

August 14, 2023

Guillaume Daoust  
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Nunavut Impact Review Board  
29 Mitik Street, PO Bo 1360  
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Sent via email: [info@nirb.ca](mailto:info@nirb.ca)

**Re: Baffinland Response to Comments Received for Baffinland's 2022 NIRB Annual Report**

Dear Guillaume,

On May 3<sup>rd</sup>, 2023, the Nunavut Impact Review Board (NIRB or Board) received Baffinland Iron Mines Corporation's (Baffinland) 2022 Annual Monitoring Report (the Annual Report), which included the marine and terrestrial environment technical reports as appendices. On May 26<sup>th</sup>, 2023, the NIRB requested that interested parties review the 2022 Annual Report and provide comments with respect to their jurisdiction and/or area of expertise on whether the conclusions reached by Baffinland in the 2022 Annual Report were valid, as well as comment on the Proponent's compliance status with regard to authorizations that have been issues for the Project Certificate. By July 11<sup>th</sup>, 2023, the NIRB had received comments from the following parties:

- Qikiqtani Inuit Association (QIA) – (NIRB Registry ID No. 346057)
- Government of Nunavut (GN) – (NIRB Registry ID No. 346055)
- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) – (NIRB Registry ID No. 346050)
- Environment and Climate Change Canada (ECCC) – (NIRB Registry ID No. 346052)
- Fisheries and Oceans Canada (DFO) – (NIRB Registry ID No. 346051)
- Parks Canada (PC) – (NIRB Registry ID No. 346053)
- Transport Canada (TC) – (NIRB Registry ID No. 346054)
- Health Canada (HC) – (NIRB Registry ID No. 346056)

On July 13<sup>th</sup>, 2023, the NIRB provided Baffinland an opportunity to respond to these comments by August 11, 2023. Responses to comments from these parties can be found in Attachment 1.

Baffinland appreciates the comments submitted by reviewers on the 2022 Annual Report to the NIRB and wishes to thank everyone for their ongoing engagement in the success of the Mary River Project.

Regards,

*Lou Kamermans*

Lou Kamermans  
Senior Director, Sustainable Development

Cc: Megan Lord-Hoyle, Cortney Oliver, Lauren Corlett (Baffinland)  
Cory Barker, Kelli Gillard (NIRB)

*Attachments*

*Attachment 1 – Baffinland Response to Reviewer Comments by Agency*

*Attachment 2 – 2022 Annual Air Quality, Dustfall and Meteorology Report*

## **Attachment 1**

Baffinland Response to Reviewer Comments by Agency

Table A.1: Response to QIA Comments on Baffinland's 2022 Annual Report to the NIRB

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
<b>GENERAL COMMENTS</b>					
1	QIA 2022 NIRB GC # 1.	<p>Baffinland provides high-level, general information about public engagements in section 2.3 of the Annual Report Main Body. Baffinland provides general information about engagement events that occurred throughout 2022 in Appendix B.1 and a summary of Comments, Questions, and Concerns received during the 2022 Shipping Season in Table B.2.2. Table B.2.2. does not identify if and how concerns were addressed.</p> <p>In comments for the 2020 and 2021 Annual Reports, QIA has requested that Baffinland provide a tracking table that summarizes key issues and feedback raised during stakeholder engagement and how these issues were addressed. Baffinland responded on comments to the 2021 report, "Baffinland requests that the QIA provide the feedback they received on Baffinland's current practices if/where additional information or gaps have been identified by Inuit substantiated with specific examples" (Baffinland Response to Comments Received for the 2021 Annual Monitoring Report PDF p. 9).</p> <p>QIA would like to clarify that this request is for the purposes of keeping a reference of key issues and how they have been resolved. QIA believes this would be of value for both Baffinland's records and for QIA's records.</p> <p>QIA recognizes that Baffinland captures comments, questions, and concerns that require specific follow-up in meeting notes and recorded minutes. Baffinland states that records from engagements are uploaded to a software program. Given that Baffinland is already tracking comments, questions, and concerns using software, the addition of how these were resolved or will be resolved would be a logical next step.</p>	<p>Baffinland to provide a tracking table that outlines all of its engagement events, the key concerns raised by communities during those events, and how Baffinland responded to those concerns. This includes how Baffinland has or will address concerns as well as reasons Baffinland identifies for concerns they choose not to address. Given that Baffinland is already taking notes and minutes at their engagement events, the concerns raised and Baffinland's responses to them are already being recorded. Including this information as an Appendix to the Annual Monitoring report would provide strong and auditable/testable evidence that Baffinland is keeping track of and responding to Inuit concerns in a meaningful fashion.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 2.3 Engagement Activities</p> <p><b>PDF Page:</b> 73 to 79 of 703</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board, Appendix B, 2022 Engagement Records and Community Comments and Questions</p> <p><b>Section:</b> Appendix B.1 and B.2</p> <p><b>Page:</b> B.1 - 8, and Table 1; B.2 - 1-6</p> <p><b>Document Name:</b> Baffinland Response to Comments Received for Baffinland's Production Increase Proposal Extension 2021 Annual Monitoring Report</p> <p><b>Section:</b> Table A.1: Response to QIA Comments on Baffinland's 2021 Annual Report to the NIRB</p> <p><b>PDF Page:</b> 8-9 of 131</p>	<p>Baffinland records extensive meeting minutes inclusive of action items that arise from engagements with Inuit. Draft minutes are circulated to meeting attendees for review, comment and feedback. If comments and feedback are received, Baffinland integrates this into the final meeting minutes kept on record. Note that often comments and feedback are not received by meeting attendees. Action items arising from various levels and formats of engagement are integrated into internal tracking mechanisms to be delegated to the appropriate resources to complete the item. Specific examples of this include the MEWG and TEWG engagements, public processes (e.g. NIRB processes such as assessments and Annual Report commenting), engagement with community groups such as Hamlet Councils and Hunters &amp; Trappers Organizations. Commitments made by Baffinland are already appended to the Project Certificate per Amendment 4 for tracking and responding to Inuit concerns in a transparent, public and meaningful fashion. All engagements are summarized within the Annual Report and referenced as relevant to specific term and condition compliance updates. Baffinlands record keeping and reporting will continue to evolve as the project continues and Baffinland is open to providing more systematic accounting of engagement in future reports.</p>
<b>METEOROLOGY AND CLIMATE</b>					
2	QIA 2022 NIRB M&C # 1.	<p>Baffinland describes the work completed over the year on their Climate Change Strategy, including updates to the</p>	<p>Baffinland to develop roadmaps that include:</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p>	<p>Baffinland thanks QIA for their recommendations. As outlined in the Climate Change Strategy (Appendix G.1, pg. 4), Baffinland will develop implementation roadmaps to guide the five-year implementation of the revised Climate Change Strategy. The</p>

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		<p>strategy based on interviews with institutions and community organizations or groups.</p> <p>While PC Conditions 2 and 4 relate to carrying out studies to validate and update climate change impact predictions and involving Inuit in those studies, Baffinland’s response is mostly about planning for those studies. There continues to be very little monitoring accomplished to understand climate change in the region to inform operations into the future as well as closure. Baffinland does continue to collect and report data on temperature, precipitation, and ice concentration at the start and end of shipping season. It is helpful to have that record for future analysis.</p> <p>Baffinland’s goals respecting the Climate Change Strategy include:</p> <ol style="list-style-type: none"> <li>1. <i>Improve energy efficiency and forge a path to decarbonization; and</i></li> <li>2. <i>Monitor changes in climate and associated risks to inform adaptation and closure strategies.</i></li> </ol> <p>During the Stratos Interviews on the Climate Change Strategy, those interviewed were asked about:</p> <ul style="list-style-type: none"> <li>• Roles and actions they may like to see Baffinland explore to manage its greenhouse gas emissions and adapt to climate change</li> <li>• Potential areas for collaboration related to climate change, and</li> <li>• Other sources of information or other groups working to research or address climate change in the North Baffin region (Climate Change Strategy p. 7 of 17).</li> </ul> <p>These topics are helpful for planning climate change studies. However, it appears there has still been no work accomplished for the implementation of studies. Baffinland suggests that work on the topic of climate change environmental monitoring in 2023 will consist of more planning – through the development of roadmaps that “will include actions required</p>	<ul style="list-style-type: none"> <li>• A description of the work they will undertake to collaborate with Inuit in the development of Inuit Qaujimagatuqangit-defined climate-related criteria to be applied in relation to the Project’s Climate Change Strategy. The description should include a timeline for criteria incorporation into the current environmental monitoring program and any future proposed environmental monitoring programs.</li> <li>• A description of how and where Inuit Qaujimagatuqangit (IQ) will be used to inform climate scenario development and to understand community and regional vulnerabilities. The description should include a timeline for the climate scenario development and when community and regional vulnerabilities and environmental priorities will be established.</li> <li>• Initiation of climate change related studies in 2023.</li> </ul> <p>Baffinland to include discussion and analysis of trends in their climate-related monitoring under PC Condition 4 – and the results of Inuit climate change monitoring Baffinland supports - in future annual reports.</p>	<p><b>Section:</b> 4.6.1 Meteorology and Climate (PC Conditions 2 and 4)</p> <p><b>PDF Page:</b> 114 to 119, 124 to 125 of 703</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.1, Climate Change Strategy</p> <p><b>Section:</b> Strategy Development Process</p> <p><b>PDF Page:</b> 7, 9 of 17</p>	<p>roadmaps will include actions required to progress the goals of the Strategy, as well as crosscutting actions to implement the governance, monitoring, reporting and assurance needed for Strategy implementation. As these are developed, Baffinland will aim to provide more detail on the incorporation of IQ and will continue to engage stakeholders on the community and regional vulnerabilities and environmental priorities.</p>

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		to progress the goals of the strategy (Baffinland's Climate Change Strategy p. 9 of 17)."			
3	QIA 2022 NIRB M&C # 2.	The Objective of PC Condition 1 is: "To provide feedback on the impacts that climate change might be having on the port facilities." (Appendix G.6.9, PDF p. 13). It requires tidal gauges to be used at the Milne and Steensby port sites to monitor sea-level changes and storm surges. However, "...Baffinland proposes not moving forward with tidal gauge monitoring in 2023 in favour of exploring alternative options to meet this Condition using one or many alternative indicators other than sea level rise (SLR) such as temperature and precipitation regime, or climate response variables such as ice cover and hydrologic response." (s.4.6.1, PDF p. 113; see also 2022 Annual report s. 4.6.10, PDF p. 333). The reason presented for this change is, "...the current survey equipment used to quantify relative sea level change using Milne Port tidal data is not providing the level of accuracy and precision required to meet this condition." (Appendix G.6.9, PDF p. 13)	Baffinland to identify the pros and cons of alternatives that are available for monitoring climate change effects on the port facilities, including alternative approaches that would provide sea-level data with the precision and accuracy needed for meaningful monitoring of sea-level changes. Baffinland to provide updates on what alternative climate change indicators they are pursuing.	<b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body <b>Section:</b> 4.6.1 Meteorology and climate (PC Condition 1) <b>Page: 55 to 57 (PDF p. 111 to 113 of 703)</b> <b>Section:</b> 4.6.10 Marine Environment (PC Condition 76) <b>Page: 269 to 278 (PDF p. 325 to 334 of 703)</b>	Baffinland is committed to fulfilling this Condition, whether through continued monitoring of relative sea levels or through a different, more suitable indicator. Baffinland commits to discussing alternative climate change indicators with the MEWG to effectively address PC Condition.
4	QIA 2022 NIRB M&C # 3.	PC Condition 2 states, "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." QIA acknowledges the ongoing efforts regarding the Climate Change Strategy. Given the nature of The Strategy and commitments regarding improving energy efficiency and greenhouse gas emissions performance, Adaptive Management principles would support the successful execution of the strategy and achieving related goals.	Baffinland to incorporate Adaptive Management principles into the Climate Change Strategy and similarly incorporate the Climate Change Strategy into the Adaptive Management Plan.	<b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board <b>Section: 4.6.1, PC Condition 2</b> <b>Page: 58-63 (PDF p. 114 to 119 of 703)</b>	Baffinland thanks QIA for the suggestion. As described in Appendix G1 on pg. 12 of the Climate Change Strategy, Baffinland will prioritize climate scenario analysis in its strategy implementation roadmaps and include the specific consideration for adaptation planning to cover the full mine life, including closure. Baffinland will consider specific amendments to the revised draft Adaptive Management Plan, released for public review on May 15, 2023 as they are received.
<b>AIR QUALITY AND NOISE</b>					
5	QIA 2022 NIRB AQ&N # 1	Baffinland notes "Baffinland has advised that it intends to provide a formal response to the Report, outlining Baffinland's next steps with respect to the recommendations. Baffinland has provided its preliminary response to the Dust Audit Committee and will issue a formal response to the NIRB in April 2024." This timeline potentially precludes implementation of the recommendations in 2023 and conflicts with the timeline	Baffinland to provide a formal response to the dust audit as soon as possible and commence implementation of recommendations as soon as feasible (i.e., implementation of operational changes	<b>Document Name:</b> Appendix F.2 PIP Renewal Commitment Status <b>Section: BIM ID 007</b> <b>PDF Page: 5 of 16</b>	Baffinland provided its initial responses to the Dust Audit Report directly to the Dust Audit Committee in February 2023. Baffinland also issued the formal response to the NIRB on August 1, 2023 which defined the scope of work and schedule for each recommendation.

