring at Bruce Head as part of the Bruce Head Shore-based Monitoring Program (2014-2017) indicate the following:
  - The relative abundance of narwhal in Milne Inlet (i.e. Bruce Head area) has not changed in consecutive survey years (from pre-shipping in 2014 to present).
  - Effects appear to be limited to localized and temporary displacement, as observed in the vicinity of Bruce Head.
- b. Not applicable.
- c. Not applicable.

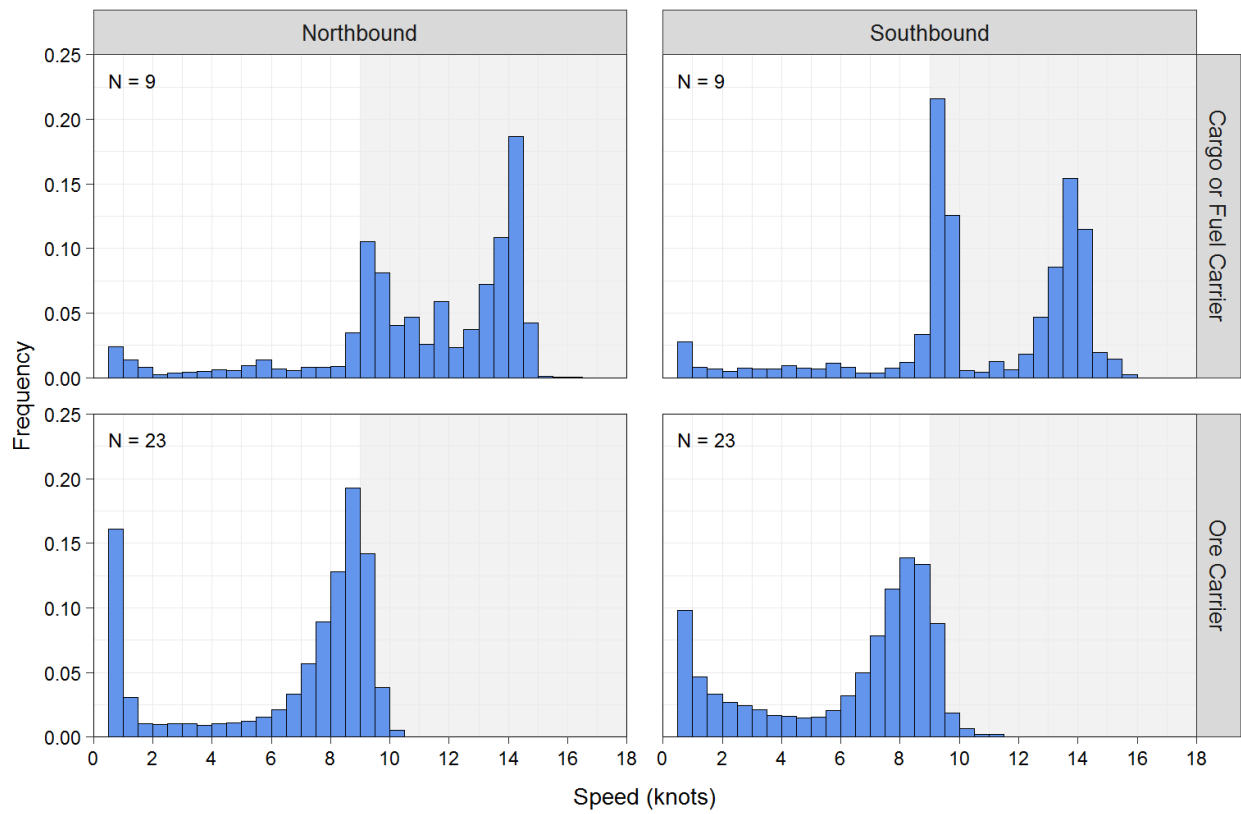
#### RECOMMENDATIONS / LESSONS LEARNED

- a. Modifications to the Bruce Head Shore-based Monitoring Program are under consideration for 2018 that would incorporate studying the response of narwhal to varying ship speeds in Milne Inlet.
- b. In 2018, cargo and fuel vessels will be provided with instruction to approach Milne Inlet with speeds limited to 7-10 knots, similar to the requirements for ore vessels.
- c. None.



**Table 4.27 Project-related Ship Speeds during Transits on Northern Shipping Route - 2017 Shipping Season**

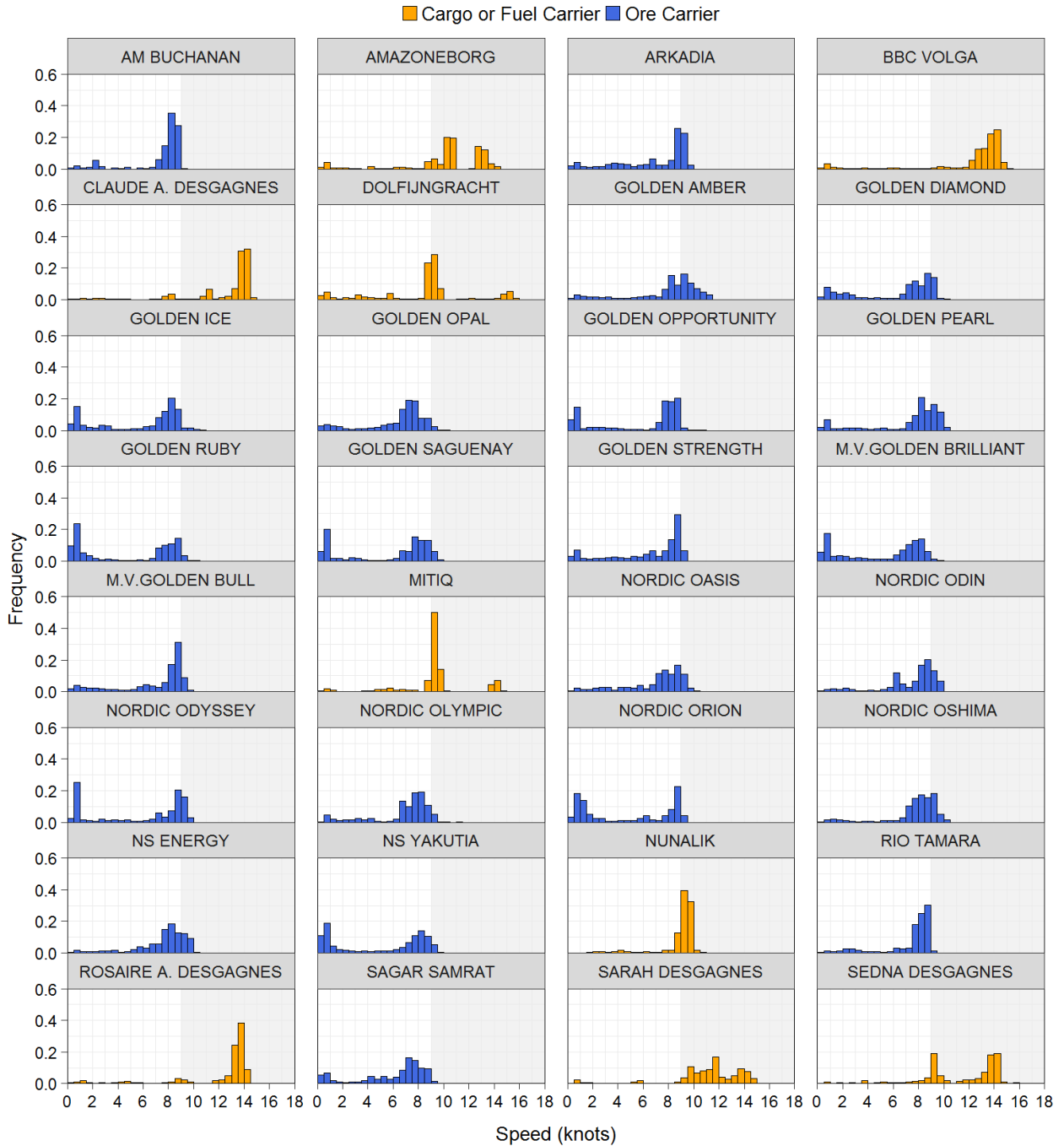
Vessel Name	# of Round Trips	Vessel Type	Max Speed	Median Speed	% of travel > 10 knots
Arkadia	2	Bulk carrier	9.7	7.2	0.0
Golden Amber	2	Bulk carrier	11.7	8	11.3
Golden Diamond	3	Bulk carrier	10.9	6.6	0.4
Golden Ice	3	Bulk carrier	10.7	5.1	0.5
Golden Opal	3	Bulk carrier	10.2	5.9	0.0
Golden Opportunity	2	Bulk carrier	10.6	3.4	0.0
Golden Pearl	2	Bulk carrier	10.5	8	1.4
Golden Ruby	2	Bulk carrier	10.5	1.2	0.2
Golden Saguenay	2	Bulk carrier	11.6	0.9	0.1
Golden Strength	2	Bulk carrier	9.6	6.6	0.0
MV Golden Brilliant	2	Bulk carrier	10.5	2.6	0.1
MV Golden Bull	2	Bulk carrier	10.1	6.1	0.0
Nordic Oasis	3	Bulk carrier	11.3	7.1	0.5
Nordic Odin	3	Bulk carrier	10	7.8	0.0
Nordic Odyssey	2	Bulk carrier	10.1	2.8	0.0
Nordic Olympic	3	Bulk carrier	13.1	7.2	0.6
Nordic Orion	3	Bulk carrier	9.8	2.3	0.0
Nordic Oshima	3	Bulk carrier	10.4	8	1.5
NS Energy	3	Bulk carrier	11.2	7.6	0.6
NS Yakutia	2	Bulk carrier	9.9	0.5	0.0
AM Buchanan	1	Bulk carrier	9.1	8.3	0.0
Rio Tamara	3	Bulk carrier	9.7	8	0.0
Sagar Samrat	3	Bulk carrier	9.8	6.4	0.0
Nunalik	1	Fuel/freight	11	9.1	1.5
BBC Volga	1	Fuel/freight	15.5	0.6	43.6
Claude A. Desgagnes	1	Fuel/freight	15.2	11.5	56.3
Dolfijngracht	1	Fuel/freight	15.6	1.2	7.8
Mitiq	1	Fuel/freight	14.7	9.2	10.4
Rosaire A. Desgagnes	1	Fuel/freight	14.6	13.4	70.7
Sarah Desgagnes	1	Fuel/freight	15.1	0.1	29.0
Amazoneborg	1	Fuel/freight	14.4	10.6	71.5
Sedna Desgagnes	1	Fuel/freight	16.1	12.5	74.1



**NOTES:**

1. All vessel speeds <0.5 knots were excluded from the analysis as it was assumed vessels were moored/anchored at this time.
2. Northbound = outbound; Southbound = inbound.

**Figure 4.15 Proportional Ship Travel Speed for all Project-related Vessels (Ore Carriers vs. Cargo/Fuel) - 2017 Shipping Season**



**NOTES:**

1. All vessel speeds <0.5 knots were excluded from the analysis as it was assumed vessels were moored/anchored at this time.

**Figure 4.16 Proportional Ship Travel Speed by Vessel - 2017 Shipping Season**

## Project Certificate Condition No. 106

Category	Marine Environment - Shipboard Observers
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure that interactions with marine mammals and Project shipping activities are effectively monitored.
Term or Condition	The Proponent shall ensure that shipboard observers are employed during seasons where shipping occurs and provided with the means to effectively carry out assigned duties. The role of shipboard observers in shipping operations should be taken into consideration during the design of any ore carriers purpose-built for the Project, with climate controlled stations and shipboard lighting incorporated to permit visual sightings by shipboard observers during all seasons and conditions. Any shipboard lighting incorporated should be in accordance with the Canada Shipping Act, 2001's Collision Regulations, and should not interfere with safe navigation of the vessel.
Relevant BIM Commitment	N/A
Reporting Requirement	As needed.
Status	Non-Compliant
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Baffinland's Ship-based Observer Program was initiated in 2013 and continued through 2015. The Ship-based Observer Program was conducted during construction activities and shipping in Milne Port. Baffinland has not designed or constructed purpose-built ore carriers, therefore there was reliance on placing ship-based observers aboard market vessels. Fuel tanker and sealift vessel traffic in and out of Milne Port provided the opportunity to conduct ship-based observations focused on the study area between Pond Inlet and Milne Port. Ship-based observers surveyed the shipping route through the Regional Study Area (RSA), embarking at Pond Inlet and disembarking at Milne Port. Marine mammal surveys typically lasted throughout daylight hours with scheduled breaks to avoid observer fatigue.

### RESULTS

No vessel collisions with marine mammals were recorded over the three (3) years of monitoring. Very few sightings of marine mammals were observed over the 3-year period (65 marine mammals in 2013, 12 in 2014 and 16 in 2015). Seabird observations declined over the 3-year period (172 sightings in 2013, 1 in 2014 and 1 in 2015.).

The Ship-based Observer program was put on hold in 2016 due to safety concerns about the on-boarding of the observers.

An alternative program had not been identified to be run during the 2017 shipping season.

## TRENDS

No vessel collisions with marine mammals or bird colonies, or other notable observations were made during the monitoring program. A decline in marine mammal and seabird observations occurred over the three years despite slightly increased observation time in 2014 and 2015 and the observation program was reduced to the regional study area rather than having observers complete the entire journey with the ship.

## RECOMMENDATIONS / LESSONS LEARNED

A number of safety concerns were raised in regard to this program that led to the postponement of the program in 2016. Originally, there were plans to have purpose built ore carriers to accommodate the Inuit observers to conduct regular marine mammal and sea bird watches. In practice, the observation efforts have been conducted only on fuel carriers as they transit to Milne Port as these were the only vessels that have berthing space for the observers. In the previous two seasons actual observation times have been limited to just a few hours per transit and little or no useful data has been collected. The situation is further complicated by the considerable safety risk associated with placing personnel on and, if the need arises extracting personnel from, the vessels as they steam by Pond Inlet.

Based on the lack of useable information collected and considering the need to mitigate personnel safety risk, Baffinland discussed with the Marine Environment Working Group (MEWG) the potential to suspend the program and to seek alternative means of community-based monitoring for interactions of vessels with marine mammals. MEWG representatives acknowledged that the program is not achieving meaningful results despite best efforts on the part of Baffinland to execute the Ship-Based Observer Program. In July 2016, Baffinland notified the MEWG that the Ship-Based Observer Program would be discontinued and that Baffinland would be evaluating alternative approaches for marine mammal monitoring that will provide for the safe, practical collection of useful information to assess marine mammal response to shipping in Milne Inlet including the potential to develop community-based environmental monitoring programs in cooperation with QIA and Pond Inlet.

Discussions with the MEWG in relation to the Ship-Based observer program continued throughout 2017. A shipboard observer program committee was formed in 2017 with the goal to identify feasible alternatives to this program. The committee consists of representatives from Baffinland, the QIA, ECCC and the GN. Alternative programs were not identified to be put in place for the 2017 season although recommendations for increasing shore based and community based observations were put forward by the QIA for consideration in 2018. At the November, 2017 MEWG meeting, alternatives to the program were discussed, including the proposal to increase the number of land-based survey points or the use of 30-cm resolution satellite imagery from Digital Globe (DG), which may allow for true counts of narwhal on a given survey day.

Baffinland will continue to work with the committee and the MEWG throughout 2018 to identify alternatives to meeting the objectives of this condition.

## Project Certificate Condition No. 107

Category	Marine Environment - Shipboard Observers
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To determine the presence of, and ensure that interactions with marine mammals, seabirds and seaducks are effectively monitored for, along the northern and southern shipping routes, as applicable.
Term or Condition	The Proponent shall revise the proposed “surveillance monitoring” to improve the likelihood of detecting strong marine mammal, seabird or seaduck responses occurring too far ahead of the ship to be detectable by observers aboard the ore carriers. A baseline study early in the shipping operations could employ additional surveillance to detect potential changes in distribution patterns and behavior. At an ambitious scope, this might be achieved using unmanned aircraft flown ahead of ships, or over known areas of importance for seabirds or haul-out sites in the case of walruses, in accordance with the requirements of their Special Flight Operations Certificate.
Relevant BIM Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Non-Compliant
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Ship-based surveillance monitoring was conducted in 2013, 2014 and 2015, but was discontinued in 2016. It was found that very few marine mammals were visible to observers on board the vessels, and there were safety concerns about having observers board the vessels at sea, which was accomplished by transferring the observers onto the ship from a smaller vessel based in Pond Inlet.

Unmanned aerial vehicle (UAV) field tests were conducted in 2014 using DJI Phantom 2 rotary-wing UAVs. Environmental conditions such as cold temperatures, high winds and wind gusts limited the ability to fly the UAV ahead of the ship during at-sea transits, and battery life restricted the maximum flight time to 13 minutes. Autonomous flight control failed, possibly due to issues with the magnetic compass, and the onboard GPS data was not logged by the Groundstation flight controller. No marine mammal or seabird sightings were recorded during the flights.

### RESULTS

Not applicable in 2017.

### TRENDS

No marine mammal ship strikes or near misses occurred in the three years of the program.

**RECOMMENDATIONS / LESSONS LEARNED**

The ship-based surveillance monitoring program was discontinued after three (3) years because neither observers nor UAV technology were demonstrated to be effective in detecting marine mammal, seabird or seaducks ahead of the ship, and there were safety issues for transfer of observers to the ship. Baffinland is continuing discussions with the Marine Environment Working Group (MEWG) to identify alternative programs to meet the intent of this condition.

## Project Certificate Condition No. 108

Category	Marine Environment - Shipboard Observers
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To ensure that interactions with marine mammals, seabirds, and seabirds are effectively monitored for along the southern and northern shipping routes, as applicable.
Term or Condition	The Proponent shall ensure that data produced by the surveillance monitoring program is analysed rigorously by experienced analysts (in addition to being discussed as proposed in the FEIS) to maximize their effectiveness in providing baseline information, and for detecting potential effects of the project on marine mammals, seabirds and seabirds in the Regional Study Area. It is expected that data from the long-term monitoring program be treated with the same rigor.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Non-Compliant
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Ship-based surveillance monitoring was conducted in 2013, 2014 and 2015, but was discontinued in 2016. It was found that very few marine mammals were visible to observers on board the vessels, and there were safety concerns about having observers board the vessels at sea, which was accomplished by transferring the observers onto the ship from a smaller vessel based in Pond Inlet.

### RESULTS

Not applicable.

### TRENDS

No marine mammal ship strikes or near misses occurred in the three (3) years of the program.

### RECOMMENDATIONS / LESSONS LEARNED

The ship-based surveillance monitoring program was discontinued after three years because neither observers nor UAV technology were demonstrated to be effective in detecting marine mammal, seabird or seabirds ahead of the ship, and there were safety issues for transfer of observers to the ship. Baffinland is continuing discussions with the MEWG to identify alternative programs to meet the intent of this condition.



## Project Certificate Condition No. 109

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	The Proponent shall conduct a monitoring program to confirm the predictions in the FEIS with respect to disturbance effects from ships noise on the distribution and occurrence of marine mammals. The survey shall be designed to address effects during the shipping seasons, and include locations in Hudson Strait and Foxe Basin, Milne Inlet, Eclipse Sound and Pond Inlet. The survey shall continue over a sufficiently lengthy period to determine the extent to which habituation occurs for narwhal, beluga, bowhead and walrus.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2017 Bruce Head Shore-based Monitoring Program (Golder, 2018d) 2017 MEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a> Appendix C1

### METHODS

Response of marine mammals to disturbance by ships noise has been studied over a 4-year consecutive period (2014-2017) in Milne Inlet as part of the Bruce Shore-based Head Monitoring Program (Golder, 2018d). The objective of this program is to characterize potential changes in narwhal behaviour related to Project ship traffic and other vessels. This includes looking at changes in relative abundance and distribution, direction of movement (toward or away from the vessel), swim speed, group formation and other narwhal behaviours in the presence and absence of vessels. This study is focused in Milne Inlet due to higher concentrations of marine mammals in this area during the shipping season, compared to Eclipse Sound and Pond Inlet. No studies were conducted in Hudson Strait or Foxe Basin, as this phase of the Project is currently inactive.

In 2017, a new narwhal monitoring program was introduced, which allowed for monitoring of narwhal at a wider spatial and temporal scale (at the individual level) throughout changing seasonal and daylight condition, as well as during periods when this species was not readily visible because they are underwater. The 2017 Narwhal Tagging Program involved deploying remote sensing tags on the backs of narwhal to effectively track the animal's 3-dimensional movements, vocal behavior and surrounding acoustic environment over an extended time-series as the animals naturally moved through their summer foraging range in the North Baffin Island region. This provided insight into the animal's behavior over a continuous 24-h period, throughout changing environmental conditions, and across a broad geographic range and longer study period. The deployment of satellite-based location/dive tags on individual narwhal allowed for the tracking of narwhal spatial movement (horizontal and vertical) in relation to shipping events and during periods of no shipping. The deployment of Acousonde (passive acoustic recorder) tags on individual narwhals allows for the evaluation of potential changes in narwhal behavior in relation to received levels of shipping noise, in comparison to their movements and behaviour when no shipping is present. Passive acoustic tags allow for a better understanding of what the whale is hearing (received sound levels) in its natural environment, while

simultaneously recording information on 3-dimensional movement and vocal behavior of the tagged animal. In addition, information from these tags helps to refine the inherent errors associated with abundance/population estimates when using visual survey techniques (as it allows to correct for surface availability bias, related to the period when animals are unobservable because they are underwater). The 2017 Narwhal Tagging Program is a collaborative study with Fisheries and Oceans Canada.

## **RESULTS**

Results from the 2017 Bruce Head Monitoring Program suggest that the effect of shipping on narwhal may be localized and temporary/short-term. Some evidence of displacement of narwhal was observed, but the total number of narwhals observed in the area did not change significantly in 2014, 2015, 2016 and 2017 despite increased shipping activity.

Data from the 2017 Narwhal Tagging Program are currently being analyzed. Findings will be presented in a technical report scheduled for delivery in Q2 2018.

## **TRENDS**

No significant change in number of narwhals using Milne Inlet, but some changes in narwhal distribution and group formation during ship passages which appear at this time to be localized and temporary.

## **RECOMMENDATIONS / LESSONS LEARNED**

The Bruce Head Shore-based Monitoring Program has proven to be a successful program option available for assessing behaviour of narwhal in close proximity to shipping. Enhancements to this multi-year program have been identified, one of which would involve integrating passive acoustic monitoring with visual monitoring to investigate potential changes in narwhal vocal behavior related to shipping. Note that the shore-based study does not provide information on larger-scale movements of whales.

Additional monitoring programs are currently being discussed with the MEWG with the objective of updating the 2018 monitoring strategy to incorporate improvements to existing programs and the addition of new programs that may be able to improve the understanding of narwhal response to vessel traffic.

## Project Certificate Condition No. 110

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	The Proponent shall immediately develop a monitoring protocol that includes, but is not limited to, acoustical monitoring, to facilitate assessment of the potential short term, long term, and cumulative effects of vessel noise on marine mammals and marine mammal populations. The Proponent is expected to work with the Marine Environment Working Group to determine appropriate early warning indicator(s) that will ensure rapid identification of negative impacts along the southern and northern shipping routes.
Relevant BIM Commitment	84
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partial-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

In 2014 and 2015, passive underwater acoustic monitoring was conducted at two monitoring sites in Milne Inlet adjacent to Bruce Head and at the mouth of Koluktoo Bay Kim and Conrad (2015; 2016). Ambient noise and received ship noise levels were quantified at both sites, and marine mammal presence was characterized through acoustic detection of marine mammal calls recorded during the deployment period. Detailed methodology is presented in Kim and Conrad (2015; 2016).

Passive acoustic monitoring was conducted in 2017 as part of the 2017 Narwhal Tagging Program. A total of 9 animals were fitted with Acousonde™ passive acoustic monitoring tags during the 2017 open water season to evaluate potential changes in narwhal behavior in relation to received levels of shipping noise, in comparison to narwhal movements and behavior when no shipping was present. Passive acoustic tags allow for a better understanding of what a tagged narwhal is hearing (received sound levels) in its natural environment, while simultaneously recording information on the 3-dimensional movements and vocal behavior the tagged animals. This provides an opportunity to evaluate changes in animal behavior related specially to noise events such as a passing ship or vessel, and may help refine behavioral disturbance thresholds for narwhal as this relates to ship noise.

No early warning indicators of negative impacts of vessel noise have been developed.

### RESULTS

Ambient noise and received ship noise levels were quantified at both sites, and marine mammal presence was characterized through acoustic detection of marine mammal calls recorded during the deployment period. Results are presented in Kim and Conrad (2015; 2016). The relationship between narwhal vocal behavior and shipping activities (ship transit events) was not investigated statistically, nor were potential changes in narwhal vocal behavior analyzed in conjunction with sightings data collected during the 2014 and 2015 Bruce Head Shore-based Monitoring Program (e.g. data on narwhal relative abundance, distribution, group composition and group behavior).

Passive acoustic data from the Acousonde deployments during the 2017 Narwhal Tagging Program are currently being analyzed. Findings will be presented in a technical report once these analyses are complete.

#### **TRENDS**

Similar noise levels were measured in the two years of the study.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Additional study is required to determine at what received sound levels narwhal elicit significant adverse changes in their behavior (movement or vocal). No early warning indicators of negative impacts of vessel noise have been developed. Baffinland and its environmental consultant are holding discussions with the MEWG to determine the best approach to meet this condition.

Baffinland is presently investigation options to conduct a joint acoustic/visual monitoring program (vessel-based pilot study) near Bruce Head to further evaluate the response of narwhal to shipping, with respect to both vocal and movement behavior. As part of this study, animal response to different vessel speeds would be evaluated, to assist in determining whether speed restrictions are an effective adaptive management tool for potential application in higher density narwhal areas.

Baffinland is planning to deploy additional Acousonde passive acoustic tags on narwhal during the 2018 open water season to further evaluate changes in animal behavior related specially to noise events such as a passing ship or vessel, which can assist in the refinement of behavioral disturbance thresholds for narwhal as this relates to ship noise. The majority of the acoustic tags deployed in 2017 using suction cup attachments released from the animals before they entered the shipping corridor area, resulting in few narwhal / ship interactions captured during the active tag deployments. Baffinland and its consultant are currently refining tag programming and deployment methodology to increase tag retention time such to increase the probability of capturing more narwhal /ship interactions during the Acousonde deployment period.

In 2018, Baffinland will, in consultation with the MEWG, consider what elements could be incorporated into the monitoring programs to provide an early warning indicator for rapid detection of adverse impacts on marine mammal such as reduced population growth.

## Project Certificate Condition No. 111

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	<p>The Proponent shall develop clear thresholds for determining if negative impacts as a result of vessel noise are occurring. Mitigation and adaptive management practices shall be developed to restrict negative impacts as a result of vessel noise. This shall include, but not be limited to:</p> <ol style="list-style-type: none"> <li>Identifications of zones where cumulative noise could be mitigated due to biophysical features (e.g., water depth, distance from migration routes, distance from overwintering areas etc.)</li> <li>Vessel transit planning, for all seasons, to determine the degree to which cumulative sound impacts can be mitigated through the seasonal use of different zones</li> </ol>
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Non-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Not completed.

Passive acoustic monitoring was conducted in 2017 by Golder on behalf of Baffinland as part of the 2017 Narwhal Tagging Program. A total of 9 animals were fitted with Acousonde™ passive acoustic monitoring tags during the 2017 open water season to evaluate potential changes in narwhal behavior in relation to received levels of shipping noise, in comparison to narwhal movements and behavior when no shipping was present. Passive acoustic tags allow for a better understanding of what a tagged narwhal is hearing (received sound levels) in its natural environment, while simultaneously recording information on the 3-dimensional movements and vocal behavior the tagged animals. This provides an opportunity to evaluate changes in animal behavior related specially to noise events such as a passing ship or vessel, and may help refine behavioral disturbance thresholds for narwhal as this relates to ship noise.

### RESULTS

Passive acoustic data from the Acousonde deployments during the 2017 Narwhal Tagging Program are currently being analyzed. Findings will be presented in a technical report once these analyses are complete.

### TRENDS

Not available.

## RECOMMENDATIONS / LESSONS LEARNED

Additional study is required to determine at what received sound levels narwhal elicit significant adverse changes in their behavior (movement or vocal). No thresholds have yet been developed for determining if negative impacts as a result of vessel noise are occurring. Baffinland and its environmental consultant are holding discussions with the Marine Environment Working Group (MEWG) to determine the best approach to meet this condition.

Baffinland is presently investigating options to conduct a joint acoustic/visual monitoring program (vessel-based pilot study) near Bruce Head to further evaluate the response of narwhal to shipping, with respect to both vocal and movement behavior. As part of this study, animal response to different vessel speeds would be evaluated, to assist in determining whether speed restrictions are an effective adaptive management tool for potential application in higher density narwhal areas.

Baffinland is planning to deploy additional Acousonde passive acoustic tags on narwhal during the 2018 open water season to further evaluate changes in animal behavior related specially to noise events such as a passing ship or vessel, which can assist in the refinement of behavioral disturbance thresholds for narwhal as this relates to ship noise. The majority of the acoustic tags deployed in 2017 using suction cup attachments released from the animals before they entered the shipping corridor area, resulting in few narwhal / ship interactions captured during the active tag deployments. Baffinland and its consultant are currently refining tag programming and deployment methodology to increase tag retention time such to increase the probability of capturing more narwhal /ship interactions during the Acousonde deployment period.

In preparation for the Phase 2 Expansion Project Proposal, Baffinland has retained a consultant to conduct underwater noise modelling and undertake an assessment of Project-generated underwater noise on marine mammals in Milne Port and along the northern shipping route with consideration of both incremental and cumulative noise effects for proposed Phase 2 operations. These study components will employ the most current acoustic threshold criteria for marine mammal injury and disturbance (NOAA 2016), which incorporate marine mammal auditory weighting functions into the derivation of the acoustic thresholds. These acoustic thresholds, which apply dual metrics of cumulative sound exposure level (SELcum) and peak sound level (PK) for impulsive sounds (e.g. pile driving noise) and SELcum for non-impulsive sounds (such as shipping noise), reflect the current state of scientific knowledge regarding the characteristics of sound that have the potential to impact marine mammal hearing sensitivity.

## Project Certificate Condition No. 112

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	<p>Prior to commercial shipping of iron ore, the Proponent, in conjunction with the Marine Environment Working Group, shall develop a monitoring protocol that includes, but is not limited to, acoustical monitoring that provides an assessment of the negative effects (short and long term cumulative) of vessel noise on marine mammals. Monitoring protocols will need to carefully consider the early warning indicator(s) that will be best examined to ensure rapid identification of negative impacts. Thresholds shall be developed to determine if negative impacts as a result of vessel noise are occurring. Mitigation and adaptive management practices shall be developed to restrict negative impacts as a result of vessel noise. This shall include, but not be limited to:</p> <ol style="list-style-type: none"> <li>Identification of zones where noise could be mitigated due to biophysical features (e.g., water depth, distance from migration routes, distance from overwintering areas etc.)</li> <li>Vessel transit planning, for all seasons</li> <li>A monitoring and mitigation plan is to be developed, and approved by Fisheries and Oceans Canada prior to the commencement of blasting in marine areas</li> </ol>
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	Partial-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

A passive acoustic monitoring program was conducted by Greeneridge on behalf of Baffinland at study sites adjacent to Bruce Head and the mouth of Koluktoo Bay during ice-free periods in 2014 and 2015 (Early Revenue Phase of the Project). As part of this program, the local soundscape along this segment of the northern shipping route was characterized in terms of ambient noise levels, shipping sounds, and marine mammal calls. Detailed methodology for the 2014 and 2015 acoustic monitoring programs are presented in Kim and Conrad (2015; 2016).