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		provided to QIA during their engagement meeting with Baffinland in February 2023. At that meeting, Baffinland committed to providing a formal response by April 15, 2023.	immediately, and physical mitigations as soon as logistics allow).		
6	QIA 2022 NIRB AQ&N # 2.	<p>PC Condition 10 states "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>a. Outline the specific plans for monitoring dust along the first few kilometres of the rail corridor leaving the Mary River mine site.</li> <li>b. 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>c. 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>d. 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> <li>e. The Proponent shall implement its Dust Management and Monitoring Plan, report all monitoring data to the NIRB annually, and take all adaptive management measures described in its Dust Management and Monitoring Plan if monitoring indicates that dust in the ambient air or dust deposition from the increased traffic associated with the increased volume of ore being shipped is greater than initially predicted." <p>The QIA disagrees with Baffinland's statement of compliance. Although Baffinland outlines the current and planned efforts being executed regarding dust suppression, the specifics of adaptive management measures are not mentioned.</p> </li></ul>	Baffinland to outline specific adaptive management measures developed respecting dust management.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section: 4.6.2, PC Condition 10</b></p> <p><b>Page: 82 to 85 (PDF p. 138 to 141)</b></p>	<p>Baffinland refers to the author to the 2022 TEAMR which outlines dust controls currently employed at the Project that are a result of adaptive management process since the start of operations. In addition to this Baffinland is currently conducting trials of a dust suppression product applied at the crusher equipment to coat the ore and reduce dust during subsequent material handling. A comprehensive summary will be included in the 2023 TEAMR regarding specific controls implemented during the 2023 calendar year. In addition to the current adaptive management efforts regarding dust described in the TEAMR, Baffinland also included an action toolkit in the draft revised Air Quality and Noise Abatement Management Plan (AQNAMP), released for public review on May 15, 2023. The action toolkit described possible actions to implement should a moderate or high risk level threshold be met, as described in the AQNAMP's trigger, action, response plan (TARP).</p>
7	QIA 2022 NIRB AQ&N # 3.	There is a strong 1:1 relationship between the dust collectors operating at 2.0 m and those at 0.5 m above ground level, with modest variability. Can the data collected be used to assess	Baffinland to assess whether there may be seasonal or other advantages to using dust collectors operating at 0.5 or 2.0 m above ground level, or to using both.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p>	The pilot study was conducted in response to community, GN and QIA requests to determine whether monitoring at 2.0 m height was under-representing, or 'missing' dustfall closer to ground level. The results of the pilot study clearly demonstrated that there is no significant difference in the magnitude of dustfall from dust

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		whether there might be seasonal or other advantages (e.g., reliability) related to using one height or another, or both?		<p><b>Section:</b> 4.6.2 Air Quality (PC Condition 10) <b>Page:</b> 82 to 85 (PDF p. 138 to 142 of 703) <b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.5.1 TEAMR</p> <p><b>Section:</b> 8.3.4 Sampling height pilot study <b>Page:</b> 86 (PDF p. 126 of 160)</p>	<p>collectors operating at 2.0 m and those at 0.5 m above ground level throughout any season, but that there was elevated variability in the dustfall collected at the dustfall collectors operating at 0.5 m above ground level. This study confirmed that monitoring dustfall at the 2.0 m height, as per the standardized methodology, is the best means of measuring dust from the installed collectors. Dustfall will continue to be measured at a standardized height of 2.0 m at all monitoring stations. Other regulators, including Environment and Climate Change Canada (ECCC) have expressed a preference to see all Projects monitoring dustfall following the standardized methodology (see ECCC comments on Meadowbank dustfall monitoring program) (Agnico Eagle Mines Limited — Meadowbank Division 2019).</p> <p>Reference: Agnico Eagle Mines Limited — Meadowbank Division. 2019. Final Written Statement Responses: Whale Tail Pit — Expansion Project. Submitted to Nunavut Impact Review Board.</p>
8	QIA 2022 NIRB AQ&N # 4.	<p>With respect to satellite imagery analysis, Baffinland states, "Dustfall extents from 2022 in dustfall concentration classes &gt;4.5 g/m2 remained consistent with 2021 except for Milne Inlet, which indicated an increase. Milne Inlet total dustfall extent remained well above the baseline (2004 and 2013) extent since 2015.". Dustfall is also elevated in the vicinity of the Mine, Tote Road and Milne Port (e.g., s.8.3.2.3, Table 8-4, pp.77 and 7 (PDF pp. 117 and 118), s.8.4.3, p.107ff (PDF p. 147ff of 160)).</p>	<p>Baffinland to assess whether dustfall is advancing the timing of snow melt and sea ice melt in Milne Inlet, and the timing of snowmelt and runoff in other areas affected by elevated dustfall.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.2 Air Quality (PC Condition 10) <b>Page:</b> 82 to 85 (PDF p. 138 to 142 of 703)</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Condition 57) <b>Page:</b> p. 214 to 219 (PDF p. 270 to 275 of 703)</p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.5.1 TEAMR</p> <p><b>Section:</b> 8.4.3 Inter-annual trends <b>Page:</b> 107 (PDF p. 147 of 160).</p> <p><b>Section:</b> 8.3.2.3, Table 8-4 PDF <b>Page:</b> 77 and 78 (PDF pp. 117 and 118 of 160)</p>	<p>This recommendation is outside of the scope of assessment. It is premature for Baffinland to assess whether dustfall is advancing the timing of snow and sea ice melt, and if so on what type of geographical scale. There are tools in development that will assist in the determination of snow and ice melt timing (eg. MODIS imagery; <a href="https://modis.gsfc.nasa.gov/about/">https://modis.gsfc.nasa.gov/about/</a>), however, these tools are not available for widespread use.</p> <p>Preliminary/anecdotal information may suggest a correlation between dust and advancement of snow and sea ice melt (NRCan presentation, August 2022), i.e., at a local level and largely within the Project Development Area. However, multiple years of data collection are necessary to meaningfully assess whether project-related dustfall is advancing the timing of snowmelt and sea ice melt in a regional sense, particularly in light of simultaneous climate change.</p> <p>Regardless of any project effect on snow or ice melt, Baffinland is working to control dust based what is likely a more sensitive indicator – aesthetics. As a result, dust controls that are being developed, or may be applied in the future at Milne Port to respond to aesthetic concerns will simultaneously address any potential impact on snow or ice melt that are within Baffinlands reasonable ability to address.</p>
9	QIA 2022 NIRB AQ&N # 5.	<p>Commitment BIM ID 036 includes the text "Baffinland is also required to describe mitigation measures which could be made to operations and ore transferring/handling under a possible future expanded project (e.g., what could be accomplished in a 2023+ project)." BIM ID 040 includes the</p>	<p>Baffinland to change the status of PIPR commitment 036 and 040 to "Noncompliant". Baffinland to provide a list of mitigation measures which could be made to operations and ore</p>	<p><b>Document Name:</b> Appendix F.2 PIP Renewal Commitment Status</p> <p><b>Section:</b> BIM ID 036; BIM ID 040 <b>Page:</b> 9, 10 of 16</p>	<p>Baffinland will continue to work with the QIA on this specific commitment and provide a full summary as part of the 2023 annual reports. The current trials of dust suppression occurring at the crusher are evaluating a specific dust control to be implemented to reduce dust throughout the material handling chain.</p>

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		<p>text: “Baffinland will define what other operational practice improvements will be made to minimize dust from Milne Port once the draft Dust Audit Report is received, and clarify how those measures will be implemented. Changes requiring additional infrastructure or materials should be implemented without delay after receiving the materials on the 2023 sealift, and within a reasonable timeframe given the final scope of required work.”</p> <p>Baffinland has described the status as of March 31, 2023 for both as compliant – in progress due with the following general text as a qualifier: “Baffinland and QIA met in-person in Ottawa, Ontario on February 16 and 17, 2023 to discuss progress towards Commitments 030 to 063... Baffinland provided status updates on each commitment, sought clarification from QIA on several items, and developed a mutual path forward on items still in progress.” No further timeline for these activities is provided. QIA’s understanding from the meeting in Ottawa was that BIM would be providing a list of operational mitigations by April 15, 2023 that could be implemented immediately / in 2023.</p> <p>As of this writing, Baffinland has not met that deliverable deadline. This failure to meet the agreed upon timeline introduces uncertainty as to whether mitigations will be implemented in a timely manner sufficient to curtail ongoing interactions between fugitive dust and both the terrestrial and aquatic environments. It also suggests Baffinland’s stated compliance status is incorrect; adherence to these commitments are currently listed as “Compliant”.</p>	<p>transferring/handling as well as operational practice improvements that could be made to minimize and mitigate project generated fugitive dust.</p>		<p>Baffinland notes that the joint interim report on compliance with Appendix B commitments, issued by Baffinland and QIA on March 31, 2023 as a reporting requirement on Term and Condition No, 189 assigned a compliance and ongoing status to Commitments 036 and 040.</p>
10	QIA 2022 NIRB AQ&N # 6.	<p>2022 TEAMR, s.7.2.1 Background noise measurements, Table 7-1, p. 46 (PDF p. 86-160). Instruments used to measure background noise levels at the Mine Site and Milne Port have a lower noise floor (lowest measurable level; i.e., 20 dBA) than those doing so along the Tote Road (30 dBA) (2022 TEAMR, s.7.2.1, Table 7-1, PDF p. 86 of 160).</p>	<p>Baffinland to clarify why instruments with different noise floors are being used for noise monitoring and how this may affect impact assessment and comparisons.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.3 Noise and Vibration (PC Condition 14b)</p> <p><b>Page: 89, PDF p. 152 to 154 of 703</b></p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.5.1 TEAMR</p>	<p>In consultation with the sound engineers (RWDI), the best/most appropriate equipment available were used to meet assessment requirements. Differences in instrumentation did not affect the data interpretations.</p> <p>Rationale and implications for the use of instrumentation are described in the 2023 TEAMR (EDI, 2023):</p> <p>Section 7.1.3 — 2022 Moise Monitoring Locations and Equipment (pg.41-42):</p> <p>“Two types of sound level meters (SLMs) were used for the measurements: Larson Davis 820 and Larson Davis 831c. The Larson Davis 820 SLMs are capable of recording sound level metrics and measuring low sound levels but do not save</p>

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				<p><b>Section:</b> 7.2.1 Background noise measurements, Table 7-1</p> <p><b>Page:</b> 46 (PDF p. 86 to 160)</p>	<p>audio files. These were preferred for locations further from Project-related activities (i.e., 3 to 6 km away). The Larson Davis 831c SLMs are capable of recording sound level metrics and audio files but are not capable of recording sound levels as low as the Larson Davis 820s. These were preferred for the locations that were 1.5 km from the PDA.”</p> <p>Section 7.2.1 — Background Noise Measurements (pg.45-46):</p> <p>“The intent of the background level monitoring was to verify that the criteria adopted and used in the FEIS remain applicable. If the background sound levels were greater than the minima described in D038, then permissible sound levels (PSL) increased accordingly. The quietest hour recorded at each location, to verify present day background levels, is presented in Table 7-1.</p> <p>The measured background levels were below 40 dBA, the nighttime minima per D038; therefore, this minimum PSL is applicable for all ground activities associated with the Project.”</p>
11	QIA 2022 NIRB AQ&N # 7.	<p>PC Condition 14(b) states “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.”</p> <p>The QIA disagrees with Baffinland’s statement of compliance. Although Baffinland clearly outlines the monitoring being done regarding operations with the potential to produce noise and sensory disturbance, there is no mention of adaptive management strategies or principles.</p>	Baffinland to outline specific adaptive management strategies or principles respecting noise and sensory disturbance.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.3, PC Condition 14(b)</p> <p><b>Page:</b> 96-98 (PDF p. 152 to 154 of 703)</p>	<p>Baffinland submitted a revised draft Air Quality and Noise Abatement Management Plan (AQNAMP) and Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) on May 15, 2023, inclusive of a trigger, action, response plans (TARP’s) and action toolkits for moderate and high risk trigger responses. The AQNAMP and TEMMP includes considerations for noise and sensory disturbance.</p>
<b>MARINE AND AQUATIC ENVIRONMENT</b>					
12	QIA 2022 NIRB M&AE# 1.	<p>PC Condition 16 states, “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.”</p>	<p>Baffinland to build the Tote Road as 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 in advance of constructing those facilities.</p> <p>QIA notes this is the same request as the last two years.</p> <p>Baffinland to provide QIA updates per finalization of Baffinland’s permanent</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.4, PC Condition 16</p> <p><b>Page:</b> 105-107 (PDF p. 161 to 163 of 703)</p>	<p>The author has not provided any additional information to support the comment since it was submitted to the Nunavut Impact Review Board (NIRB) the past two years, or indicated any specific deficiencies with Baffinland’s previous response. The NIRB did not advise Baffinland to provide any additional information or take specific actions on this topic following the submission of the 2020 or 2021 Annual Reports and so our understanding is that it considered our responses sufficient.</p> <p>Baffinland commits to providing updates on the permanent crossing plan at 20 fish-bearing crossing locations along the Tote Road, and will inform QIA of any permanent corrective actions along the Tote Road on Inuit Owned Land via the submission of an application under the Tote Road Adjustment Notice (TRAN).</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		The QIA disagrees with Baffinland's statement of compliance. The Tote Road has never been built to the presented designs as approved in the FEIS Addendum. QIA notes this remains a concern and has been highlighted year after year.	crossing plan at 20 fish-bearing crossing locations along the Tote Road, which is currently being advised by DFO.  Baffinland to inform QIA of any permanent corrective actions along the Tote Road on Inuit Owned Land.		
13	QIA 2022 NIRB M&AE# 2.	<p>The Report states under PC Condition 17 that there were seven (7) discharge events in 2022 that did not comply with applicable discharge criteria, occurring at the Milne Port East Ore Stockpile Sedimentation Pond, the Mine Site Crusher Facility Pond, the KM 105 pond, KM 106 ROM Ore Stockpile Facility Pond, and the Mine Site Sewage Treatment Plants (p.165).</p> <p>A majority of the non-compliance discharges occurred due to heavy snow accumulation (during spring freshet), limiting the remaining capacity of the ponds and triggering controlled discharges, which were typically not compliant for Total Suspended Sediment (TSS) under MDMER criteria. However, the Report does not mention efforts that will be made during future spring freshets to mitigate non-compliant water (i.e., managing capacity in the ponds during spring freshet). This may be elaborated on in the appropriate management plans, but specific reference to plans for managing pond capacity (particularly during spring freshet) should be included/referenced in the NIRB submission.</p> <p>QIA notes this is an ongoing concern and additional quality control measures should be investigated and implemented.</p>	<p>Baffinland to include a plan for managing capacity in ponds during spring freshet in the NIRB submission, as capacity issues in several storage ponds at the Mine Site led to controlled discharges and subsequent MDMER exceedances in 2022.</p> <p>Baffinland to continue to improve their sampling procedures to provide better confidence in monitoring results.</p> <p>Baffinland to continue to improve preventative maintenance measures and develop a Standard Operating Procedure for equipment monitoring.</p> <p>Baffinland to provide a performance update for the new MS-11 Surface Water Management Pond regarding freshet 2023.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board.</p> <p><b>Section:</b> 4.6.3 Hydrology and Hydrogeology, PC Condition 17</p> <p><b>PDF Page:</b> 159 to 174 of 703</p>	<p>The KM 105 Pond and other Long-Term Water Management plan infrastructure were designed to accommodate the Environmental Design Flood capacity to hold a 1 in 100 year snowpack melt event plus the average June rainfall volume for each catchment area reporting to the facility.</p> <p>It is important to note that the 2022 controlled discharges were not specifically due to the capacity of the ponds, but due to the required settling time for solids removal within the ponds. It was discovered in 2022 (the first year of operation of the KM 105 Pond) that the suspended solids took longer than the designed-for 3 days to settle, and that they required chemical dosing of the influent to achieve proper settling. Baffinland began chemical dosing in June 2022 when this issue became apparent, however was unable to achieve proper settling before a controlled discharge was initiated as per the Metal and Diamond Mining Effluent Regulation Emergency Response Plan. Baffinland has since procured an engineered pre-treatment dosing system for this facility as well as a post-settling clarification system to ensure maximum capabilities to discharge compliant water before the pond reaches capacity. Baffinland has also obtained authorization from ECCC for inter-pond transfers in order to maximize available storage capacities in all of the ponds and direct non-compliant discharges to larger ponds for additional treatment/settling time.</p> <p>Sampling and equipment maintenance and monitoring procedures follow manufacturers recommendations and are continually updated to reflect lessons learned.</p> <p>The KM 105 Pond has not performed as designed in 2023, due to the development of a new seep that is preventing the storage of water within the pond to enable appropriate settling of Total Suspended Solids. This seep was confirmed on May 20, 2023 and subsequently reported to QIA, CIRNAC, GN, and ECCC on May 20 via NU/NT Spill Reporting.</p> <p>A follow-up spill report was submitted on June 20, and additional follow-up regarding mitigative actions is ongoing with the regulatory agencies through various information requests and inspection follow-up.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
					<p>It is important to note that the seep discovered in 2023 is not in the same location, nor is it believed to be the same mechanism of release as was encountered and remediated in 2022. The mitigation completed in 2022 was successful at addressing the root of the 2022 seepage, however further issues with containmant that have arisen in 2023 were not known, nor were they within the scope of the 2022 remediation.</p> <p>Mitigations are being developed by a third party engineering consultant, and options are being reviewed for implementation in 2023 that will comprehensively address the current and future potential seepage from this facility.</p> <p>As-built plans of the chosen remedial action will be submitted following completion of the construction work.</p>
14	<b>QIA 2022 NIRB M&amp;AE# 3.</b>	<p>The Annual Report states that "In December 2022, there were 5 exceedances of the site specific grab sample limits stipulated in the water licence at Mary River effluent monitoring stations MS-01 and MS-01B. Three of the exceedances were above the site specific grab sample limit of 4.0 mg/L for Total Ammonia (as N) and 2 of the exceedances were above the site specific grab sample limit of 4.0 mg/L for Total Phosphorus" (p.166-167). However, no explanation is given for these exceedances.</p>	<p>Baffinland to provide further information on the Total Ammonia and Total Phosphorus exceedances in December 2022, to help QIA understand the cause of the exceedances and inform mitigative measures to prevent future exceedances. Baffinland to discuss what management options will be implemented to limit these types of exceedances in the future.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board.</p> <p><b>Section:</b> 4.6.3 Hydrology and Hydrogeology</p> <p><b>PDF Page:</b> 159 to 174 of 703</p>	<p>Baffinland conducted an investigation into both the ammonia and phosphorus exceedance in December of 2022. The investigation revealed that the phosphorus exceedance was due to an inadequate dosing amount of aluminium sulphate. The inadequate dosing was caused by debris in the dosing valves. The valves were cleaned and subsequent testing showed that the phosphorus was in accordance to our discharge limits. The ammonia exceedance was due to insufficient airflow through the aeration tank diffusers. It was found that the sheaves were worn out on the blower and the belts were slipping. The blower was replaced and sufficient airflow was re-established. Ensuing testing showed that the ammonia was then within discharge parameters.</p> <p>Baffinland has revamped the preventative maintenance program for its WWTP operations to mitigate equipment failures. The maintenance program is now done through workflow planning supported by SAP. All OEM maintenance recommendations, parts, and schedules were uploaded into SAP to create the workflow planning.</p>
15	<b>QIA 2022 NIRB M&amp;AE# 4.</b>	<p>PC Condition 18 states, "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."</p> <p>The QIA disagrees with Baffinland's statement of compliance. Baffinland states that mining activities have not yet created a pit at Deposit No.1 and as such Tasks 1 and 2 of the reclamation research program for the Open Pit flooding timeline outlined in Appendix D.2 of the ICRP cannot commence until an Open Pit has formed and active dewatering is occurring.</p>	<p>QIA requests Baffinland treat Deposit 1 as an Open Pit or provide evidence to the contrary.</p> <p>QIA notes this is the same request as the last two years.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.4, PC Condition 18</p> <p><b>PDF Page:</b> 171 of 703</p>	<p>The author has not provided any additional information to support the comment since it was submitted to the NIRB last year, or indicated any specific deficiencies with Baffinland's previous response. The NIRB did not advise Baffinland to provide any additional information or take specific actions on this topic following the submission of the 2020 or 2021 Annual Reports and so our understanding is that it considered our responses sufficient. Baffinland has no additional information to provide at this time.</p> <p>Baffinland welcomes QIA to clarify if they are seeking any new or additional information from Baffinland regarding this concern.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>QIA notes that it witnessed dewatering of Deposit 1 during its 2020 Environmental Audit and that Baffinland confirmed verbally during the 2021 Environmental Audit that ponding occurs with pumping to the Waste Rock Facility. QIA disagrees that Deposit 1 is currently not a pit. As such, this PCC is deemed non-compliant until such time that analysis occurs.</p>			
16	<p><b>QIA 2022 NIRB M&amp;AE# 5.</b></p>	<p>PC Condition 19 states, "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."</p> <p>Baffinland exceeded the daily water withdrawal limits defined in the Type 'A' Water Licence five times for domestic purposes and thirty times for dust suppression based on operational limitations. While Baffinland is completing the tasks outlined in the PC Condition (monitor, document, and report withdrawal rates), the withdrawal rates are beyond the limits outlined in the Water Licence. It is not clear how this is affecting the aquatic environment.</p>	<p>NIRB to assess Baffinland's measures taken to reduce water withdrawal exceedances and monitor the effectiveness of those actions.</p> <p>QIA notes this is the same request as the last two years.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.4, PC Condition 19</p> <p><b>Page:</b> 116-118 (PDF p. 172 to 174 of 703)</p>	<p>QIA comment M&amp;AE# 5 is not directed to Baffinland.</p> <p>The author has not provided any additional information to support the comment since it was submitted to the NIRB last year, or indicated any specific deficiencies with Baffinland's previous response. The NIRB did not advise Baffinland to provide any additional information or take specific actions on this topic following the submission of the 2020 or 2021 Annual Reports and so our understanding is that it considered our responses sufficient. Baffinland has no additional information to provide at this time.</p> <p>Baffinland will continue to provide an update on daily water withdrawal volumes used for domestic, industrial and dust suppression purposes in the 2023 QIA &amp; NWB Annual Report for Operations.</p>
17	<p><b>QIA 2022 NIRB M&amp;AE# 6.</b></p>	<p>The Annual Report states that TSS exceedances occurred at the Mine Site, Milne Port and along the Tote Road corridor, but that erosion and sedimentation impacts were within FEIS predictions (Table 4.15, p.176). However, no additional information on these TSS exceedances is provided in the body of the report (i.e., which monitoring stations detected exceedances, how high the exceedances were, etc.). Further, no indication as to which management and mitigation options have been implemented to address sporadic TSS exceedances.</p>	<p>QIA requests Baffinland provide information on how events leading to the exceedances will be managed in the future to minimize or prevent ongoing noncompliance.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board.</p> <p><b>Section:</b> 4.6.5 Groundwater and Surface Water</p> <p><b>PDF Page:</b> 175 to 199 of 703</p>	<p>TSS exceedances that are historically observed along the Tote Road and at Mary River and Milne Port sites are typically associated with spring run-off/freshet conditions, where dust entrained snow melts prior to other snow melt, resulting in elevated TSS in runoff for short periods of time. The ongoing work to identify and implement increased dust control mitigations along the material handling chain and transport corridor will assist in reducing dust-entrained snow. In addition, the proactive deployment of sedimentation controls such as silt fencing and coir logs in the fall at known or suspected locations of early melt increased TSS should aid in preventing or reducing the impacts of these events.</p> <p>Other TSS Exceedances are associated with local erosion of disturbed land during freshet or heavy rainfall events. Deployment and maintenance of ESC measures (each one specific to each situation/condition) in preparation to freshet conditions (i.e. deployed in the fall) should also help to prevent increased sedimentation or reduce the impact.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
					<p>Furthermore, Baffinland has expended considerable investment in the construction of the KM 105 Sedimentation Pond, which is part of the overall Long-Term Water Management Plan (Modification No. 13) that is intended to reduce and potentially eliminate the sedimentation events at the Mine Site. Once the current seep is permanently remediated, we anticipate this facility, along with active pre-treatment and pre-release clarification capabilities, will greatly improve the water quality from the Mine Site infrastructure.</p> <p>Continued engineering and construction of the final facilities identified in Modification No. 13, will address potential sedimentation issues at SDLT Tributary 1.</p> <p>Baffinland is also making substantial improvements to the Mine Haul Road (MHR), including engineered Sedimentation/erosion controls in the MHR Ditches that will greatly reduce the sediment loadings to the KM 105 Sedimentation Pond.</p>
18	<b>QIA 2022 NIRB M&amp;AE# 7.</b>	<p>PC Condition 28 states that "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" (PDF p.195). However, the Report does not provide any clear commitments from BIM regarding measures that will be taken to minimize further impacts of the Project on permafrost along the Tote Road.</p> <p>The Annual Report states that "To improve historical permafrost degradation issues along the Tote Road, Baffinland will continue to develop and prioritize preventative and mitigation measures to minimize impacts of the Project's activities and infrastructures on landforms along the Tote Road." (PDF p.196), and that past geotechnical inspections recommended that a lack of appropriate drainage ditches at 4 former borrow pit areas be rectified along the Tote Road (PDF p.189). Thaw settlement was observed on road embankments adjacent to some borrow pit locations (PDF p.190).</p> <p>Additional mitigation measures (and specific timelines for preventative measures to be implemented) are not clear in the document, and should be provided to emphasize that BIM is addressing their requirement to reduce permafrost degradation.</p>	<p>QIA requests Baffinland provide more information regarding specific preventative measures that are being implemented to minimize future permafrost degradation along the Tote Road and prevent erosion.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board.</p> <p><b>Section:</b> 4.6.5 Groundwater and Surface Water, PC Condition 28</p> <p><b>PDF Page:</b> 175 to 199 of 703</p>	<p>Specific preventative measures that are being implemented to minimize future permafrost degradation along the Tote Road and prevent erosion are a part of Baffinland's policies and procedures for construction and maintenance activities on the Tote Road. These are detailed in Section 3 of Baffinland's Roads Management Plan (BAF-PH1-830-P16-0023). These preventative measures include:</p> <ul style="list-style-type: none"> <li>• Minimizing the use of 'cut-and-fill' techniques that involve excavating sections of existing road bed and/or ground surface and can result in changes to the thermal regime in the area</li> <li>• Maintenance on water crossings (prior to, during and following freshet) to ensure unobstructed passage of water through natural drainages and existing streams and rivers, and to minimize ponding of water along the Tote Road</li> </ul> <p>Implementation of sediment and erosion control measures along the Tote Road to prevent the removal of surface material which can cause underlying permafrost to melt</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
19	QIA 2022 NIRB M&AE# 8.	<p>PC Condition 21 relates to Groundwater/Surface Waters – Aquatic Effects Monitoring Plan (AEMP) and dustfall monitoring and PC Condition 57</p> <p>Mitigating and Monitoring for Impacts to Wildlife, including the timing of snowmelt. Dustfall has continued to exceed predictions along the Tote Road (Table 8-4, PDF p. 116 and 117 of 160). Of the 26 year-round monitoring sites sampled in both 2021 and 2022, 20 had higher dust accumulations in 2022 than in 2021 (see also 2021 TEAMR, Table 7-4, PDF p. 82 of 328). The amount of dustfall and sediment from Project activities that enters the Tote Road streams, its fate in the streams, and its effects on the biota, including Arctic Char, are unknown.</p> <p>Appendix G.4.2 states, “The pattern in sedimentation rates at all Sheardown Lake NW study areas appeared to closely reflect patterns in dustfall reported for the Mary River Project Mine Site since 2014 as part of the dustfall monitoring program. No multi-year seasonal trends in increasing dustfall were identified at the Mine Site; however, dustfall in 2022 was among the highest measured since 2016/2017” (Appendix G.4.2 PDF p. 18).</p> <p>Under the Production Increase Proposal Review (PIPR) Baffinland committed (Commitment BIM ID #065, QIA ID-24A; NIRB 2022, p. 124) to a study to address these concerns. A draft study plan that was initially to be provided to QIA on December 31, 2022 and then February 3, 2023 was received on June 23, 2023. The brief plan characterizes the study as an “initial pilot (special) investigation” to aid in the development of a robust study approach and methodology. It arrived when QIA reviews of Baffinland’s 2022 Annual Report to QIA and the NWB on Operations and 2022 Annual Report to NIRB were ongoing, and the freshet already well advanced, minimizing Baffinland’s opportunity to benefit from and incorporate feedback into their 2023 study design.</p>	<p>Baffinland to provide:</p> <p>a) A detailed study plan and photographic record of the methods tested and sampling locations and protocols once the initial pilot investigation has been completed, in 2023, to inform future discussion on the study, and</p> <p>b) Information on other studies that are ongoing in 2023 in the creeks being considered.</p> <p>Baffinland to:</p> <p>c) Consider establishing an additional test site in a non-erosional stream for comparison with the erosional streams. that have been recommended as study candidates.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.5 Groundwater &amp; Surface Water (PC Conditions 21)</p> <p><b>Page:</b> 124 to 126 (PDF p. 180 to 182 of 703)</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Condition 57)</p> <p><b>Page:</b> p. 214 to 219 (PDF p. 270 to 275 of 703)</p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.5.1 TEAMR</p> <p><b>Section:</b> 8.3.2.3 2022 Annual Dustfall, Table 8-4</p> <p><b>Page:</b> 76 and 77 (PDF pp. 116 and 117 of 160)</p> <p><b>Document Name:</b> Mary River Project, Terrestrial Environment, 2021 Annual Monitoring Report [220920-08MN053-2021 Annual Report Terrestrial Enviro-IA2E.pdf]</p> <p><b>Section:</b> Table 7-4</p> <p><b>Page:</b> 71 (PDF p. 97 of 326)</p> <p><b>Document Name:</b> Nunavut Impact Review Board [NIRB]. 2022. NIRB Project Certificate [No. 005]</p> <p><b>Section:</b> Appendix B. Commitments</p> <p><b>Page:</b> 124 (PDF p. 124 of 129)</p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.4.2 2022 Lake Sedimentation Monitoring Report</p> <p><b>Section:</b> 3.1.2 Temporal Comparisons for the 2021/2022 Ice-Cover and 2022 Open-Water Periods</p>	<p>a. Acknowledged. The study methods, including photographic record and sampling locations for the study, together with results of the Tote Road monitoring pilot investigation that will be conducted in 2023, will be detailed within a report produced by Baffinland. The information acquired from this pilot investigation will serve to inform discussion for the design of a Tote Road monitoring program used to assess potential Project-related impacts on aquatic conditions within the Phillips Creek watershed based on the establishment of long-term monitoring stations. The pilot investigation report will be included as part of Baffinland’s 2023 NIRB Annual Report.</p> <p>b. Creeks considered for the pilot investigation have previously been evaluated for presence of fish, habitat, and water quality. The occurrence of arctic charr within each of the candidate creeks was a key criterion for use as part of the pilot investigation. Historical information collected at the candidate creek used for the pilot investigation will be summarized as part of the pilot investigation report.</p> <p>Following the pilot investigation, Baffinland will discuss the potential inclusion of sedimentation monitoring within a representative non-erosional stream with applicable intervenors. Note that, as stated within the draft (June 23, 2023) Tote Road Monitoring Program proposal, characterization of habitat for creeks crossing the Tote Road within the Phillips Creek watershed indicate most are fast-flowing and erosional in nature, as is Phillips Creek itself. Thus, focus of the study on this habitat type appears to be most relevant for evaluating potential impacts to the Philips Creek system.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
20	QIA 2022 NIRB M&AE# 9.	<p>PC Condition 23 states, "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."</p> <p>QIA disagrees with Baffinland's assessment of compliance. The following was found during 2022 monitoring activities:</p> <p>"At the Landfill Facility; Groundwater sampled from monitoring location MS-LF-GW1, situated approximately 10 m downgradient and southwest of the Landfill Facility, had water quality above the comparative guidelines for dissolved chloride, dissolved sulphate, dissolved boron, dissolved cadmium, dissolved copper, dissolved manganese, dissolved nickel, dissolved uranium and dissolved zinc (relative to Federal Interim Groundwater Quality Guidelines or FIGQ guidelines). The dissolved sulphate concentration measured at MS-LF-GW1 has exhibited an increasing trend since 2017. At monitoring location MS-LF-GW3, situated approximately 10 m downgradient and southeast of the Landfill Facility and approximately 150 m south of MS-LF-GW1, had concentrations of dissolved sulphate and dissolved boron above the FIGQ" (Appendix G.3.1 PDF pp.4-5).</p> <p>As requested in the comments for the 2020 Annual Monitoring Report, Baffinland does include commentary on the direction of flow and indicates it is probable that the guideline exceedances are localized and do not migrate to waterbodies. However, additional monitoring data is now available that exceeds guidelines yet no prevention or mitigative actions related to those exceedances are discussed.</p>	<p>Baffinland to confirm steps being taken to prevent and mitigate the cause and extent of the groundwater contamination around the landfill.</p> <p>QIA notes that the same request was made the last 2 years.</p>	<p><b>PDF Page: 14</b></p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.5, PC Condition 23</p> <p><b>Page:</b> 128-130 (PDF p. 184)</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Appendix G.3.1 Groundwater Monitoring Reports</p> <p><b>Section:</b> Executive Summary</p> <p><b>PDF Pages: 4-5</b></p>	<p>Baffinland conducted an expanded groundwater monitoring program in 2022 that consisted of test pits within the landfill to verify the presence of leachate (not previously completed) and the installation of additional groundwater monitoring wells downgradient the landfill. Work was initiated on a contaminant transport model, and this determined that additional wells will be required. Baffinland's consultant recommended the installation of wells in drilled holes, rather than well installations in test pits or the use of drive-point piezometers. Baffinland is conducting an expanded field program in 2023 consistent with consultant recommendations that include the following:</p> <ul style="list-style-type: none"> <li>• Drilling and installation of up to 13 monitoring wells</li> <li>• Additional hydraulic conductivity tests, particle size distribution tests, and groundwater testing</li> </ul> <p>The 2023 field program will provide additional data to assist in characterizing the flow path and estimating the hydraulic conductivity in the active layer during seasonal variability of thaw and frozen seasons (completion of slug tests and particle size distribution laboratory testing). This additional data will be used to complete a contaminant transport model.</p> <p>The contaminant transport model will estimate the mobility of contaminants coming from the landfill facility towards Sheardown Lake. The model will assist Baffinland in determining if mitigation measures are required.</p>
21	QIA 2022 NIRB M&AE# 10.	<p>PC Condition 24 states, "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."</p> <p>The QIA disagrees with Baffinland's statement of compliance. Baffinland had five discharges of non-compliant effluent at the Mine Site Sewage Plants MS-01 and MS-01B. A number of</p>	<p>Baffinland to provide QIA its measures to reduce exceedances, above and beyond improved sampling methods and internal training.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.5, PC Condition 24</p> <p><b>Page:</b> 131 (PDF p. 187)</p>	<p>Baffinland conducts incident investigations to identify root causes of exceedances so that effective long-term corrective actions can be developed and implemented to limit identified causes leading to exceedances.</p> <p>An incident investigation is conducted for all spills and incidents that are reported to the 24-hour NT-NU Spill Report Line, or other applicable reporting process, to assist in determining the root cause of an exceedance event and in identifying appropriate and effective incident specific corrective actions.</p>