Passive acoustic monitoring was conducted in 2017 as part of the 2017 Narwhal Tagging Program. A total of 9 animals were fitted with Acousonde™ passive acoustic monitoring tags during the 2017 open water season to evaluate potential changes in narwhal behavior in relation to received levels of shipping noise, in comparison to narwhal movements and behavior when no shipping was present. Passive acoustic tags allow for a better understanding of what a tagged narwhal is hearing (received sound levels) in its natural environment, while simultaneously recording information on the 3-dimensional movements and vocal behavior the tagged animals. This provides an opportunity to evaluate changes in animal behavior related specially to noise events such as a passing ship or vessel, and may help refine behavioral disturbance thresholds for narwhal as this relates to ship noise.

No early warning indicators of negative impacts of vessel noise have been developed.

## RESULTS

Ambient noise and received ship noise levels were quantified at both sites, and marine mammal presence was characterized through acoustic detection of marine mammal calls recorded during the deployment period. Results are presented in Kim and Conrad (2015; 2016). The relationship between narwhal vocal behavior and shipping activities (ship transit events) was not investigated statistically by Greenridge (2015; 2016), nor were potential changes in narwhal vocal behavior analyzed in conjunction with sightings data collected during the 2014 and 2015 Bruce Head Shore-based Monitoring Program (e.g. data on narwhal relative abundance, distribution, group composition and group behavior).

Passive acoustic data from the Acousonde deployments during the 2017 Narwhal Tagging Program are currently being analyzed. Findings will be presented in a technical report once these analyses are complete.

## TRENDS

Not available.

## RECOMMENDATIONS / LESSONS LEARNED

Additional study is required to determine at what received sound levels narwhal elicit significant adverse changes in their behavior (movement or vocal). No thresholds have yet been developed for determining if negative impacts as a result of vessel noise are occurring. Baffinland and its environmental consultant are holding discussions with the Marine Environment Working Group (MEWG) to determine the best approach to meet this condition.

Baffinland is presently investigating options to conduct a joint acoustic/visual monitoring program (vessel-based pilot study) near Bruce Head to further evaluate the response of narwhal to shipping, with respect to both vocal and movement behavior. As part of this study, animal response to different vessel speeds would be evaluated, to assist in determining whether speed restrictions are an effective adaptive management tool for potential application in higher density narwhal areas.

Baffinland is planning to deploy additional Acousonde passive acoustic tags on narwhal during the 2018 open water season to further evaluate changes in animal behavior related specially to noise events such as a passing ship or vessel, which can assist in the refinement of behavioral disturbance thresholds for narwhal as this relates to ship noise. The majority of the acoustic tags deployed in 2017 using suction cup attachments released from the animals before they entered the shipping corridor area, resulting in few narwhal / ship interactions captured during the active tag deployments. Baffinland and its consultant are currently refining tag programming and deployment methodology to increase tag retention time such to increase the probability of capturing more narwhal /ship interactions during the Acousonde deployment period.

In 2018, Baffinland will, in consultation with the MEWG, consider what elements could be incorporated into the monitoring programs to provide an early warning indicator for rapid detection of adverse impacts on marine mammal such as reduced population growth.

No blasting activities are planned in the marine environment (or near-shore environment) in 2018.



In preparation for the Phase 2 Proposal, Baffinland has retained a consultant to conduct underwater noise modelling and undertake an assessment of Project-generated underwater noise on marine mammals in the study area with consideration of both incremental and cumulative noise effects for Phase 2 operations. These study components will employ the most current acoustic threshold criteria for marine mammal injury and disturbance (NOAA 2016), which incorporate marine mammal auditory weighting functions into the derivation of the acoustic thresholds. These acoustic thresholds, which apply dual metrics of cumulative sound exposure level (SELcum) and peak sound level (PK) for impulsive sounds (e.g. pile driving noise) and SELcum for non-impulsive sounds (such as shipping noise), reflect the current state of scientific knowledge regarding the characteristics of sound that have the potential to impact marine mammal hearing sensitivity.

## Project Certificate Condition No. 113

Category	Marine Environment - Arctic Char
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine fish in Steensby Inlet and Milne Inlet
Term or Condition	The Proponent shall conduct monitoring of marine fish and fish habitat, which includes but is not limited to, monitoring for Arctic Char stock size and health condition in Steensby Inlet and Milne Inlet, as recommended by the Marine Environment Working Group
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2017 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2018a)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a> Appendix C1

### METHODS

The fish community in the Milne Port area was monitored in 2010 and annually from 2013 to 2017. The fish study portion of the Marine Environmental Effects Monitoring Program (MEEMP) program was conducted to provide a general characterization of the fish community, including Arctic char, and was initially developed based on traditional fishing areas (i.e., IQ) and sites adjacent to the Milne Port facility. Fishing data from the field program were analyzed to include:

- Relative abundance and distribution of species;
- Catch per unit of effort (CPUE);
- Length/weight distribution of each fish species; and
- Age distribution, body burden, and diet of incidental fish mortalities.

In 2017, fishing efforts were expanded from gill net and Fukui trap collection strategies to include angling and minnow traps. Angling, including jigging and trolling, were used to sample bottom and demersal fish. Jigging occurred from the field vessel at a stationary position where two rods and lines were suspended over the side of the vessel. Baited hooks were allowed to hit the bottom of the seabed then were flicked upwards to attract bottom fish. Trolling occurred along a pre-determined depth contour where the lines with spoons (flashers) were cast over the side of the vessel and were allowed to trail behind the vessel at a known depth to attract pelagic fish.

Monofilament gill nets were used to sample shallow subtidal areas for characterization of pelagic fish communities present in the Milne Port area. Gill nets consisted of six panels with each panel measuring 15.2 metres (m) in length and 2.4 m in width (mesh sizes consisting of 2.5 centimetres (cm), 3.8 cm, 5.1 cm, 6.4 cm, 7.6 cm and 10.2 cm). The gill net was suspended just below the water surface from the shoreline to offshore, perpendicular to the shoreline at 14 stations. At two stations, weights were attached to the gill net and positioned along the bottom. Gill nets were set for a maximum of two hours prior to being lifted and checked for fish presence. The net was then reset in the same location and rechecked and pulled at the end of each day.

Fukui traps were baited and set to sample bottom and demersal fish and were left in place for one to two days at 17 stations. The traps measured 61 cm x 46 cm x 20 cm, with 1.25 cm stretch mesh and were baited with sardines and bait scent. Five traps were set at each location along a line to increase probability of fish capture. Once retrieved, bait containers were checked and refilled prior to redeployment.

Minnow traps were set on the riprap, off the ore dock at Milne Port to sample reef dwelling bottom fish. Minnow traps were deployed at five stations. At each station, two minnow traps were deployed with bait containers consisting of sardines and bait scent. The traps were left in place for approximately three days, after which time they were retrieved and sampled. All fish collected were transferred to aerated buckets with station water prior to processing. Fish were identified to species, measured for length and weight and returned to aerated buckets to allow for recovery prior to release to the approximate area of capture.

A mark-recapture study previously conducted by SEM in 2016 noted that the existing resident sculpin population was too small to support the level of lethal sampling required for tissue analysis. Thus, only incidental fish mortalities were retained for aging, body burden analysis, and stomach content analysis.

The stomach assessment was conducted prior to dissection. The percent fullness and percent digestion of each stomach was recorded. Stomach fullness was estimated by considering two factors: the degree of distention of the stomach, and the weight of the bolus relative to the size of the fish. The bolus was dissected, working anterior-posterior, and its identifiable components weighed. Prey items were identified to the lowest practicable taxonomic level.

Whole fish were examined for lesions or tumors. Tissue was removed from the dorsal musculature with a knife, rinsed and wrapped in new food-grade aluminum foil and placed in clean labeled bags and sent to Maxxam laboratories for analysis. Maxxam analyzed the wet weight tissue samples by atomic spectroscopy.

The sagittal otoliths were removed from each fish head, cleaned and placed in labelled vials. Whole otoliths were placed in glass petri dish with distilled water and examined over a black background using a dissecting scope (10-40x magnification). Incomplete or weak bands were considered malformed or damaged and were not processed. Detailed sampling methodology and analytical procedures for the MEEMP fish sampling program are presented in Golder (2018b).

In addition to the MEEMP Program, environmental effects monitoring (EEM) was conducted for Arctic Char in their freshwater environment - initially implemented in August of 2017. The program focused on the evaluation of effects at effluent-exposed areas of two watercourses, Mary River Tributary-F and Mary River. The Mary River Project Phase 1 EEM fish population survey employed a non-lethal sampling approach targeting Arctic Char at representative effluent-exposed and reference study areas (Minnow 2016).

## RESULTS

Detailed results for the 2017 MEEMP fish sampling program are presented in Golder (2018b). Overall, fish surveys in 2017 were successful, with approximately 1,049 hours of fishing effort and a total of 118 fish captured comprising five species.

Shorthorn sculpin (*Myoxocephalus Scorpius*) was the most abundant fish species caught during the angling survey followed by Arctic sculpin (*Myoxocephalus scorpioides*) and fourhorn sculpin (*Myoxocephalus quadricorni*). All of the species caught during the angling survey have been captured during the previous monitoring surveys in the Milne Port area. The relative abundance, as indicated by catch-per-unit-effort (CPUE), was highest for shorthorn sculpin, the most abundant fish species captured, with 2.4 fish/h ( $\pm 4.8$  SD), followed by Arctic sculpin with 1.20 fish/h ( $\pm 2.7$  SD).

Fourhorn sculpin (n=5) was the most abundance fish species caught during the Fukui trap survey followed by sand lance (*Ammodytes* spp.) and shorthorn sculpin (n=1). Sand lance were not captured during any of the previous Baffinland monitoring surveys in the Milne Port area. This fish was an incidental mortality and was sent to a laboratory for identification to species; however, given the similarity of meristic characteristics (i.e., number of fin, anal and dorsal rays) between multiple sand lance species, this specimen could not be positively identified. In addition to the adult specimen captured, larval sand lance were also collected in the zooplankton samples in the Milne Port area indicating successful spawning is likely occurring in Milne Inlet.

Arctic char (*Salvelinus alpinus*; n=23) was the most abundance fish species caught during the gill net survey followed by fourhorn sculpin (n=12) and shorthorn sculpin (n=2). All of the species caught during the gill net survey have been captured during the previous monitoring surveys in the Milne Port area. The highest CPUE was for Arctic char, the most abundant fish species captured, with 0.37 fish/h ( $\pm 0.70$  SD), followed by fourhorn sculpin with 0.19 fish/h ( $\pm 0.44$  SD) and shorthorn sculpin with 0.04 fish/h ( $\pm 0.14$  SD).

Minnow traps were not an effective method for fish capture during the survey with no fish catch reported.

Overall, fourhorn sculpin and Arctic char were the dominant species captured with a relative abundance of 36% and 29% of the total catch, respectively. In addition to these species, shorthorn sculpin, Arctic sculpin and sand lance were also captured during the fish survey with relative abundance of 26%, 8% and 1% of the total catch.

Two incidental Arctic char mortalities were retained for aging, body burden analysis, and stomach content analysis. The larger Arctic char measured 630 mm in length and 2,950 g in weight and was estimated to be 11 years old based on the number of annuli (growth rings). Stomach contents included an unidentified species of mysid shrimp (Mysidae Family) one unidentified species of larval fish, and one larval cod species (Gadidae).

The smaller Arctic char, measured 266 mm in length and 175 g in weight, and was aged to be 5 years old based on the number of annuli (growth rings). The dominant stomach content taxon was planktonic amphipods (Hyperiididae). Two fish species were identified in the stomach contents, one unidentified and one belonging to the Cottidae (sculpin) family.

Tissue samples were analyzed to detect changes in fish body burden. Metals in Arctic char tissue samples were primarily below detectable limits, except for arsenic, cadmium, copper, iron, magnesium, manganese, mercury, and zinc, whose concentrations exceeded detection limits during at least one sampling event. The samples did not exceed Health Canada's guideline for mercury in fish tissue for human consumption of 0.5 mg/kg.

Results of the 2017 Mary River Project Phase 1 EEM Arctic char fish population survey are noted in Project Certificate Condition No. 48a response.

## TRENDS

Fish surveys in the Milne Port area have been conducted in 2010 and annually from 2013 to 2017. During this time, 13 species have been identified in the Milne Port area with a total catch of 584 individuals. Overall, composition of catch was 46% Arctic char, 51% sculpin species and 3% other fish species. General fish species catch has been consistent from year to year with additional fish species added to the species list each year as collection efforts are reassessed and collection methods are better adapted to the field conditions.

Body burden of metals in fish tissue were consistent in 2010 and from 2013 to 2017. The samples did not exceed Health Canada's guideline for mercury in fish tissue for human consumption of 0.5 mg/kg.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Body burden analysis is recommended to continue should there be incidental fish mortalities. Sculpin, Arctic char and other large bodied fish species are recommended to be submitted for body burden analysis. The MEWG has also recommended that sampling for fish tissue analysis be continued in future monitoring programs (Appendix C1).

In 2018, it is recommended that unidentified fish and larval fish captured during zooplankton hauls be sent for DNA barcoding for positive identification.

In 2018, Baffinland will continue monitoring to provide a general characterization of the fish community, including Arctic char, in the Milne Port area. Fish community monitoring results will include:

- Relative abundance and distribution of species;
- Catch per unit of effort (CPUE);
- Length/weight distribution of each fish species; and
- Age distribution, body burden and diet of incidental fish mortalities.

## Project Certificate Condition No. 114

Category	Marine Environment - Arctic Char
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine fish in Steensby Inlet and Milne Inlet.
Term or Condition	In the event of the development of a commercial fishery in the Steensby Inlet area or Milne Inlet-Eclipse Sound areas, the Proponent, in conjunction with the Marine Environment Working Group, shall update its monitoring program for marine fish and fish habitat to ensure that the ability to identify Arctic Char stock(s) potentially affected by Project activities and monitor for changes in stock size and structure of affected stocks and fish health (condition, taste) is maintained to address any additional monitoring issues identified by the MEWG relating to the commercial fishery.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	N/A
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

No commercial fishery was developed in the vicinity of Milne Port or Steensby Port during 2017.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will adapt the monitoring programs to meet this requirement in the future in the event of development of commercial fishery.

## Project Certificate Condition No. 115

Category	Marine Environment - Arctic Char
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine fish in Steensby Inlet and Milne Inlet.
Term or Condition	The Proponent is encouraged to continue to explore off-setting options in both the freshwater and marine environment to offset the serious harm to fish which will result from the construction and infrastructure associated with the Project.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada (DFO), Marine Environment Working Group (MEWG)
Reference	2017 Milne Ore Dock Fish Offset Monitoring Report (Golder, 2017b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland was issued a Fisheries Authorization from the DFO in 2014 to allow for construction of the current ore dock. A fish habitat off-setting plan was included with Baffinland's application for an authorization under the *Fisheries Act*. This includes fish habitat enhancement measures constructed around the ore dock.

### RESULTS

The ore dock was constructed in 2014, and the offsetting plan was implemented. The 2017 Milne Ore Dock Fish Offset Monitoring Report was submitted to DFO on December 31, 2017. The annual report demonstrates that the off-setting plan has been supporting biological activity at all trophic levels as expected.

### TRENDS

The off-setting plan has been effective in supporting biological activity.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor the success of fish habitat off-setting measures and will provide the results of the annual monitoring program to DFO, the MEWG and other interested stakeholders, as requested.

## Project Certificate Condition No. 116

Category	Marine Environment - Blasting
Responsible Parties	The Proponent, Fisheries and Oceans Canada
Project Phase(s)	Construction
Objective	To prevent impacts to marine fish and fish habitat from explosives.
Term or Condition	Prior to construction, the Proponent shall develop mitigation measures to minimize the effects of blasting on marine fish and fish habitat, marine water quality and wildlife that includes, but is not limited to compliance with the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) as modified by Fisheries and Oceans Canada for use in the North and as revised from time to time.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Blasting in the marine environment has not occurred on site to date. In the event it is required, Baffinland will provide operational control procedures in consultation with the MEWG that prescribe the requirements for the use of explosives in or near marine water bodies to ensure the activity is carried-out in accordance with Fisheries and Oceans Canada guidance and best practice.

### RESULTS

Blasting in the marine environment has not occurred on site to date.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 117

Category	Marine Environment - Blasting
Responsible Parties	The Proponent, Fisheries and Oceans Canada
Project Phase(s)	Construction
Objective	To prevent impacts to marine fish and fish habitat from explosives.
Term or Condition	The Proponent shall ensure that blasting in, and near, marine water shall only occur during periods of open water. Blasting in, and near, fish-bearing freshwaters shall, to the greatest degree possible, only occur in open water. If blasting is required during ice-covered periods, it must meet requirements established by Fisheries and Oceans Canada.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Fisheries and Oceans Canada (DFO), Marine Environment Working Group (MEWG)
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2016f) Quarry Blasting Operations Management Plan (Baffinland, 2013b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Blasting in the marine environment has not occurred on site to date. In the event it is required, Baffinland will provide operational control procedures in consultation with the MEWG that prescribe the requirements for the use of explosives in or near marine water bodies to ensure the activity is carried-out in accordance with Fisheries and Oceans Canada (DFO) guidance and best practice, including the requirement that blasting in, and near, marine water shall only occur during periods of open water.

For freshwaters, Baffinland's Surface Water and Aquatic Ecosystem Management Plan SWAEMP and Quarry Blasting Operations Management Plan have been developed to include the requirements for the use of explosives (blasting) in or near freshwater bodies. The requirements were developed in accordance with Fisheries and Oceans Canada (DFO) guidance, including the *Guidelines for Use of Explosives In or Near Canadian Fisheries Water, 1998* (Wright and Hopky, 1998), in order to mitigate possible effects on fish habitat and fish health.

### RESULTS

Blasting in the marine environment has not occurred on site to date.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 118

Category	Marine Environment - Blasting
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to marine fish and fish habitat from explosives.
Term or Condition	The Proponent shall incorporate into the appropriate mitigation plan prior to construction, thresholds for the use of specific mitigation measures meant to prevent or limit marine wildlife disturbance, such as bubble curtains for blasting, and nitrate removal.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

A detailed mitigation plan was developed for dredging and vibratory pile driving that was undertaken during construction of the ore dock. Monitoring was undertaken during dock construction in 2014 to confirm the effectiveness of the mitigation measures.

### RESULTS

Ore dock construction activities were fully compliant with marine environment monitoring thresholds for disturbance from noise and turbidity, according to the data collected in the environmental monitoring program. Turbidity measurements near the Works were similar to baseline and reference conditions, and were less than the long-term CCME guideline threshold. Noise verification surveys demonstrated that noise levels outside of the exclusion zone were below harmful thresholds for marine mammals for both fill placement and sheet pile installation activities. The marine mammal surveys verified that marine mammals were generally not in the exclusion zone, and confirmed the exit of animals prior to the start of construction activities.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

The methodology and execution of ore dock construction including the implementation of mitigation measures was successful in meeting environmental monitoring thresholds.

## Project Certificate Condition No. 119

Category	Marine Environment - Ringed Seals
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction
Objective	To prevent impacts to ringed seals from icebreaking associated with Project shipping.
Term or Condition	The Proponent shall, in conjunction with the Marine Environment Working Group, monitor ringed seal birth lair abundance and distribution for at least two years prior to the start of icebreaking to develop a baseline, with continued monitoring over the life of the project as necessary to test the accuracy of the impact predictions and determine if mitigation is needed. Monitoring shall also include a control site outside of the Project's zone of influence.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable. Ice breaking has not been required in the Early Revenue Phase of the project.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

A monitoring study of ringed seal lairs in Eclipse Sound was being considered for winter 2017-2018 when the winter sealifts associated with the Phase 2 Expansion Project was still being considered. However, as ice breaking and winter sealifts are no longer currently being proposed, this monitoring study was not implemented.

## Project Certificate Condition No. 120

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals associated with Project shipping.
Term or Condition	The Proponent shall ensure that, subject to vessel and human safety considerations, all project shipping adhere to the following mitigation procedures while in the vicinity of marine mammals: <ol style="list-style-type: none"> <li>Wildlife will be given right of way</li> <li>Ships will when possible, maintain a straight course and constant speed, avoiding erratic behavior</li> <li>When marine mammals appear to be trapped or disturbed by vessel movements, the vessel will implement appropriate measures to mitigate disturbance, including stoppage of movement until wildlife have moved away from the immediate area.</li> </ol>
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan – Rev 06 – March 2016 2017 MEWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Appendix C1

### METHODS

Given the difficulty in observing marine mammals from ore vessels and the distance required to stop an ore vessel, the primary mitigation procedure has been to maintain a straight course and constant speed through Milne Inlet and Eclipse Sound. The Shipping and Marine Wildlife Management Plan (SMWMP) provides guidance on ship speeds and ship tracks that should be followed. The requirements are provided to ore vessel contractors prior to entry to Eclipse Sound.

Project-related ship tracks and ship speeds along the Northern Shipping Route were recorded throughout the 2017 shipping season using an automatic ship tracking system (Automated Identification System or AIS) which tracks the movement of each ship using an onboard AIS transceiver with integrated Global Positioning System (GPS). Vessels fitted with AIS transceivers are tracked in the Project area by an AIS base station set up at Bruce Head; and when out of range of the base station, through a number of satellites fitted with AIS receivers. Information provided by AIS equipment includes the vessel's unique identification number, position, course, and speed. Baffinland has contracted exactAIS®, a global vessel monitoring and tracking service based on AIS data from polar orbiting satellites to track and report on vessel movements. The ship tracks are publicly accessible through the Baffinland website during the shipping season.

### RESULTS

There were no significant deviations from the nominal shipping route in 2017 for ore carriers. The 2017 ship tracks are plotted in Figure 4.14 (see Condition No. 103).

In 2017, ore carriers rarely exceeded 10 knots when transiting in Project area (i.e. along the Northern Shipping Route). The maximum recorded vessel speed for an ore carrier in 2017 was 13.1 knots (Nordic Olympic). Freight / fuel tankers were shown to regularly exceed 10 knots (ranging from 1 to 71% of their transit time). The maximum recorded vessel speed for a freight / fuel tanker in 2017 was 16.1 knots (Sedna Desgagnes). Vessel speed information for all Project-related vessels calling at Milne Port in 2017 are presented in Table 4.27 and Figures 4.15 and 4.16 (see Condition No. 105).

#### **TRENDS**

None.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to record and monitor ship tracks and ship speeds to ensure compliance with the SMWMP. In 2018, all vessels will be provided with instruction to approach Milne Inlet with speeds limited to 7-10 knots similar to the requirements for ore vessels.

## Project Certificate Condition No. 121

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent, Fisheries and Oceans Canada, Environment Canada
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and seabird colonies associated with Project shipping.
Term or Condition	<p>The Proponent shall immediately report any accidental contact by project vessels with marine mammals or seabird colonies to Fisheries and Oceans Canada and Environment Canada, respectively, by notifying the appropriate regional office of the:</p> <ol style="list-style-type: none"> <li>Date, time and location of the incident;</li> <li>Species of marine mammal or seabird involved;</li> <li>Circumstances of the incident;</li> <li>Weather and sea conditions at the time;</li> <li>Observed state of the marine mammal or sea bird colony after the incident; and,</li> <li>Direction of travel of the marine mammal after the incident, to the extent that it can be determined.</li> </ol>
Relevant BIM Commitment	80, 83
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-compliant
Stakeholder Review	Marine Environment Working Group (MEWG), Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

In 2013 with the transport of fuel and supplies, a Ship-based Observer Program was initiated to monitor interactions of marine mammals and seabird colonies with Project shipping activities. As part of the surveying efforts, accidental contact by Project vessels with marine wildlife was also recorded. The program was conducted through 2014 and 2015 but was halted in 2016 due to safety concerns. Baffinland's Shipping and Marine Wildlife Management Plan also mandates the recording of any contact that occurs between Project vessels and marine mammals or seabird colonies.

### RESULTS

There were no observations of accidental contact between project vessels and marine mammals or seabird colonies during the three years that the ship board observer program was run. No notifications of accidental contact were reported by Baffinland in 2017 from vessel operators, observers at the Bruce Head Shore Based Observer station or local hunters.

**TRENDS**

In 2013 through 2017, no notifications of accidental contact were reported.

**RECOMMENDATIONS / LESSONS LEARNED**

The safety concerns related to the Ship-based Observer Program have been raised in the MEWG meetings. Baffinland is looking to identify an alternative program that incorporates an accidental strikes reporting protocol and may engage with NIRB to discuss changing this condition.

## Project Certificate Condition No. 122

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and seabird colonies associated with Project shipping.
Term or Condition	The Proponent shall summarize and report annually to the NIRB regarding accidental contact by project vessels with marine mammals or seabird colonies through the applicable monitoring report.
Relevant BIM Commitment	N/A
Reporting Requirement	To be provided in the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016h)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's Shipping and Marine Wildlife Management Plan mandates the recording of any contact that occurs between Project vessels and marine mammals or seabird colonies.

### RESULTS

No contacts reported.

### TRENDS

No contacts have been reported in any year.

### RECOMMENDATIONS / LESSONS LEARNED

No specific recommendations.



## Project Certificate Condition No. 123

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and seabird colonies associated with Project shipping.
Term or Condition	The Proponent shall provide sufficient marine mammal observer coverage on project vessels to ensure that collisions with marine mammals and seabird colonies are observed and reported through the life of the Project. The marine wildlife observer protocol shall include, but not be limited to, protocols for marine mammals, seabirds, and environmental conditions and immediate reporting of significant observations to the ship masters of other vessels along the shipping route, as part of the adaptive management program to address any items that require immediate action.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Non-Compliant
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Ship-based surveillance monitoring was conducted in 2013, 2014 and 2015, but was discontinued in 2016. It was found that very few marine mammals were visible to observers on board the vessels, and there were safety concerns about having observers board the vessels at sea, which was accomplished by transferring the observers onto the ship from a smaller vessel based in Pond Inlet.

As part of the Instructions to Masters for all vessel captains, marine mammal strikes are to be reported to Baffinland.

### RESULTS

Not applicable in 2017.

### TRENDS

No marine mammal ship strikes or near misses occurred in the three years of the program. No marine mammal ship strikes have been reported by vessel captains throughout the life of the Project.

### RECOMMENDATIONS / LESSONS LEARNED

The ship-based surveillance monitoring program was discontinued after three years because neither observers nor UAV technology were demonstrated to be effective in detecting marine mammal, seabird or seaducks ahead of the ship, and there were safety issues for transfer of observers to the ship. Discussions with the MEWG in relation to the Ship-Based observer program continued throughout 2017. A shipboard observer program committee was formed in 2017 with the goal to identify feasible alternatives to this program. The committee consists of representatives from Baffinland, the QIA, ECCC and the GN. Alternative programs were not identified to be put in place for the 2017 season although recommendations for increasing shore based and community based observations were put forward by the QIA for consideration in 2018. At the November,

2017 MEWG meeting, alternatives to the program were discussed, including the proposal to increase the number of land-based survey points or the use of 30-cm resolution satellite imagery from Digital Globe (DG), which may allow for actual counts of narwhal on a given survey day.

Baffinland will continue to work with the committee and the MEWG throughout 2018 to identify alternatives to meeting the objectives of this condition.

## Project Certificate Condition No. 124

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and marine fish populations from increased harvesting pressures in Project areas.
Term or Condition	The Proponent shall prohibit project employees from recreational boating, fishing, and harvesting of marine wildlife in project areas, including Steensby Inlet and Milne Inlet. The Proponent is not directed to interfere with harvesting by the public in or near project areas, however, enforcement of a general prohibition on harvesting in project areas by project employees during periods of active employment (i.e. while on site and between work shifts) is required.
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada (DFO), Indigenous and Northern Affairs Canada (INAC), Qikiqtani Inuit Association (QIA), Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018) Hunting and Harvesting Policy (Baffinland, 2013d) Environmental Protection Plan (Baffinland, 2016g)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=4&amp;archive=1&amp;lang=en</a>

### METHODS

As part of the Site orientation and training on the Environmental Protection Plan (EPP) individuals coming onto site participate in cultural awareness training and are provided with an overview of the policies outlined in the Hunting and Fishing (Harvesting) Policy. The policy states that no employee or contractor will be permitted to hunt or fish (harvest) on lands leased to Baffinland. Baffinland does not interfere with rights of public hunting or fishing near or on the Project Development Area. All visitors and visitor activities are tracked through a visitor's log (the Human Use log), provided in the Baffinland Terrestrial Annual Monitoring Report.

Upon approval from the Department of Fisheries and Oceans Canada (DFO), fishing activities and fish population health surveys do occur annually for the collection of environmental data and fish population health metrics by trained contracted professionals for aquatic effects assessment. Required Scientific permits are applied for and received before sampling or fish population health programs occur. Results are published under various annual reports. Scientific collection permits are intended non-lethal programs

**RESULTS**

No incidences of Project personnel hunting or fishing within lands leased to Baffinland occurred in 2017.

Consulting groups; Minnow Environmental Inc., North South Consultants and Golder Associates Inc. completed various fish surveys over the course of 2017 to collect environmental data and fish population health metrics. The purpose was to gather information on distribution, relative abundance, size distribution and other biological characteristics to evaluate potential mine related effects as required under Fishery Authorisations, licences and applicable management plans.

154 hunters visited the Project site in 2017 to hunt near the Project area. Baffinland accommodated all individuals, providing support when required for breakdowns and maintenance issues.

**TRENDS**

No Project personnel have participated in hunting or fishing on the Project Development Area unless approved by scientific permit and have not interfered with public rights to fish or hunt in or near the Project Development Area.

Baffinland continues to accommodate all hunting parties that travel to the Project.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to monitor and implement the policy banning all employees and contractors from hunting and fishing within the Project Development Area and accommodating all hunting parties.

## Project Certificate Condition No. 125

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assess acceptability of acoustic deterrent devices for the general public.
Term or Condition	Prior to use of acoustic deterrent devices, the Proponent shall carry out consultations with communities along the shipping routes and nearest to Steensby Inlet and Milne Inlet ports to assess the acceptability of these devices. Feedback received from community consultations shall be incorporated into the appropriate mitigation plan.
Relevant BIM Commitment	41
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

No acoustic deterrents have been considered for use on the Project to date.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 125(a)

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure public acceptability of project vessel anchor sites and reduce potential conflicts between project marine shipping and local harvesting.
Term or Condition	The Proponent shall consult with potentially-affected communities and groups, particularly Hunters' and Trappers' Organizations regarding the identification of project vessel anchor sites and potential areas of temporary refuge for project vessels along the shipping routes within the Nunavut Settlement Area. Feedback received from community consultations shall be incorporated into the most appropriate mitigation or management plans.
Relevant BIM Commitment	35
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group
Reference	Shipping Marine and Wildlife Management Plan – Section 3.3 (Baffinland, 2016h)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

The Qikiqtani Inuit Association (QIA) and the Mittimatalik Hunters and Trappers Organization (HTO) were consulted during emergency response planning for the northern shipping route, which included the establishment of anchor sites and potential temporary refuge areas. If required, anchor sites are discussed in Marine Environment Working Group (MEWG) meetings, of which the QIA and MHTO are members.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

In 2017, water quality and AIS monitoring was extended to Ragged Island (north of the LSA boundary) in response to concerns that ships were potentially discharging ballast water while occupying anchorage sites in this area (based on feedback provided during community workshops and annual MEWG meetings in 2016).