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		<p>these non-compliance were attributed to potential sampling errors. Due to these exceedances, this PCC is considered non-compliant. QIA notes this is an ongoing concern and that additional quality control measures should be investigated and implemented.</p>			<p>As per Baffinland's Incident Investigation and Reporting Procedure, Baffinland applies a hierarchy of controls in determining appropriate corrective actions to address incidents. While the objective of corrective actions is to aim for elimination, substitution, isolation, or engineered controls where practical, administrative controls may be found to be more practical and may be implemented if they effectively address the root cause of the incident. In other instances, administrative controls may be implemented as a short-term control until longer-term corrective actions are completed. Corrective actions implemented or planned to be implemented are outlined in follow-up spill reports, and subsequently detailed in the 2022 QIA &amp; NWB Annual Report for Operations (Table 6.2).</p> <p>Baffinland employs an adaptive management strategy of regular monitoring supported by operational change and adoption of other mitigating measures where necessary to achieve continuous improvement across all Project activities.</p> <p>Beyond improved sampling methods and internal training, a few examples of adaptive management measures Baffinland has implemented to ensure effluent from Project-related facilities and/or activities satisfies all discharge criteria prior to being discharged to the receiving environment include:</p> <ul style="list-style-type: none"> <li>• Implementation of the Long Term Surface Water Management Plan to enable effective management of surface water at the Mine Site.</li> <li>• Third-party engineering assessment and subsequent implementation of remedial measures at the KM 105 Surface Water Management Pond to address seepage following initiation of the operation of the facility in 2022.</li> <li>• Following the discovery in 2022 that suspended solids within the KM 105 Surface Water Management Pond took longer than the designed-for 3 days to settle, and that they required chemical dosing of the influent to achieve proper settling, Baffinland began chemical dosing in June 2022 in an attempt to achieve proper settling, before a controlled discharge was initiated as per the Metal and Diamond Mining Effluent Regulation Emergency Response Plan. Baffinland has since procured an engineered pre-treatment dosing system for this facility as well as a post-settling clarification system to ensure maximum capabilities to discharge compliant water before the pond reaches capacity.</li> <li>• Baffinland has also obtained authorization from ECCC for inter-pond transfers to maximize available storage capacities in all of the surface water management ponds and direct non-compliant discharges to larger ponds for additional treatment/settling time.</li> <li>• Following a thorough investigation into the December 2022 MS-01 and MS-01B exceedances, Baffinland improved the preventative maintenance (PM) plan for</li> </ul>

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					<p>the Project's wastewater treatment facilities to properly coordinate the timely inspection, cleaning, repair and replacement of system components to mitigate equipment failures. PM is now completed through workflow planning; managed through a Computerized Maintenance Management System (CMMS). Additionally, a Standard Operating Procedure was developed to outline regulatory requirements for Project water and wastewater treatment facilities.</p> <ul style="list-style-type: none"> <li>Substantial improvements to the Mine Haul Road (MHR), including engineered sedimentation and erosion controls in the MHR ditches that will greatly reduce the sediment loadings to the KM 105 Sedimentation Pond.</li> </ul> <p>Baffinland will continue to conduct incident-specific investigations for all reported spills and incidents to identify effective mitigative actions, as well as update the Project's management practices and procedures and implement new mitigation measures as required to ensure effluent discharges to the receiving environment are in compliance with applicable water quality discharge criteria.</p>
22	<b>QIA 2022 NIRB M&amp;AE# 11.</b>	<p>PC Condition 25 states, "The Proponent shall undertake 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."</p> <p>QIA disagrees with Baffinland's assessment of compliance, as the Tote Road has not been built to design and concerns on the state of the Tote Road are ongoing. The 2019 Tetra Tech Report confirms most concerns along the Tote Road from the 2014 Tetra Tech Report were not addressed. QIA understands Baffinland has a multi-year Execution Plan for addressing recommendations made by Tetra Tech regarding permafrost degradation. QIA will continue monitoring these mitigative actions, the status of the Tote Road and settling of water retention structures and will consider assessment within the context of the 2022 Environmental Audit.</p>	<p>Baffinland to build the Tote Road as designed or provide a satisfactory effects assessment of operating the road in its current state. PC Condition 25 should be considered non-compliant until this occurs.</p> <p>This PC Condition will not be re-assessed by QIA until completion of the multi-year Execution Plan to address the priority areas identified in the Tetra Tech Report.</p> <p>QIA notes this is the same request as the last two years</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.5, PC Condition 25</p> <p><b>Page:</b> 132-134 (PDF pp. 188 - 190)</p> <p><b>Document Name:</b> 2019 Inspection of the Milne Inlet Tote Road and Associated Borrow Sources</p> <p>[NIRB Registry: 200521-08MN053-App G15-Tetra Tech 2019 Report Pt 1-IA1E.pdf, 200521-08MN053-App G15-Tetra Tech 2019 Report Pt 2-IA1E.pdf, 200521-08MN053-App G15-Tetra Tech 2019 Report Pt 3-IA1E.pdf, and 200521-08MN053-App G15-Tetra Tech 2019 Report Pt 4-IA1E.pdf]</p>	<p>Baffinland agrees with its assignment of compliance, as the goal of the PC Condition is to complete geotechnical inspections to develop and implement mitigation measures, which it has done. Baffinland has, and continues to, complete geotechnical inspections along the Tote Road where required mitigative measures are identified. Baffinland is actively implementing these measures, and believes it is acceptable that the measures are implemented in a phased approach from both a risk-assessment and resource-availability perspective.</p> <p>The author has not provided any additional information, or indicated a deficiency with Baffinland's previous response, which is listed below. Baffinland has no additional information to provide at this time.</p> <p>Baffinland continues to implement recommendations from the 2019 Tetra Tech report with continued focus on the sites that were identified by the third party consultant as first priority.</p> <p>Since 2013, there have been ongoing upgrades to sections of the Tote Road as part of the construction and operation of the Early Revenue Phase (ERP) for the Project and in an effort to mitigate sedimentation and erosion concerns, and to safely transport iron ore from the Mine Site to Milne Port. Any changes in design or proposed deviations from those in the Final Environmental Impact Statement (FEIS) and FEIS Addendum have been approved by all relevant regulatory authorities prior to construction, and were completed to minimize any adverse impacts to the environment. This has included widening, straightening and re-alignment of the Tote Road at certain locations for road safety, and to minimize erosion and sedimentation</p>