## Project Certificate Condition No. 126

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To incorporate local input into monitoring data collection.
Term or Condition	The Proponent shall design monitoring programs to ensure that local users of the marine area in communities along the shipping route have opportunity to be engaged throughout the life of the Project in assisting with monitoring and evaluating potential project-induced impacts and changes in marine mammal distributions.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

In 2017, Baffinland hired 12 Inuit to participate in the marine mammal and environment monitoring programs. Baffinland involves and trains residents from local communities to act as observers and who provide invaluable Inuit Qaujimagatuqangit (Inuit Traditional Knowledge) to the program. Participants underwent training in advance of the program, as well as undergoing on-site training.

A total of 15 positions were available for Inuit to participate as employees in the 2017 Environmental Monitoring Programs. Due to a number of factors, only 12 of the original candidates stayed on to participate in the 2017 monitoring programs.

All employees were provided with a number of different health and safety policies before completing the hands-on training in the field. Hands-on training for the Bruce Head program included training employees on how to record narwhal observations, how to record ship presence and how to measure distance from the ships. Hands-on training for the Marine Environmental Effects Monitoring Program (MEEMP) introduced program participants to procedures for water quality, sediment and zooplankton sampling and processing, conducting marine habitat surveys and how to properly use fish sampling equipment. Participants in the Tremblay Sound Tagging Program were introduced to shore-based marine mammal monitoring and recording narwhal observations, live capture of narwhal using seine nets set perpendicular to shore, attachment and deployment of dive tags and passive acoustic tags on narwhal and installation of a satellite tag receiver stations.

At the end of the field season, Baffinland held meetings with Inuit that participated in the program to share and obtain feedback on the preliminary results from monitoring in 2017.

The Mittimatalik Hunters and Trappers Organization (MHTO) is also a member of the Marine Environment Working Group (MEWG). Representative members from the MHTO who participate in the MEWG provide valuable insights into annual program planning and design and feedback on the results of the monitoring programs as they are presented to the MEWG at the end of the field season.

**RESULTS**

The inclusion of local Inuit land users in the marine monitoring programs (Tremblay Sound, MEEMP and Bruce Head) have proven to be a successful example of community based environmental monitoring providing tangible results that contribute to Baffinland's overall marine environment monitoring efforts. The MHTO has also provided invaluable advice regarding marine mammal behaviour through the MEWG.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Based on the success of the 2017 marine monitoring programs, Baffinland will continue to explore ways to further enhance Inuit participation in marine monitoring programs in 2018.



## Project Certificate Condition No. 127

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To promote public awareness and engagement with Project shipping activities.
Term or Condition	The Proponent shall ensure that communities and groups in Nunavik are kept informed of Project shipping activities and are provided with opportunity to participate in the continued development and refinement of shipping related monitoring and mitigation plans.
Relevant BIM Commitment	27, 28
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mittimatilik Hunter and Trappers Organization, Marine Environment Working Group (MEWG)
Reference	N/A
Ref. Document Link	<a href="http://www.baffinland.com/mary-river-mine/location/?lang=en">http://www.baffinland.com/mary-river-mine/location/?lang=en</a>

### METHODS

To ensure that the public is made aware of shipping related activities, Baffinland has enlisted exactAIS®, a global vessel monitoring and tracking service based on AIS (Automatic Identification System) data from polar orbiting satellites to track and report on vessel movements. The information is readily available on the Baffinland website.

Information on ships such as last reported coordinates of the vessel, whether the vessel is moving, the direction of vessel movement and destination of the vessel are provided.

The vessel locations plotted on the map are not “real-time”, but provide a regularly updated snap shot of vessel movement in the North Baffin region. Baffinland encourages all land and water users to continue to practice safe boating, hunting, and other travel activities, and be aware of your surroundings at all times.

Further, Makivik is a member of the MEWG where any proposed changes to shipping activities would be discussed.

### RESULTS

Baffinland has made vessel routing accessible to the public.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland has found the use of exactAIS® to be beneficial in providing information related to ship routing to the public. Baffinland will continue its use of this service. Information on project shipping activities will be continue to be shared with the MEWG.

## Project Certificate Condition No. 128

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure habitat compensation is acceptable to local communities.
Term or Condition	The Proponent shall consult with local communities as fish habitat off-setting options are being considered and demonstrate its incorporation of input received into the design of the Fish Habitat Off-Setting Plan required to offset the Harmful Alteration, Disruption or Destruction of Fish and Fish Habitat (HADD).
Relevant BIM Commitment	27, 28
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada, Mittimatalik Hunter and Trapper Organization, Pisiksik Working Group
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland and Fisheries and Oceans Canada (DFO) consulted the community of Pond Inlet in 2013 and 2014 regarding the development of off-setting measures for the ore dock. This included discussions during the final hearing for the Early Revenue Phase, as well as meetings with both the Pisiksik Working Group and the Mittimatalik HTO on May 13-14, 2014. DFO attended these meetings and described the Fisheries Act requirements for the protection of fish habitat, and Baffinland described its proposed habitat offset plan.

### RESULTS

The consultation activities described above did not identify any objections to the undertaking or the habitat offset measures implemented during construction of the ore dock.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## 4.7 PERFORMANCE ON SOCIO-ECONOMIC CONDITIONS

### 4.7.1 Population Demographics (PC Conditions 129 through 134)

Six (6) PC conditions are listed under the heading of Population Demographics in the Project Certificate. Three of these describe the NIRB’s expectations with respect to working with the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and establishing a Project-specific working group. Three PC conditions relate to mitigating the potential for demographic changes or monitoring and reporting of demographic change within the communities due to Project employment.

#### Stakeholder Feedback

Key stakeholders that provide input related to the socio-economic monitoring program for the Project include the communities, the QIA, various departments of the GN, and INAC. These agencies are active members of the Mary River Socio-economic Monitoring Working Group (SEMWG). While the potential for in-migration of non-Inuit into the North Baffin communities and out-migration of Inuit from the North Baffin were raised as concerns by the GN and by communities during the environmental assessment, it hasn’t been raised as a concern in recent consultation (Appendix B).

#### Monitoring

Baffinland conducts monitoring of population demographics in the Local Study Area - the five (5) North Baffin communities (LSA) by reviewing government population statistics, tracking employee origin information, and tracking worker changes in address. Table 4.28 provides an evaluation of the Project’s impacts on population demographics, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.28 Population Demographics Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Mine Employment	In-migration of a small number of workers from the south or other Nunavut communities will have an effect on the demographic make-up of communities	Baffinland’s 2017 Socio-economic Monitoring Report, which includes a review of population statistics, BCLO tracking of worker changes in address, and results from the Employee Information Survey.	Effects did not occur
	Migration of non-Inuit Project employees into the North Baffin LSA	The percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant. Based on annual information received from BCLOs, a net of zero known non-Inuit employees/contractors have in-migrated to the North Baffin LSA, and a net of three known Inuit employees/contractors have out-migrated from the North Baffin LSA since 2015. Results from the 2018 Employee Information Survey (71 surveys received) indicated 7 respondents had moved to a different community in the past 12 months, 4 of whom moved within the North Baffin LSA, and 3 of which did not indicate their moving destination.	
	Migration of non-Inuit into North Baffin for indirect jobs		
	Inter-community Inuit migration		
	Out-migration from North Baffin		

Effects to population demographics as a result of Project employment have not occurred.

#### Path Forward

Baffinland will continue to monitor this aspect of the socio-economic environment, and will discuss monitoring results with the SEMWG and QSEMC. Reporting on each PC condition follows.

## Project Certificate Condition No. 129

Category	Population Demographics - Qikiqtaaluk Socio-Economic Monitoring Committee
Responsible Parties	The Proponent, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Description of the general monitoring framework to be developed in consultation with the Qikiqtaaluk Socio-Economic Monitoring Committee.
Term or Condition	The Proponent is strongly encouraged to engage in the work of the Qikiqtaaluk Socio-Economic Monitoring Committee along with other agencies and affected communities, and it should endeavour to identify areas of mutual interest and priorities for inclusion into a collaborative monitoring framework that includes socio-economic priorities related to the Project, communities, and the North Baffin region as a whole.
Relevant BIM Commitment	41, 43, 45, 46
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland continues to engage with the Qikiqtaaluk Socio-Economic Monitoring (QSEMC), and participates in the Mary River Socio-Economic Monitoring Working Group (SEMWG), a sub-set of the QSEMC whose members include Baffinland, the Government of Nunavut, the Government of Canada, and the QIA. A Terms of Reference for the Mary River SEMWG (which identifies socio-economic monitoring priorities and objectives for the Project) has been developed and provided in the 2017 Socio-Economic Monitoring Report. However, the SEMWG is currently revising its Terms of Reference to better reflect its current activities. Baffinland also incorporated feedback from Mary River SEMWG members in 2016 to finalize the Project's socio-economic monitoring plan. The 2017 Socio-Economic Monitoring Report presents this plan (which continues to be updated and refined) and assesses the socio-economic performance of the Project in 2017.

### RESULTS

Socio-economic performance of the Project in 2017 was assessed using socio-economic indicators for a number of Valued Socio-Economic Components (VSECs) considered in the FEIS (Baffinland, 2012). The information presented in the 2017 Socio-Economic Monitoring Report supports many of the FEIS predictions for these VSECs and identifies positive effects the Project has had. The report also highlights areas where Project activities did not fully match FEIS predictions in 2017 (e.g. Local Study Area (LSA) employment hours) and describes steps being taken by Baffinland to address these areas. Various Project Certificate conditions pertaining to socio-economic monitoring are also reported on throughout the report.

## TRENDS

Where appropriate, trends have been described for the indicators assessed in the 2017 Socio-Economic Monitoring Report. These trends (i.e. pre-development, post-development, and since the previous year) demonstrate whether an indicator has exhibited change and describes the direction of that change. Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used. A 'pre-development' trend refers to the five-year period preceding Project construction (i.e. 2008 to 2012). In some cases, averaged data from this period have been compared against averaged data from previous years (i.e. 2003-2007, where available) to determine a trend. Likewise, a 'post-development' trend refers to the period after Project construction commenced (i.e. 2013 onwards). Averaged data from this period may have also been compared against averaged data from the pre-development period to determine a trend. A trend 'since previous year' refers to the two most recent years in which indicator data are available.

Trend analyses are useful for assessing potential Project influences on an indicator. In some cases, additional data and monitoring will be necessary before the FEIS predictions presented in the report can be fully verified. In others, correlations between the Project and data trends were either unable to be identified or were unclear. The process of socio-economic monitoring often requires many years of data to effectively discern trends and causality. Even then, various factors may be found to influence causality and some of these may not be easy to measure. Successful socio-economic monitoring for the Project will require appropriate long-term data, the regular input of all Project stakeholders, and a focus on continual improvement.

## RECOMMENDATIONS / LESSONS LEARNED

With the finalization of the Project's socio-economic monitoring plan and Baffinland's ongoing engagement with the QSEMC and Mary River SEMWG, Baffinland is in compliance with this Project Certificate condition. The information contained in the 2017 Socio-Economic Monitoring Report suggests the mitigation and management measures established by Baffinland are functioning largely as anticipated. However, LSA employment and Inuit employee turnover are areas Baffinland will continue to address in 2018. This will occur in large part through implementation of Baffinland's new Inuit Human Resources Strategy (IHRS) and Inuit Procurement and Contracting Strategy (IPCS). The new Baffinland Apprenticeship Program, development of a labour pool of multi-skilled Inuit Heavy Equipment Operators, and implementation of the Q-STEP training program (in conjunction with QIA) and other actions to meet the Minimum Inuit Employment Goal (MIEG) should also assist with increasing LSA employment over time. Continued monitoring of LSA employment hours, causes of employee turnover, and the initiatives described in the IHRS and IPCS will be necessary to ensure successful socio-economic outcomes. Opportunities for potential performance improvements in these areas will also be assessed throughout 2018.

While additional monitoring will be required to confirm the findings presented in this report over the long-term, no need has been identified in 2017 to update any of the FEIS predictions or to significantly modify Baffinland's existing management approach. However, Baffinland will continue to use adaptive management as a tool for improving the Project's overall socio-economic performance in the future.

## Project Certificate Condition No. 130

Category	Population Demographics - Project-specific monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Recognizing that some Project-specific socio-economic monitoring initiatives may be best addressed in smaller more focused working groups, this is encouraged where possible.
Term or Condition	The Proponent should consider establishing and coordinating with smaller socio-economic working groups to meet Project specific monitoring requirements throughout the life of the Project.
Relevant BIM Commitment	41, 43, 46
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland continues to work with the QSEMC and the SEMWG on socio-economic monitoring initiatives. In addition, Baffinland regularly engages North Baffin community members and other committees that operate under provisions of the Inuit Impact Benefit Agreement (IIBA), on various socio-economic topics.

### RESULTS

Baffinland continues to engage with the QSEMC and participates in the Mary River SEMWG, a sub-set of the QSEMC whose members include Baffinland, the Government of Nunavut, the Government of Canada, and the QIA. A Terms of Reference for the SEMWG (which identifies socio-economic monitoring priorities and objectives for the Project) has been developed. However, the SEMWG is currently revising its Terms of Reference to better reflect its current activities. Baffinland also incorporated feedback from Mary River SEMWG members in 2016 to finalize the Project's socio-economic monitoring plan (which continues to be updated and refined). The 2017 Socio-Economic Monitoring Report presents this plan and assesses the socio-economic performance of the Project in 2017. Baffinland's meetings with the SEMWG and QSEMC in 2017 included:

- February 2, 2017 - Teleconference meeting with members of the SEMWG. The focus of the meeting was to provide an update on the 2016 Socio-Economic Monitoring Report, obtain SEMWG feedback on the new Baffinland Employee Information Survey, and discuss Baffinland's plans for addressing the socio-economic impact assessment portion of the Phase 2 Proposal EIS.
- July 5-6, 2017 - In-person meeting held with members of the QSEMC in Arctic Bay. The focus of the meeting was to review and discuss regional socio-economic monitoring initiatives and findings. Baffinland also presented the findings of its 2016 Socio-Economic Monitoring Report (JPCSL, 2017a).

- September 14, 2017 - In-person meeting held with members of the SEMWG in Iqaluit. The focus of the meeting was to discuss NIRB draft Appendix A, the role of socio-economic monitoring in NIRB community information sessions, plans for the 2017 Socio-Economic Monitoring Report, provide an update on the Phase 2 Expansion Project Proposal, discuss SEMWG follow-up to reviewer comments on the 2016 Socio-Economic Monitoring Report, and discuss revising the SEMWG TOR.

Baffinland participated in the September 2017 territorial socio-economic monitoring workshop held by the Government of Nunavut in Iqaluit. Primary objectives of this workshop included development of a list of core monitoring indicators for the territory, identification of methods for addressing socio-economic monitoring data gaps, establishing preferred monitoring report compositions and assessment methodologies, and endorsement of the Government of Nunavut's territorial reporting proposal. Baffinland was an active participant in this workshop (in addition to other territorial mineral developers, federal/territorial governmental agencies, and Inuit organizations) and provided feedback throughout the process. The Company received the Government of Nunavut's draft workshop report and recommendations in December 2017 and some modifications to Baffinland's socio-economic monitoring plan were made as a result. Upon receiving the final workshop report Baffinland will investigate the possibility of further aligning its monitoring program with the Government of Nunavut's recommendations, where practical.

#### **TRENDS**

Not applicable.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to engage with the QSEMC and participate in the Mary River SEMWG in the future and will consider establishing smaller, focussed socio-economic working groups to address specific community issues or Project challenges if deemed appropriate.

## Project Certificate Condition No. 131

Category	Population Demographics - Monitoring demographic changes
Responsible Parties	The Proponent, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor demographic changes affecting the North Baffin communities and the territory as a whole in order to understand changes and to evaluate the Proponent's predictions as related to population demographics.
Term or Condition	The Qikiqtaaluk Socio-Economic Monitoring Committee is encouraged to engage in the monitoring of demographic changes including the movement of people into and out of the North Baffin communities and the territory as a whole. This information may be used in conjunction with monitoring data obtained by the Proponent from recent hires and/or out-going employees in order to assess the potential effect the Project has on migration.
Relevant BIM Commitment	45
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland has provided demographic change information in the 2017 Socio-Economic Monitoring Report. This includes data on population estimates, known in-migrations of non-Inuit Project employees and contractors, known out-migrations of Inuit Project employees and contractors, percentage of Inuit vs. non-Inuit residents in the North Baffin Local Study Area (LSA), and Nunavut annual net migration. Baffinland also implemented a revised Inuit Employee Survey in 2018, which collected information related to employee changes of address, housing status, and migration intentions.

### RESULTS

The trends in the demographic change key indicators is provided in Table 4.29. Detailed results are presented in the 2017 Socio-Economic Monitoring Report.



**TRENDS**
**Table 4.29 2017 Monitoring of Key Indicators of Demographic Change**

Indicator(s)	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Known in-migrations of non-Inuit Project employees and contractors	Not applicable	No change	No change	N. Baffin LSA	Since 2015, a net of zero known non-Inuit employees/contractors have in-migrated to the North Baffin LSA.
In-migration of non-Inuit to the North Baffin LSA	Not available	Not available	Not available	N. Baffin LSA	Limited data currently available. However, the percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant.
Known out-migrations of Inuit Project employees and contractors	Not applicable	↑	No change	N. Baffin LSA	Since 2015, a net of five known Inuit employees/contractors have out-migrated from the North Baffin LSA.
Out-migration of Inuit from the North Baffin LSA	Not available	Not available	Not available	N. Baffin LSA	Limited data currently available. However, the percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant.
Population estimates	↑ ↑	↑ ↑	↑ ↑	N. Baffin LSA Iqaluit	Population numbers continue to increase across the territory.
Nunavut net migration	↑	↓	↑	Territory	A decreasing post-development trend in Nunavut annual net migration is currently occurring.
Employee changes of address, housing status, and migration intentions	Not applicable	Not applicable	Not applicable	Project	22.8% of the 2018 <i>Inuit Employee Survey</i> respondents housing situation changed in the past 12 months. 9.9% moved to a different community in the past 12 months but no one moved into or out of the North Baffin LSA. 17.7% intend to move to a different community in the next 12 months. 8.8% intend to move away from the North Baffin LSA. No individuals intend to move into the North Baffin LSA. 60.7% of respondents currently live in public housing.

**NOTES:**

- Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to provide demographic change information through its socio-economic monitoring program. However, only limited government data are currently available for the indicators 'in-migration of non-Inuit to the North Baffin LSA' and

'out-migration of Inuit from the North Baffin LSA'. For this reason, Baffinland continues to present data from various non-government sources (e.g. workplace survey, BCLO survey) to help better understand this topic.

## Project Certificate Condition No. 132

Category	Population Demographics - Training programs
Responsible Parties	The Proponent, North Baffin Hamlets, Municipal Training Organization, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To develop training programs in ways which contribute to limiting the potential for migration to occur as North Baffin residents seek training and employment opportunities in the larger centre of Iqaluit.
Term or Condition	The Proponent is encouraged to partner with other agencies such as Hamlet organizations in the North Baffin region, the Municipal Training Organization, and the Government of Nunavut in order to adapt pre-existing, or to develop new programs which encourage Inuit to continue living in their home communities while seeking ongoing and progressive training and development. Programs may include driver training programs offered within Hamlets, providing upgraded equipment to communities for use in municipal works, providing incentives for small businesses to remain operating out of their community of origin, or supplementing existing recreational facilities and programming in North Baffin communities.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 SEMWG Meeting Records
Ref. Document Link	Appendix C3

### METHODS

Baffinland is committed to exploring ways to partner with local and regional governmental agencies and educational institutions to support local communities and develop training programs for residents while limiting the potential for out-migration. Measures introduced or implemented during 2017 to achieve these goals include the following initiatives:

#### *Q-STEP*

Baffinland and the Qikiqtani Inuit Association (QIA) have partnered in the \$19 million Qikiqtani Skills and Training for Employment Partnership (Q-STEP) training program, which has as its objective the provision of Inuit with skills and qualifications to meet the employment needs of the Mary River Project as well as other employment opportunities in the region. Q-STEP is a four-year initiative consisting of work readiness measures as well as targeted training programs directed at apprenticeships, skills development, supervisor training, and formal certification in heavy equipment operation.

#### *Work Readiness*

A key component of Baffinland's efforts to provide opportunities to local communities to enhance labour skills is the development and delivery of pre-employment training programs. Baffinland successfully carried out a 'Work Ready' pre-employment training program with North Baffin residents in 2012 and 2013. There were 277 graduates of the program and 150 of those graduates went on to be employed at the Project in 2013. From 2014 to 2017, Baffinland focused on revising and improving its Work Ready program. In 2017, Baffinland worked with Hamlet Governments from the five (5) North Baffin

communities (Arctic Bay, Clyde River, Hall Beach, Igloolik, and Pond Inlet), the QIA, and Arctic College to develop a revised Work Ready Program that is scheduled to commence in the first quarter of 2018. Using curriculum developed by the Mining Industry Human Resource Council (MIHR) the new Work Ready Program will be delivered in the five (5) North Baffin Communities as well as Iqaluit. The curriculum has been expanded from what was included in 2012 and 2013, and the length of classroom time was also extended to offer Inuit participants a more robust work preparedness program. For 2018, the total program length will be 12 weeks.

#### *Apprenticeships and Other Opportunities*

Baffinland recently began recruiting candidates for a new apprenticeship program for individuals interested in pursuing a career in the skilled trades. Baffinland is currently recruiting 26 candidates, spread across eight positions: carpenter, electrician, heavy duty mechanic, heavy equipment technician, housing maintainer, millwright, plumber, and welder. Recruits will join Baffinland as trades assistants for six months, job shadowing and learning about their prospective trade. Upon successful completion of the six-month term, candidates will write their Trades Entrance exam. Pending successful enrollment in that program, candidates will become full-time, permanent apprentices at Baffinland. As the apprenticeship program was initiated in late 2017, the number of apprentices employed by Baffinland during the year was limited. In 2017, Baffinland employed one Inuit apprentice.

#### *Heavy Equipment Training*

In partnership with the Operating Engineers Training Institute of Ontario (OETIO), Baffinland will offer local Inuit opportunities to participate in the Heavy Equipment Operating Training delivered by the OETIO in Morrisburg, Ontario. This training is set to begin in early 2018 with the first class of 12 Inuit and a second class of 12 Inuit to follow. Plans are also under way to offer advanced training for four existing Baffinland Inuit employees to upgrade their heavy equipment skills.

#### *Support for Local Businesses*

In addition to provisions respecting the participation of Inuit Firms in Project contracting opportunities as detailed in Article 6 of the Inuit Impact and Benefit Agreement (IIBA) and the Inuit Procurement and Contracting Strategy, Baffinland supports the development of local businesses through its annual contribution of \$250,000 through the IIBA's Business Capacity and Start Up Fund. The fund, which is administered by the QIA, is designed to assist existing Inuit Firms to develop capacity to participate in the bidding process and to encourage business start-ups in the communities.

In addition, Baffinland has worked and will continue to work with local businesses on an ongoing basis to create contracting opportunities in the communities. One example of this is the Inuit employee ground transportation initiative. Through this initiative Baffinland has contracted businesses to provide ground transportation for Inuit employees travelling to and from the Project work site. Currently, two such contracts have been concluded in Pond Inlet and Igloolik and Baffinland is working with local authorities to identify potential service providers in the other communities.

#### *Support for Local Communities*

Baffinland also supports a number of community investment programs.

Pursuant to Article 12 of the IIBA, Baffinland and QIA each contribute \$375,000 annually to the Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat fund. The fund, which is administered by QIA is designed to meet the following objectives:

- Creation of opportunities for community capacity building;
- The fair distribution of impacts and benefits between communities and across generations;
- Maintenance of consistency with community development objectives; and
- Promotion of mutual understanding and learning.

The Fund is intended to support a wide range of activities including participation in community projects, youth and Elder programs, hunter support activities, cultural learning and revitalization, social support programs for families and individuals and counseling and healing programs.

In addition, through its community sponsorship program, Baffinland supports a wide range of social, recreational and cultural activities in the communities. Examples of community investment in 2017 include the donation of \$25,000 for Christmas hampers in each of the five (5) North Baffin communities, the sponsorship of school lunch programs, the provision of laptops to North Baffin high school graduates, the 2017 Community Literacy Initiative (donations of books in Inuktitut and English to local libraries) and financial contribution to a variety of regional and local recreational and cultural events.

## RESULTS

The types of training currently provided or proposed by Baffinland reveal the full scope of learning opportunities available at the Project. Most training opportunities continue to be offered on-site. Training programs with the highest levels of Inuit participation in 2017 included heavy equipment operator (1,803 hours), site orientation (923 hours), mobile support equipment (445 hours), and ore haul truck (121 hours). Baffinland is also working to develop new training programs that would be offered both in the community and at the Mine site. Baffinland is also working with contractors to explore new skills development initiatives. Training programs are expected to continue to evolve at the Project as operations advance, employment increases, and feedback from Inuit employees is implemented.

With respect to programs associated with the Q-STEP program, 14 Inuit have registered in the Baffinland Apprenticeship program and are progressing towards certification. Through the OETIO, Baffinland has registered 2 classes of Inuit to receive training. These Inuit participants can use the training obtained for employment with Baffinland or other industries requiring heavy equipment operators.

The value of Project-related procurement with Inuit-owned businesses and joint ventures demonstrates the business opportunities created by the Project. Approximately \$387.2 million in contracts were awarded to Inuit-owned businesses and joint ventures in 2017. Of a total 18 contracts awarded to Inuit-owned businesses and joint ventures, all were awarded to businesses based out of the five (5) North Baffin communities. Total procurement (with Inuit *and* non-Inuit firms) in 2017 totalled \$1,068.0 million. Since Project development, a total of \$819.1 million worth of contracts has been awarded to Inuit-owned businesses and joint ventures.

## TRENDS

On an annual basis, Baffinland has and continues to seek multiple avenues for offering training and education and employment opportunities to local Inuit, and to further explore new partnerships with local Hamlets and training institutes and strengthen existing programs or partnerships, where these already exist.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with its partners, such as Arctic College, to encourage Inuit to continue living in their home communities while seeking ongoing and progressive training and development.

Baffinland will also continue to identify new opportunities to encourage the development of local businesses and is committed to ongoing support for local community programs, initiatives and events.

## Project Certificate Condition No. 133

Category	Population Demographics - Monitoring demographic changes
Responsible Parties	The Proponent, members of QSEMC, Government of Nunavut, Nunavut Housing Corporation
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Training programs may be developed with the goal of limiting the potential for migration to occur as North Baffin residents may choose to seek employment and therefore move from smaller North Baffin communities to the larger centre of Iqaluit
Term or Condition	The Proponent is encouraged to work with the Qikiqtaaluk Socio-Economic Monitoring Committee and in collaboration with the Government of Nunavut's Department of Health and Social Services, the Nunavut Housing Corporation and other relevant stakeholders, design and implement a voluntary survey to be completed by its employees on an annual basis in order to identify changes of address, housing status (i.e. public/social, privately owned/rented, government, etc.), and migration intentions while respecting confidentiality of all persons involved. The survey should be designed in collaboration with the Government of Nunavut's Department of Health and Social Services, the Nunavut Housing Corporation and other relevant stakeholders. Non-confidential results of the survey are to be reported to the Government of Nunavut and the NIRB.
Relevant BIM Commitment	43, 45
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSCL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

In January 2018, Baffinland implemented a revised voluntary Inuit Employee Survey, which collected information related to employee changes of address, housing status, and migration intentions. The revised survey also addressed several other topics related to Project Certificate terms and conditions, and IIBA requirements. Baffinland and the QIA worked together on developing this new survey and jointly administered it on-site. This survey was offered to Inuit employees and contractors at the Mary River Project. Baffinland continues to discuss the content and results of the workplace survey with members of the Mary River SEMWG (including GN, QIA, and INAC representatives) and will continue to solicit feedback on potential improvements to the survey.

*Note: Baffinland has experienced certain planning challenges when implementing its recent employee surveys. For this reason, the survey discussed in the 2017 Socio-Economic Monitoring Report was completed in January 2018, while the survey discussed in the 2016 Socio-Economic Monitoring Report was completed in February/March 2017. Baffinland is working to address this timing discrepancy moving forward.*

## RESULTS

A total of 71 surveys were completed by Inuit employees and contractors. Table 4.30 summarizes results pertaining to changes in employee housing situation. 18.3% of respondents indicated their housing situation had changed in the past 12 months, 62.0% indicated their housing situation had not changed in the past 12 months, and results were unknown for 19.7% of respondents ( $n=71$ ). When 'unknown' results are removed, 22.8% of respondents indicated their housing situation had changed in the past 12 months and 77.2% indicated it had not.

**Table 4.30 Changes in Inuit Employee Housing Situation (2018 Inuit Employee Survey Results)**

Type of Change	Number of Respondents	Percentage of Respondents
Housing situation changed in the past 12 months	13	18.3%
Housing situation did not change in the past 12 months	44	62.0%
Unknown	14	19.7%
<b>Total</b>	<b>71</b>	<b>100.0%</b>

**NOTES:**

1. Source: 2018 Inuit Employee Survey.

Table 4.31 summarizes results pertaining to changes in Inuit employee community. 9.9% of respondents had moved to a different community in the past 12 months while 90.1% had not ( $n=71$ ). Respondents who had moved to a different community ( $n=7$ ) were then asked which community they had moved from; this result was compared against information provided on their current community of residence. Of these respondents, 0.0% had moved either into or out of the North Baffin LSA, while 57.1% (or 5.6% of all survey responses) had moved within the North Baffin LSA. 28.6% (or 2.8% of all survey responses) had moves classified as 'Other' (i.e. moves that did not involve a North Baffin LSA community) and the type of move was unknown for 14.3% (or 1.4% of all survey responses) (i.e. this individual indicated their current community of residence was in the North Baffin LSA, but later indicated they had moved to outside the North Baffin LSA).

**Table 4.31 Changes in Inuit Employee Community (2018 Inuit Employee Survey Results)**

Type of Change	Number of Respondents	Percentage of Respondents
<i>All survey respondents (n=71)</i>		
Moved to a different community in the past 12 months	7	9.9%
Did not move to a different community in the past 12 months	64	90.1%
<b>Total</b>	<b>71</b>	<b>100.0%</b>
<i>Moved to a different community in the past 12 months (n=7)</i>		
Moved from North Baffin LSA to outside of North Baffin LSA	0	0.0%
Moved from outside of North Baffin LSA to North Baffin LSA	0	0.0%
Moved within the North Baffin LSA	4	57.1%
Other	2	28.6%
Unknown	1	14.3%
<b>Total</b>	<b>7</b>	<b>100.0%</b>

**NOTES:**

1. Source: 2018 Inuit Employee Survey.

Table 4.32 summarizes results pertaining to current employee housing status. 5.6% of respondents lived in a private dwelling owned by them, 12.7% lived in a private dwelling owned by another individual, 4.2% were renting from a private company, 52.1% lived in public housing, 0.0% lived in other staff housing, 9.9% lived in another type of housing not listed on the survey,



and results were unknown for 14.1% of respondents ( $n=71$ ). When 'unknown' results are removed, 60.7% of respondents lived in public housing.

**Table 4.32 Current Inuit Employee Housing Status (2018 Inuit Employee Survey Results)**

Current Housing Status	Number of Respondents	Percentage of Respondents
Privately owned – Owned by you	4	5.6%
Privately owned – Owned by another individual	9	12.7%
Renting from a private company	3	4.2%
Public housing	37	52.1%
Government of Nunavut staff housing	1	1.4%
Other staff housing	0	0.0%
Other	7	9.9%
Unknown	10	14.1%
<b>Total</b>	<b>71</b>	<b>100.0%</b>

**NOTES:**

1. Source: 2018 Inuit Employee Survey.

Table 4.33 summarizes results pertaining to Inuit employee migration intentions.

**Table 4.33 Inuit Employee Migration Intentions (2018 Inuit Employee Survey Results)**

Migration Intentions	Number of Respondents	Percentage of Respondents
<i>All survey respondents (n=71)</i>		
Intend to move to a different community in the next 12 months	12	16.9%
Do not intend to move to a different community in the next 12 months	56	78.9%
Unknown	3	4.2%
<b>Total</b>	<b>71</b>	<b>100.0%</b>
<i>Intend to move to a different community in the next 12 months (n=12)</i>		
Intend to move from North Baffin LSA to outside of North Baffin LSA	6	50.0%
Intend to move from outside of North Baffin LSA to North Baffin LSA	0	0.0%
Intend to move within North Baffin LSA	1	8.3%
Other	3	25.0%
Unknown	2	16.7%
<b>Total</b>	<b>12</b>	<b>100.0%</b>

**NOTES:**

1. Source: 2018 Inuit Employee Survey.

16.9% of respondents intended to move to a different community in the next 12 months while 78.9% did not. Migration intentions were unknown for 4.2% of respondents ( $n=71$ ). When 'unknown' results are removed, 17.7% of respondents intended to move to different community in the next 12 months and 82.4% did not. Respondents who intended to move to a different community in the next 12 months ( $n=12$ ) were then asked which community they intended to move to; this result was compared against information provided on their current community of residence. Of these respondents, 50.0% (or 8.8% of known survey responses) intended to move from the North Baffin LSA to outside of the North Baffin LSA. 0.0% intended to move from outside of the North Baffin LSA to the North Baffin LSA and 8.3% (or 1.5% of known responses) intended to move

within the North Baffin LSA. 25.0% (or 4.4% of known responses) had intentions classified as 'Other' (i.e. intended moves that did not involve a North Baffin LSA community) and the type of move was unknown for 16.7% (or 2.9% of known responses).

#### **TRENDS**

2018 was the second year questions on employee changes of address, housing status, and migration intentions were included in the workplace survey; as such, no long-term trends are yet apparent. However, Baffinland will continue to administer this survey on an annual basis and report on any observed future trends.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to administer the workplace survey on an annual basis. Baffinland will also continue to solicit feedback on potential improvements to the survey from SEMWG members on an ongoing basis.

## Project Certificate Condition No. 134

Category	Population Demographics - Employee origin
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Project-specific information regarding employee origin is important to comparing predictions of labour availability and employment opportunities with actual levels of employment from various demographic segments over different geographic areas.
Term or Condition	<p>The Proponent shall include with its annual reporting to the NIRB a summation of employee origin information as follows:</p> <ol style="list-style-type: none"> <li>The number of Inuit and non-Inuit employees hired from each of the North Baffin communities, specifying the number from each</li> <li>The number of Inuit and non-Inuit employees hired from each of the Kitikmeot and Kivalliq regions, specifying the number from each</li> <li>The number of Inuit and non-Inuit employees hired from a southern location or other province/territory outside of Nunavut, specifying the locations and the number from each</li> <li>The number of non-Canadian foreign employees hired, specifying the locations and number from each foreign point of hire.</li> </ol>
Relevant BIM Commitment	N/A
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSCL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Data on the origin, number, and ethnicity of Project employees and contractors who worked on the Project in Nunavut-based positions in 2017 are presented in the 2017 Socio-Economic Monitoring Report. This information was obtained from internal Baffinland records.

### RESULTS

An average of 1,572 individuals worked on the Project in 2017, of which 219 (13.9%) were Inuit. In 2017, most of the Project's Inuit employees and contractors were based in LSA communities with smaller numbers residing outside of Nunavut. Most of the Project's non-Inuit employees and contractors were based in Canadian locations outside of Nunavut, with Ontario having the greatest number. Small numbers of non-Inuit employees and contractors were based in Nunavut. There were also a small number of non-Inuit international contractors, and various employees and contractors whose origin was unknown. Within the North Baffin LSA, Pond Inlet had the greatest average number of employees and contractors (41), while Igloodik had the fewest (19). Several employees and contractors also resided in Iqaluit (55).

**TRENDS**

Similar to previous years, the Project employed many Inuit from the LSA communities in 2017. This is a likely reflection of the Inuit hiring commitments Baffinland has made in those locations and the access to the mine work locations provided by weekly flights from the five (5) North Baffin communities and Iqaluit directly to the site. Most non-Inuit employees and contractors were based in Canadian locations outside of Nunavut. A mine as large and complex as Mary River requires many employees with various skill sets. Individuals with advanced mining and/or more technical skill sets are in limited supply in Nunavut. The large number of Baffinland employees and contractors from outside of Nunavut would at least partly reflect this skills gap.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to provide information regarding employee origin in future socio-economic monitoring reports.

4.7.2 Education and Training (PC Conditions 135 through 141)

Seven (7) PC conditions relate to education and training, mostly encouraging Baffinland to maximize education and training benefits to Nunavummiut in the local communities. This includes the development of recognizable and transferable skills that can be used outside of the mining industry. The NIRB required Baffinland to conduct a labour market analysis, which was updated for the Early Revenue Phase.

*Stakeholder Feedback*

As noted in Section 3.5.1, the key stakeholders focused on the socio-economic environment include the communities, the QIA, various departments of the GN, and INAC. There is an inherent relationship between the education and training initiatives and objectives implemented by Baffinland and the Government of Nunavut, which is responsible for delivering most education and training programs in Nunavut. Commitments for Baffinland to provide education and training opportunities are contained in the IIBA. The SEMWG and QSEMC also regularly discuss this element of the Project. Aside from employment (discussed in Section 3.5.3), Baffinland’s stakeholders have viewed education and training opportunities as a key benefit of the Project (Appendix B).

*Monitoring*

Baffinland tracks and reports on the amount of training delivered each year (including the amount of training delivered to Inuit workers), government educational attainment statistics, and results from an Employee Information Survey. Table 4.34 provides an evaluation of the Project’s impacts on education and training, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.34 Education and Training Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Life Skills	Training of workers and contractors, resulting in improved life skills amongst LSA residents. Training in 2017 is described in PC Condition No 137. The elder-in-residence counsels Inuit workers as requested.	All Inuit training hours for Baffinland staff are tracked and reported quarterly and annually to the QIA. Baffinland reports on its training programs annually in its socio-economic monitoring report	Positive effects consistent with FEIS predictions
Education and Skills	Training programs as described above; incentives related to school attendance and success (i.e., laptop program, scholarships); opportunities to gain skills on the job	In 2017, a total of 43,397 hours of training were completed at the Project site, of which 4,024 hours (or 9.3%) were provided to Inuit. There has been a total of 122,950 hours of training provided since Project development, of which 15,867 hours (or 12.9%) were provided to Inuit	Positive effects consistent with FEIS predictions

Positive effects with respect to life skills and to education and work skills have occurred as a result of the Project.

*Path Forward*

Baffinland will continue to implement and refine its training programs, in consultation with the SEMWG, QSEMC, and the Project’s workforce. Reporting on each PC condition follows.

## Project Certificate Condition No. 135

Category	Education and Training - Employee work/study programs
Responsible Parties	The Proponent, Qikiqtani Inuit Association
Project Phase(s)	Construction and Operations
Objective	Recognizing the 12-hour work days inherent with work at the Project site, it is not clear how employees would successfully engage in a work/study program offered by the Proponent.
Term or Condition	The Proponent is encouraged to consider offering additional options for work/study programs available to Project employees (in addition to study programs at project sites that would be offered to employees when off-shift).
Relevant BIM Commitment	93
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2017 SEMWG Meeting Records
Ref. Document Link	Appendix C3

### METHODS

The Baffinland Inuit Employment and Training Specialist works closely with various levels of Government, Inuit Organizations, and other resource development companies to continue the identification of programs and activities that would provide new opportunities for work/study programs.

The Baffinland Inuit Apprenticeship program, partially funded by the Qikiqtani Skills and Training for Employment Partnership (Q-STEP) program, will offer employment and apprenticeship training to Inuit. The training components of this program will be administered by Nunavut Arctic College both in Nunavut and through their partner educational institutions outside of Nunavut. Baffinland is currently recruiting 26 candidates, spread across eight positions: carpenter, electrician, heavy duty mechanic, heavy equipment technician, housing maintainer, millwright, plumber, and welder. Recruits will join Baffinland as trades assistants for six months, job shadowing and learning about their prospective trade. Upon successful completion of the six-month term, candidates will write their Trades Entrance exam. Pending successful enrollment in that program, candidates will become full-time, permanent apprentices at Baffinland.

As this program was not commenced until late in 2017, the number of apprentices employed by Baffinland during the year was limited. In 2017, Baffinland employed one Inuit apprentice.

In partnership with the Operating Engineers Training Institute of Ontario (OETIO), Baffinland will offer local Inuit opportunities to participate in the Heavy Equipment Operating Training delivered by the OETIO in Morrisburg, Ontario. This training is set to begin in early 2018 with the first class of 12 Inuit and a second class of 12 Inuit to follow. Plans are also under way to offer advanced training for four existing Baffinland Inuit employees to upgrade their heavy equipment skills.

Additional programs, including financial literacy, General Education Development (GED) upgrading and other initiatives are currently under consideration by Baffinland for implementation in 2018 or 2019.

**RESULTS**

The Baffinland Inuit Employment and Training Specialist has been working with the Mary River Inuit Impact and Benefit Agreement (IIBA) Joint Management Committee to discuss training opportunities at both the mine site and in communities. These discussions are of an ongoing and iterative nature and will continue to occur in 2018.

QIA and Baffinland are also engaged in implementation of the Q-STEP program and associated training initiatives.

**TRENDS**

Given the remote location of Baffinland's Point of Hire Communities as well as the lack of comprehensive post secondary educational infrastructure in these communities, offering work/ study programs continues to be a challenge.

**RECOMMENDATIONS/ LESSONS LEARNED**

Baffinland will continue to examine programs offered in other jurisdictions, including those offered by other mining companies operating in similar conditions, to determine their potential suitability for offer at the Mary River Project.

## Project Certificate Condition No. 136

Category	Education and Training - Transferable skills and training
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Government of Nunavut, Municipal Training Organization
Project Phase(s)	Construction and Operations
Objective	Offering training which results in certifications that are valid for employment at more than one site or in different fields provides an investment in the long-term employability of Nunavummiut.
Term or Condition	The Proponent is encouraged to work with training organizations and/or government departments offering mine-related or other training in order to provide additional opportunities for employees to gain meaningful and transferable skills, credentials and certifications especially where such training of employees offered by the Proponent remains valid only at the Mary River Project sites.
Relevant BIM Commitment	92, 94
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2017 SEMWG Meeting Records
Ref. Document Link	Appendix C3

### METHODS

As described in Project Certificate No 135, Baffinland is providing the opportunities for Inuit to become certified in the Skilled Trades. These certifications are recognized Canada-wide. These skills and associated certifications can be used for employment opportunities outside of the Mary River Project.

Baffinland recently began recruiting candidates for a new apprenticeship program for individuals interested in pursuing a career in the skilled trades. Baffinland is currently recruiting 26 candidates, spread across eight positions: carpenter, electrician, heavy duty mechanic, heavy equipment technician, housing maintainer, millwright, plumber, and welder. Recruits will join Baffinland as trades assistants for six months, job shadowing and learning about their prospective trade. Upon successful completion of the six-month term, candidates will write their Trades Entrance exam. Pending successful enrollment in that program, candidates will become full-time, permanent apprentices at Baffinland.

As this program did not commence until late in 2017, the number of apprentices employed by Baffinland during the year was limited. In 2017, Baffinland employed one Inuit apprentice.

Baffinland is also partnering with the Operating Engineer Training Institute of Ontario (OETIO) in to train Inuit candidates from Arctic Bay, Clyde River, Hall Beach, Igloolik, Pond Inlet and Iqaluit. The trainees will learn the foundations of heavy equipment operation and build skills to be able to operate various pieces of heavy equipment confidently and safely.

### RESULTS

Fourteen (14) Inuit have registered in the Baffinland Apprenticeship program and are progressing towards certification.

Through the OETIO, Baffinland has registered two classes of 12 Inuit to receive training. These Inuit participants can use the training obtained for employment with Baffinland or other industries requiring heavy equipment operators.



**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland views offering training programs as a fundamental component of expanding the Inuit workforce for the Project.

Baffinland will continue to develop and implement new initiatives that will support education and capacity-building for the North Baffin region. This will ensure that Inuit, particularly those from the North Baffin, continue to develop new skillsets for advancement at the Project.

## Project Certificate Condition No. 137

Category	Education and Training - Transferable skills and training
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	Offering training which results in certifications that are valid for employment at more than one site or in different fields provides an investment in the long-term employability of Nunavummiut.
Term or Condition	Prior to construction, the Proponent shall develop an easily referenced listing of formal certificates and licences that may be acquired via on-site training or training during employment at Mary River, such listing to indicate which of these certifications and licences would be transferable to a similar job site within Nunavut. This listing should be updated on an annual basis, and is to be provided to the NIRB upon completion and whenever it is revised.
Relevant BIM Commitment	92
Reporting Requirement	The initial listing should be provided to the NIRB at least 60 days prior to the start of construction, an annually thereafter or as may otherwise be required.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2017 SEMWG Meeting Records
Ref. Document Link	Appendix C3

### METHODS

On-site and on-the-job training is delivered in all departments and employment-types at the Project site. Many of the resultant certificates or licenses are transferable to other jobs within Nunavut. A summary of the transferable skills/certificates delivered includes:

- Fall Arrest
- First Aid (Standard)
- Mine Rescue Training (MRT); including, but not limited to: Cold Water Rescue, Small Vessel Operation and High Angle Rescue
- Bear Awareness
- Fire Extinguisher
- Light Vehicle Training and Fuelling
- Mobile Support Equipment (Machine Specific, I.E., Skid Steer, Aerial Lift, etc.)
- Ore Truck (B-Train)
- Ship Loader Operations
- Hoisting and Rigging Basics
- Defensive Driving
- Mine Licence
- Transportation of Dangerous Goods (TDG)
- Fall Arrest Evaluation
- Standard Safety Training; (Field Level Risk Assessments (FLRA), Job Hazard Analysis (JHA), etc.)
- Spill Response
- Environmental Protection Plan
- Zero Energy State Lock Out / Tag Out
- Power Mobile Equipment Operation (Machine Specific, I.E., CAT 740, CAT 777, etc.)
- WHMIS (Workplace Hazardous Materials Information System)
- Crusher Operation
- Aerial Work Platform
- 5-S System
- Aircraft De-Icing
- Six-Sigma Green Belt and Yellow Belt

Baffinland delivers training that is job specific. The above listing, although not exhaustive, is subject to operational need. It is noteworthy that due to poor internet connections in some communities, employees who reside in the North Baffin Communities upon hire complete the full suite of training once they arrive onsite for their first employment rotation.

In 2017, Baffinland also provided training to both the Baffinland Community Liaison Officers and QIA Community Liaison Officers. This training provided participants with insight into presentation preparation and delivery as well as issues resolution.

### **RESULTS**

A total of 43,397 hours of training were delivered in 2017, including 4,024 hours of training to Inuit workers. Training programs with the highest levels of Inuit participation in 2017 included heavy equipment operator (1,803 hours), site orientation (923 hours), mobile support equipment (445 hours), and ore haul truck (121 hours).

### **TRENDS**

Not applicable.

### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor and evaluate training programs to ensure that training is effective and offers employees the opportunities to advance in their chosen careers and to develop transferable skills. New initiatives and programs are being considered to enhance the subject matter of training (i.e. Mental Health and First Aid Programs, Inuktitut as a Second Language) as well as enhance the support that is offered by Baffinland Management to Project employees.

Baffinland will also continue to work with contractors to ensure Inuit content in the form of training opportunities and to explore new skills development initiatives. Training programs are expected to continue to evolve at the Project as operations advance, employment increases, and feedback from Inuit employees is considered.

## Project Certificate Condition No. 138

Category	Education and Training - Inuit employee training
Responsible Parties	The Proponent, Qikiqtani Inuit Association (QIA)
Project Phase(s)	Construction
Objective	Working together with the QIA to prepare effective training programs developed specifically for Inuit will assist in employee preparedness and may improve employee retention
Term or Condition	The Proponent is encouraged to work with the QIA to ensure the timely development of effective Inuit training and work-ready programs
Relevant BIM Commitment	92
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2017 SEMWG Meeting Records
Ref. Document Link	Appendix C3

### METHODS

Throughout 2017 Baffinland and the QIA continued to work closely to identify candidates for training opportunities, and to secure additional government funding to support the provision of the skills necessary to gain meaningful and long term employment at Baffinland.

Baffinland together with the QIA, as a project partner, is currently engaged in the implementation of the Qikiqtani Skills and Training Partnership (QSTEP) program. This program is designed to prepare Inuit for employment both at the Project and elsewhere in the region through a number of training-to-employment initiatives. This program will boost skills development across the Qikiqtani Region, with a focus on training in the mining sector, for a four-year period ending on March 2021.

Baffinland and the QIA also approved an Inuit Human Resource Strategy in 2017. Its purpose is to describe the underlying values, goals and high-level initiatives that Baffinland, in cooperation with QIA and other stakeholders as appropriate, will undertake to implement the provisions of the Inuit Impact and Benefit Agreement (IIBA) relating to employment, education and training in respect of Inuit.

### RESULTS

The Q-STEP program has been announced and is being implemented. This program is partially supporting Baffinland's Work Ready, Apprenticeship, and Heavy Equipment Operator training programs.

The approved Inuit Human Resource Strategy will guide the work of the Baffinland Human Resources Department. Baffinland and the QIA are developing procedures to operationalize the Inuit Human Resources Strategy. These procedures will be finalized in early 2018.

### TRENDS

Not Applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to work closely with the QIA to implement the employment and education and training provisions of Mary River Project IIBA. Through the Joint Management Committee, Baffinland and the QIA work to monitor training initiatives, develop and plan for new potential opportunities, and jointly review proposed activities that may lead to improved retention among Inuit employees.

## Project Certificate Condition No. 139

Category	Education and Training - Hiring southern Canadians and foreign employees
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	With the unknown availability of labour from the North Baffin region and Nunavut as a whole to provide employment to the Project, the need to employ southern Canadians or foreign workers may implicate the Proponent's on-site language, cross-cultural awareness, and other programming. Having information available regarding the sourcing of labour for the Project is important to ensuring the Proponent and others are prepared for any influx of southern or foreign employees.
Term or Condition	Prior to commencing construction, the Proponent is requested to undertake and provide the results of a detailed labour market analysis which provides quantitative predictions of the number of employees that may reasonably need to be sourced from southern Canada and from foreign markets, identifying where applicable, the country of origin for the foreign labour. Within 90 days of the issuance of the Project Certificate, the Proponent is required to submit an updated Labour Market Analysis which considers requirements of the ERP as well as hiring points within Nunavut and outside of the North Baffin region and RSA.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Mary River Socio-Economic Monitoring Working Group
Reference	2017 SEMWG Meeting Records
Ref. Document Link	Appendix C3

### METHODS

A revised labour market analysis was presented in the 2014 Annual Report to the NIRB (Baffinland, 2015c).

### RESULTS

The 2014 analysis concluded the following:

- After preference is given to local Inuit and local non-Inuit employees, there will be a requirement to source talent from the rest of Nunavut.
- After this, it will be necessary to source talent from a broader region. The remainder of the talent required can be sourced from the fly in/fly out hub of Waterloo, Ontario and from additional locations across Canada, if necessary.
- There will be sufficient talent available in the Greater Toronto Area to fill all of the corporate office positions.
- It will not be necessary to source employees internationally.

### TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

A revised labour market analysis was undertaken in 2017. This information will be used to support planning of the proposed Phase 2 Expansion Project. The updated labour market analysis will be submitted as part of the environmental assessment documentation for the Phase 2 Expansion Proposal Project.

## Project Certificate Condition No. 140

Category	Education and Training - Survey of Nunavummiut employees
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	Monitoring the number of employees who leave previous employment in their home communities or who leave some type of formal education in pursuit of employment with the Project is important to evaluate predictions made and the potential impacts to North Baffin communities and education rates.
Term or Condition	The Proponent is encouraged to survey Nunavummiut employees as they are hired and specifically note the level of education obtained and whether the incoming employee resigned from a previous job placement or educational institution in order to take up employment with the Project.
Relevant BIM Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

In January 2018, Baffinland implemented a revised voluntary Inuit Employee Survey, which collected information related to employee level of education obtained and whether the employee resigned from a previous job placement or educational institution in order to take up employment with the Project. The revised survey also addressed several other topics related to Project Certificate terms and conditions, and IIBA requirements. Baffinland and the QIA worked together on developing this new survey and jointly administered it on-site. This survey was offered to Inuit employees and contractors at the Mary River Project. Baffinland continues to discuss the content and results of the workplace survey with members of the Mary River SEMWG (including GN, QIA, and INAC representatives) and will continue to solicit feedback on potential improvements to the survey.

*Note: Baffinland has experienced certain planning challenges when implementing its recent employee surveys. For this reason, the survey discussed in the 2017 Socio-Economic Monitoring Report was completed in January 2018, while the survey discussed in the 2016 Socio-Economic Monitoring Report was completed in February/March 2017. Baffinland is working to address this timing discrepancy moving forward.*

### RESULTS

A total of 71 surveys were completed by Inuit employees and contractors. Table 4.35 summarizes results on the highest level of education obtained by survey respondents. 38.0% of respondents had no certificate, diploma, or degree. 22.5% had a high school diploma or equivalent, 5.6% had an apprenticeship or trades certificate or diploma, and 4.2% had a college, CEGEP, or other non-university certificate or diploma. 0.0% had any type of university certificate, diploma, or degree, and 29.6% of



respondents had unknown educational levels ( $n=71$ ). When 'unknown' results are removed, 54.0% had no certificate, diploma, or degree, 32.0% had a high school diploma or equivalent, and 14.0% had higher than a high school diploma or equivalent.

**Table 4.35 Highest Level of Education Obtained (2018 Inuit Employee Survey Results)**

Highest Level of Education	Number of Respondents	Percentage of Respondents
No certificate, diploma or degree	27	38.0%
High school diploma or equivalent	16	22.5%
Apprenticeship or trades certificate or diploma	4	5.6%
College, CEGEP or other non-university certificate or diploma	3	4.2%
University certificate or diploma below bachelor level	0	0.0%
University certificate, diploma or degree - Bachelor's degree	0	0.0%
University certificate, diploma or degree above bachelor level	0	0.0%
Unknown	21	29.6%
<b>Total</b>	<b>71</b>	<b>99.9%</b>

**NOTES:**

1. Source: 2018 Inuit Employee Survey.
2. Total percentage may not equal 100.0% due to rounding.

Table 4.36 summarizes results on the employment status of survey respondents prior to Project employment. 31.0% of respondents resigned from a previous job in order to take up employment with the Project, while 67.6% did not. Results were unknown for 1.4% of respondents ( $n=71$ ). When 'unknown' results are removed, 31.4% resigned from a previous job in order to take up employment with the Project while 68.6% did not. Of those respondents that resigned from a previous job in order to take up employment with the Project ( $n=22$ ), 22.7% (or 7.1% of known survey responses) had casual employment status, 9.1% (or 2.9% of known responses) had part-time employment status, and 68.2% (or 21.4% of known responses) had full-time employment status.

**Table 4.36 Employment Status Prior to Project Employment (2018 Inuit Employee Survey Results)**

Pre-Employment Status	Number of Respondents	Percentage of Respondents
<i>Did you resign from a previous job in order to take up employment with the Mary River Project? (n=71)</i>		
Yes	22	31.0%
No	48	67.6%
Unknown	1	1.4%
<b>Total</b>	<b>71</b>	<b>100.0%</b>
<i>If yes, what was your previous employment status? (n=22)</i>		
Casual	5	22.7%
Part-time	2	9.1%
Full-time	15	68.2%
<b>Total</b>	<b>22</b>	<b>100.0%</b>

**NOTES:**

1. Source: 2018 Inuit Employee Survey.

Table 4.37 summarizes results on the education status of survey respondents prior to Project employment. 9.9% of respondents were enrolled in an academic or vocational program at the time of their hire at the Project, while 81.7% were not. Results were

unknown for 8.5% of respondents ( $n=71$ ). When 'unknown' results are removed, 10.8% of respondents were enrolled in an academic or vocational program at the time of their hire at the Project while 89.2% were not. Of those respondents that were enrolled in an academic or vocational program at the time of their hire at the Project ( $n=7$ ), 28.6% (or 3.1% of known survey responses) suspended or discontinued their education because they were hired to work at the Project while 71.4% (or 7.7% of known responses) did not.

**Table 4.37 Education Status Prior to Project Employment (2018 Inuit Employee Survey Results)**

Pre-Employment Status	Number of Respondents	Percentage of Respondents
<i>Were you enrolled in an academic or vocational program at the time of your hire at the Mary River Project? (n=71)</i>		
Yes	7	9.9%
No	58	81.7%
Unknown	6	8.5%
<b>Total</b>	<b>71</b>	<b>100.1%</b>
<i>If yes, did you suspend or discontinue your education because you were hired to work at the Mary River Project? (n=7)</i>		
Yes	2	28.6%
No	5	71.4%
<b>Total</b>	<b>7</b>	<b>100.0%</b>

**NOTES:**

1. Source: 2018 Inuit Employee Survey.
2. Total percentage may not equal 100.0% due to rounding.

**TRENDS**

2018 was the second year questions on employee level of education obtained and whether the employee resigned from a previous job placement or educational institution in order to take up employment with the Project were included in the workplace survey; as such, no long-term trends are yet apparent. However, Baffinland will continue to administer this survey on an annual basis and report on any observed future trends.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to administer the workplace survey on an annual basis. Baffinland will also continue to solicit feedback on potential improvements to the survey from SEMWG members on an ongoing basis.

## Project Certificate Condition No. 141

Category	Education and Training - Training of Inuit
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To ensure that effective training is available in a timely manner.
Term or Condition	The Proponent is encouraged to work with the Qikiqtani Inuit Association prior to construction in order to prioritize the provision of training of Inuit to serve as employees in monitoring or other such capacities.
Relevant BIM Commitment	92
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA), Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

This PC Condition is focused on Baffinland working cooperatively with the Qikiqtani Inuit Association (QIA) to prepare the local workforce for mine construction. Mine construction was last undertaken in 2013 and 2014 but a new construction phase is anticipated subject to regulatory approval of the Phase 2 Expansion Project.

Baffinland continues to work collaboratively with the QIA to promote Inuit training, education and employment, consistent with the provisions of the Inuit Impact Benefit Agreement (IIBA). The Inuit Training and Employment Coordinators from Baffinland and the QIA are to work closely with the Joint Management Committees to ensure the timely development of training.

In July 2017, QIA, with the support of Baffinland in the form of a commitment of approximately \$9.4 million, comprising both cash and in-kind contributions, applied for the funding under the Skills Partnership Fund administered by Employment and Social Development Canada. If the application is successful, funding will be applied to the Q-STEP program developed by QIA. Q-STEP is a four-year initiative intended to provide Inuit with skills and qualifications to meet the employment needs of the Mary River Project during both construction and operations as well as other employment opportunities in the region. The program will consist of both work readiness measures as well as targeted training programs directed at apprenticeships, skills development, supervisor training and formal certification in heavy equipment operation. The program will be implemented through the joint efforts of Baffinland and QIA.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland recognizes the need to institute training programs at the earliest stage to ensure that potential Inuit employees are equipped with the necessary skills to take advantage of employment opportunities at the Mary River Project. Baffinland's new Inuit Human Resources Strategy prioritizes pre-employment skills development is being further advanced through the delivery of a revised Work Readiness program.

### 4.7.3 Livelihood & Employment (PC Conditions 142 through 147)

The Project provides direct and indirect employment opportunities to residents of the five (5) North Baffin communities and other Nunavummiut.

Six (6) PC conditions relate to potential impacts of the Project on livelihood and employment. The conditions identify actions that Baffinland and other parties (the GN, QIA and the Nunavut Housing Corporation) should undertake to remove barriers to employment of Inuit, including those barriers faced by Nunavummiut with limited or no previous wage employment experience; women; those living in social housing (the majority of Nunavummiut); and unilingual candidates.

The IIBA outlines the commitments Baffinland has made to ensuring the North Baffin communities benefit from employment opportunities of the Project. Baffinland and QIA also establish an annual Minimum Inuit Employment Goal (MIEG) to set a target for Inuit employment and to outline the actions that need to be taken to meet it.

Baffinland and QIA initiated the development of an Inuit Human Resources Strategy (IHRS) in 2016. The IHRS was finalized with QIA in 2017.

#### *Stakeholder Feedback*

Discussions around livelihood and Project-related employment opportunities continue to be a key focus of the comments provided by community members and other stakeholders during public meetings. Comments when Baffinland hosts public meetings in the communities (Appendix B). The SEMWG and QSEMC also regularly discuss this element of the Project (Appendices C3 and C4).

#### *Monitoring*

Baffinland tracks and reports on the Inuit employment levels reached each year. This information is presented in quarterly IIBA reports to the QIA, and annually in the socio-economic monitoring report. Furthermore, Baffinland has provided information on potential barriers to employment for women in the 2017 Socio-Economic Monitoring Report for the Mary River Project. This includes indicator data on hours worked by female employees and contractors, and information on childcare availability and costs. Table 4.38 provides an evaluation of the Project's impacts on employment, relative to predictions presented in the FEIS and to the 2017 MIEG.

Although the level of Inuit participation in the Project's workforce (13.5% of the total hours worked in 2017) was largely consistent with FEIS predictions (e.g. consistent with North Baffin LSA predictions, but slightly lower than LSA predictions), it was below the 2017 MIEG.

#### *Path Forward*

Baffinland continues to refine its Inuit human resources programs and remains committed to meeting Inuit employment targets. The new Baffinland Apprenticeship Program, the development of a labour pool of multi-skilled Inuit Heavy Equipment Operators, implementation of the Q-STEP training program (in conjunction with QIA) and other actions to meet the MIEG should also assist with increasing employment in the North Baffin communities. The establishment of an annual MIEG with the QIA and finalization of Baffinland's IHRS and Inuit Contracting and Procurement Strategy (ICPS) should also support increased Project-related employment levels in the North Baffin communities. Baffinland will continue to monitor Inuit employment levels at the Project for future trends. Reporting on each PC condition follows.