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					issues. Additional armouring has also been added at road embankments for erosion mitigation measures. To maintain fish passage, Baffinland has obtained the required approvals for the installation, movement and/or extension of culverts at identified stream crossings to improve transportation safety and minimize impacts to fish. Any proposed changes to the Tote Road design as outlined in the FEIS Addendum, were completed to maintain the safety of personnel working along the Tote Road, and to protect sensitive environmental receptors.
23	QIA 2022 NIRB M&AE# 12.	<p>PC Condition 27 states "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."</p> <p>While Baffinland reports on discussions respecting aesthetic value held with communities throughout 2022, Baffinland has not provided information on the effectiveness of consultation efforts related to this PC Condition. The IIBA requires a detailed engagement plan, which should be shared with QIA so that consultation efforts can be assessed by QIA.</p> <p>QIA notes this is the same comment as provided for the 2020 and 2021 Annual Monitoring Report Reviews.</p>	Baffinland to provide, as required by the IIBA, a detailed engagement plan so the 2022 consultation efforts can be assessed, commented on and revised accordingly.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.5, PC Condition 27</p> <p><b>Page:</b> 137-138 (PDF p.193 -194)</p>	<p>Public consultation continues to not reveal any significant concerns from affected communities about specific impacts regarding changes to the topography and landscape have had on the aesthetic value of the Project area. Most comments about changes to the land and sea continue to focus 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).</p> <p>With respect to 'aesthetics', concerns related to dust (specifically on snow), which may be visible on the landscape depending on distance from the Project, continue to be voiced as part of current operations particularly around Milne Port and along the Tote Road and with respect to current and future operations. Please see Baffinland's 2022 Annual Report to the Nunavut Impact Review Board, Section 4.6.5, for more details.</p> <p>Other discussions on aesthetic values as they relate to mine closure and the final state of the mine following reclamation were initiated by Baffinland during the May 7, 2019 Community Risk Workshop at the Mary River Mine Site. While limited direct feedback on aesthetic values was gained during the workshop discussion, Baffinland will continue to engage with Inuit to identify closure objectives and criteria that respect the aesthetic values and end land use, while incorporating and respecting Inuit Qaujimagatuqangit.</p> <p>Before any engagement with Inuit, Baffinland submits and engagement notification to QIA 15 days in advance of the engagement in accordance with article 14 of the IIBA. QIA has an open invitation to attend any Baffinland engagement with Inuit of the impacted communities and may comment and inform any engagement Baffinland conducts.</p>
24	QIA 2022 NIRB M&AE# 13.	<p>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.</p> <p>QIA agrees with Baffinland's assessment of compliance.</p>	Baffinland to provide a discussion on how they measure effects to permafrost.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.5, PC Condition 28</p>	Biannual geotechnical inspections are undertaken at various facilities and structures that contain waste materials, and store or retain/convey water at both the Mary River Mine Site and Milne Port. Through these inspections, structures are inspected for signs of settlement, cracking, and/or seepage, which would indicate if localized permafrost degradation is taking place.

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				Page: 139-140 (PDF p. 195 -196)	
25	QIA 2022 NIRB M&AE# 14.	<p>PC Condition 29 state, "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."</p> <p>QIA agrees with Baffinland's assessment of compliance. However, commentary on as-builts submitted in the 2022 QIA &amp; NWB Annual Report for Operations was submitted under that cover. The QIA will continue to assess as-built documentation as received.</p>	None.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.5, PC Condition 29</p> <p><b>Page:</b> 141-142 (PDF p. 197 -198)</p>	No response required.
26	QIA 2022 NIRB M&AE# 15.	<p>Despite identifying eleven fish passage issues at Tote Road stream crossings in 2021, including six culverts that were perched in spring and remained perched in the fall, there was "no construction work at fish-bearing stream crossings along the Tote Road in 2021."(2021 Annual Report to NIRB, Appendix G.17, s. 2.1, PDF p. 8 of 70). Most of these crossings have required remediation on multiple occasions since 2011 (Table 9, PDF p. 51 of 70).</p> <p>In the 2022 Annual Report Baffinland states, "There was no construction work at fish-bearing stream crossings along the Tote Road in 2022." (2022 Annual Report QIA – NWB for Ops., p. 36 of 91). These fish passage issues can delay or prevent access by small fish to summering habitats upstream of the Tote Road. In the case of these culverts, the delay may have obstructed fish passage by at least 2 years—longer if they were not remediated in the spring of 2023.</p> <p>In 2021, the DFO Tote Road Report provided monitoring data on these culverts including, updates on their status, remediation required and completed, and fish passage (2021 Annual Report to NIRB, Appendix G.17, parts 1 and 2). In 2022, the DFO Tote Road Report was not prepared, so this information is no longer readily accessible. However, DFO inspected the fish-bearing crossings and a plan is being</p>	<p>Baffinland to:</p> <p>a) Provide updates on the status of the culvert stream crossings and their ability to provide unobstructed fish passage for juvenile Arctic char in 2022, and remediation planned for 2023;</p> <p>b) Clarify what monitoring of these crossings will be continued over the long term; and</p> <p>c) Commit to providing reports similar to the DFO Tote Road reports that have provided well-illustrated annual updates on the status of Tote Road stream crossings, remediation required and completed, and passage of Arctic char.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.7 Freshwater Environment (PC Condition 45)</p> <p><b>Page: 177 to 179 (PDF p. 232 to 234 of 703)</b></p> <p><b>Section:</b> 4.6.7 Freshwater Environment (PC Condition 47)</p> <p><b>Page:</b> 181 (PDF p. 237 of 703)</p> <p><b>Document Name:</b> Baffinland Iron Mines 2021 Annual Report to the Nunavut Impact Review Board, Appendix G.17 DFO Tote Road Report</p> <p><b>Section:</b> 1.2 Authorization for Works; 2.1 Construction work</p> <p><b>Page: 3 (PDF p. 8 of 70)</b></p> <p><b>Section:</b> Table 8, 1.2 Authorization for Works; 2.1 Construction work</p> <p><b>Page: n/a (PDF p. 9 of 51)</b></p>	<p>a) Baffinland is currently working with DFO on the long-term crossing plan for these culvert stream crossings, with remediation expected to start in fall 2023. These works will be submitted to QIA for approval as part of a Tote Road Adjustment Notice (TRAN) and be reported on accordingly.</p> <p>b) Baffinland will continue monitoring at these crossing locations as required by DFO and the Project Certificate.</p> <p>Baffinland will provide reporting on monitoring at fish-bearing crossing locations on the Tote Road as required by DFO, and will integrate this reporting into annual monitoring reports, as appropriate.</p>

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		<p>developed by Baffinland to address the fish passage issues (2022 Annual Report QIA - NWB for Ops, s.10.1.4, PDF p. 86 of 91).</p> <p>As in 2021, QIA remains concerned by the number of culverts each year that are perched, obstructed, or damaged and by the delays between identifying and correcting passage issues (see 2021 comment QIA 2021 AMR M&amp;AE #11). Monitoring conducted for the annual DFO Tote Road Report should be continued and reported annually to ensure the culverts are operating properly and not obstructing fish passage.</p>		<p><b>Document Name:</b> Baffinland Iron Mines 2021 Annual Report to the Nunavut Impact Review Board, Appendix G.17 DFO Tote Road Report</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 QIA – NWB Annual Report for Operations</p> <p><b>Section:</b> 2.4 Other construction activities</p> <p><b>Page: 7 (PDF p. 36 of 91)</b></p> <p><b>Document Name:</b> Qikiqtani Inuit Association comments on Baffinland Iron Mines Annual Report to the Nunavut Impact Review Board [NIRB registry: 220630 - QIA Comments Submission - 2021 MRP NIRB Annual Report [220630 - QIA Comments Submission - 2021 MRP NIRB Annual Report.pdf]</p> <p><b>Section:</b> Appendix 1, Comment # QIA 2021 AMR M&amp;AE #11</p> <p><b>Page: 61 (PDF p. 61 of 98)</b></p>	
27	QIA 2022 NIRB M&AE# 16.	<p>In 2021, QIA welcomed this ongoing study of Arctic Char, by the MHTO and Minnow Environmental Inc., to address concerns Inuit have expressed about the health of Arctic Char in the Milne Inlet area. However, QIA also expressed concerns that the conclusions reached were not supported by the data presented (QIA Comments 2021 Annual Report to NIRB, Appendix 1, p. 62). The 2022 report (2022 Annual Report to NIRB, Appendix G.4.3) is a big improvement and recognizes many of the study limitations.</p> <p>Going forward, careful attention must be paid to both the timing and fishing locations, particularly in Qurluqtuq Lake where there are both anadromous and lake dwelling char. This mix is not unusual and will explain the higher mercury in the smaller, older fish. Close attention must also be paid to the timing and location of spawning and migration, both of which can drastically alter the catch composition.</p>	<p>QIA recommends that the Milne Inlet Arctic Char Health Study:</p> <p>a) Consider conducting parasite autopsies of fish that Inuit consider unhealthy</p> <p>b) Explore the application of Inuit traditional knowledge and western science (e.g., bone strontium, genetics) as means to differentiate anadromous fish from those that are lake-dwelling, and</p> <p>c) Include sample sizes on report figures and in tables with summary statistics.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.7 Freshwater Environment (PC Condition 48a)</p> <p><b>Page: 183 (PDF p. 239 to 241 of 703)</b></p> <p><b>Section:</b> 4.6.7 Freshwater Environment (PC Condition 113)</p> <p><b>Page:</b> 183 (PDF p. 239 to 241 of 703)</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.4.3 2022 Milne Inlet Freshwater Fish Health Program</p> <p><b>Section:</b> 4.2 Recommendations</p>	<p>c. Completing autopsies on fish that Inuit consider unhealthy while working together is feasible and adds value at reasonable effort. We propose the joint development of a simple evaluation form that can be filled and retained to document categories of parasite loads and muscle tone/tissue quality.</p> <p>d. We agree with the fundamental goal of distinguishing resident and anadromous arctic charr to the extent possible to eliminate or minimize this confounding factor. Baffinland will continue engagements with the MHTO to explore this study component further while ensuring the intent of the Project Certificate condition is achieved.</p> <p>Sample size will be provided in future reporting.</p>

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		<p>The Inuit reaction to fish quality is valuable and required further engagement. In some lakes on Baffin Island the char can be heavily parasitized by larvae of the tapeworm <i>Diphyllobothrium</i> spp. which form pearl-like cysts on the body cavity wall and internal organs. These fish can look very healthy but are passive when caught and lack muscle tone. Inuit don't eat them because they taste bad. This is not a manmade problem, but one found in some very isolated lakes. Anadromous char shed many of their freshwater parasites when they go to sea, and their marine parasites when they return to freshwater.</p> <p>"The Inuit project partners have expressed interest in the development of an approach to effectively distinguish resident versus anadromous individuals.</p> <p>A combination of both western science (e.g., otolith chemistry) and traditional knowledge (e.g., colour, smell, size or other attributes identified) should be implemented" (2022 Milne Inlet Arctic char Health, PDF p. 67 of 291). In some areas Inuit can distinguish fish from different rivers by their morphology. DFO has done a lot of genetic work and has expressed interest in the past in getting samples from the lakes on northern Baffin Island to see if the stocks are genetically different. If so, it would be possible to tell where fish caught in a particular area originate from. This has important management implications for mixed or single stock fisheries, and impact assessment. Bone strontium in the otoliths also works well in most areas for differentiating between lake dwelling or anadromous fish.</p> <p>Interpretation of the figures and tables would be made easier if the sample sizes were presented in each case.</p>		<p><b>Page: 58 (PDF p. 67 of 291)</b></p> <p><b>Document Name:</b> Qikiqtani Inuit Association comments on Baffinland Iron Mines Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> Appendix 1, Comment QIA 2021 AMR M&amp;AE #12</p> <p><b>Page: 62 (PDF p. 62 of 98)</b></p>	
28	QIA 2022 NIRB M&AE# 17.	<p>Damage to specimens, poor visibility, and limited access have been persistent problems with respect to marine species identification, and will continue to be a problem due to the sampling limitations and methods used to collect and preserve specimens (Appendix G.6.9, Executive Summary, PDF p.12 of 565). Environmental DNA (eDNA) is now used to screen for the</p>	<p>QIA requests that Baffinland clarify whether it plans to use eDNA for species identification, to augment its species lists, and/or to screen for the arrival of non-indigenous species and, if it does not plan to do so, what developments would be</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.10 Marine Environment (PC Condition 76)</p>	<p>Baffinland does not plan to use eDNA for species identification at this time. However, DNA analysis has been, and continues to be, an important tool in the marine monitoring program – particularly for resolving taxon identifications to the species level as part of NIS/AIS screening. eDNA sampling (i.e., collection of DNA from the environment in contrast to DNA analysed from individual collected organisms) has been considered, but has limitations. As noted by QIA, the</p>