**Table 4.38 Livelihood and Employment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Wage Employment	Employment of LSA residents	<p>Direct employment in 2017 included 313,068 hours worked by LSA residents (Inuit and non-Inuit), representing 13.1% of total worked in Nunavut (2,380,990 hours). This is slightly lower than FEIS predictions for the total labour supply potential of 342,000 h/a, but slight higher than in 2016.</p> <p>Of this, 229,658 hours were worked by North Baffin LSA residents (representing 9.6% of the total). This is consistent with FEIS predictions of 230,000 h/a for the North Baffin LSA labour supply potential.</p> <p>Project hours worked by North Baffin LSA residents decreased (by 1,074 hours) from 2016, while Project hours worked by Iqaluit residents increased (by 8,306 hours) from 2016. Inuit individuals worked 277,454 Project hours in 2017 (representing 14.7% of the total. Approximately, 1,181 full time equivalent (FTE) positions were held in 2017 of which 159 FTEs (13.5%) were held by Inuit individuals at the Project in 2017. This is below the 2017 MIEG of 25% set by Baffinland and the QIA.</p>	Positive effects consistent with FEIS predictions
	Creation of indirect jobs within the LSA	<p>Spending on Inuit businesses is an indicator of potential indirect employment: In 2017, eighteen contracts worth approximately \$387.2 million were awarded to Inuit-owned businesses and joint ventures. All of the contracts were awarded to Inuit-owned businesses and joint ventures in the LSA. Procurement values in 2017 were higher than in 2016 (i.e. by \$322.8 million). Total procurement (with Inuit and non-Inuit firms) in 2017 totaled \$1,068.0 million. Since Project development, a total of \$819.1 million worth of contracts have been awarded to Inuit-owned businesses and joint ventures.</p>	Positive effects consistent with FEIS predictions
Job Progression and Career Advancement	Expanded employment and career development options	A total of 3 Inuit workers received promotions in 2017.	Positive effects consistent with FEIS predictions

## Project Certificate Condition No. 142

Category	Livelihood and Employment - Employee Cohesion
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To promote cohesion between employees on site, and between employees and their families.
Term or Condition	The Proponent is encouraged to address the potential direct and indirect effects that may result from Project employees' on-site use of various Inuktitut dialects as well as other spoken languages, specifically paying attention to the potential alienation of some employees that may occur as a result of language or other cultural barriers.
Relevant BIM Commitment	105
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA), Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland's Inuktitut in the Workplace Policy outlines the corporate position respecting support for the use of Inuktitut at all sites in Nunavut and ensures that a lack of proficiency in English will not be a barrier to Inuit employment, subject to considerations of health and safety. The Inuktitut in the Workplace Policy has been shared with the QIA at both the Executive and Management Committees and was updated in 2017.

Although the working language at the Mine and Port Sites is English, the Company supports the principle of increased use of Inuktitut in the workplace over the lifetime of the Project. Baffinland is looking to further reduce barriers associated with language through increased use of bilingual signs and documents, and the use of graphics and symbol where possible. While on-site training is delivered in English, two site Elders are available to provide ongoing support for Inuit employees and to provide translation and interpretation services when required as outlined in the Inuktitut in the Workplace Policy

Pursuant to Article 11.6 of the IIBA, Baffinland provides Inuit employees with access to professional career counselling and professional counselling for personal problems on an as-needed basis. Services are available from Inuktitut speaking counsellors. Baffinland is also in the process of updating the company website with news articles and other information related to the Project. It is intended that the website will be bilingual (English and Inuktitut).

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 143

Category	Livelihood and Employment - Employee family contact
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To enable and foster connection and contact between employees and family members.
Term or Condition	The Proponent is encouraged to consider the use of both existing and innovative technologies (e.g. community radio station call-in shows, cell phones, video-conferencing, Skype, etc.) as a way to ensure Project employees are able to keep in contact with family and friends and to ward off the potential for feelings of homesickness and distance to impact on employee retention and family stability.
Relevant BIM Commitment	N/A
Reporting Requirement	As needed
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Internet and telephone access is available free of charge to employees in the bunkhouse rooms at site, and in some common areas. Bandwidth and utilization levels may limit the use of some applications.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 144

Category	Livelihood and Employment - Requirements for employment
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To ensure that the prerequisites and requirements for employment are clear and well known in work readiness programs.
Term or Condition	The Proponent is encouraged to make requirements for employment clear in its work-readiness and other public information programs and documentation, including but not limited to: education levels, criminal records checks, policies relating to drug and alcohol use and testing, and language abilities.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland Community Liaison Officers (BCLOs) communicate these requirements to individuals who drop off their résumés to Baffinland. Job postings also identify many of these requirements. Employment requirements are made clear to potential employees during pre-screening for Work Ready training. They are also reviewed during pre-screening for new hiring. These requirements (background check, criminal record check and medical) are included in the employment agreement that new employees receive and sign.

From April 3-7, 2017, Baffinland hosted a Career and Training Information Tour in the five (5) North Baffin communities. An important component of the information presented during this tour related to sharing description of the various pre-employment and work-readiness requirements to interested community members.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland is continuously seeking ways to increase Inuit employment in the Project and to provide relevant and meaningful training opportunities for local community members. Baffinland plans to implement the Inuit Hiring Strategy (IHS) in 2018, following implementation of the IHS Baffinland will iteratively evaluate the success of its communication strategy for sharing information related to employment-requirements with interested potential candidates.

In 2017 Baffinland, in partnership with the Mining Industry Human Resources Council, worked to implement a pilot 'Mining Essentials' (Work Ready Program) in Igloolik. The free program is designed to help prepare Inuit for a career in mining, providing practical skills and teaching Inuit what it is like to work in a heavy industrial setting. The program will also provide skills for Inuit to adapt to the unique challenges of a fly-in/out, two-weeks-on/off working rotation. Unfortunately, due to a lack of uptake in the program in Igloolik, the pilot program has been rescheduled to begin in early-2018 in the community of Pond Inlet.

## Project Certificate Condition No. 145

Category	Livelihood and Employment - Barriers to employment for women
Responsible Parties	The Proponent, Government of Nunavut, members of QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor and understand the existence of barriers to employment for women specifically relating to childcare availability and costs.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut and the Qikiqtaaluk Socio-Economic Monitoring Committee to monitor the barriers to employment for women, specifically with respect to childcare availability and costs.
Relevant BIM Commitment	43, 45
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland has provided information on potential barriers to employment for women in the 2017 Socio-Economic Monitoring Report. This includes indicator data on hours worked by female employees and contractors, and information on childcare availability and costs. Furthermore, specific reference is made in the Mary River Project Inuit Impact and Benefit Agreement (IIBA) to women in the workplace and the associated barriers they may face. This topic is addressed by Baffinland and QIA through Section 7.15 of the IIBA.

### RESULTS

Table 4.39 presents the hours (and percentage of hours) worked by women and men on the Project in Nunavut-based positions from 2013 to 2017. In 2017, 162,550 hours (or 6.8% of total hours worked on the Project) were worked by women, which is 11,422 hours more than documented for 2016. The percentage of hours worked by Inuit and non-Inuit women in 2017 were similar (3.6% and 3.2%, respectively). However, the percentage of hours worked by Inuit women compared to Inuit males on the Project (approximately 26.8% of this total) was much higher than non-Inuit women compared to non-Inuit males (approximately 3.7% of this total) in 2017. A similar trend was noted from 2013 to 2016.

Appropriate community-level indicator data are currently unavailable for the topic of 'childcare availability and costs'. As such, this topic continues to be tracked through the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Baffinland's community engagement program (and is reported on in the annual socio-economic monitoring report). Baffinland acknowledges securing access to adequate childcare remains an issue in some parts of Nunavut and can act as a barrier to employment for women. While Baffinland will continue to track this issue in future socio-economic monitoring reports, it is apparent that women continue to face barriers to employment in the Canadian mining industry as a whole. Further details on this are provided in the 2017 Socio-Economic Monitoring Report.

## TRENDS

While Baffinland has continued to encourage the employment of women at the Project, women work considerably fewer hours on the Project than their male counterparts. Baffinland will continue to track this issue in future socio-economic monitoring reports.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland continues to provide information on potential barriers to employment for women through its socio-economic monitoring program. However, only limited data are available for the topic of 'childcare availability and costs'. As such, this topic continues to be tracked through the QSEMC and Baffinland's community engagement program. Baffinland will also continue discussing with the Mary River Socio-Economic Monitoring Working Group (SEMWG) how improved indicator data may be obtained for this.

Baffinland notes that the Government of Nunavut (GN) commented that Baffinland should investigate the feasibility of using the Ilagiiiktunut Nunalinnullu Pivalliajutsait Kiinaujat (INPK) to provide additional supports to community daycares or child care services over and above what is available through the GN's Start-Up Contribution program. Baffinland supports two funds established under the IIBA, which could potentially be accessed to provide additional supports to community daycares or child care services in the LSA. While Baffinland makes significant financial contributions to these funds, they are administered solely and exclusively by the QIA. It is possible these funds could be used to provide additional supports over and above what is available through the Government of Nunavut's start-up contribution program; however, all decision-making on this matter rests with the QIA. The funds include:

- Ilagiiiktunut Nunalinnullu Pivalliajutsait Kiinaujat (INPK) Fund
  - Fund provides up to \$750,000/year for projects in the Qikiqtaaluk Region which enhance community wellness (equal annual contributions of \$375,000 by QIA and Baffinland).
  - Fund objectives include the creation of opportunities for community capacity building, the fair distribution of impacts and benefits between communities and across generations, maintenance of consistency with community development objectives, and promotion of mutual understanding and learning.
  - Application details can be found at: <http://qia.ca/programs/ilagiiiktunut-fund/>
- Business Capacity and Start-Up Fund
  - Fund provides up to \$250,000/year to Designated Baffin Inuit Firms (solely funded by Baffinland).
  - Fund helps with start-up capital and financing, management development, ongoing business management, financial management, contracts and procurement or human resources management.

Application details can be found at: <http://qia.ca/programs/business-capacity-start-up-fund/>

Baffinland engages with both the GN and the QIA on issues related to employment turnover rates, and access to childcare through the SEMWG. Baffinland remains open to discussing these issues with the GN and the QIA further as part of engagement with these groups through the SEMWG.

**Table 4.39 Hours Worked by Project Employees and Contractors in Nunavut (2013 to 2017)**

Hours Worked by Project Employees and Contractors in Nunavut, by Ethnicity and Gender											
Employee Ethnicity & Gender		2013		2014		Q4 2015 <sup>4</sup>		2016		2017	
		Hours Worked	% of total (863,177)	Hours Worked	% of total (1,867,882)	Hours Worked	% of total (430,244)	Hours Worked	% of total (1,881,506)	Hours Worked	% of total (2,380,990)
Inuit	Male	124,754	14.5%	267,169	14.3%	54,794	12.7%	208,592	11.1%	235,038	9.9%
	Female	49,611	5.8%	112,437	6.0%	20,732	4.8%	68,862	3.7%	85,988	3.6%
Non-Inuit	Male	639,468	74.1%	1,394,204	74.6%	336,124	78.1%	1,521,786	80.9%	1,983,402	83.3%
	Female	49,200	5.7%	94,072	5.0%	18,594	4.3%	82,266	4.4%	76,562	3.2%
<b>TOTAL</b>		<b>863,177</b>	—	<b>1,867,882</b>	—	<b>430,244</b>	—	<b>1,881,506</b>	—	<b>2,380,990</b>	—

**NOTES:**

 1. Source: Baffinland<sup>1</sup>

This table includes employees and contractors who worked on the Project in Nunavut-based positions (including community-based Baffinland positions). This table does not include individuals who worked on the Project in non-Nunavut based positions, Baffinland corporate head office staff, or off-site contractors.

<sup>4</sup> As Baffinland's human resources data management system was in the process of being developed, some information gaps were unable to be reconciled in 2015. In 2015, gender data related to hours worked was only available for Q4.

## Project Certificate Condition No. 146

Category	Livelihood and Employment - Availability of childcare for Project Employees
Responsible Parties	Government of Nunavut and Qikiqtani Inuit Association
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To lessen the barriers to employment as relating to the availability of childcare.
Term or Condition	The Government of Nunavut and the Qikiqtani Inuit Association are strongly encouraged to investigate the possibility for Project revenue streams to support initiatives or programs, which offset or subsidize childcare for Project employees.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

This PC Condition is not directed at Baffinland. See PC Condition 145 for Baffinland's work with the SEMWG in this area.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 147

Category	Livelihood and Employment - Affordability of housing
Responsible Parties	The Proponent, Government of Nunavut and Nunavut Housing Corporation
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To lessen the barriers to maintaining employment as relating to the availability and costs of housing.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut and the Nunavut Housing Corporation to investigate options and incentives which might enable and provide incentive for employees living in social housing to maintain employment as well as to negotiate for and obtain manageable rental rates.
Relevant BIM Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Government of Nunavut (Nunavut Housing Corporation; Community and Government Services; Economic Development and Transportation); Mary River Socio-Economic Monitoring Working Group (SEMWG); Qikiqtani Socio-economic Monitoring Committee (QSEMC)
Reference	2017 SEMWG Meeting Records 2017 QSEMC Meeting Records
Ref. Document Link	Appendices C3 and C4

### METHODS

Baffinland discusses housing related issues with the SEMWG, of which the Government of Nunavut (including Nunavut Housing Corporation) are active participants.

At the July 5 and 6, 2017 QSEMC meeting, concerns related to public housing were discussed by the participants.

### RESULTS

Not applicable

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Housing in Nunavut is the responsibility of the Government of Nunavut and the Nunavut Housing Corporation NHC. Baffinland will continue to participate with these parties on related housing issue discussions and as requested and can advocate for more work-friendly social housing policies for its workers.

#### 4.7.4 Economic Development, Self Reliance, and, Contracting and Business Opportunities (PC Conditions 148 through 152)

Five (5) PC conditions relate to the potential impacts of the Project on economic development and self-reliance, and contracting and business opportunities. The objectives of the conditions are to: encourage Baffinland to investigate what measures the Proponent could take to encourage home ownership; promote the contracting of Inuit firms by contracting with smaller work packages; undertake collaborative monitoring with regional agencies to evaluate the Project's interactions with harvesting and food security; outline measures to minimize impacts on park users; and to complete an assessment of the risk presented by temporary mine closure on local employment and economic development.

##### *Stakeholder Feedback*

With respect to economic development, local communities, the QIA, the GN, and the federal government are all key stakeholders. As with employment, these stakeholders are interested to see the Project deliver and induce economic development in the region. Conversely, concerns were expressed regarding the potential negative effects or challenges associated with temporary or early closure of the Project. Commitments and contracting guidelines are contained in the IIBA to encourage contracting of Inuit firms, and an Inuit Contracting and Procurement Strategy (ICPS) has recently been finalized. Procurement and contracting workshops were held in Pond Inlet and Iqaluit in 2017 (Appendix B).

##### *Monitoring*

Baffinland tracks and reports on the amount spent on contracting with Inuit firms each year and on LSA payroll amounts. Baffinland has also presented information on Project harvesting interactions and food security, household income and food security, and landuser-Project interactions in the 2017 socio-economic monitoring report. Table 4.40 provides an evaluation of the Project's impacts on economic development and self-reliance, and contracting and business opportunities based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

Positive effects with respect to aspects of the economy in the North Baffin communities have accrued as a result of Project employment.

##### *Path Forward*

Baffinland recently finalized an ICPS jointly with the QIA, to further enhance business opportunities to Inuit companies in the Qikiqtani Region and within Nunavut. Baffinland will continue to monitor and report on Project-related economic-development effects in future years. Reporting on each PC condition follows.



**Table 4.40 Economic Development Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Land	Mine operation and ongoing construction activities causing increased industrial utilization of land, may affect harvesting and travel, or result in changes to how people engage in the land-based economy	Effects are difficult to monitor and assess. However, 154 land use visitor person-days were recorded at Project sites in 2017, which indicates these sites continue to be used for land use activities.	N/A
People	Employment, training and contracting resulting in increased human capacity and well-being; opportunities for youth, improved education and training; and increased wealth and well-being	Baffinland's 2017 Socio-economic Monitoring Report presents 2017 employment and contracting statistics, discussed also in Section 3.5.3. GN (2015) also reported positive feedback from Igloolik and Pond Inlet in regard to Project employment bringing observable benefits to the communities, and GN (2016) reported positive benefits accruing to the LSA as a whole.	Positive effects consistent with FEIS predictions
Community Economy	Employment of North Baffin residents resulting in an improved ability to achieve strategic community development objectives; increased wealth in community; increased local business opportunities	Employment monitoring and results are described in Section 3.5.3. In 2017, eighteen contracts worth approximately \$387.2 million were awarded to Inuit-owned businesses and joint ventures. All of the contracts were awarded to Inuit-owned businesses and joint ventures in the LSA. Procurement values in 2017 were higher than in 2016 (i.e. by \$322.8 million). Total procurement (with Inuit and non-Inuit firms) in 2017 totaled \$1,068.0 million. Since Project development, a total of \$819.1 million worth of contracts have been awarded to Inuit-owned businesses and joint ventures. Furthermore, Baffinland's LSA employee payroll expenditures (in Canadian dollars, not including contractors, but including both Inuit and non-Inuit employees) totaled \$8,313,897.59 in 2017.	Positive effects consistent with FEIS predictions
Territorial Economy	Employment of Nunavut residents causing growth in the territorial economy Expanded economic activity (GDP) Increased diversity of territorial economy	Impacts to the territorial economy consist of employment (Section 3.5.3) and contracting within Nunavut (see above), as well as corporate and payroll taxes, mineral royalties (once they begin), and IIBA payments.	Positive effects consistent with FEIS predictions

## Project Certificate Condition No. 148

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – Food security
Responsible Parties	The Proponent, Members of the QSEMC
Project Phase(s)	Construction and Operations
Objective	To improve understanding of the interactions between the Project and Inuit harvesting and how this relates to food security for residents of the North Baffin.
Term or Condition	The Proponent is encouraged to undertake collaborative monitoring in conjunction with the Qikiqtaaluk Socio-Economic Monitoring Committee’s monitoring program which addresses Project harvesting interactions and food security and which includes broad indicators of dietary habits.
Relevant BIM Commitment	45
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSCL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland has provided information on potential Project harvesting interactions and food security in the 2017 Socio-Economic Monitoring Report.

### RESULTS

Appropriate community-level and/or Project-level indicator data are currently unavailable for this topic. As such, this topic continues to be tracked through the QSEMC process, Baffinland’s community engagement program, and a suite of related indicators (and is reported on in the annual socio-economic monitoring report). For example, comments on harvesting, food security, and Project-harvesting interactions continue to be received through Baffinland’s community engagement program. Some territorial-scale (but not community-level or Project-level) data are also available on rates of harvesting and food security amongst Nunavummiut. Additional indicator data related to this topic are presented on proportion of tax filers with employment income, median employment income, percentage of population receiving social assistance, number of recorded land use visitor person-days at Project sites, and number of Wildlife Compensation Fund claims.

Results provided in the 2017 Socio-Economic Monitoring Report confirm that harvesting and consumption of country food remain a valued and important part of the Inuit culture and diet. Some concerns have been expressed about potential negative interactions between the Project and local harvesting. Concerns have also been expressed about declining rates of country food consumption and the lack of food security in Nunavut, generally.

There are indications the Project continues to improve household income and food security in the Local Study Area (LSA), by providing LSA residents with meaningful incomes (through employment) that enable the purchase of food and support the

participation in harvesting activities. Baffinland also contributes to various community wellness initiatives directly (e.g. through the INPK Fund in the IIBA, school meal program, seasonal country food exchange program, community food bank donations) and indirectly (e.g. through the *QIA Legacy Fund* and *QIA Benefits Fund*)<sup>5</sup>, which may assist individuals not directly benefiting from Project employment.

Monitoring data presented in the 2017 Socio-Economic Monitoring Report suggests Inuit land use and harvesting coexists with the Project. For example, local land users have continued to access Project sites and a total of 154 land use visitor person-days were recorded in 2017. Inuit employee harvesting is also permitted at the Project (subject to certain restrictions) although Baffinland's most recent Inuit Employee Survey indicates only minimal harvesting is currently being conducted.

The Nunavut Food Security Coalition (2014) has additionally outlined four components of food security and factors affecting each component: availability, accessibility, quality, and use. Baffinland acknowledges it has a role to play in each of these food security components but agrees with the Nunavut Food Security Coalition (2014: 2) who state that food security components "are influenced by many complex factors" and note "this critical and complex issue is larger than the mandate of any one organization. A collaborative approach is essential." Baffinland will continue making positive contributions to the four components of food security through initiatives commensurate with its role as a regional mineral developer. Baffinland's role in each of the four food security components identified by the Nunavut Food Security Coalition (2014) is found in the 2017 Socio-Economic Monitoring Report.

#### TRENDS

No long-term trends are yet apparent. However, Baffinland will continue to monitor issues associated with potential Project harvesting interactions and food security on an annual basis and report on any observed future trends.

#### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide information on potential Project harvesting interactions and food security through its socio-economic monitoring program. However, appropriate community-level and/or Project-level indicator data are currently not available for this topic. As such, this topic continues to be tracked through the QSEMC process, Baffinland's community engagement program, and a suite of related indicators. Baffinland will continue to discuss with the Mary River SEMWG how improved indicator data may be obtained for this topic.

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<sup>5</sup> The *QIA Legacy Fund* is designed to invest money for the future and help reduce Inuit reliance on outside funding over time by creating an internal pool of revenue for benefits and programs. It has been designed to ensure that revenues placed in it are never used for QIA operational purposes, thereby protecting long-term benefits for Inuit. Money that QIA will invest into the Legacy Fund includes IIBA payments from major projects such as the Mary River Project, money received from NTI from the mining of Inuit owned minerals, money received from sand and gravel projects on Inuit owned land, dividends from Qikiqtaaluk Corporation and the Nunasi Corporation, money received from any investments of the Legacy Fund, and surplus revenues from the QIA's Economic Development Fund, which is designed to receive money from licenses and leases on Inuit Owned Land. The *QIA Benefits Fund* is used to deliver programs to Inuit. As the Legacy Fund grows, revenues from it go to the Benefits Fund to increase programs for Inuit. The Benefits Fund is designed to receive annual payments from the Legacy Fund so that QIA can ensure a stable base of funding to run programs even if revenues change over time. The fund also allows for programs to expand in the future as the invested money grows (QIA, 2017).

## Project Certificate Condition No. 149

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – Impacts of temporary closure
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To further the understanding of how a temporary closure may impact on the well-being of the residents and businesses of the North Baffin region.
Term or Condition	Prior to the commencement of operations, the Proponent is required to undertake an analysis of the risk of temporary mine closure, giving consideration to how communities in the North Baffin region may be affected by temporary and permanent closure of the mine, including economic, social and cultural effects and taking into consideration the potential drop in employment between the construction and operations phases of the Project.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA), Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

The Potential Effects of a Mine Closure study was completed in 2014.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

When the Project is approaching closure, Baffinland will work with government and community stakeholders to implement programs to support employee transition. Baffinland employees will be able to demonstrate a solid work record and a variety of on-the-job and formal training experiences, which will assist them in their transition to new endeavours.

Baffinland is working with the QIA to develop a Mine Closure Working Group that will include members from the local communities and will address biophysical, economic and socio-economic issues related to temporary and permanent site closure.

## Project Certificate Condition No. 150

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – Impacts to visitors of Sirmilik National Park
Responsible Parties	The Proponent, Parks Canada
Project Phase(s)	Construction and Operations
Objective	To limit potential of Project impacts upon visitors, researchers and/or beneficiary users of the Sirmilik National Park.
Term or Condition	<p>The Proponent will ensure the following:</p> <ul style="list-style-type: none"> <li>a. The Proponent will maintain, where possible, a minimum flying altitude of 2,000 feet over the park, except for approaches to land, take-off or for safety reasons</li> <li>b. The Proponent will ensure that certification of noise compliance is current, where compliance is applicable</li> <li>c. For the purpose of briefing Park visitors, the Proponent will provide Parks Canada (1) prior to commencing the shipping season, with planned daily shipping schedules, and (2) annually, with air traffic information, and (3) to provide updates when significant variations from these are expected</li> <li>d. The Proponent is strongly encouraged to provide due consideration to wilderness experience during its operations in the open water season, especially during the month of August which is typically a time of high use by sea kayakers.</li> </ul>
Relevant BIM Commitment	34
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Parks Canada, Environment Climate Change Canada, Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board, Parks Canada
Reference	Environmental Protection Plan (Baffinland, 2016g) 2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	Management Plans available at: <a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a> Monitoring Reports available at: <a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

Pilots are made aware of the minimum flying altitude over the park and this condition is written into aviation contracts. Flight Height compliance was monitored in 2017 and is reported on in the 2017 Annual Terrestrial Report No flights over Sirmilik Park occurred in 2017 and therefore no noise implications are possible.

Parks Canada is made aware of the shipping schedules for each upcoming shipping season and any variations from the schedule.

In 2014, Baffinland worked directly with Parks Canada to develop a brochure on kayaking safely around large ships. The brochure was published in French, English and Inuktitut and installed in the Pond Inlet Parks office.

**RESULTS**

No flights over Sirmilik Park occurred in 2017.

Parks Canada continues to be appraised of shipping seasons through public accessible information.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to include the minimum flying altitude in aviation contracts and notify pilots of the condition.

Baffinland remains open to discussion with Parks Canada if updates to the brochure or other additional information is requested.

## Project Certificate Condition No. 151

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – Access to housing
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To investigate ways that economic development and self-reliance may improve access to housing by employees.
Term or Condition	The Proponent is encouraged to investigate measures and programs designed to assist Project employees with homeownership or access to affordable housing options.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Access to affordable housing in Nunavut is the responsibility of the Government of Nunavut and the Nunavut Housing Corporation. However, with the introduction of paid employment at the Project, Nunavut-based employees may be introduced to banking activities and programs, including savings and investment accounts and possible access to mortgages and similar opportunities, all of which may help employees with eventual home ownership.

Baffinland implemented a revised Inuit Employee Survey in January 2018, which collected data on employee housing status and other topics. This survey was offered to Inuit employees and contractors at the Mary River Project and will continue to be offered on an annual basis. Baffinland will report on any trends documented through this survey in future socio-economic monitoring reports.

### RESULTS

Currently, there is not a clear and direct relationship between Project employment and any measures or programs undertaken by Baffinland or others and home ownership. However, Project employment should eventually act to increase the purchasing power of local residents and decrease the number of individuals receiving income support. This is expected to occur primarily through increases in local wealth generated by Project-related employment and other economic opportunities. While the manner in which Project employees spend their incomes will ultimately be a personal choice, access to adequate housing (including private ownership) can be an important goal for many individuals. Incomes generated by the Project can help individuals accomplish this goal should they wish.

Furthermore, financial literacy is a component of the new 12-week Work Ready program, which will be delivered by Baffinland in each of the five (5) North Baffin communities beginning in Q1 of 2018. Financial literacy is one program Baffinland provides that may assist Project employees with eventual homeownership or access to affordable housing options in the future.

**TRENDS**

The First Nations Bank of Canada (FNBC) established a branch in Pond Inlet in 2014. The FNBC also has a branch in Iqaluit, and one in Baker Lake. Though FNBC has established these branches independent of any action by Baffinland, it is likely that the establishment of the Pond Inlet branch was induced at least partly by the Project, in the same way that the branch in Baker Lake was likely induced at least partly by the Meadowbank Mine.

Furthermore, the Nunavut Housing Corporation (NHC) continues to make investments in new housing units across the territory and has several existing programs, which support improved access to housing for Nunavut residents. These programs include recent changes made to the Public Housing Rent Scale (in 2014) to reduce disincentives to work and encourage savings (e.g. by assessing only the incomes of the two primary tenants rather than non-primary tenants, placing limits on rent increases due to income increases every year until the rent assessed total is eventually reached). The NHC also offers home purchase assistance programs (e.g. the Nunavut Downpayment Assistance Program; Tenant to Owner Program) and home renovation and repair programs to Nunavut residents (NHC 2016). Together, these programs and investments are expected to lead to improved housing circumstances for individuals, help reduce overcrowding, and address public housing deficits in the territory.

**RECOMMENDATIONS / LESSONS LEARNED**

Not applicable.



## Project Certificate Condition No. 152

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – IIBA contract requirements
Responsible Parties	The Proponent, Qikiqtani Inuit Association
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To improve ability of small businesses to access Project contract and sub-contract opportunities.
Term or Condition	The Qikiqtani Inuit Association is encouraged to provide the Board and the Qikiqtaaluk Socio-Economic Monitoring Committee with information regarding the effectiveness of any provisions within the Inuit Impact and Benefit Agreement which may require that larger contracts be broken down into smaller size in order that they are reasonably managed by smaller businesses in the North Baffin region, while respecting any confidential or privileged information.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not applicable
Stakeholder Review	Qikiqtani Inuit Association, Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 SEMWG Meeting Records
Ref. Document Link	Appendix C3

### METHODS

Responsibility for implementation of this PC Condition is primarily directed towards the QIA.

Pursuant to Article 6 of the IIBA, Baffinland has committed to implement best efforts to maximize Inuit participation in contracting and procurement. Measures to enhance Inuit participation in Project contracting opportunities include advance notice of contracting opportunities, the mandatory requirement of Inuit content in each bid, the weighting of Inuit content proposals in bid evaluation and the establishment of contractual Minimum Inuit Employment Goals for the Project.

In 2017, as part of IIBA implementation Baffinland developed an Inuit Procurement and Contracting Strategy (IPCS). This strategy aims to increase Inuit business participation in contracting opportunities for the Mary River Project. The IPCS will be operationalized and implemented through a series of procedures currently under development. The operation of the IIBA's contracting and procurement provisions as well as the IPCS are regularly monitored by the Joint Management and Joint Executive Committees (IIBA implementation committees) and Baffinland provides quarterly reports to QIA on the number and value of contracts awarded to Inuit Firms.

Baffinland also annually contributes \$250,000.00 to a Business Capacity and Start Up Fund. The fund, which is administered by QIA, is intended to develop business capacity and enhance the ability of Inuit Firms to participate in the Project bidding process through the provision of advice and assistance related to start-up capital and financing, management development, ongoing business management, financial management, contracts and procurement or human resources management.

Baffinland also participates in both the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and the SEMWG. These Working Groups provide a discussion forum and information sharing hub that supports impacted communities and interested stakeholders to take part in monitoring efforts to Project-specific economic monitoring.

**RESULTS**

The value of Project-related procurement with Inuit-owned businesses and joint ventures is a useful indicator of the business opportunities created by the Project. Approximately \$387.2 million in contracts were awarded to Inuit-owned businesses and joint ventures in 2017. Of a total 18 contracts awarded to Inuit-owned businesses and joint ventures, all were awarded in the five (5) North Baffin communities. Procurement values in 2017 were higher than in 2016 by \$322.8 million. Total procurement (with Inuit *and* non-Inuit firms) in 2017 totaled \$1,068.0 million. Since Project development, a total of \$819.1 million worth of contracts has been awarded to Inuit-owned businesses and joint ventures (JPCSL, 2018).

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to work with the QIA through the Joint Management and Joint Executive Committees to maximize Project-related benefits to Inuit Firms. Baffinland will continue to improve and refine the IPCS and has committed to conduct a Procurement and Contracting information tour in the five (5) North Baffin Communities in 2018 to meet with business leaders and entrepreneurs to discuss potential business opportunities offered by the Mary River Project.