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		<p>presence of many marine species but requires their DNA be in the DNA library and that the specimen's DNA has not been damaged by preservation. Using DNA, Kupper et al. (2016) found evidence in north Baffin Island waters of taxa closely related to two new taxa of interest, <i>Punctaria latifolia</i> and <i>Stictyosiphon soriferus</i>. Has Baffinland considered testing the value of using eDNA to augment its species lists, and as an alternative to visual identification for confirming the presence of potentially introduced taxa such as <i>Marenzelleria</i> spp. and <i>Tricellaria</i> spp.?</p>	<p>required to make use of these techniques feasible and worthwhile.</p>	<p><b>Page: 269 to 278 (PDF p. 325 to 334 of 703)</b>  <b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.6.9 MEEMP  <b>Section:</b> Executive Summary  <b>Page: x</b> (PDF p. 12 of 565)            Küpper, F.C., Peters, A.F., Shewring, D.M., Sayer, M.D.J., Mystikou, A., Brown, H., Azzopardi, E., Dargent, O., Strittmatter, M., Brennan, D., Asensi, A.O., van West, P. and Wilce, R.T. 2016. Arctic marine phytobenthos of northern Baffin Island. <i>J. Phycol.</i>, 52: 532-549.  <a href="https://doi.org/10.1111/jpy.12417">https://doi.org/10.1111/jpy.12417</a></p>	<p>identification achievable by eDNA is only as good as the DNA sequences available in a DNA reference library, which is particularly incomplete for Arctic taxa. Through collaborations with DNA researchers, Baffinland's taxonomic team has been working to overcome this limitation by augmenting existing DNA libraries for the Arctic; for example, invertebrate and macroalgal specimens identified using traditional taxonomic methods have been shared with researchers at the University of Guelph. In 2023, a new collaboration with the University of New Brunswick aims to further develop the Arctic DNA databases for macroalgae. While Baffinland does not rule out the possibility of using eDNA in the future, there are additional limitations to the technical issues noted above, that affect the usefulness of eDNA for NIS/AIS management. Namely, the method detects traces of DNA in the environment, regardless of whether the actual animal or plant is still in the environment, so eDNA detection does not necessarily mean the species is still present, or alive, or established in the water body. For example, if a species is present on the hull of a vessel that passes through Milne Inlet, whether that is a Project vessel or not, a DNA water test is likely to pick up traces of that species for a period of time even after the vessel has departed (the rate of DNA decomposition, or dilution to below detectable limits, varies with temperature, wind, currents, etc.), so that detection cannot be interpreted to mean that the species is present at Milne Inlet. For these reasons, Baffinland believes that, at this time, NIS/AIS management requires collection of a physical specimen rather than an eDNA detection.</p> <p>While Baffinland does not intend to use eDNA for species identification at this time, DFO will be collecting eDNA samples during the 2023 ballast water monitoring program, and a collaborative agreement will be in place for Baffinland to access this data.</p>
29	<p><b>QIA 2022 NIRB M&amp;AE# 18.</b></p>	<p>WSP Canada Inc. recommends that sediment quality at stations SW-1 to SW-4 be monitored in 2023 for changes in sediment fines content related to both natural factors and propeller wash. This monitoring has been ongoing since 2020 in response to anomalous sediment and benthic infauna data that may have been related to scouring by propeller wash from tugboats assisting ore vessel docking. QIA supports this recommendation and further recommends that this monitoring be continued annually at these stations and others in the immediate vicinity of the ore dock if the larger Baby Cape and Capesize carriers are to load ore at Milne Port.</p>	<p>Baffinland to monitor sediment stations SW-1 to SW-4 and others in the immediate vicinity of Milne Port annually if Baby Cape and/or Capesize carriers are to load ore at Milne Port.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body  <b>Section:</b> 4.6.10 Marine Environment (PC Condition 76)  <b>Page: 269 to 278 (PDF p. 325 to 334 of 703)</b>  <b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.6.9 MEEMP  <b>Section:</b> 1.6 Conclusions and Recommendations</p>	<p>The design of the sediment quality sampling program will be evaluated and discussed annually with the MEWG, however, at this time Baffinland anticipates the monitoring of sediment at SW-1 through SW-4 will continue as an annual activity.</p>

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30	QIA 2022 NIRB M&AE# 19.	<p>WSP Canada Inc. recommends Baffinland "continue to monitor opportunistically for observations of deceased bivalves and that a sample should be collected, when possible, for toxicological analyses." In 2023 phytotoxins were reported for the first time from bivalves in the Beaufort Sea (Pucko et al. 2023). Blooms of phytotoxic algae are unlikely to occur in cold Arctic waters, but the species that cause them can be introduced with ballast water discharges (Dhifallah et al. 2022). Their toxins can harm species that eat the bivalves. QIA supports the WSP recommendation and recommends that Baffinland also collect shellfish samples and have them analyzed for phytotoxins at 3-year intervals in conjunction with its full benthic infauna monitoring program to monitor for the presence of phytotoxins and thereby the phytoplankton species that produce these toxins.</p>	<p>Baffinland to test shellfish for the presence of phytotoxins at 3-year intervals to monitor for the presence of harmful algae.</p>	<p><b>Page:</b> 20 (PDF p. 51 of 565)</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.10 Marine Environment (PC Condition 76)</p> <p><b>Page:</b> 269 to 278 (PDF p. 325 to 334 of 703)</p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.6.9 MEEMP</p> <p><b>Section:</b> 1.6 Conclusions and Recommendations</p> <p><b>Page:</b> 21 (PDF p. 52 of 565)</p> <p>Dhifallah, F., Rochon, A., Simard, N., McKindsey, C.W., Gosselin, M., Howland, K.L., 2022. Dinoflagellate communities in high-risk Canadian Arctic ports, Estuarine, Coastal and Shelf Science 266 107731, <a href="https://doi.org/10.1016/j.ecss.2021.107731">https://doi.org/10.1016/j.ecss.2021.107731</a>.</p> <p>Pucko, M, Rourke, W., Hussherr, R, Archambault, P., Eert, J., Majewski, A.R., Niemi, A, Reist, J, and Michel, C. 2023. Phytotoxins in bivalves from the western Canadian Arctic: the first evidence of toxigenicity. Harmful Algae 127, doi: <a href="https://doi.org/10.1016/j.hal.2023.102474">https://doi.org/10.1016/j.hal.2023.102474</a></p>	<p>Baffinland does not believe a shellfish phycotoxin sampling program is warranted as there is no linkage to the Project. The intent of the MEEMP is to verify predictions relating to effects of the Project on the marine environment, and there is no pathway by which the project would trigger harmful algal blooms.</p> <p>The bivalve mortalities observed in 2022 were most likely not caused by phycotoxins as the effects of phycotoxins on bivalves are generally sublethal. However, if any unexplained mortalities of invertebrates or fishes are observed in 2023, these will be collected and frozen for necropsy and toxicological analyses to attempt to determine the cause of death.</p> <p><u>References:</u></p> <p>Bates, S.S., Beach, D.G., Comeau, L.A., Haigh, N., Lewis, N.I., Locke, A., Martin, J.L., McCarron, P., McKenzie, C.H., Michel, C., Miles, C.O., Poulin, M., Quilliam, M.A., Rourke, W.A., Scarratt, M.G., Starr, M., and Wells, T. 2020. Marine harmful algal blooms and phycotoxins of concern to Canada. Can. Tech. Rep. Fish. Aquat. Sci. 3384: x + 322 p.</p> <p>McKenzie, C.H., Bates, S.S., Martin, J.L., Haigh, N., Howland, K.L., Lewis, N.I., Locke, A., Peña, A., Poulin, M., Rochon, A., Rourke, W.A., Scarratt, M.G., Starr, M., and Wells, T. 2021. Three decades of Canadian marine harmful algal events: Phytoplankton and phycotoxins of concern to human and ecosystem health. Harmful Algae 102: 101852.</p>
31	QIA 2022 NIRB M&AE# 20.	<p>WSP Canada Inc. recommends "that efforts for angling, gill nets, and hoop nets are increased to improve statistical power."(PDF p. 52). It has demonstrated the need to increase these sampling efforts and to improve the statistical power (Pt 3 Appendix 6E Power analysis, PDF p. 15 to 20 of 190), but has not recommended effects sizes or power(s), provided estimates of the additional mortalities, or suggested how mortalities would be reduced or used. QIA's preference would be to optimize the sampling, increasing the power to detect changes in Arctic Char and Fourhorn Sculpin while minimizing the additional mortalities. For example, 18 gillnet sets per area</p>	<p>Baffinland to provide estimates of how changes in the fishing effort at the magnitude of the increase in fishing effort for the methods used and the expected increase in power to detect changes.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.10 Marine Environment (PC Condition 76)</p> <p><b>Page:</b> 269 to 278 (PDF p. 325 -334 of 703)</p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.6.9 MEEMP</p>	<p>The field teams conducting the sampling in 2023 have already been instructed to refocus sampling effort to angling, gillnetting and hoop nets in an effort to increase sample size for statistical power. If logistically possible, the sampling taking place in 2023 will endeavour to reach 12 gillnets in each area which was determined to be sufficient for detection of 20% reduction in numbers of Arctic Char or total of all fish species combined, and 40% reduction in Fourhorn Sculpin. In 2022, the monitoring program conducted 10 gillnet sets in the Direct Project Footprint area and 12 sets in the Indirect Project Footprint. Angling (jigging) in 2022 approached the number of sampling events required to detect 40% reduction in all species combined (8 events in each of the Direct and Indirect Project Footprint areas), Arctic Char were not captured by angling (jigging), and the model determined that more than 20 events</p>

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		would have a power of 0.9 to detect a 20% drop in Arctic char or all species, and a 30% drop in Fourhorn Sculpin. It would be more likely to detect smaller changes than the current sampling. What are the potential tradeoffs of such a change in terms of additional mortalities of fish that Inuit might otherwise use and how would these mortalities be reduced or used?		<p><b>Section:</b> 1.6 Conclusions and Recommendations</p> <p><b>Page:</b> 21 (PDF p. 52 of 565)</p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.6.9 MEEMP</p> <p><b>Section:</b> Appendix 6E Power analysis</p> <p><b>Page:</b> PDF pp. 15 - 20 of 190</p>	<p>per fishing area would be required to detect 40% change in Fourhorn Sculpin; in 2022, there were 8 fishing events in the Direct Project Footprint and 5 in the Indirect Project Footprint, so increasing these to 20 events per area may not be logistically feasible. Hoop net sampling will be increased, but may not achieve the levels estimated for statistical power. In 2022, there were 6 hoop net events in the Direct Project Footprint and 3 in the Indirect Project Footprint. To detect 40% change in all species combined, the power analysis determined 24 events per area would be required. Arctic Char were not captured by hoop nets. The number of hoop net fishing events required to detect 40% change in Fourhorn Sculpin exceeded 24 events and was not modelled.</p> <p>Gillnetting is the fish sampling method most likely to result in mortalities in this monitoring program. As only a small additional effort is required to achieve statistical power, it is expected that little additional fish mortality would occur. Incidental mortalities of Arctic Char that occur in gillnet sampling are currently analysed for the fish health program. Mortalities are unlikely to occur with other fishing methods and additionally those methods are unlikely to capture Arctic Char. In the few cases that mortalities of other species potentially used for food by Inuit have occurred, the fishes were typically juveniles which naturally have a high mortality rate at that life history stage. These small fish, generally only a few centimetres in length, are usually either frozen and sent to the taxonomic laboratory for confirmation of identification, or may be used as bait for the monitoring program.</p>
32	QIA 2022 NIRB M&AE# 21.	<p>PC Condition 101 requires Baffinland to incorporate into the appropriate monitoring plans: efforts to involve Inuit in monitoring studies at all levels (101b) and monitoring protocols that are responsive to Inuit concerns (101c).</p> <p>Reporting in the methods section regarding PC Condition 101c, Baffinland states that "ongoing development and refinement of monitoring programs and protocols considers input from local community members... as well as discussions with the MEWG, in which Inuit organizations actively participate (p. 402 of 703)." Baffinland provides a description of some of the ways Inuit are involved in monitoring programs, including communications between Baffinland and Inuit and opportunities for Inuit to review monitoring results through the MHTO and the MEWG.</p> <p>In the results section for 101c, Baffinland states, "Not applicable in 2022." It is not clear what this means. It appears from the methods section that Inuit have opportunities to</p>	Baffinland to provide a discussion on what feedback Inuit provided on the 2022 monitoring results and how that feedback was utilized to modify monitoring program plans. Baffinland should identify if there was no feedback, or there was feedback but it was not utilized. If there was feedback but it was not utilized, Baffinland should describe why it was not utilized. This information should be included in Annual Reports going forward.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.11 Marine Wildlife (PC Condition 101)</p> <p><b>PDF Page:</b> 401 to 412 of 703</p>	<p>Inuit feedback on the 2022 monitoring programs results was facilitated through the use of Inuit researchers to collect observational data during the field programs (in collaboration with WSP biologists) and via feedback through mechanisms such as the NIRB marine workshops and direct Baffinland engagement sessions (pre- and post- field seasons). Members of the MHTO also periodically participate in the aerial surveys. Additionally, five (5) HTOs are now members of the MEWG, which is another mechanism of providing feedback on monitoring programs, as well as reviewing program results and proposed study designs.</p> <p>Further to this, as part of the study design for each monitoring program, statistical testing is undertaken of multiple hypotheses (i.e., hypothesis testing) regarding potential shipping effects on the observed population (e.g., shipping does or does not have an effect on narwhal travel speed). In support of this process, a null and alternative hypothesis are developed for each response variable. The origin of each hypothesis is based on Inuit observations and/or community concerns regarding Project impacts on the marine environment and/or marine wildlife (e.g., Inuit hunter observations indicating narwhal are avoiding areas in the RSA with increased shipping). Statistical analyses of the data are then performed to determine whether</p>