#### 4.7.5 Human Health & Wellbeing (PC Conditions 153 through 157)

Five (5) PC conditions relate to the potential impacts of the Project on human health and well-being. These conditions focus on the implementation of measures to support Inuit employed by the Project, including: the provision of employee assistance programs, addressing potential cultural conflicts at site, the provision of services or programs to benefit families in potentially affected communities to mitigate the impact of employees' absence from home, and monitoring of potential indirect effects of the Project on human health and well-being. Commitments to the provision of employee assistance and counselling are contained in the IIBA.

##### *Stakeholder Feedback*

As noted in Section 3.5.1, the key stakeholders focused on the socio-economic environment include the communities, the QIA, various departments of the GN, and the federal government. There is an inherent relationship between the Project and the Government of Nunavut for managing socio-economic effects from the Project as the GN is responsible for delivering most health and social services programs in Nunavut. Key concerns expressed by stakeholders relate to the effects of fly-in/fly-out employment on workers and their families. These concerns were raised during the environmental assessment, and also in recent consultation (Appendix B). The SEMWG and QSEMC also regularly discuss this element of the Project (Appendices C3 and C4).

##### *Monitoring*

Baffinland tracks and reports on a number of indicators of human health and well-being. This includes reporting on the number of instances that illegal substances or alcohol are identified during security searches at the Project sites, and occupational health and safety statistics. Baffinland has also presented information on the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases, rates of teenage pregnancy, high school completion rates, proportion of tax filers with employment income and median employment income, percentage of population receiving social assistance, and other topics (e.g. crime rates) in the 2017 socio-economic monitoring report. Table 4.41 provides an evaluation of the Project's impacts on human health and well-being, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

Changes in human health and well-being are often more apparent over a longer term, and attributing cause can be challenging. As Project construction only began in 2013, there is a minimal amount of post-Project data currently available. Human health and well-being can also be influenced by many different socio-economic factors, including those which are external to the Project. Direct correlations between the Project and human health and well-being will only come to light with the analysis of additional annual data. However, there is currently no indication the FEIS predictions are not being met and it is expected that the Project is improving the health and well-being of some individuals and families in the LSA who participate in the Project. There were no significant injuries and no fatalities at the Project sites in 2017.

##### *Path Forward*

Baffinland will continue to deliver and refine its training and employee assistance programs, and monitor indicators of human health and well-being, in consultation with the SEMWG, the QSEMC, and the Project's workforce. Reporting on each PC condition follows.

**Table 4.41 Human Health and Well-being Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Substance Abuse	Increased substance abuse due to the transportation of substances through Project sites	Security searches of employees arriving and departing site and site searches with drug dog and trained staff. In 2017, 15 drug and alcohol related contraband infractions occurred at Project sites amongst employees and contractors. This was 4 infractions higher than in 2016. While all contraband infractions are of concern and taken seriously by Baffinland, the 15 infractions that occurred in 2017 represent only a small number of individuals from the Project workforce. All individuals who do not comply with Baffinland's no drugs/no alcohol policy are immediately removed from site and disciplinary action (up to and including termination) is commenced. Baffinland also notifies the RCMP, where appropriate, of search results. There has been an increasing trend in the number of impaired driving violation and in the number of drug violations in the North Baffin LSA in the post-development period, which was also evident prior to Project development. Conversely. There have been decreasing trends in Iqaluit and Nunavut in the post development period, which was not evident prior to Project development. Reason for lack of a similar trend reversals in the North Baffin LSA are currently unknown. As Project construction only began in 2013, there is minimal post-development data currently available. However, the area positive indications the Project continues to improve attitudes toward substances and additions in the LSA, by providing LSA residents with meaningful employment opportunities within a drug and alcohol-free environment.	Relevant monitoring activities for human health and well-being are longer term and conclusions will be drawn in future years.
	Increased substance abuse because Project employment makes substances more affordable		
	The Company's focus on health and safety, and employee assistance and counselling programs will increase awareness of employees, reducing substance abuse		
Increased Well-being and Community Social Stability	Project employment resulting in increased well-being of children, and increased community social stability	There are positive indications the Project is contributing to the enhanced well-being of children, by providing LSA residents (and parents) with opportunities to obtain meaningful employment and incomes. These opportunities can help reduce the various family stresses and uncertainties associated with un- and under-employment. Baffinland has also implemented an Employee and Family Assistance Program for workers and their family members who may require family-related or other forms of personal assistance. There are also positive indications the Project continues to improve household income and food security in the LSA. This has occurred through contributions to community wellness initiatives and by providing LSA residents with meaningful employment opportunities. Increased employment income facilitates the purchase of store bought food and other family goods, while also providing an improved means to participate in harvesting. As Project construction only began in 2013, there is a minimal amount of post-Project data currently available. Correlations between the Project the various indicators being tracked (e.g. youth crime, employment income, social assistance rates), if any, will only come to light with the analysis of additional annual data.	Relevant monitoring activities for human health and well-being are longer term and conclusions will be drawn in future years.
Lost Time Incident/fatality	Worker fatality	Occupational health and safety monitoring. There were no fatalities in 2017.	

## Project Certificate Condition No. 153

Category	Human Health and Well-Being - Employee and family health and well-being
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure and Post-Closure Monitoring
Objective	To provide adequate medical services on site, including those that contribute to the mental health and well-being of all employees.
Term or Condition	The Proponent is encouraged to employ a mental health professional to provide counselling to Inuit and non-Inuit employees in order to positively contribute toward employee health and well-being.
Relevant BIM Commitment	96
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's benefit plan includes an Employee and Family Assistance Program (EFAP), which offers all permanent employees and their dependents professional short-term counselling on an as-needed basis. In addition, on-site Inuit Elders are available for the Project's Inuit employees to meet with. Baffinland also provides all employees with regular access to an on-site Project medic.

### RESULTS

In 2017 there were a total of 38 EFAP cases. This is 20 cases more than in 2016. Employees and their families who reside in Nunavut accounted for 31.6% of annual EFAP use. Furthermore, there were 6,337 recorded visits to the on-site Project medic in 2017, an increase of 2,325 visits since 2016.

### TRENDS

A summary of monitoring results and trends is provided in Table 4.42. Detailed results are presented in the 2017 Socio-Economic Monitoring Report.

**Table 4.42 On-site Health and Counselling Indicators and Trends in 2017**

Indicator(s)	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Number of times the Project EFAP is accessed	Not applicable	↑	↑	Project	The EFAP was accessed 38 times in 2017; 12 of these were by Nunavummiut
Number of visits to Project site medic	Not applicable	↑	↑	Project	There were 6,337 visits to the Project site medic in 2017 (1,193 visits by Inuit)

### NOTES:

- Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland has received informal positive feedback about the presence of Inuit Elders on site to work with and mentor Baffinland employees. Baffinland will maintain the employment of Inuit Elders on site. Baffinland will also continue to explore other options and opportunities to provide support to its Inuit employees.

## Project Certificate Condition No. 154

Category	Human Health and Well-being - Indirect impacts to health and well-being
Responsible Parties	The Proponent, Government of Nunavut, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To understand the indirect impacts of the Project upon health and well-being.
Term or Condition	The Proponent shall work with the Government of Nunavut and the Qikiqtaaluk Socio-Economic Monitoring Committee to monitor potential indirect effects of the Project, including indicators such as the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases, rates of teenage pregnancy, high school completion rates, and others as deemed appropriate.
Relevant BIM Commitment	43, 45
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland has provided information on potential indirect effects of the Project in the 2017 Socio-Economic Monitoring Report. This includes indicator data on the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases, rates of teenage pregnancy, high school completion rates, and other topics (e.g. crime rates).

### RESULTS

See 'Trends' below for summarized results. Detailed results are presented in the 2017 Socio-Economic Monitoring Report.

### TRENDS

A summary of monitoring results and trends is provided in Table 4.43. Detailed results are presented in the 2017 Socio-Economic Monitoring Report.

**Table 4.43 Key Socio-Economic Indicators and Trends in 2017**

Indicator(s)	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Number of drug and alcohol related contraband infractions at Project sites	Not applicable	↑	↑	Project	There were 15 drug and alcohol related contraband infractions at Project sites in 2017
Number of impaired driving violations	↑ ↑	↑ ↓	↑ ↓	N. Baffin LSA Iqaluit	An increasing post-development trend in the number of impaired driving violations is apparent in the North Baffin LSA and was evident prior to the Project. A decreasing trend is apparent in Iqaluit, which was not evident prior to the Project.
Number of drug violations	↑ ↑	↑ ↓	↓ ↓	N. Baffin LSA Iqaluit	An increasing post-development trend in the number of drug violations is apparent in the North Baffin LSA and was evident prior to the Project. A decreasing trend is apparent in Iqaluit, which was not evident prior to the Project.
Prevalence of gambling issues	Not available	Not available	Not available	Project	These topics continue to be tracked through the QSEMC process and Baffinland's community engagement program
Prevalence of family violence					
Prevalence of marital problems					
Percent of health centre visits related to infectious diseases	↓ ↓	↓ ↓	↓ ↓	N. Baffin LSA Iqaluit	A decreasing post-development trend in the percent of health centre visits related to infectious diseases is apparent in the LSA and was evident prior to the Project
Rates of teenage pregnancy	Not available	Not available	Not available	Project	This topic continues to be tracked through the QSEMC process and Baffinland's community engagement program
Number of secondary school graduates	↑ ↑	↓ ↓	↑ ↓	N. Baffin LSA Iqaluit	A decreasing post-development trend in graduation numbers is apparent in the LSA, which was not evident prior to the Project
Secondary school graduation rate	↑	↓	↑	Region	A decreasing post-development trend in graduation rates is apparent in the region, which was not evident prior to the Project
Crime rate	↑ ↑	↓ ↓	↓ ↓	N. Baffin LSA Iqaluit	A decreasing post-development trend in crime rates is apparent in the LSA, which was not evident prior to the Project

**NOTES:**

- Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used.



**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to provide information on potential indirect effects of the Project through its socio-economic monitoring program and is in compliance with this Project Certificate condition. In instances where appropriate community-level indicator data are currently unavailable (e.g. for the topics of prevalence of gambling issues, prevalence of family violence, prevalence of marital problems, and rates of teenage pregnancy), these topics continue to be tracked through the QSEMC process and Baffinland's community engagement program. Baffinland will also continue discussing with the Mary River SEMWG how improved indicator data may be obtained for these topics.

## Project Certificate Condition No. 155

Category	Human Health and Well-being - Employee cohesion
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To encourage the on-site cohesion of employees through cultural-awareness and social programs.
Term or Condition	The Proponent is strongly encouraged to provide the NIRB with an updated report on its development of mitigation measures and plans to deal with potential cultural conflicts which may occur at site as these may become needed
Relevant BIM Commitment	N/A
Reporting Requirement	To be provided at least 60 days prior to the commencement of any construction activities
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland is committed to promoting employee cohesion through cultural awareness and social programs. In 2017, Baffinland continued to provide cultural recognition programs such as cultural awareness, promotion of Inuktitut in the workplace and Elder support for Inuit employees.

Baffinland President and Chief Executive Officer Brian Penney was joined by Mr. Levi Barnabas of the QIA to preside over a Nunavut Day Celebration at the Mary River Project July 9-10, 2017. Activities included traditional Inuit games hosted by Baffinland Elders, a video screening of Inuit focused films, as well as the serving of country food.

Baffinland Elders attended select Management Team meetings to discuss Inuit culture and history as well as ways to approach Inuit employees to discuss work related matters in a culturally appropriate manner. Elders also gave informal Inuktitut as second language lessons during non-working hours.

Consistent with the provisions of the IIBA, Baffinland has also instituted measures to reduce and address potential cultural conflicts at site, including:

- Development of a revised Work Readiness Program to prepare Inuit for work at a Fly-in-Fly-Out site, including a cross-cultural training component
- Mandatory cultural awareness training provided to all new employees and contractors and the development of an on-line cultural awareness course
- Providing culturally appropriate working conditions, including the use of Inuktitut in the workplace
- On-site Inuit Elders to provide counselling services
- New Employee Concern policy and procedure approved and implemented in 2017
- Development of an Inuktitut in the Workplace Policy which is currently under review
- Country food kitchen provided for the consumption and sharing of traditional country food

- Development of a revised Workplace Conditions Survey which will be delivered in the first quarter of 2018 to gain information from Inuit employees with respect to workplace conditions, including cultural matters
- Delivery of introductory Inuktitut language sessions to management teams
- Addition of 209 Inuktitut signs at site to ensure effective communication to and safety of all employees.

**RESULTS**

Not applicable.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland is committed to supporting Inuit employees at site. A number of initiatives are planned for 2018 to increase cultural awareness and reduce conflict including:

- Measures to promote the use of Inuktitut
- Increase in the number of elders-on-site to oversee cultural activities and support Inuit employees
- Review and modification of cross-cultural training programs and on-boarding orientation programs
- Delivery of presentations (on-site and at corporate head office) relating to Inuit culture and the IIBA
- Implementation of IHRS procedures respecting use of Inuktitut instructors and training in Inuktitut
- Introduction of a bilingual corporate website
- Investigation of options to reduce barriers associated with language through increased use of bilingual signs and documents, and the use of graphics and symbols where possible.
- Development of measures based on the results of the Workplace Conditions survey to enhance cultural awareness and sensitivity.

## Project Certificate Condition No. 156

Category	Human Health and Well-Being - Support Initiatives
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assist with fostering well-being within point-of-hire communities
Term or Condition	The Proponent is encouraged to assist with the provision and/or support of recreation programs and opportunities within the potentially affected communities in order to mitigate potential impacts of employees' absences from home and community life
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

An Ilagiktunut Nunalinnullu Pivalliajutsait Kiinaujat Fund (the Fund) has been established under Article 12 of the IIBA (Support for Communities). The objectives of the fund include:

- Creation of opportunities for community capacity building;
- The fair distribution of impacts and benefits between communities and across generations;
- Maintenance of consistency with community development objectives; and
- Promotion of mutual understanding and learning.

The Fund is intended to support a wide range of activities including participation in community projects, youth and Elder programs, hunter support activities, cultural learning and revitalization, social support programs for families and individuals and counseling and healing programs. Baffinland and QIA each contribute \$375,000 annually to the fund which is administered by QIA.

Baffinland also supported numerous community centered events and activities in 2017. This includes, but is not limited to, community snowmobile races, fishing derbies, square dances, as well as various sports team travel and sponsorship.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 157

Category	Human Health and Well-Being - Counseling and treatment programs
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To make available, necessary treatment and counseling services for employee and family well-being.
Term or Condition	The Proponent should consider providing counseling and access to treatment programs for substance and gambling addictions as well as which address domestic, parenting, and marital issues that affect employees and/or their families.
Relevant BIM Commitment	96
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	2017 Socio-Economic Monitoring Report (JPCSL, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland's employee benefit plan includes an Employee and Family Assistance Program (EFAP), which offers all permanent employees and their dependents access to professional short-term counselling on an as-needed basis. Baffinland also employs on-site Inuit Elders from nearby communities to provide additional support and guidance to the Project's Inuit employees. Furthermore, Baffinland provides all employees with regular access to an on-site Project medic.

### RESULTS

In 2017 there were a total of 38 EFAP cases. This is 20 cases more than in 2016. Employees and their families who reside in Nunavut accounted for 31.6% of annual EFAP use. Furthermore, there were 6,337 recorded visits to the Project site medic in 2017, an increase of 2,325 visits since 2016.

### TRENDS

A summary of monitoring results and trends is provided in Table 4.44. Detailed results are presented in the 2017 Socio-Economic Monitoring Report.

**Table 4.44 On-site Health and Counselling Indicators and Trends in 2017**

Indicator(s)	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Number of times the Project EFAP is accessed	Not applicable	↑	↑	Project	The EFAP was accessed 38 times in 2017; 12 of these were by Nunavummiut
Number of visits to Project site medic	Not applicable	↑	↑	Project	There were 6,337 visits to the Project site medic in 2017 (1,193 visits by Inuit)

### NOTES:

- Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to provide employee access to an EFAP, on-site Elders, and a Project-site medic. Baffinland also encourages its employees and stakeholders to provide feedback on how its various programs and initiatives can be improved in the future. For example, Baffinland's 2018 Workplace Survey included questions on the counselling and support services available to Project employees.

#### 4.7.6 Community Infrastructure and Public Services (PC Conditions 158 through 161)

Four (4) PC conditions relate to the potential impacts of the Project on community infrastructure and public services. All four conditions name the GN as the responsible party for implementation of these conditions. NIRB encourages Baffinland to work with the GN to address public service issues, particularly those that may be adversely affected by the Project.

##### *Stakeholder Feedback*

Key stakeholders focused on community infrastructure and public services include community members, Hamlet administrations, the QIA, the GN, and INAC. The GN is the primary stakeholder, since it is responsible for the delivery of many public services. Hamlets expressed concern that skilled workers may leave their workforce to work for the Project, resulting in a skills gap, at least temporarily. Some Project employees and contractors have left positions in their communities to pursue employment at the Project. However, the recent Mary River Experience – The First Three Years report (BDSI, 2016) describes a lack of full time hamlet work in many communities and the important role the Project plays in filling this gap. Potential opportunities for the community to realize new community infrastructure, for example by receiving retired heavy equipment from the Project, continue to be expressed (Appendix B).

##### *Monitoring*

Baffinland conducted an Employee Information Survey in early 2017, and another survey in early 2018. Results are provided in the annual socio-economic monitoring reports. Baffinland also reports on indicators pertaining to competition for skilled workers, labour force capacity, pressures on existing health and social services provided by the GN that may be impacted by Project-related in-migration of employees, and on Project-related pressures on community infrastructure. Table 4.45 provides an evaluation of the Project’s impacts on community infrastructure and public services, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.45 Community Infrastructure and Public Services Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Recruitment and Retention of Hamlet Employees	Competition for skilled workers may lead to temporary effects on municipal services	Based on the 2018 Employee Information Survey (71 surveys received), 22 Project employees (or 31.4%) indicated they had left positions in their communities to pursue employment at the Project. Of these, 7 were casual/part-time positions, while 15 were full-time positions.	Effect within FEIS predictions
Education and Skills	Long term improvement in labour force capacity	Since 2013, the Project has cumulatively generated 122,950 hours of training for Project employees, 15,867 hours (or 12.9%) of which were completed by Inuit employees (this does not include the additional training and experience gained by Project contractors). Likewise, 8,837,636 hours of labour have been cumulatively performed in Nunavut as a result of the Project since 2013, 1,483,359 hours (or 16.8%) of which were performed by Inuit employees and contractors.	Long-term effect to be realized over time

It is also expected that ongoing training and experience generated by the Project, in addition to regular employee turnover, will continue to increase the pool of skilled workers in the local labour force and negate any short-term, negative Project effects. Effects to community infrastructure and public services as a result of Project employment are consistent with FEIS predictions. An overall improvement in the capacity of the local labour force will occur and become apparent with time.

##### *Path Forward*

Baffinland will continue to monitor this aspect of the socio-economic environment, and will discuss monitoring results with the SEMWG. Reporting on each PC condition follows.

## Project Certificate Condition No. 158

Category	Community Infrastructure and Public Services – Impacts to health services
Responsible Parties	The Proponent, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor indirect Project impacts to health and social services provided by the Government of Nunavut.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut and other parties as deemed relevant in order to develop a Human Health Working Group which addresses and establishes monitoring functions relating to pressures upon existing services and costs to the health and social services provided by the Government of Nunavut as such may be impacted by Project-related in-migration of employees, to both the North Baffin region in general, and to the City of Iqaluit in particular.
Relevant BIM Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland continues to work with the QSEMC and SEMWG on socio-economic monitoring initiatives and the Government of Nunavut (GN) actively participates in both these groups. Baffinland also signed a Memorandum of Understanding (MOU) with the GN Department of Health in November 2013 and updated in 2017 regarding site health services and medevac procedures. More specifically, this MOU describes the health care staff and services Baffinland will provide on-site, including procedures Baffinland will follow during medevac situations, for pre-employment medical examinations, and for the reporting and management of communicable diseases, amongst other topics. The MOU also describes how Baffinland will pay for and/or reimburse the GN Department of Health's for costs associated with the medical transportation of employees and for conducting pre-employment medical exams.

Baffinland has additionally provided information on potential socio-economic effects of the Project in its 2017 Socio-Economic Monitoring Report. This includes indicator data related to pressures on existing health and social services provided by the GN that may be impacted by Project-related in-migration of employees (i.e. total and per capita number of health centre visits in the Local Study Area (LSA), number of visits to Project site medic).

### RESULTS

While there have been increasing trends in the number of total and per capita health centre visits in the North Baffin and Iqaluit in the post-development period, these trends were also evident in the pre-development period. An increasing trend has also been noted throughout Nunavut in the post-development period, which implies a longer-term and/or territory-wide trend is



likely occurring rather than a Project-induced one. However, health centre utilization rates can be influenced by many different socio-economic factors. As Project construction only began in 2013, there is a minimal amount of post-development data currently available. Correlations between the Project and health centre utilization, if any, may only come to light with the analysis of additional annual data.

One of the primary ways the Project could negatively influence health service provision in the North Baffin LSA in-migration of workers - has been shown not to be occurring in any significant manner. In fact, the Project may be having a positive effect on LSA health service provision, by providing employees with regular access to an on-site Project medic. This access allows LSA residents to have at least some of their health needs addressed on-site, thereby reducing demands placed on local health care providers (Table 4.46).

**Table 4.46 Human Health and Well-being Indicators and Trends in 2017**

Indicator(s)	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Number of health centre visits (total)	↑ ↑	↑ ↑	↓ ↓	N. Baffin LSA Iqaluit	An increasing post-development trend in the total number of health centre visits is apparent in the LSA and was evident prior to the Project
Number of health centre visits (per capita)	↑ ↑	↑ ↑	↓ ↓	N. Baffin LSA Iqaluit	An increasing post-development trend in the per capita number of health centre visits is apparent in the LSA and was evident prior to the Project
Number of visits to Project site medic	Not applicable	↑	↑	Project	There were 6,337 visits to the Project site medic in 2017 (1,193 visits by Inuit)

**NOTES:**

1. Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used.

**TRENDS**

Trends are also presented in Table 4.46.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to provide information related to pressures on existing health and social services provided by the GN that may be impacted by Project-related in-migration of employees. Baffinland will also continue to engage the Mary River SEMWG and QSEMC on this topic.

## Project Certificate Condition No. 159

Category	Community Infrastructure and Public Services – Impacts to infrastructure
Responsible Parties	The Proponent, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor Project-related impacts to infrastructure within the Local Study Area communities.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut to develop an effects monitoring program that captures increased Project-related pressures to community infrastructure in the Local Study Area communities, and to airport infrastructure in all point-of-hire communities and in Iqaluit.
Relevant BIM Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG and QSEMC Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendices C3 and C4

### METHODS

Baffinland continues to work with the QSEMC and the SEMWG on socio-economic monitoring initiatives and the Government of Nunavut (GN) actively participates in both these groups. Baffinland has also provided information on potential socio-economic effects of the Project in the 2017 Socio-Economic Monitoring Report. This includes indicator data related to increased Project-related pressures to community and airport infrastructure in the Local Study Area (LSA) communities (i.e. Arctic Bay, Clyde River, Hall Beach, Igloolik, Pond Inlet, and Iqaluit).

### RESULTS

Like previous years, Baffinland continued to use some community infrastructure to support ongoing Project operations in 2017. This use is small in comparison to other ongoing community uses and adds only minimal incremental pressure on LSA facilities. For example, Baffinland's rental of office spaces in the LSA is generally limited to small facilities (i.e. to support individual BCLOs and Northern Affairs staff), and the use of local meeting rooms and accommodations is often intermittent and short-term in nature (e.g. community meetings may only occur a limited number of times per year). Furthermore, the use of these spaces can be considered a positive economic contribution of the Project to local economies (e.g. through payments of rental fees, purchase of related goods and services).

LSA community airports also regularly accommodate various non-Project passenger, cargo, and other aircraft (both scheduled and charter). Project-related aircraft movements add only minimal incremental pressure on these facilities. For example, in 2016 (the most recent year in which data is available) there were a total of 22,157 aircraft movements within the North Baffin communities. This includes 5,518 aircraft movements at North Baffin LSA airports (Statistics Canada 2017a) and 16,639 aircraft

movements at the Iqaluit airport (Statistics Canada 2017b).<sup>6</sup> Project-related aircraft movements at community airports in 2016 represent only a small portion (5.7%) of this total. The 2017 monitoring results for indicators of the Project’s effects on community infrastructure and public services is presented in Table 4.47.

**Table 4.47 2017 Monitoring Results for Community Infrastructure and Services Indicators**

Indicator(s)	Pre Dev’t Trend	Post Dev’t Trend	Trend Since Prev. Year	Scale	Summary
Baffinland use of LSA community infrastructure	Not applicable	↑	No change	Project	Baffinland continued to use some LSA community infrastructure to support Project operations in 2017
Number of Project aircraft movements at LSA community airports	Not applicable	↑	↑	Project	There were 1,628 Project aircraft movements at LSA airports in 2017

**NOTES:**

- Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change ‘No change’ is used. Where there are insufficient data or other issues preventing a trend analysis, ‘Not applicable’ or ‘Not available’ are used.

**TRENDS**

Trends are also presented in Table 4.47.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to provide information related to increased Project-related pressures to community infrastructure in the LSA communities, and to airport infrastructure in all point-of-hire communities and in Iqaluit. Baffinland will also continue to engage the Mary River SEMWG and QSEMC on this topic.

<sup>6</sup> In 2016, the number of aircraft movements at the Clyde River airport were unavailable. 2015 aircraft movements at the Clyde River airport were used as an estimate of 2016 aircraft movements instead.

## Project Certificate Condition No. 160

Category	Community Infrastructure and Public Services – Distribution of benefits
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure the distribution of benefits is done in a way that off-sets Project-related impacts to infrastructure or services.
Term or Condition	The Government of Nunavut and the Qikiqtani Inuit Association are encouraged to cooperate to ensure in a broad sense, that Project benefits are distributed across impacted communities and across various demographic groups within these communities in a manner that best offsets any Project-related impacts to infrastructure or services.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA) and Government of Nunavut (GN)
Reference	The Mary River Project Inuit Impact and Benefit Agreement Between Qikiqtani Inuit Association and Baffinland Iron Mines Corporation (Baffinland and QIA, 2013) 2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=7&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=7&amp;archive=1&amp;lang=en</a> <a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a>

### METHODS

While Baffinland cannot influence how the QIA and GN cooperate with one another, the Proponent regularly engages with both organizations to help ensure Project benefits are distributed appropriately and Project-related impacts are addressed.

Baffinland produces an annual socio-economic monitoring report and regularly engages the QSEMC and SEMWG to discuss socio-economic impacts and benefits of the Project. GN and QIA representatives are members of both the QSEMC and Mary River SEMWG. Furthermore, Baffinland regularly communicates with the QIA on various matters related to the Mary River Project Inuit Impact and Benefit Agreement (IIBA).

### RESULTS

The 2017 Socio-Economic Monitoring Report identifies positive effects the Project had in 2017. Approximately 2.38 million hours of Project labour were performed by Baffinland employees and contractors in Nunavut in 2017, which was equal to approximately 1,181 full time equivalent positions. In addition, approximately \$7.06 million in payroll was provided to Baffinland LSA employees and \$387.2 million was spent on procurement with Inuit-owned businesses and joint ventures in 2017. Various programs under the IIBA also continued to operate in 2017, such as the Illagiiktunut Fund, which provides up to \$750,000 per year for projects across the Qikiqtani Region that are designed to enhance community wellness.

### TRENDS

Not Applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to support the QIA and GN in 2018, where appropriate, to ensure that Project benefits are distributed across impacted communities and across various demographic groups within these communities, and to help offset any Project-related impacts to infrastructure or services in the communities. Baffinland and the GN are also in the process of negotiating a Memorandum of Understanding (MOU) to deal with items of mutual concern and interest between the parties. The parties hope to finalize the MOU in 2018 and can provide further details on its content in the 2018 annual report.

## Project Certificate Condition No. 161

Category	Community Infrastructure and Public Services – Policing
Responsible Parties	The Proponent, Government of Nunavut, Royal Canadian Mounted Police
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure the territorial government and its policing service are adequately prepared to handle any Project-related increases to the need for service and associated impacts.
Term or Condition	The Government of Nunavut should be prepared for any potential increased need for policing, and ensure that the Royal Canadian Mounted Police is prepared to handle ongoing Project-related demographic changes and subsequent crime prevention that may be needed as a result of the development, operation, and closure of the Project.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Government of Nunavut (GN)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland regularly engages with the Government of Nunavut (GN) with regards to Project-related socio-economic monitoring. For example, Baffinland produces an annual socio-economic monitoring report (which includes demographic and crime-related information) and regularly engages the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG) to discuss socio-economic impacts and benefits of the Project. GN representatives are active members of both the QSEMC and the SEMWG. Information obtained by the GN during these meetings and through review of Baffinland's annual socio-economic monitoring reports may be used to prepare for any potential increased need for policing and crime prevention activities.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland continues to cooperate with the GN regarding Project-related socio-economic monitoring (including monitoring of demographic and crime-related information). Baffinland will continue to engage the GN through the QSEMC and Mary River SEMWG, moving forward.

#### 4.7.7 Culture, Resources & Land Use (PC Conditions 162 through 166)

Five (5) PC conditions relate to the potential impacts of the Project on culture, resources and land use. The conditions request Baffinland notify communities regarding Project activities and particularly shipping and that Baffinland engage communities in monitoring programs and the establishment of mitigation measures to ensure that both consider traditional activities.

##### *Stakeholder Feedback*

Key stakeholders focused on culture, resources and land use include the communities, the QIA, the GN Department of Culture and Heritage, and the Inuit Heritage Trust. The latter two organizations are responsible for the management of cultural heritage including archaeological sites. The potential for the Project to affect current land uses and the availability of wildlife resources were key concerns of the communities and the QIA. The GN departments expressed concern regarding the potential for adverse effects to archaeological sites and ensuring proper planning and procedures took place. Concerns regarding potential impacts to resources and land use continue to be a theme of community engagement (Appendix B).

##### *Monitoring*

Baffinland conducts annual monitoring and when required mitigation work under an Archaeological Permit issued by the GN. Baffinland also monitors the number of land use visitor person-days at Project sites, and the number of Wildlife Compensation Fund claims recorded annually. Table 4.48 provides an evaluation of the Project's impacts on culture, resources and land use, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.48 Culture, Resources and Land Use Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Archaeological Sites	Unauthorized removal of artifacts from known archaeological sites	Worker site orientation training includes rules regarding archaeological sites, with dismissal a consequence of offence. Baffinland's consulting archaeologist visits sites most years. Sites are successfully mitigated or protected, as applicable.	Effects did not occur
	Disturbance to archaeological sites due to ground disturbance activities without mitigation		
	Potential for chance finds		
Inuit Harvesting of Wildlife	Mine operations affecting the harvesting of caribou, marine mammals and fish	Land user visits to the Mine Site and Milne Port were recorded. Monitoring suggests Inuit harvesting successfully coexists with the Project's activities. However, one Wildlife Compensation Fund claim was filed in 2017, which was approved and resulted in compensation being paid.	Effect within FEIS predictions
Travel and Camps	Potential for reduced safety travelling around Eclipse Sound and Pond Inlet, and through Milne Port. Emissions and noise disruption during travel and/or camping	Site observations suggest Inuit land use coexists with the Project's activities. In 2017, a total of 154 land use visitor person-days were recorded at Project sites, which is 139 person-days less than in 2016.	Effect within FEIS predictions
	Sensory disturbance and safety along Milne Inlet Tote Road	Fewer hunters using cabins due to the limited Total Allowable Harvest (TAH) of 250 set for caribou on Baffin Island.	Effect within FEIS predictions
	Detour around Mine Site		
	HTO cabin closure	HTO cabin at Milne Port and the Mine Site were relocated several years ago. The new cabins appear to be used satisfactorily.	Effect within FEIS predictions

Meaningful effects to culture, resources and land use as a result of the Project have not occurred, based on monitoring and site observations. In fact, monitoring data suggests Inuit land use and harvesting coexists with the Project. Local land users continued to access Project sites in 2017, and the number of land use visitor person-days have increased every year since record-keeping was commenced, with the exception of 2017, which saw a decrease in land use visitor person-days. Baffinland acknowledges the potential for future wildlife-related impacts from the Project and has contributed \$750,000.00 to a Wildlife Compensation Fund (administered by the QIA under the terms of the IIBA) to address this issue. One Wildlife Compensation Fund claims were made in 2017, which was approved and resulted in the compensation of \$14,200.00.

*Path Forward*

Baffinland will continue to monitor this aspect of the socio-economic environment, and will discuss monitoring results with the MRSMWG and QSEMC. Reporting on each PC condition follows.



## Project Certificate Condition No. 162

Category	Culture, Resources and Land Use - Public consultation
Responsible Parties	The Proponent, Elders and community members of the North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure the ongoing and consistent involvement of Elders and community members in developing and revising monitoring and mitigation plans.
Term or Condition	The Proponent should make all reasonable efforts to engage Elders and community members of the North Baffin communities in order to have community level input into its monitoring programs and mitigative measures, to ensure that these programs and measures have been informed by traditional activities, cultural resources, and land use as such may be implicated or impacted by ongoing Project activities.
Relevant BIM Commitment	97
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA), North Baffin Communities
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland meets with various community groups on a regular basis to discuss aspects of the Project and ongoing issues, concerns or recommendations these Community representatives may have. The groups Baffinland engaged with during 2017 includes the Iqaluit Business Community, the Pond Inlet Business Community, Community HTOs and other community residents and groups (i.e., business community or those interested in career and training opportunities).

### RESULTS

Meetings held with the public and with community groups in 2017 are listed in Table 4.49. Feedback received during the Phase 2 Expansion Proposal workshops helped contribute to Baffinland's decision making with respect to the duration of shipping on the Phase 2 Expansion Proposal submitted to the Nunavut Planning Commission in 2017, removal of the use of sealifts and increased monitoring at Ragged Island.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide the results of the key monitoring programs of interest to the communities. The engagement with the Mittimatalik Hunters and Trappers Organization (MHTO) during the Marine Environment and Terrestrial Working Group meetings continues to provide valuable input that helps guide the development of monitoring programs and mitigation measures as, needed.

**Table 4.49 Public and Community Group Meetings in 2017**

Community	Stakeholder Group	Date	Topic
Arctic Bay	Community residents	April 3-7 2017	Career and Training Information Tour
	Hamlet of Arctic Bay	May 31 2017	Project Update and Phase 2 Expansion Proposal
	Ikajutit Hunters and Trappers Organization	May 31 2017	Project Update and Phase 2 Expansion Proposal
Clyde River	Community residents	April 3-7 2017	Career and Training Information Tour
	Hamlet of Clyde River	May 29 2017	Project Update and Phase 2 Expansion Proposal
	Clyde River Hunters and Trappers Organization	May 29 2017	Project Update and Phase 2 Expansion Proposal
Hall Beach	Community residents	April 3-7 2017	Career and Training Information Tour
	Hamlet of Hall Beach	June 2 2017	Project Update and Phase 2 Expansion Proposal
	Hall Beach Hunters and Trappers Organization	June 2 2017	Project Update and Phase 2 Expansion Proposal
Igloolik	Community residents	April 3-7 2017	Career and Training Information Tour
	Hamlet of Igloolik	June 1 2017	Project Update and Phase 2 Expansion Proposal
	Igloolik Hunters and Trappers Organization	June 1 2017	Project Update and Phase 2 Expansion Proposal
Iqaluit	Iqaluit Business Community	January 16 2017	Procurement and Contracting Workshop
Pond Inlet	Pond Inlet Business Community	January 18-19 2017	Procurement and Contracting Workshops
	Community residents	April 3-7 2017	Career and Training Information Tour
	MHTO	March 15-16 2017	Marine Environment and Terrestrial Working Group meetings
	MHTO	May 3-4 2017	Marine Environment and Terrestrial Working Group meetings
	Hamlet of Pond Inlet	May 30 2017	Project Update and Phase 2 Expansion Proposal
	MHTO	May 30 2017	Project Update and Phase 2 Expansion Proposal
	MHTO	June 12-13 2017	2017 Monitoring Program and Community Involvement
	MHTO	September 13 2017	Marine Environment Working Group meeting
	MHTO	October 3 2017	Terrestrial Environment Working Group meeting
	MHTO	November 29-30 2017	Marine Environment and Terrestrial Working Group meetings

## Project Certificate Condition No. 163

Category	Culture, Resources and Land Use - Public consultation
Responsible Parties	The Proponent, North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To involve communities in the development and evolution of management and monitoring plans.
Term or Condition	The Proponent shall continue to engage and consult with the communities of the North Baffin region in order to ensure that Nunavummiut are kept informed about the Project activities, and more importantly, in order that the Proponent's management and monitoring plans continue to evolve in an informed manner.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	North Baffin Communities
Reference	2017 Community Meeting Records
Ref. Document Link	Appendix B

### METHODS

Baffinland is committed to meaningful engagement with stakeholders potentially affected by the Project, including the five (5) North Baffin Inuit Communities (Arctic Bay, Clyde River, Hall Beach, Igloolik and Pond Inlet).

In support of the Company's focus on continuous improvement and the engagement objectives defined for the Project (Section 2.2), Baffinland implements a variety of engagement mechanisms that are intended to ensure that a broad and comprehensive approach to the identification of stakeholders and that the creation of enhanced opportunities for dialogue and input are executed. During 2017, Baffinland completed a number of engagement activities, which included:

- Providing regular and ongoing opportunities for the dissemination of Project-related information and receipt of stakeholder input through Baffinland Community Liaison Officers stationed in each of the five (5) North Baffin communities;
- Hosting public meetings and open houses;
- Conducting community and employee surveys;
- Participating in multi-stakeholder forums (e.g. Working Groups);
- Holding focus groups, workshops and meetings with individual community groups and hamlet Councils;
- Hosting site meetings for interested observers; and
- Distributing Project-related information through websites, newsletters, advertisements and other means.

In the spring of 2017 Baffinland held public meetings within the five (5) North Baffin communities. These public meetings provided an important opportunity for Baffinland to share information with the Communities related to current operations, the results of ongoing environmental monitoring programs and future planning to support the development of the Project.

A list of the public meetings held in the communities is provided in Table 4.50.

**Table 4.50 Community Public Meetings in 2017**

Community	Date(s)	Description
Arctic Bay	May 31 2017	Project Update and Phase 2 Expansion Proposal
Clyde River	May 29 2017	Project Update and Phase 2 Expansion Proposal
Hall Beach	June 2 2017	Project Update and Phase 2 Expansion Proposal
Igloolik	June 1 2017	Project Update and Phase 2 Expansion Proposal
Pond Inlet	May 30 2017	Project Update and Phase 2 Expansion Proposal
All communities	April 3-7, 2017	Career and Training Information Tour

## RESULTS

During the public meetings a number of comments were raised by community members. The feedback provided by community members was a mix of comments that were both supportive of the Project and comments related to concerns or issues the community members perceived or were experiencing. Most of the comments raised at the public meetings were related to:

- Employment and Income;
- Marine Environment;
- Terrestrial Environment;
- Potential effects on Land Use and Harvesting Practices;
- Education and Training Opportunities;
- Potential effects of the Project on Climate Change;
- Concerns related to Potential Accidents and Malfunctions; and
- Dust and Air Quality.

Comments received during public meetings are considered by Baffinland and incorporated into management and monitoring plans, as relevant.

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to implement a proactive approach to engagement with various stakeholders, through meetings, workshops, surveys and dissemination of information and reports. This will ensure that the communities, QIA, regulators and the public are informed in a timely and culturally sensitive manner of the Project's progress and the potential environmental and social impacts of ongoing operations.

## Project Certificate Condition No. 164

Category	Socio-Economic Impacts – Shipping notification
Responsible Parties	The Proponent, Elders and community members of the North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	In order to inform members of North Baffin communities of planned Project shipping transits such that community members’ planned travel routing may be adjusted to avoid interaction with Project ships and/or ship tracks.
Term or Condition	The Proponent is required to provide notification to communities regarding scheduled ship transits throughout the regional study area including Eclipse Sound and Milne Inlet, real-time data regarding ships in transit and any changes to the proposed shipping schedule to the MEWG and agencies within Pond Inlet on a weekly basis during open water shipping, and to the RSA communities on a monthly basis.
Relevant BIM Commitment	30, 34
Reporting Requirement	The information required shall be provided on a monthly basis at a minimum or more often as the Proponent determines necessary and is to be provided to the Proponent’s community liaison officers and those of the Qikiqtani Inuit Association as well as the Hunters and Trappers Organizations and Hamlet organizations of the North Baffin communities, Coral Harbour, and the NIRB’s Monitoring Officer. Where deviations from the proposed schedule or routing are required, this information shall be provided as soon as possible.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Baffinland Website
Ref. Document Link	<a href="http://www.baffinland.com/mary-river-mine/location/?lang=en">http://www.baffinland.com/mary-river-mine/location/?lang=en</a>

### METHODS

Baffinland has enlisted exactAIS®, a global vessel monitoring and tracking service based on AIS (Automatic Identification System) data from polar orbiting satellites to track and report on vessel movements. The ship location data from exactAIS is available on the Baffinland web site for easy access by the local communities. In addition, access to a tracking portal was provided to the QIA and Parks Canada in Pond Inlet.

Information on ships such as: last reported coordinates of the vessel, whether the vessel is moving, the direction of vessel movement and destination of the vessel are provided.

The vessel locations plotted on the map are not “real-time”, but provide a regularly updated snap shot of vessel movement in the North Baffin region. Baffinland encourages all land and water users to continue to practice safe boating, hunting, and other travel activities, and be aware of your surroundings at all times.

A workshop was held in July of 2016 in Pond Inlet to present the 2016 shipping plans to the community prior to the start of the season.

### RESULTS

Baffinland has made vessel routing accessible to the public. There were no changes to the shipping route in 2017.

**TRENDS**

Not applicable

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland has found the use of exactAIS<sup>®</sup> to be beneficial in providing information related to ship routing to the public. Baffinland will continue its use of this service. Baffinland will continue to communicate changes to the proposed shipping schedule to the Marine Environment Working Group where the Mittimatalik Hunters and Trappers Organization is a member.

## Project Certificate Condition No. 165

Category	Socio-Economic Impacts - Emergency shelters
Responsible Parties	The Proponent, Elders and community members of the North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	In order to provide for human safety precautions in the event of adverse weather or other emergency situations along segments of linear transportation infrastructure.
Term or Condition	The Proponent is strongly encouraged to provide buildings along the rail line and Milne Inlet Tote Road for emergency shelter purposes, and shall make these available for all employees and any land users travelling through the Project area. In the event that these buildings cannot, for safety or other reasons be open to the public, the Proponent is encouraged to set up another form of emergency shelters (e.g. seacans outfitted for survival purposes) every 1 kilometre along the rail line and Milne Inlet Tote Road. These shelters must be placed along Tote Road and rail routing prior to operation of either piece of infrastructure, and must be maintained for the duration of project activities, including the closure phase.
Relevant Baffinland Commitment	14
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Emergency Response Plan (Baffinland, 2017i) Roads Management Plan (Baffinland, 2016e)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland has constructed three (3) refuge stations at Km 33, 40 and 69 along the Tote Road. Each station is heated with beds and bedding, water, an automatic external defibrillator (AED), food and a digital radio that will contact security or dispatch and that is always monitored. A fourth station is to set-up at km 60, which currently has a heated washroom and an AED. In addition to the four refuge stations, there are 11 sea cans co-located at communication towers along the Tote Road, equipped with a fire extinguisher, first aid kits and are heated. The sea cans do not house radios, food or water.

Baffinland has a trained emergency response team at both ends of the Tote Road with emergency vehicles to respond to any concerns rapidly. The emergency response team also has a Hagglands rescue vehicle and access to snowmobiles, and a side by side that is capable of moving through snowdrifts and effecting a rescue as required. The Tote Road Travel Procedure is publicly available and outlines the emergency response procedure.

Ensuring the health and safety of local hunters on-site is of utmost important to Baffinland. In the summer months, locals have been advised to report to security and request a transport for their equipment and personnel. In the winter, they are to check in with security and are given instructions on where to safely travel around both sites.

All vehicles carry emergency survival packs with blankets and provisions in case they get stuck on the Tote Road, which could be used in an emergency situation.

Baffinland has also constructed a new HTO cabin for visitors to use and stay at while visiting the Project Site.

The Steensby rail line project has been deferred at this time.

### **RESULTS**

154 hunters visited the Project site in 2017 to hunt near the Project area. Baffinland accommodated all individuals, providing support when required for breakdowns and maintenance issues.

No safety related incidents occurred in 2017 for visiting hunters; all emergency shelters were available for use.

### **TRENDS**

Emergency shelters continue to be available for use.

### **RECOMMENDATIONS / LESSONS LEARNED**

PC Condition No. 165 was originally developed for the development of the southern railway to Steensby Inlet. There are significant operating differences between the approved Project, which includes the development of Steensby, and the ERP of the Project that reduces risk to land users travelling through the Project area that Baffinland felt warranted a reduced number of emergency shelters. The approved Project, which includes the development of Steensby, would not have had a road alongside it, and so organizing a rescue required more logistics. With the Tote Road, the ability of multiple types of vehicles to access a person in need of assistance is significantly increased. The time between passing vehicles is also significantly different. Therefore, Baffinland does not feel that construction of emergency shelters along every 1 km of the Tote Road is warranted at this time.

With the rail project, it was predicted that there were three trains with a 10.5 hr cycle time operating 300 days per year. In a given day when all three trains were running this means that, you have up to 3.5 hours between a passing vehicle that could be alerted to an emergency situation. With an average of 195.9 ore haul transits per day and an annual average of 32.2 non-ore haul truck transits per day down the 100 km Tote Road, averaging a cycle time of 7 hours, there is less than 8 minutes between passing vehicles.

Construction of emergency shelters along the railway to Steensby Port will be considered when this phase of the Project becomes active. Baffinland commits that buildings placed along the rail line for signal and switch requirements will also be intended for use as emergency shelters for Railway personnel.



## Project Certificate Condition No. 166

Category	Socio-Economic Impacts - Public Consultation
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure members of the public are able to access shipping information on an as-required basis in order to inform potential users of the scheduled Project activities, which could require deviations to land users' schedules or routing.
Term or Condition	The Proponent should ensure through its consultation efforts and public awareness campaigns that the public have access to shipping operations personnel for transits into and out of both Steensby Inlet port and Milne Inlet port either via telephone or internet contact, in order that any questions regarding ice conditions or ship movements that could assist ice users in preparing for travel may be answered by Project staff in a timely fashion.
Relevant BIM Commitment	30
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Hunter and Visitor Site Access Procedure - Attachment F of the Roads Management Plan (Baffinland, 2016e)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Vessel transit information is publicly available on the Baffinland website. The webpage displaying ship transit information also posts an email address ([contact@baffinland.com](mailto:contact@baffinland.com)) to contact regarding any shipping updates or information.

Baffinland has developed a Hunter and Visitor Site Access Procedure (Baffinland, 2015d) for visitors wanting to access the Project area, made available to local communities and accessible on the Baffinland web portal. All policies related to visitor's access to the Project Area are developed with rights of NLCA beneficiaries and conditions of the IIBA in mind. The Procedure was being updated by Baffinland in 2017, and a revised version will be made available on the Baffinland document portal in early 2018.

### RESULTS

The public have access to shipping operations personnel via telephone and internet contact.

### TRENDS

Not applicable

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to promote the use of the Hunter and Visitor Site Access Procedure and the ship transit web tracking service available on the Baffinland website.

#### 4.7.8 Benefits, Royalties and Taxation (PC Condition 167)

One PC condition relates to the potential impacts of the Project on benefits, royalties and taxation: that Baffinland negotiate a Development Partnership Agreement with the GN. The GN, however, no longer negotiates such agreements.

##### *Stakeholder Feedback*

Key stakeholders focused on the benefits, royalties and taxation include the following:

- QIA - Receives IIBA benefits; also receives surface lease rents and royalties on aggregate on Inuit Owned Land (IOL);
- NTI - recipient of mineral royalties first payable to the Government of Canada, since Inuit hold sub-surface rights to Deposit No. 1 covered by a grandfathered federal mining lease;
- GN - Recipient of territorial taxes (corporate, property and payroll taxes);
- Qikiqtani Inuit - Beneficiaries of benefits and royalties that accrue to the QIA, as well as a portion of mineral royalties paid to NTI and then dispensed to the QIA and other regional Inuit organizations; and
- Other Nunavummiut - Beneficiaries of mineral royalties payable to NTI.

Communities continue to express a desire to maximize benefits of the Project (Appendix B).

##### *Monitoring*

Baffinland tracks payments made as benefits, royalties and taxes, and this information is presented in annual monitoring reports. Table 4.51 provides an evaluation of the Project’s impacts on benefits, royalties and taxes, based on monitoring activities completed in 2017, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.51 Benefits, Royalties and Taxation Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Benefits and Royalty Payments to Inuit Organizations	Increased revenues that can be dispensed to Inuit beneficiaries	Monitoring is not required.	Within FEIS predictions
Territorial Own-source Revenues	Increased taxes and revenues; Payments of payroll and corporate taxes to territorial government	Monitoring is not required to validate if taxation occurs	Within FEIS predictions

Significant positive benefits have been realized by the stakeholders listed above, as a result of benefits, royalties and taxes paid by the Project in 2017.

##### *Path Forward*

Baffinland will continue to meet its commitments with respect to benefits, royalties and taxes. Reporting on PC Condition 167 follows.

## Project Certificate Condition No. 167

Category	Benefits, Royalty and Taxation – Partnership Agreements
Responsible Parties	The Proponent, Government of Nunavut
Project Phase(s)	Construction
Objective	The Proponent and the Government of Nunavut develop a formalized partnership agreement.
Term or Condition	The Proponent and the Government of Nunavut are strongly encouraged to, as soon as practical following the issuance of the Project Certificate, enter into discussions to negotiate a Development Partnership Agreement.
Relevant BIM Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland issued an invitation letter to the Government of Nunavut (GN) in September 2013 regarding the negotiation of a Development Partnership Agreement (DPA). However, a DPA between the GN and Baffinland has not yet been formalized. It has come to Baffinland's attention the DPA program for new mines is currently on hold, while the GN's Department of Economic Development and Transportation and Department of Finance work to develop a replacement (Gregoire 2016). For added context, the GN's Department of Economic Development and Transportation webpage on this topic (i.e. Government of Nunavut 2017) contains a DPA Policy that is noted to have expired on March 31, 2016.

### RESULTS

Not applicable.

### TRENDS

Not applicable

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will consider re-engaging with the GN on this topic once a replacement policy has been developed by the GN.

#### 4.7.9 Governance & Leadership (PC Conditions 168 through 169)

Two (2) PC conditions relate to the potential impacts of the Project on governance and leadership, both of which relate to the collection of socio-economic data and annual reporting to NIRB.

##### *Stakeholder Feedback*

Members of the SEMWG include Baffinland, the QIA, the GN, and INAC. Each organization has an interest and a role in improving socio-economic conditions within the Qikiqtani Region and Nunavut as a whole. Baffinland has actively engaged the group over the past several years. In 2015 and early 2016, Baffinland revised its socio-economic monitoring program based on feedback from this group. Baffinland is also actively involved in the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and regularly participates in its meetings.

##### *Monitoring*

Baffinland completes a socio-economic monitoring report annually, which presents monitoring results for aspects of the socio-economic environment that interacts with the Project. The socio-economic monitoring program has been developed in consultation with the SEMWG, and monitoring results are also reviewed by this group and QSEMC annually.

##### *Path Forward*

Baffinland will continue to undertake the collection of socio-economic monitoring data in consultation with the SEMWG and QSEMC, and report this monitoring data annually. Reporting on each PC condition follows.

## Project Certificate Condition No. 168

Category	Governance and Leadership - Monitoring program
Responsible Parties	The Proponent, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Outline variables that are relevant to the Project and which should be adopted by the QSEMC's monitoring program
Term or Condition	The specific socioeconomic variables as set out in Section 8 of the Board's Report, including data regarding population movement into and out of the North Baffin Communities and Nunavut as a whole, barriers to employment for women, project harvesting interactions and food security, and indirect Project effects such as substance abuse, gambling, rates of domestic violence, and education rates that are relevant to the Project, be included in the monitoring program adopted by the Qikiqtani Socio-Economic Monitoring Committee
Relevant BIM Commitment	45
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	In-Compliance
Stakeholder Review	Socio-economic monitoring results are presented annually to the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a>

### METHODS

Data collection and analysis methods are presented in the annual socio-economic monitoring report. Government data is collected from the Nunavut Bureau of Statistics and Statistics Canada. Change of address information is collected by Baffinland's Community Liaison Officers and from voluntary employee surveys. Other Project-specific data is also presented by Baffinland.

### RESULTS

The results and trends in the 2017 socio-economic monitoring data are presented in Table 4.52. Detailed results are presented in the annual socio-economic monitoring report referenced above, including additional information for indicators where appropriate community-level indicator data are currently unavailable (e.g. for the topics of childcare availability and costs, Project harvesting interactions and food security, prevalence of gambling issues, prevalence of family violence).

**Table 4.52 2017 Monitoring Results and Trends for Key Socio-Economic Indicators**

Indicator(s)	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Known in-migrations of non-Inuit Project employees and contractors	Not applicable	No change	No change	N. Baffin LSA	Since 2015, a net of zero known non-Inuit employees/contractors have in-migrated to the North Baffin LSA.
In-migration of non-Inuit to the North Baffin LSA	Not available	Not available	Not available	N. Baffin LSA	Limited data currently available. However, the percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant.
Known out-migrations of Inuit Project employees and contractors	Not applicable	↑	No change	N. Baffin LSA	Since 2015, a net of five known Inuit employees/contractors have out-migrated from the North Baffin LSA.
Out-migration of Inuit from the North Baffin LSA	Not available	Not available	Not available	N. Baffin LSA	Limited data currently available. However, the percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant.
Nunavut annual net migration	↑	↓	↑	Territory	A decreasing post-development trend in Nunavut annual net migration is currently occurring.
Employee changes of address, housing status, and migration intentions	Not applicable	Not applicable	Not applicable	Project	22.8% of the 2018 Inuit Employee Survey respondents housing situation changed in the past 12 months. 9.9% moved to a different community in the past 12 months but no one moved into or out of the North Baffin LSA. 17.7% intend to move to a different community in the next 12 months. 8.8% intend to move away from the North Baffin LSA. No individuals intend to move into the North Baffin LSA. 60.7% of respondents currently live in public housing.
Hours worked by female employees and contractors	Not applicable	↑	↑	Project	162,550 hours were worked by female employees and contractors in 2017 (6.8% of total), 85,988 hours of which were worked by Inuit females (3.6% of total).
Childcare availability and costs	Not available	Not available	Not available	Project	This topic continues to be tracked through the QSEMC process and Baffinland's community engagement program.
Project harvesting interactions and food security	Not available	Not available	Not available	Project	This topic continues to be tracked through the QSEMC process, Baffinland's community engagement program, and related indicators.
Number of drug and alcohol related contraband infractions at Project sites	Not applicable	↑	↑	Project	There were 15 drug and alcohol related contraband infractions at Project sites in 2017.
Number of impaired driving violations	↑ ↑	↑ ↓	↑ ↓	N. Baffin LSA and Iqaluit	An increasing post-development trend in the number of impaired driving violations is apparent in the North Baffin LSA and was evident prior to the Project. A decreasing trend is apparent in Iqaluit, which was not evident prior to the Project.
Number of drug violations	↑ ↑	↑ ↓	↓ ↓	N. Baffin LSA and Iqaluit	An increasing post-development trend in the number of drug violations is apparent in the North Baffin LSA and was evident prior to the Project. A decreasing trend is apparent in Iqaluit, which was not evident prior to the Project.

Indicator(s)	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Prevalence of gambling issues	Not available	Not available	Not available	Project	These topics continue to be tracked through the QSEMC process and Baffinland's community engagement program.
Prevalence of family violence					
Number of secondary school graduates	↑ ↑	↓ ↓	↑ ↓	N. Baffin LSA Iqaluit	A decreasing post-development trend in graduation numbers is apparent in the LSA, which was not evident prior to the Project.
Secondary school graduation rate	↑	↓	↑	Region	A decreasing post-development trend in graduation rates is apparent in the region, which was not evident prior to the Project.

**NOTES:**

- Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used.

**TRENDS**

Trends in the monitoring data relative to the previous year and pre-development period (and during the pre-development period itself in some instances) are presented in Table 4.52.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to provide information on potential socio-economic effects of the Project through its socio-economic monitoring program. In instances where appropriate community-level indicator data are currently unavailable, these topics continue to be tracked through the QSEMC process and Baffinland's community engagement program. Baffinland will also continue discussing with the Mary River SEMWG how improved indicator data may be obtained for these topics.

## Project Certificate Condition No. 169

Category	Governance and Leadership – Monitoring economic effects
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To maintain transparency inform communities in relation to economic benefits associated with the Project.
Term or Condition	The Proponent provide an annual monitoring summary to the NIRB on the monitoring data related to the regional and cumulative economic effects (positive and negative) associated with the Project and any proposed mitigation measures being considered necessary to mitigate the negative effects identified.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2017 Socio-Economic Monitoring Report for the Mary River Project (JPCSL, 2018) 2017 SEMWG Meeting Records
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=1&amp;archive=1&amp;lang=en</a> Appendix C3

### METHODS

Baffinland has provided a summary of monitoring data related to regional and cumulative economic effects (positive and negative) associated with the Project in its annual socio-economic monitoring report.

### RESULTS

The Project continued to make positive contributions to the Nunavut economy in 2017. A total of 2.38 million hours of Project labour were performed by Baffinland employees and contractors in Nunavut in 2017, which was equal to approximately 1,181 full-time equivalent positions (JPCSL, 2018). In addition, approximately \$7.06 million in payroll was provided to Baffinland LSA employees, and \$387.2 million was spent on procurement with Inuit-owned businesses and joint ventures in 2017. Since Project development, approximately 8.84 million hours of Project labour have been performed, \$33.3 million in payroll has been provided to Inuit employees, and \$819.1 million has been awarded to Inuit-owned businesses and joint ventures.

When compared to annual economic outputs for Nunavut as a whole, these values are notable. In 2016 (the most recent year for which estimates are available), for example, there were a total of 16,565 jobs held in Nunavut and 30,103,000 total hours worked (Nunavut Bureau of Statistics 2017a), with average weekly earnings of \$1,274.60 per employee (Nunavut Bureau of Statistics 2017b). By comparison, hours worked by Baffinland's employees and contractors in Nunavut in 2016 (i.e. 1,881,506) represent 6.3% of the Nunavut total. Average weekly earnings of Baffinland's Inuit employees in 2016 were also higher than the Nunavut average, at \$1,538.70.



Mining remains an important contributor to the Nunavut economy. Nunavut's real gross domestic product<sup>7</sup> (GDP) for all industries in 2016 was \$2,039.6 million. Of this amount, '*mining, quarrying, and oil and gas extraction*' was responsible for contributing \$377.8 million (or 18.5%). Mining projects also typically make economic contributions to supporting industries such as '*construction*' (\$207.8 million contribution to the Nunavut economy in 2016), '*transportation and warehousing*' (\$49.1 million contribution to the Nunavut economy in 2016), and '*accommodation and food services*' (\$26.5 million contribution to the Nunavut economy in 2016) (Nunavut Bureau of Statistics 2017c). The Mary River Project has likely been an important contributor to these amounts, as has Agnico Eagle Mines Limited's Meadowbank Mine (Nunavut's only other operating mine in 2016), and several other Nunavut-based mining projects that are in various stages of development. Mining in Canada, generally, contributed \$55.6 billion to the country's GDP, or 3.4% of total Canadian GDP (in 2015). The industry also directly employs more than 373,000 individuals and remains the largest proportional private sector employer of Indigenous peoples in the country (Mining Association of Canada 2017).

### TRENDS

The Project continues to provide positive regional and cumulative economic effects.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland continues to provide information on regional and cumulative economic effects of the Project through its socio-economic monitoring program. No negative regional or cumulative economic effects associated with the Project were identified in 2017. As such, no mitigation measures were required.

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<sup>7</sup> The Bank of Canada (2016) notes real GDP is "the most common way to measure the economy... GDP is the total value of everything - goods and services - produced in our economy. The word "real" means that the total has been adjusted to remove the effects of inflation." The real GDP amounts by industry presented by the Nunavut Bureau of Statistics (2017c) are in chained 2007 dollars.

## 4.8 PERFORMANCE ON OTHER CONDITIONS

### 4.8.1 Accidents & Malfunctions (PC Conditions 170 through 177)

Eight (8) PC conditions relate to accidents and malfunctions. Two of these conditions relate to the TEMMP, four relate to spill response planning, one relates to implementing adaptive management measures around hunter safety around ice tracks, and one relates to the use of foreign flagged vessels. Baffinland's updates to these PC conditions are provided in the pages that follow.

## Project Certificate Condition No. 170

Category	Accidents and Malfunctions - Terrestrial Wildlife Management and Monitoring Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	Updates to plan in order to better understand the potential for, and to minimize possible caribou-railway interactions.
Term or Condition	The Proponent shall include in an updated Terrestrial Wildlife Management and Monitoring Plan, plans for increased caribou monitoring efforts including weekly winter track surveying and summer and fall surveys undertaken on foot twice per month.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Nunavut Impact Review Board
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Project Certificate Condition No. 170 refers to better understanding and minimizing caribou interactions with the Railway. The Railway has not been built, and therefore these monitoring activities have not been triggered.

## Project Certificate Condition No. 171

Category	Accidents and Malfunctions - Terrestrial Wildlife Management and Monitoring Plan
Responsible Parties	The Proponent
Project Phase(s)	Pre-Construction
Objective	Updates to plan in order to minimize potential for caribou-railway interactions.
Term or Condition	The Proponent shall include within its updated Terrestrial Wildlife Management and Monitoring Plan, a commitment to establish deterrents along the railway and Tote Road embankments at any areas where it is determined that caribou are utilizing the embankments or transportation corridors to facilitate movement and where such movement presents a likelihood of caribou mortality to occur.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2017 Terrestrial Environment Annual Monitoring Report (EDI, 2018)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=5&amp;archive=1&amp;lang=en</a>

### METHODS

Areas along the Tote Road that caribou may use for movement were identified in the FEIS Terrestrial Wildlife Baseline Report (EDI Environmental Dynamics Inc. 2012). Successive Height of Land Surveys and driver observations have continued to provide information on potential areas of use by caribou along the Tote Road.