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		<p>provide feedback on monitoring programs so they can be adjusted. The results section should include a discussion on what feedback Inuit provided on the 2022 monitoring results and how that feedback was utilized in future monitoring program plans. If there was no feedback, or there was feedback but it was not utilized, then Baffinland should report this in the results section.</p>			<p>the evidence supports the alternative hypothesis (e.g., there is an effect of shipping on narwhal travel speed, group size, group composition, etc.). The tests are core elements of statistical inference, used in the interpretation of collected experimental data, to separate a relationship (e.g., correlation between proximity of vessel and narwhal travel speed) from data noise (i.e., variability in the collected data). The results of the statistical analyses are then compared to reported observations from Inuit community members (i.e., hunter observations) to determine if there is agreement or not between the two sources of information. Even if there are discrepancies between the empirical data and Inuit observations, these can still trigger specific adaptive management measures (e.g., follow-up studies, enhanced monitoring, alternative study designs, and new or enhanced mitigation measures).</p> <p>A summary of changes made to the 2022 monitoring programs due to feedback from and engagement with Inuit community members, including but not limited to the MHTO and the Hamlet of Pond Inlet, is provided in Baffinland's 2022 Marine Shipping and Vessel Management Report (Baffinland, 2023). This included, but was not limited to, MHTO participation on 2022 aerial surveys, DFO pilot ballast water program based on concerns from NIRB mitigation workshop/pre-shipping meeting, purchase of high resolution cameras for individual identification of whales (one community member concerned about double counting at NIRB marine mitigation workshop), continued suspension of the narwhal tagging program, and expansion of satellite imagery dust monitoring program such to include marine areas and ten areas of community concern identified in QIA dust report.</p> <p>The ISP and TK framework presently in development will provide further opportunities for Inuit input into the programs moving forward.</p> <p><u>References:</u></p> <p>Baffinland Iron Mines Corporation (Baffinland). 2023. Marine Shipping and Vessel Management Report to the Nunavut Impact Review Board (NIRB). 04 August 2023.</p>
33	<p>QIA 2022 NIRB M&amp;AE# 22.</p>	<p>PC Condition 128 requires Baffinland to consult with local communities on fish habitat off-setting options.</p> <p>In the Annual Report, Baffinland provides an overview of consultation completed during the offsetting design work for the Ore Dock and Freight Dock at Milne port as well as habitat effectiveness monitoring. Baffinland states they continue to explore potential offsetting options in both freshwater and marine environments.</p>	<p>Baffinland to include in annual reports results of consultation, and how Baffinland actions utilized those results, in their Annual Reports. QIA considers this important information necessary for determining compliance with the PC Conditions that require consultation with local communities.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.11 Marine Wildlife (PC Condition 128)</p> <p><b>PDF Page:</b> 504 - 506</p> <p><b>Document Name:</b> Baffinland Response to Comments Received for Baffinland's</p>	<p>Baffinland will include results of consultation regarding off-setting options as part of <i>Fisheries Act Authorization</i> Applications and will include any future feedback regarding the implementation and monitoring of those off-setting measures in the Annual Report to NIRB as required.</p>

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		<p>Baffinland’s submission regarding PC Condition 128 focuses on the effectiveness of the offsetting works that have occurred. There is no information demonstrating the “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)” as is stated by the PC Condition.</p> <p>Baffinland responded to similar comments made by QIA in 2021 that the MHTO and QIA both supported the method of offsetting identified for the freight dock at Milne Port (Baffinland Response to Comments Received for the 2021 Annual Monitoring Report PDF 67). This kind of information should be included in Baffinland’s Annual Reports going forward because it provides evidence that consultation with Inuit is being considered in project planning. It is not enough to say that communities were consulted. Baffinland should be required to provide examinable evidence – details to support assertions that consultation results are being utilized in project decisions, planning, and operations.</p>		<p>Production Increase Proposal Extension          2021 Annual Monitoring Report</p> <p><b>Section:</b> Table A.1: Response to QIA Comments on Baffinland’s 2021 Annual Report to the NIRB</p> <p><b>PDF Page:</b> 67 of 131</p>	
34	<p><b>QIA 2022 NIRB M&amp;AE# 23.</b></p>	<p>PC Condition 113 states, “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.”</p> <p>QIA disagrees with Baffinland’s assessment of compliance. While Baffinland has provided an explanation as to why Arctic char stock size is not being monitored, it is nonetheless part of this PC Condition.</p>	<p>Baffinland to identify by what authority they have determined that Arctic char stock does not need to be monitored. The PC Condition requires Baffinland to monitor Arctic char stock and health conditions.</p>	<p><b>Document Name:</b>          Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.11, PC Condition 113</p> <p><b>Page:</b> 403 to 415 (PDF p. 459)</p>	<p>Baffinland would like to reiterate to the Board that Arctic char stocks are monitored in their freshwater environment, not in the marine environment. This is because Arctic char are only present in the marine environment during a short summer window, and multiple different char stocks would be mixing in the marine environment at this time. Further to this, there are also challenges with monitoring Arctic char stock size due to the current lack of information regarding how many unique stocks actually exist in the Project area. For example, anadromous Arctic char are common in many river systems feeding into Milne Inlet and Eclipse Sound on North Baffin Island. It is presently unknown if individual river systems in this region represent genetically discrete stocks or if there is a high degree of migration (gene flow) between these systems (DFO 2013; NWRTF 2017, 2018, 2020). Most river system fisheries on North Baffin Island, especially during the open-water season, have the potential to harvest a mixture of Arctic char stocks from proximate systems (i.e., these likely represent mixed-stock fisheries) such as the Tugaat river, Koluktoo (i.e., Robertson River), Ikaluit river and Satuut river watersheds.</p> <p>Although Baffinland’s Environmental Effects Monitoring (EEM) program (i.e., monitoring designed for detection of potential Project-related effects) does not monitor stock size explicitly as a Project indicator, the Marine Environmental Effects Monitoring Program (MEEMP) includes monitoring of catch-per-unit-effort (i.e.,</p>

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					<p>relative abundance) of Arctic char, which is a proxy indicator for char abundance in the marine environment (WSP, 2023).</p> <p>Project effects monitoring for Arctic char in the marine environment also includes other indicators, such as monitoring of Arctic char body condition and tissue condition (i.e., fish health), Arctic char habitat quality (water and sediment quality, productivity) and habitat use (relative abundance). To date, the extensive monitoring completed in the marine environment at Milne Port has not demonstrated any evidence of adverse effects of the Project on Arctic Char via these pathways (WSP, 2023). The rationale follows that if no Project effects are being observed on Arctic char relative abundance, Arctic char health, Arctic char habitat quality or Arctic char habitat use near Milne Port where impacts from the Project are greatest, then it is highly unlikely that the Project is resulting in adverse effects on Arctic Char stock sizes in the local marine receiving environment.</p> <p><u>References:</u></p> <p>Department of Fisheries and Oceans Canada (DFO), 2013. DFO Review of Pond Inlet Emerging Arctic Char Fishery Application. Submission to the Nunavut Wildlife Management Board (NWMB).</p> <p>Nunavut Wildlife Research Trust Fund (NWRTF). 2017. Pond Inlet Arctic Char Fishery Development Research Program. NWRTF Final Project Report 2017/2018.</p> <p>Nunavut Wildlife Research Trust Fund (NWRTF), 2018. Pond Inlet Arctic Char Fishery Development Research Program. NWRTF Final Project Report 2018/2019. NWRT Project Number: 3-18-02.</p> <p>Nunavut Wildlife Research Trust Fund (NWRTF), 2020. Pond Inlet Arctic Char Fishery Development Research Program. NWRTF Final Project Report 2020/2021. NWRT Project Number: 3-20-11.</p> <p>WSP. 2023. 2022 Marine Environmental Effects Monitoring Program (MEEMP) and Non-indigenous Species / Aquatic Invasive Species (NIS/AIS) Monitoring Program. Report # 1663724-430a-R-Rev0-64000. 28 April 2023.</p>
35	<b>QIA 2022 NIRB M&amp;AE# 24.</b>	Project Certificate Condition (PC Condition) 10 (s. 4.4, pg. 46) requires that the Proponent keep and maintain all records of Project-related monitoring data for the life of the Project. Baffinland notes that it <i>"keeps and maintains all Project-related monitoring data and will continue to do so"</i> . Does Baffinland now have the raw data from the 2014/2015 aerial	Baffinland to clarify whether it has access to all the raw data from the 2014 and 2015 aerial surveys flown by LGL Ltd on its behalf. If so, QIA recommends that EWI calculations using aerial survey results include a full statistical analysis.	<b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body  <b>Section:</b> 4.4 (Performance on General Terms and Conditions)	The 2014 and 2015 EWI results were derived by LGL Environmental Associates Ltd. (LGL), with this information presented as a poster at the 2019 World Marine Mammal Conference (WMMC) in Barcelona, Spain (Moulton et al. 2019). No formal publication or report summarizing these results has been undertaken. Baffinland does not own or have access to this data and therefore cannot statistically compare

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		surveys that were flown by LGL Ltd? In the past we were told that these data were not available to Baffinland. Furthermore, regarding the Early Warning Indicator (EWI), the Annual Report states (e.g., s.4.6.11, pg. 351, pdf pg. 407 of 703) that "a statistical analysis was not possible since the raw data from 2014/2015 aerial surveys were not available".		<p><b>Page: 46 (PDF p. 102 of 703)</b></p> <p><b>Section: 4.6.11 Marine Wildlife (PC Terms and Conditions 99 through 128)</b></p> <p><b>Page: 351 (PDF p. 407 of 703)</b></p>	<p>EWI results for these years (2014 and 2015) to EWI results derived for the 2020-2022 shipping seasons.</p> <p>Reference:</p> <p>Moulton, V., W.R. Koski and T. Thomas. 2019. Importance of the Pond Inlet-Eclipse Sound-Milne Inlet area as nursery and calf-rearing habitat for narwhals (Monodon monoceros). Poster Abstract #1176. World Marine Mammal Conference (WMMC) - Barcelona 2019. December 9-12, 2019. Available at: <a href="https://drive.google.com/file/d/1O9TIRRCh0aO__eOkd51WTWts02DHraS/view?pli=1">https://drive.google.com/file/d/1O9TIRRCh0aO__eOkd51WTWts02DHraS/view?pli=1</a></p>
36	QIA 2022 NIRB M&AE# 25.	WSP Canada Inc. is considering replacing Fukui traps with hoop nets on the basis that the latter capture more fish per sampling event (PDF p. 9). What other factors, such as the number of different species captured, are being considered in this decision as to whether to keep one or both sampling methods (i.e., might they be complementary)?	Baffinland to clarify what factors are being considered in its assessment of whether to continue using Fukui Traps.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section: 4.6.10 Marine Environment (PC Condition 76)</b></p> <p><b>Page: 269 to 278 (PDF p. 325 to 334 of 703)</b></p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.6.9 MEEMP</p> <p><b>Section: 1.6 Conclusions and Recommendations</b></p> <p><b>Page: 21 (PDF p. 52 of 565)</b></p>	The question of whether hoop nets and Fukui traps are complementary methods is being addressed in the 2023 sampling plan. In the three years of comparative fishing using these two gear types, the hoop nets have consistently outperformed the Fukui traps in terms of catch per unit effort, but the Fukui traps have sampled several fish species that were not detected with the hoop nets. At present it is not possible to determine whether this is the result of the gear type versus an unequal level of effort (for example, in 2022, there were 1,852 net-hours fished by Fukui traps but only 669 net-hours by hoop nets). In 2023, it is planned that the two gear types will be fished at more equitable levels of effort to allow for an unbiased comparison of their effectiveness for sampling fish biodiversity at Milne Inlet.
37	QIA 2022 NIRB M&AE# 26.	The updated "Risk Assessment for Introduction of Aquatic Invasive Species [AIS] from Ballast Water" ranked the relative level of AIS invasion risk posed by ballast water as intermediate, with a moderate to high level of uncertainty (WSP 2023, s.4.0, p. 16, PDF p. 22 of 25). This assessment factors in the use of both exchange and treatment of ballast water to reduce AIS risk, which is an important advance. However, it has had to rely on several correction factors and is not based on biological data from the ballast water of Project vessels.  As part of its Sustaining Operations Proposal (SOP), Baffinland proposes to carry forward the following Phase 2 commitments related to AIS monitoring:	<p>Baffinland to:</p> <p>a) Confirm its proposed commitment to carrying forward into the SOP the Phase 2 commitments listed above related to AIS monitoring.</p> <p>b) Commit to phase out use of Project vessels that are shown by risk-based biological studies of ballast water or hull fouling to pose the highest risk of introducing potentially invasive species into Project ports.</p> <p>c) Update the WSP (2023) risk assessment when results are available from the DFO</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section: 4.6.10 Marine Environment (PC Condition 88)</b></p> <p><b>Page: 310 to 314 (PDF p. 366 to 370 of 703)</b></p> <p><b>Document Name:</b> Baffinland Iron Mines Corporation (Baffinland). 2023. Mary River Project – Sustaining Operations Proposal. [NIRB Registry: 08MN053_SOP_20230413 - 1_of_4_main_app1-3.pdf]</p> <p><b>Section: 6.5.3.3 NIRB Phase 2 Recommendation Report Findings</b></p>	<p>Baffinland confirms that the Phase 2 commitments referenced in QIA's comment will be carried forward into the SOP should it be approved. Baffinland agrees that obtaining Project-specific data will improve the quality of risk assessment, and to that end is collaborating with DFO in 2023 to conduct a biological sampling program for ballast water in vessels arriving to Milne Port. This will be a multi-year study. It is premature to commit to phasing out vessels based on a yet to be developed risk based targeting methodology.</p> <p>An updated risk assessment will be conducted after completion of that multi-year study. Currently there are no species on the Trigger List, but should high risk NIS/AIS species be detected they would be placed on the Trigger List and a Rapid Response Plan would be developed, as mandated by Baffinland's NIS/AIS management plan.</p>