### RESULTS

During 2017, two groups of caribou were observed by local Inuit hunters around Bylot Island and in the valley northeast of the Tote Road by the km 60 pull-out; however, no caribou were seen within the PDA, or identified during the Height-of-Land surveys. Generally, caribou observations near the Tote Road have diminished since 2013. The lack of observations near site is likely correlated with region-wide low caribou numbers.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

To date, the implementation of deterrents along the Tote Road have not been required.

## Project Certificate Condition No. 172

Category	Accidents and Malfunctions – Overwintered fuel vessel
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To provide evidence that vessel to be used is fit and insured for proposed use.
Term or Condition	The Proponent is encouraged to provide the Government of Nunavut with evidence that the vessel that it intends to use for the overwintering of fuel has been designed and certified for use under the conditions which it is expected to operate, and that it be required to provide copies of the vessel owners' insurance policies.
Relevant BIM Commitment	8
Reporting Requirement	The required information is to be provided to the Government of Nunavut as soon as possible, and at a minimum, at least 60 days prior to the commencement of any construction related shipping.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

None.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland did not require the overwintering of fuel in 2017. If overwintering of fuel is required, Baffinland will provide the Government of Nunavut with the requested information.

## Project Certificate Condition No. 173

Category	Accidents and Malfunctions - Use of best practices
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure
Objective	To provide additional spill contingency measures for spills in marine areas.
Term or Condition	The Proponent shall employ best practices and meet all regulatory requirements during all ship-to-shore and other marine-based fuel transfer events.
Relevant Baffinland Commitment	9
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Environment and Climate Change Canada, Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board.
Reference	Oil Pollution Emergency Plan – Milne Inlet (Baffinland, 2017k) Shipping and Marine Wildlife Management Plan (Baffinland, 2016h) Spill at Sea Response Plan (Baffinland, 2015b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Baffinland maintains a Transport Canada approved Oil Pollution Emergency Plan (OPEP) for ship to shore fuel transfers at Milne Port which is currently a Class 1 Oil Handling Facility. Updates to the OPEP were made on June 27, 2017. Training of Baffinland staff on the Milne Inlet OPEP was conducted by a qualified marine spill response contractor between August 5–8, 2017. Baffinland is committed to undertaking fuel transfer from vessels under good weather conditions.

Oil Spill Response USA Inc, (OSR) Baffinland’s external oil spill response company was contracted to respond to any major spill in the Port or Inlet.

### RESULTS

OPEP training occurred in 2017 and the required number of responder’s received this training. A mock spill exercise was performed to ensure spill readiness. Required equipment for a Class 1 Oil Handling Facility was met. No ship-to-shore spills occurred.

### TRENDS

As in previous years, Transportation Canada’s Guidelines for Baffinland’s Class 1 Oil Handling Facility were adhered to.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to conduct routine training exercises and strategically place resources and equipment on site for spill response during ship-to-shore fuel transfer events.

## Project Certificate Condition No. 174

Category	Accidents and Malfunctions - Community level spill response
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure
Objective	To improve community ability to assist in spill response.
Term or Condition	The Proponent and the Canadian Coast Guard are required to provide spill response equipment and annual training to Nunavut communities along the shipping route to potentially improve response times in the event of a spill.
Relevant BIM Commitment	108,110
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Environment Climate Change Canada, Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board.
Reference	Oil Pollution Emergency Plan – Milne Inlet (Baffinland, 2017k) Shipping and Marine Wildlife Management Plan (Baffinland, 2016h) Spill at Sea Response Plan (Baffinland, 2015b)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

In a January 29, 2015 letter from the Canadian Coast Guard (CCG) letter to NIRB, the CCG noted that the provision of spill response equipment and training to communities was the responsibility of CCG.

Training of Baffinland staff on the Milne Inlet Oil Pollution Emergency Plan (OPEP) was conducted by a qualified marine spill response contractor between August 5<sup>th</sup> – 8<sup>th</sup>, 2017. This ensured that Baffinland is ready to respond to potential spills along the shipping route within the Inlet. Oil Spill Response Inc. has continued to be retained to respond to significant spills that occur.

Baffinland is committed to ensuring that adequate resources are allocated to the development and deployment of emergency and spill response capabilities within the Project.

### RESULTS

OPEP training occurred in 2017 and the required number of responder's received this training. A mock spill exercise was performed to ensure spill readiness. Baffinland has invited communities of the North Baffin Region to participate and observe training. Required equipment for a Class 1 Oil Handling Facility was met. No Ship to shore spills occurred

### TRENDS

Baffinland is committed, during operations, to conducting regular and annual spill response exercises and training in known and effective techniques for responding to spills

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to conduct routine training exercises and strategically place resources and equipment on site for spill response during ship-to-shore fuel transfer events.

## Project Certificate Condition No. 175

Category	Accidents and Malfunctions – Ship track markers in ice cover
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Hunters and Trappers Organizations of the North Baffin region and Coral Harbour
Project Phase(s)	Construction, Operations, Closure and Post-Closure Monitoring
Objective	To ensure that measures taken to mark the shipping track(s) during periods of ice cover are effective in advising ice-based travelers, and that, where necessary, revisions to this practice can be made to ensure public safety.
Term or Condition	The Proponent shall, in coordination and consultation with the Qikiqtani Inuit Association and the Hunters and Trappers Organizations of the North Baffin communities and Coral Harbour, provide updates to its Shipping and Marine Mammals Management Plan to include adaptive management measures it proposes to take should the placement of reflective markers along the ship track in winter months not prove to be a feasible method of marking the track to ensure the safety of ice-based travelers.
Relevant BIM Commitment	34, 57
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland is currently conducting all of its shipping during open water and there is currently no winter shipping or ice-breaking being conducted. Action on this PC Condition is deferred until the Steensby Port is developed and transits through ice are scheduled.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 176

Category	Accidents and Malfunctions - Revised spill modeling
Responsible Parties	The Proponent
Project Phase(s)	Pre-Construction, Construction Operations, Closure
Objective	To improve community ability to assist in spill response.
Term or Condition	The Proponent is required to revise its spill planning to include additional trajectory modeling for areas of Hudson Strait, such as Mill Island, where walrus concentrate, as well as for mid-Hudson Strait during winter conditions as well as for the northern shipping route, including Milne Inlet, Eclipse Sound and Pond Inlet.
Relevant BIM Commitment	N/A
Reporting Requirement	The updated modeling shall be provided to the NIRB, Fisheries and Oceans Canada, and Environment Canada for review at least 3 months prior shipment of bulk fuel to Steensby Inlet or Milne Inlet.
Status	Not applicable
Stakeholder Review	Transport Canada, Canadian Coast Guard, Fisheries and Oceans Canada, Environment and Climate Change Canada
Reference	Milne Inlet Spill Modelling Report Fuel Spill Modelling: Northern Shipping Route Open Water Season – Milne Inlet, Eclipse Sound, Pond Inlet (AMEC Foster Wheeler, 2015) Oil Pollution Emergency Plan – Milne Inlet (Baffinland, 2017k) Shipping and Marine Wildlife Management Plan (Baffinland, 2016h) Spill at Sea Response Plan (Baffinland, 2015b) Spill Contingency Plan (Baffinland, 2017j) Exploration Spill Contingency Plan (Baffinland, 2014e)
Ref. Document Link	<a href="http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en">http://www.baffinland.com/document-portal-new/?cat=9&amp;archive=1&amp;lang=en</a>

### METHODS

Revised oil spill modelling was conducted for shipping from Milne Port in 2015. Leading up to this modelling, a fuel spill preparedness workshop was held in April 2014 with Transport Canada and the Canadian Coast Guard. This workshop established the following credible spill scenarios for modelling:

- For arctic diesel - two compartments of a double-hull, multi-compartment fuel tanker, which amounts to 4,000 m<sup>3</sup> (4 ML). The expected maximum size of the fuel tanker is 15 ML.
- For IFO - half of the IFO fuel remaining in the ship when sailing into Milne Inlet which amounts to 2,000 m<sup>3</sup> (2 ML) of IFO.

The spill assessment considered the open water season, and the month of September was selected as representative in terms of meteorological and oceanographic conditions. Five potential spill locations along the shipping route were selected considering community recommendations.

Two scenarios were modelled at each of the five locations using the software OST, which computes spill probability distributions to indicate geographical regions (e.g., Pond Inlet, Eclipse Sound, Navy Board Inlet and Milne Inlet) which might be affected as a result of a spill, how frequently and how soon.

In addition, 10 (two fuel types x five locations) simulations were run with a September 'P50' wind condition defined as the average wind speed conditions and the associated most frequent wind direction. Finally, a sensitivity run considering a full fuel tanker loss of 15 ML arctic diesel cargo at a location in Eclipse Sound was also prepared. For these scenarios, RPS ASA's OILMAP (RPS 2014) was used to provide additional estimation of spill weathering and fate. This includes slick characteristics, estimate of fuel concentrations in the surface layer, amounts evaporated and that have reached shore, and remaining amounts of fuel, and fuel and water (mousse) volume. The spill modelling completed in this study assumes no intervention, response or containment and that the slick is assumed to freely discharge (during a very short duration) from the damaged vessel.

The OILMAP oil spill model and response system introduced above was used to provide additional estimates of spilled fuel fate, in particular, slick characteristics and weathering. OILMAP calculates the evaporation, dispersion and remaining percentage for a given spill scenario where the user defines a fuel product type, weather conditions, properties of the receiving water, and the amount of fuel released.

The fate or weathering processes considered were evaporation, the conversion of liquid fuel into gaseous component, and natural dispersion, the breakup of a fuel slick into small droplets that are mixed into the sea by wave action. These are two important weathering processes that typically occur over the first five days following a spill and act to remove fuel from the sea surface. Fuel will also be brought to shore depending on the prevailing currents and winds at the time as well as the type and amount of fuel, and type of shoreline. Consideration of the amounts lost due to these processes yields an estimate of the remaining amount of fuel on the surface at any time. These are the key fates modeled and tracked by OILMAP. No containment or recovery of spilled fuel was assumed in the simulations.

## **RESULTS**

The modelling results were presented in a series of figures showing expected spill trajectories after one (1) day and five (5) days. The spill model informed the development of Baffinland's Spill at Sea Response Plan.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

There have been no changes to the shipping practices since the spill modelling was conducted; therefore, no updates are required.

## Project Certificate Condition No. 177

Category	Accidents and Malfunctions - Foreign flagged vessels
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure and Post-Closure Monitoring
Objective	To ensure foreign flagged ships operating in Canadian waters are held to the same standard as domestic ships with regard to emergency response planning.
Term or Condition	The Proponent shall enroll any foreign flagged vessels commissioned for Project-related shipping within Canadian waters into the relevant foreign program equivalent to Transport Canada's Marine Safety Delegated Statutory Inspection Program.
Relevant BIM Commitment	13, 37
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada
Reference	N/A
Ref. Document Link	N/A

### METHODS

Ship owners / operators are responsible for enrolling their foreign flagged vessel with the appropriate program. Baffinland incorporates this requirement into contract terms and conditions with all vessels contracted directly by Baffinland.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 178

Category	Alternatives Analysis - Mill Island shipping route consideration
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Nunavut Impact Review Board, Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance
Objective	To prevent disturbance to walrus and walrus habitat on the northern shore of Mill Island.
Term or Condition	Subject to safety considerations and the potential for conditions, as determined by the crew of transiting vessels, to result in route deviations, the Proponent shall require project vessels to maintain a route to the south of Mill Island to prevent disturbance to walrus and walrus habitat on the northern shore of Mill Island.
Relevant BIM Commitment	N/A
Reporting Requirement	Where project vessels are required to transit to the north of Mill Island owing to environmental or other conditions, an incident report is to be provided to the Marine Environment Working Group and the NIRB within 30 days, noting all wildlife sightings and interactions as recorded by shipboard monitors. The Proponent shall summarize all incidences of deviations from the nominal shipping route as presented in the FEIS to the NIRB annually, with corresponding discussion regarding justification for deviations and any observed environmental impacts.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Shipping through Steenby Inlet is not currently part of the Project's operations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 179

Category	Operational Variability
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To apply the precautionary principle in respect of potential effects on marine wildlife and marine habitat from changes to shipping frequency that may result from a significant increase in mine production for an extended period of time.
Term or Condition	Baffinland shall not exceed 20 ore carrier transits to Steensby Port per month during the open water season and 242 transits per year in total.
Relevant BIM Commitment	4
Reporting Requirement	To be developed following approval by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	NA
Ref. Document Link	N/A

### METHODS

Shipping through Steensby Inlet is not currently part of the Project's operations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 179a

Category	Operational Variability/Flexibility
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To ensure that there are appropriate limits on the Early Revenue Phase Proposal marine shipping component in order to limit and manage likely project effects, while balancing the need for operational flexibility.
Term or Condition	In any given calendar year, the total volume of ore shipped via Milne Inlet, shall not exceed 4.2 million tonnes.
Relevant BIM Commitment	4
Reporting Requirement	For each year after the Proponent commences shipping ore via Milne Inlet under the Early Revenue Phase Proposal, the Proponent shall include in the Annual Report to the NIRB, a summary of the total amount of ore shipped via Milne Inlet for the previous calendar year.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

The total volume of ore shipped via Milne Inlet is tracked annually by Baffinland.

### RESULTS

During the shipping season, Baffinland ensured that the total number of ships commissioned for bulk shipping did not exceed 4.2M tonnes. A total of 56 ships were loaded with a final shipped tonnage of 4,046,397.

### TRENDS

The total volume of ore shipped via Milne Inlet in 2016 was 2.7 million tonnes.

Baffinland continues to operate within the existing allowance for shipping limits outlined in PC Condition 179a.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to track ore volumes shipped.

Baffinland may consider working with regulators in 2018 to review the volume limits for future operational years.

## Project Certificate Condition No. 179b

Category	Operational Variability/Flexibility
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To ensure that there are appropriate limits on the Early Revenue Phase Proposal project land transportation component in order to limit and manage likely project effects, while balancing the need for operational flexibility.
Term or Condition	In any given calendar year, the total volume of ore transported by truck on the Milne Inlet Tote Road shall not exceed 4.2 million tonnes.
Reporting Requirement	For each year after the Proponent commences transportation of ore via the Tote Road under the Early Revenue Phase Proposal, the Proponent shall include in the Annual Report to the NIRB, a summary of the total amount of ore shipped via the Tote Road for the previous calendar year.
Relevant BIM Commitment	4
Status	Non-Compliant
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

The total volume of ore transported by truck on the Milne Inlet Tote Road is tracked annually by Baffinland.

### RESULTS

In 2017, the total volume of ore transported by truck on the Milne Inlet Tote Road exceeded the allowed 4.2 million tonnes. In 2017, a total of 4.54 million tonnes total volume were transported by truck on the Milne Inlet Tote Road.

On December 8, 2017 Baffinland sent a letter to NIRB providing them with an update on the levels of shipping and hauling of ore for 2017. Baffinland noted that in 2017 the Proponent achieved higher levels of production and anticipated by the end of December that road hauling would exceed the 4.2 Mtpa by 5-7%. Baffinland noted that if the Proponent was to cease the road haulage operation in December, it would require shutting down the operations due to limited surge capacity.

On December 12, 2017 the NIRB responded to Baffinland's December 8, 2017 letter. NIRB noted that they appreciated the proactive notice provided by Baffinland with respect to compliance with PC Condition 179b, however reminded Baffinland that the Proponent is required to operate the Project within the terms and conditions outlined in Project Certificate No.005. NIRB also advised Baffinland of the process for requesting formal reconsideration of the terms and conditions, in the event that Baffinland foresees an ongoing inability to maintain compliance with this condition. NIRB also noted that they expected that Baffinland would provide the agency with an analysis of potential ecosystemic and socio-economic effects associated with the exceedance from predicted/permitted levels of road haulage activities can be completed.

**TRENDS**

Prior to 2017, Baffinland had not exceeded the approved 4.2 million tonnes total volume transported by truck on the Milne Inlet Tote Road. The previous two years of haulage were:

- 2016: 3,256,474 tonnes; and
- 2015: 1,330,541 tonnes.

The shortfalls in production and hauling in 2015 and 2016 would indicate that the cumulative effects of hauling for the three years combined to date are well below the predicted effects.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to track ore volumes transported by truck on the Milne Inlet Tote Road and will continue to be diligent and responsible in managing the volume limits. Baffinland also committed to provide NIRB with a full accounting of the haulage volumes for 2017 in Q1 2018.

Baffinland may consider working with regulators in 2018 to review the volume limits for future operational years.



## Project Certificate Condition No. 180

Category	Transboundary Effects - Makivik Corporation involvement in the Marine Environment Working Group (MEWG)
Responsible Parties	The Proponent, members of the Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enable Makivik Corporation and Nunavik communities near shipping lanes to remain informed and involved in those shipping activities which could affect the marine environment and marine mammals.
Term or Condition	The Marine Environment Working Group established for this Project shall invite a representative from Makivik Corporation to be a member of the Group.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval by the Minister
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Makivik is a member of the MEWG established in 2013. Meeting minutes of working group meetings are distributed to all parties. If a representative of Makivik is unable to attend a meeting, they are informed of Project plans.

### RESULTS

Makivik received MEWG meeting minutes and other technical information in 2017.

### TRENDS

Not applicable

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to update Makivik on Project activities through the MEWG meetings and distribution of technical documentation.

## Project Certificate Condition No. 181

Category	Transboundary Effects - Marine Environment Working Group (MEWG) reporting
Responsible Parties	The Proponent, members of Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enable Makivik Corporation and Nunavik communities near shipping lanes to remain informed and involved in those shipping activities which could affect the marine environment and marine mammals.
Term or Condition	Regardless of whether Makivik Corporation participates as a member of the Marine Environment Working Group, the Marine Environment Working Group will provide Makivik Corporation with regular updates regarding the activities of the Marine Environment Working Group throughout the Project life cycle.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval by the Minister
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2017 MEWG Meeting Records
Ref. Document Link	Appendix C1

### METHODS

Makivik is a member of the MEWG established in 2013. Meeting minutes of the MEWG meetings are distributed to all parties. If a representative of Makivik is unable to attend a meeting, they are informed of Project plans.

### RESULTS

Makivik received working group meeting minutes and other technical information in 2017.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to update Makivik on Project activities through working group meetings and distribution of technical documentation.

## Project Certificate Condition No. 182

Category	Transboundary Effects - Reporting to Marine Environment Working Group (MEWG)
Responsible Parties	The Proponent, Makivik Corporation
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enable Makivik Corporation and Nunavik communities near shipping lanes to remain informed and involved in those shipping activities which could affect the marine environment and marine mammals.
Term or Condition	Baffinland shall make available to Makivik Corporation any ship route deviation reports provided to the NIRB in accordance with the terms and conditions set out in Section 4.12.4 of the Final Hearing Report.
Relevant BIM Commitment	N/A
Reporting Requirement	To be developed following approval by the Minister
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	N/A
Ref. Document Link	<a href="http://www.baffinland.com/mary-river-mine/location/?lang=en">http://www.baffinland.com/mary-river-mine/location/?lang=en</a>

### METHODS

Vessel transit information is publicly available on the Baffinland website. Baffinland will provide ship route deviation reports to Makivik when required. This condition is focused on shipping through the shared waters of Hudson Strait from Steensby Port. The Project has not utilized the southern shipping route to transport ore to date.

### RESULTS

There were no changes to the ship route in 2017.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to make ship route information publicly available and will provide Makivik with any ship route deviation reports.

## 5 – NIRB CORRESPONDENCE

During 2017, Baffinland undertook two main exchanges of information with the NIRB regarding current operations. These information exchanges included:

- Reviewer comments received on the 2016 Annual Report for the Mary River Project (Baffinland, 2017l);
- Draft NIRB Monitoring Framework (NIRB, 2017a);
- Baffinland response to Draft NIRB Monitoring Framework (Baffinland, 2017m);
- NIRB Site visits and related correspondence;
- The NIRB's 2016-2017 Annual Monitoring Report for the Mary River Project (NIRB, 2017b) and Board's Recommendations (NIRB, 2017c); and
- Baffinland's response to NIRB's Board recommendations (Baffinland, 2017n).

### 5.1 COMMENTS ON THE 2017 ANNUAL REPORT TO THE NIRB

The NIRB presented Baffinland with regulatory agency comments on Baffinland's 2017 Annual Report on June 23, 2017. Baffinland provided a response to comments in a letter to the NIRB on July 28, 2017. A summary and response to the feedback received is provided below.

#### **Baffinland's Performance on Compliance with Licenses, Permits, Authorizations and Approvals**

General comments received from regulatory agencies on the 2016 Annual Report indicated that regulatory agencies still wish to see the number and extent of non-compliance with the Project Certificate reduced. In Baffinland's response to NIRB on July 28, 2017, Baffinland affirmed that all efforts to reduce the number and extent of non-compliances and accidents is a top priority. To support this commitment, Baffinland provided an overview of the operational challenges faced by the Company in 2016 and the adaptive management strategies employed by Baffinland to respond to these challenges, and in turn improve the environmental performance of the Project. A summary of comments received by reviewers on Baffinland's overall performance is provided in below.

#### **Baffinland Overview of Enhanced Stakeholder Engagement Efforts**

In Baffinland's July 28, 2017 response to NIRB, the Proponent also provided a discussion of the significant efforts made by Baffinland to enhance stakeholder engagement for the Project. These efforts included restructuring the 2016 Annual Report with the aim of making it more accessible to a wider range of stakeholders, developing a document portal on the Baffinland website to increase transparency with stakeholders regarding Baffinland's performance and improving consultation efforts with the terrestrial, marine and socio-economic working groups for the Project.

#### **Baffinland Response to NIRB's List of Comments**

In Baffinland's response to the NIRB regarding comments received on the 2016 Annual Report, Baffinland provided itemized responses to the comments identified in Tables A.1 to A.8 in the Company's letter to NIRB on July 28, 2017. Where requested, and available, Baffinland also included attachments to fulfill reviewer requests. A complete version of the itemized responses is available on the NIRB Public Registry.

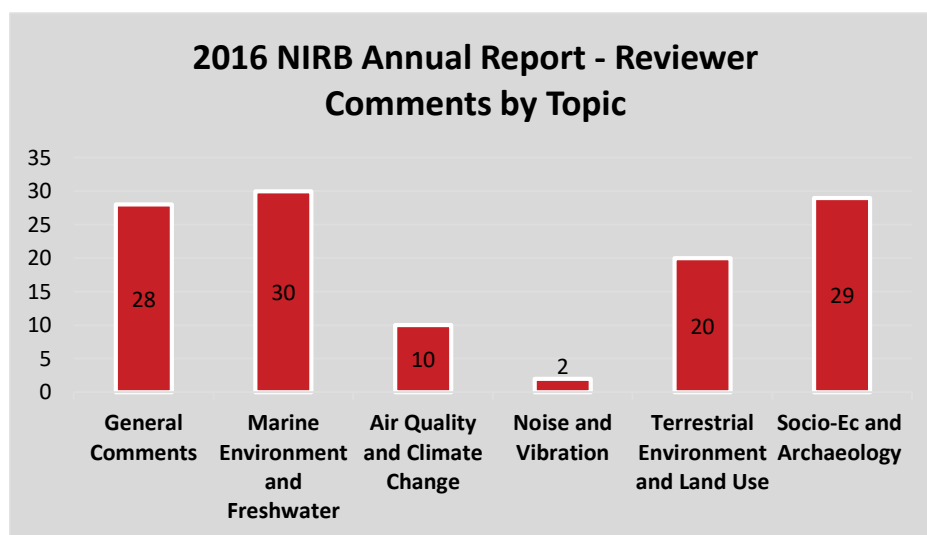
Comments received on the 2016 NIRB Annual Report were generally focused on the marine environment and effects on water resources, concerns related to air quality monitoring, dust and climate change, noise and vibration effects as a result of Project-related activities, comments related to the terrestrial environment and effects of the Project on land use, and comments on the effects of the Project on archaeological resources and socio-economic benefits of the Project. There were also a number of

general comments on the overall Project and report. A summary of the main comments by reviewing agency is provided in Table 5.1.

**Table 5.1 Summary of Agency Comments on Regulatory Performance**

Agency	Summary of Comments on Regulatory Performance and Compliance
Qikiqtani Inuit Association	<ul style="list-style-type: none"> <li>“Concerns with Project activity exceeding predicted levels, namely vehicle traffic on the tote road, and the consequence of continued exceedances of fugitive dust from the tote road and subsequent sedimentation in watersheds within the Project area.”</li> <li>“A poor record of compliance, inconsistent salinity values, and a lack of adequate monitoring of invasive species in ballast water and on ship hulls also concerns QIA, especially given the increasing number of chartered bulk carriers.”</li> <li>QIA is hopeful that the 2017 IIBA Work Plan will mark a transition toward improved benefits for Inuit.”</li> </ul>
Indigenous and Northern Affairs Canada	<ul style="list-style-type: none"> <li>“INAC would like to commend BIMC for presenting an annual report that is well-structured and easy to read. However, as a general comment, given that the project was in its third year and operating on a relatively small scale, INAC believes the number of extent of Non-Compliances, exceedances and accidents (i.e., non-compliance of discharge, spills, impacts of nitrate and dust fall on fresh water quality, etc.) that occurred could be reduced.”</li> <li>“INAC recommends that BIMC make the necessary efforts to learn from such experience and mistakes and incorporate appropriate proactive measures in its future management and operational plans and activities.”</li> </ul>
Environment and Climate Change Canada	<ul style="list-style-type: none"> <li>“ECCC has determined that Baffinland completed the actions as indicated in the six Bi-Weekly reports to address the Fisheries Act Direction measures to be taken”.</li> <li>“ECCC has determined that Baffinland has complied with the Fisheries Act Direction and no further enforcement action is necessary.”</li> </ul>
Department of Fisheries and Oceans	<ul style="list-style-type: none"> <li>DFO noted that based on their Site Visit and review of the Annual Monitoring Report that Baffinland was in compliance with conditions in its Fisheries Act authorization (comment paraphrased by Baffinland).</li> </ul>
Natural Resources Canada	<ul style="list-style-type: none"> <li>“Explosives Factory Licence F76068 is in good standing.”</li> </ul>

A breakdown of the comments received by regulatory agencies and other stakeholders by topic is provided in Figure 5.1.



**Figure 5.1 Number of Comments by Topic Received on the 2016 NIRB Annual Report**

## 5.2 NIRB'S ANNUAL MONITORING REPORT AND BOARD RECOMMENDATIONS

On November 27, 2017 the NIRB issued its *2016-2017 Annual Monitoring Report for Baffinland Iron Mines Corp.'s Mary River Project* (Monitoring Report; NIRB, 2017a), to Baffinland, which included comments subsequent to NIRB's Winter and Summer 2017 Site Visits. The Monitoring Report also contained 34 Recommendations to Baffinland.

Baffinland provided a response to NIRB's Monitoring Report on December 22, 2017 where a response to comments or recommendations was required within 30 days (Baffinland, 2017n). The remaining responses to comments on the Monitoring Report have been provided in this 2017 Annual Report.

Additional follow up on Baffinland's responses to the NIRB Board's recommendations, including further updates requested by NIRB for inclusion in the 2017 Annual Report, can be found in Appendix E.

## 6 – MANAGEMENT PLAN UPDATES

Table 6.1 provides an extensive list of all the Management Plans for the Project.

**Table 6.1 Current List Environmental Monitoring and Management Plans**

Document Number	Plan Name	Current Revision Date
BAF-PH1-300-P16-0002	Snow Management Plan	Sep-17
BAF-PH1-830-P16-0001	Surface Water Sampling Program - Quality Assurance and Quality Control Plan	Mar-17
BAF-PH1-830-P16-0002	Air Quality and Noise Abatement Management Plan	Mar-16
BAF-PH1-830-P16-0004	Borrow Pit and Quarry Management Plan	Mar-14
BAF-PH1-830-P16-0006	Cultural Heritage Resource Protection Plan	Mar-16
BAF-PH1-830-P16-0008	Environmental Protection Plan	Aug-16
BAF-PH1-830-P16-0010	Fresh Water Supply, Sewage and Wastewater Management Plan	Mar-18
BAF-PH1-830-P16-0011	Hazardous Materials and Hazardous Waste Management Plan	Mar-17
BAF-PH1-830-P16-0012	Interim Abandonment and Reclamation Plan	Mar-16
BAF-PH1-830-P16-0013	Oil Pollution Emergency Plan - Milne Inlet (OPEP)	Jun-17
BAF-PH1-830-P16-0017	Q1 Quarry Management Plan	Jul-17
BAF-PH1-830-P16-0023	Roads Management Plan	Mar-16
BAF-PH1-830-P16-0024	Shipping and Marine Wildlife Management Plan	Mar-16
BAF-PH1-830-P16-0025	Stakeholder Engagement Plan	Mar-16
BAF-PH1-830-P16-0026	Surface Water and Aquatic Ecosystems Management Plan	Mar-16
BAF-PH1-830-P16-0027	Terrestrial Environmental Management and Monitoring Plan	Mar-16
BAF-PH1-830-P16-0028	Waste Management Plan	Mar-18
BAF-PH1-830-P16-0029	Phase 1 Waste Rock Management Plan	Nov-17
BAF-PH1-830-P16-0030	Borrow Source Management Plan – Kilometre 2	Oct-14
BAF-PH1-830-P16-0031	Life of Mine Waste Rock Management Plan	Apr-14
BAF-PH1-830-P16-0032	Borrow Source Management Plan - Kilometre 97	Oct-14
BAF-PH1-830-P16-0035	Borrow Source Management Plan - Kilometre 104	Mar-14
BAF-PH1-830-P16-0036	Spill Contingency Plan	Mar-17
BAF-PH1-830-P16-0037	Exploration Spill Contingency Plan	Jun-14
BAF-PH1-830-P16-0038	Exploration Closure and Reclamation Plan	Jul-14
BAF-PH1-830-P16-0039	Aquatic Effects Monitoring Plan	Oct-15
BAF-PH1-830-P16-0040	QMR2 Quarry Management Plan	Jul-17
BAF-PH1-830-P16-0041	Polar Bear Safety Plan	Mar-16
BAF-PH1-830-P16-0042	Spill at Sea Response Plan	Aug-15
BAF-PH1-830-P16-0046	Marine Environmental Effects Monitoring Plan	Mar-16
BAF-PH1-830-P16-0047	MMER Emergency Response Plan	Oct-17
BAF-PH1-840-P16-0002	Emergency Response Plan	Mar-18

Document Number	Plan Name	Current Revision Date
H349000-3000-07-245-0001	Q7 Quarry Management Plan	Oct-13
H349000-3000-07-245-0002	Q11 Quarry Management Plan	Oct-13
H349000-3000-07-245-0003	Q19 Quarry Management Plan	Oct-13
H349000-4200-07-245-0001	D1Q1 Quarry Management Plan	Oct-13
H349000-4200-07-245-0002	D1Q2 Quarry Management Plan	Oct-13

Some Environmental Management and Monitoring Plans for the Project have been updated and submitted to applicable regulatory authorities or review agencies throughout 2017. A revised version of the Milne Port Oil Pollution Emergency Plan, was submitted in June 2017 and the Quarry Management Plans for Quarry Q1 and QMR2 were submitted in July 2017. An update to the Interim Closure and Reclamation Plan was submitted to the NWB and QIA as an appendix to the 2018 Work Plan in November 2017; Table 6.1 lists the current approved version of the Interim Closure and Reclamation Plan.

A copy of Baffinland’s Environmental Management Plans are available on the document web portal: <http://www.baffinland.com/document-portal-new/?cat=9&archive=1&lang=en>.



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