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		<ul style="list-style-type: none"> <li>• "Follow the most updated version of DFO's AIS Rapid Response Framework in the event that a nonindigenous species is introduced and/or becomes established.</li> <li>• Work with the MEWG and DFO to establish species-specific Rapid Response Plans. Rapid Response Plans will be developed for species identified as high risk and placed on the Trigger List.</li> <li>• Implement a ballast water compliance sampling plan based on a risk-based targeting methodology to be developed in consultation with DFO and TC." (Baffinland 2023, s.6.5.3.3, PDF p. 201 of 319)</li> </ul> <p>Referring to the AIS risk assessment, Baffinland has noted that "<i>Identifying and quantifying the actual proportions of harmful AIS present in the ballast water per each vessel would provide a more accurate estimate.</i>" (WSP 2023, s.4.0, p. 16, PDF p. 22 of 25).</p> <p>Biological and shipping data from the risk-based study involving DFO could provide these data and, together with the scientific literature, be used in the future to reduce uncertainty in the WSP (2023) risk assessment and thereby improve AIS risk mitigation. The updated risk assessment should incorporate information on:</p> <ul style="list-style-type: none"> <li>• species presence and abundance in the ballast water,</li> <li>• proportion of number of invasive species identified in source ports, and</li> <li>• interannual variability in the source ports used by Project vessels</li> </ul> <p>This material can reduce uncertainty and lead to better understanding of the sensitivity of the AIS risk assessment to these factors. Correction factors for exchange efficiency and treatment reduction of species entrained with ballast water should also be updated.</p>	<p>risk-based biological study of Project vessel ballast water.</p>	<p><b>Page: 188</b> (PDF p. 201 of 319)</p> <p>WSP Canada Inc. (WSP). 2023. Mary River Project – Sustaining Operations Proposal: Risk Assessment for Introduction of Aquatic Invasive Species from Ballast Water. Report No. 1663724-427-R-Rev1-77000. 17 April 2023. 19 p.</p>	
38	<p><b>QIA 2022 NIRB M&amp;AE# 27.</b></p>	<p>PC Condition 76 states, "The Proponent shall develop a comprehensive Environmental Effects Monitoring Program to address concerns and identify potential impacts of the Project on the marine environment." QIA believes the information</p>	<p>Baffinland to provide updates regarding alternative options to monitor physical oceanography.</p>	<p><b>Document Name:</b></p>	<p>Baffinland would like to clarify that the tidal gauge monitoring is not undertaken as part of PC Condition 76 to identify potential impacts of the Project on the marine environment. Rather, the tidal gauge monitoring seeks to inform the effects of climate change on the Project and hence is not relevant to PC Condition 76. To</p>

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		<p>provided to be insufficient. Baffinland states, "Baffinland proposes not moving forward with tidal gauge monitoring in 2023 in favour of exploring alternative options to meet this Term and Condition using an indicator(s) other than Sea Level Rise (SLR)."</p>		<p>Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section: 4.6.10</b>, PC Condition 76</p> <p><b>Page:</b> 269 to 278 (PDF p. 325 to 334 of 703)</p>	<p>address and fulfil PC Term and Condition No. 76, annual monitoring is conducted to detect potential Project-related effects on marine water and sediment quality, benthic invertebrates, substrate and macroflora, fish communities, and fish health and tissue chemistry as well as a comprehensive NIS/AIS surveillance program. The MEEMP sampling design is generally based on Environmental Effects Monitoring (EEM) guidance from Environment Canada (EC, 2012). Baffinland believes that the information provided annually in the Marine Environmental Effects Monitoring Program (MEEMP) report sufficiently meets the condition given the multi-disciplinary nature of the monitoring program, the intensity and comprehensiveness of sampling, and the rigour behind study design and analysis.</p> <p>Refer to the response to QIA 2022 M&amp;C #2 above regarding alternative options to tide gauge monitoring.</p> <p>References:</p> <p>Environment Canada (EC), 2012. Metal Mining Technical Guidance for Aquatic Environmental Effects Monitoring. National EEM Office, Environment Canada, Ottawa, Ontario. 560 pp.</p>
39	<p><b>QIA 2022 NIRB M&amp;AE# 28.</b></p>	<p>PC Condition 77 states, "A Marine Environment Working Group (MEWG) shall be established as an advisory oversight body providing advice, guidance and enforceable recommendations to fulfill the intended objectives. The operation of the MEWG shall not duplicate or impede the exercise of regulatory authority of authorizing agencies or government. The MEWG shall have the following permanent members: The Proponent, the Qikiqtani Inuit Association, the Government of Nunavut, the Government of Canada, the Mittimatalik HTO, and the Hunters and Trappers Organizations of the other Impacted Communities (Arctic Bay, Clyde River, Sanirajak, Igloolik), should they wish to participate. Makivik Corporation shall also be entitled to membership on the MEWG at its election.</p> <p>A Terms of Reference shall be established that guides the participation of observers. The MEWG shall be chaired by an independent third party as chosen by the permanent members. A revised Terms of Reference shall be presented to NIRB no later than December 15th, 2022, or at another date on consent of the Proponent, Canada, and the Qikiqtani Inuit Association."</p>	<p>Baffinland to utilize Adaptive Management and/or Monitoring, Learning, and Evaluation to implement changes to the Terms of Reference as well as expectations, communication, and outcomes.</p>	<p><b>Document Name:</b></p> <p>Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section: 4.6.10</b>, PC Condition 77</p> <p><b>Page:</b> 279 to 285 (PDF p. 335 to 341 of 703)</p>	<p>Baffinland acknowledges that the revised Terms of Reference (TOR) were not submitted to the NIRB by December 15th, 2022 as stated in the reviewer's detailed comment. This submission has been delayed to ensure that member and observer feedback is effectively incorporated into the TOR and the majority of parties are satisfied with the revisions prior to final submission.</p> <p>Baffinland released an initial revised TOR to the MEWG on August 22nd, 2022. On August 23rd, 2022, Baffinland requested that all members and observers submit their comments on the initial draft by September 30th, 2022. Comments were not received from all parties until February 9th, 2023, which prevented Baffinland from meeting the timeline that had previously been committed to. Baffinland requested to meet with multiple organizations following their review of comments on the initial TOR draft to ensure that feedback was understood and to allow for improved revisions on the second draft. Only two observer groups, Oceans North (ON) and World Wildlife Fund (WWF), agreed to meet with Baffinland to discuss their comments.</p> <p>The second revision of the TOR, which incorporated member feedback received on the first draft, was released to the MEWG on April 3rd, 2023. This version also served as the initial draft for the revised TEWG TOR. This draft included a Table of Concordance, which provided an explanation as to why certain feedback was not incorporated into the second draft. The original intention was to submit the second draft to the NIRB, however, Baffinland hosted a combined MEWG/TEWG</p>

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		<p>Baffinland states, “In its most recent draft Terms of Reference (ToR) for the Working Groups Baffinland presented a reasonable path forward that would result in meaningful changes to the Groups current structure, operational schedule, and ability to influence the Project. It is expected that this should improve Members’ expectations, communication within the Group and outcomes. Baffinland will continue to engage with the Working Groups on the development of a revised Terms of Reference throughout 2023 in hopes of resolving any outstanding concerns raised by members to date.” QIA agrees with Baffinland’s assessment of compliance.</p>			<p>teleconference on April 19th, 2023 from 1:00 – 4:00 pm to further discuss comments on this draft and concerns were raised regarding this submission. Members felt as though parties could reach a better agreement by developing a third draft for subsequent review. Baffinland agreed to accommodate this request and committed to developing a third draft for member review, which has not been released at the time of this submission. Members and observers were asked to submit their comments to Baffinland on the second draft by May 1st, 2023. This deadline was extended until May 5th, 2023 to further accommodate members and observers with competing priorities.</p> <p>The aforementioned engagements with the Working Groups indicate that Baffinland is communicating effectively by responding to concerns of members and observers to ensure that the desired outcomes and expectations related to the TOR are achieved. Additionally, Baffinland has extended the TOR revision process in an effort to develop a draft that is agreed upon by the majority of members and will allow for improved functionality of the Working Groups, where monitoring and learnings can be discussed.</p> <p>With regards to adaptive management, Baffinland developed a draft Adaptive Management Plan (AMP), which was submitted to the NIRB on May 15th, 2023. Members and observers from both the MEWG and TEWG are able to provide comments on the draft AMP through the NIRB public registry. NIRB registry file no., application no., and identification no. for this document were provided to the Working Groups via email on June 9th, 2023 (08MN053, 125710, and 344993, respectively). The AMP highlights Baffinland’s Adaptive Management Response Framework, including the development of low, moderate, and high action level responses, as well as a summary of how adaptive management has been integrated into Baffinland’s various Management Plans, which are used to guide monitoring and on site activities. Baffinland will continue to use adaptive management to inform decisions and encourages members and observers on the Working Group to address any concerns on the current Adaptive Management Framework through the NIRB registry process.</p>
40	<p><b>QIA 2022 NIRB M&amp;AE# 29.</b></p>	<p>PC Condition 83 states, “The Proponent shall install tidal gauges at Steensby and Milne Port to monitor sea levels and storm surges.”</p> <p>QIA believes the information provided to be insufficient. Baffinland states, “Baffinland recommends discontinuing tidal gauge monitoring in 2023 in favour of exploring alternative options to better meet the objective of this Term and Condition using an alternative climate change indicator other</p>	<p>Baffinland to provide updates regarding alternative options to monitor physical oceanography.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section: 4.6.10,</b> PC Condition 83</p> <p><b>Page:</b> 293 to 295 (PDF p. 349 to 351 of 703)</p>	<p>Recommendation is a repeat of QIA 2022 NIRB M&amp;AE #27. Refer to QIA 2022 NIRB M&amp;C # 2 response.</p>

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		than Sea Level Rise (SLR) such as temperature and precipitation regime, or climate response variables such as ice cover and hydrologic response."			
41	QIA 2022 NIRB M&AE# 30.	<p>PC Condition 91 states, "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."</p> <p>Baffinland states, "Ship hull surveys were not conducted during the 2022 open water season as an options analysis for hull fouling monitoring is in progress, following the conclusion that results from the three-year ROV-based ship hull biofouling program demonstrated that the ROV-based video surveys do not allow for adequate taxonomic resolution (to species-level) to achieve the program objective of identifying NIS/AIS due to the difficulty of identification of encrusting or small bodied taxa without collecting a specimen. Diver-based sample collection from hulls is also not possible due to health and safety concerns associated with diving on a berthed ship. As an alternative however, the settlement substrates deployed through Milne Port served to monitor for recruitment of encrusting species, similar to what may be present on ship hull biofouling."</p> <p>QIA agrees with Baffinland's assessment of compliance.</p>	Baffinland to provide updates regarding new sample methodology for ship hull biofouling monitoring that improves taxonomic resolution and/or proven performance for settlement substrates as a proxy monitoring tool.	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.10, PC Condition 91</p> <p><b>Page:</b> 322-324 (PDF p. 378 to 380 of 703)</p>	<p>Transport Canada has issued no applicable regulatory requirements or guidelines for monitoring hull fouling at this time. All existing hull fouling monitoring methods that do not involve diver-based sampling do not offer adequate taxonomic resolution for the purpose of NIS/AIS detections. Because diver-based sampling is not feasible at Milne Port due to safety concerns, Baffinland has been monitoring for hull biofouling via annual monitoring of settlement substrates (i.e., settlement plates and baskets) deployed in the vicinity of the ore dock at Milne Port. This is an established monitoring method for NIS/AIS introductions from biofouling or ballast water discharges that has been used as a proxy for NIS/AIS monitoring for many years by DFO and internationally (e.g., Darbyson et al. 2009, Floerl et al. 2012, McKenzie et al. 2016, Ruiz et al. 2021, Sephton et al. 2016).</p> <p>References:</p> <p>Darbyson, E.A., Hanson, J.M., Locke, A., and Willison, J.H.M. 2009. Settlement and potential for transport of clubbed tunicate (<i>Styela clava</i>) on boat hulls. <i>Aquatic Invasions</i> 4: 95-103.</p> <p>Floerl, O., Inglis, G., Peacock, L., and Plew, D. 2012. The efficacy of settlement plate arrays for marine surveillance. <i>New Zealand Ministry for Primary Industries Technical Paper No. 2012/16</i>. 87pp.</p> <p>McKenzie, C.M., Matheson, K., Caines, S. and Wells, T. 2016. Surveys for non-indigenous tunicate species in Newfoundland, Canada (2006-2014): a first step towards understanding impact and control. <i>Management of Biological Invasions</i> 7: 21-32.</p> <p>Ruiz, G.M., McCann, L., and Zabin, C. 2021. Protocols for the PlateWatch Program. <i>Citizen Marine Science Network: Understanding Change in Coastal Marine Environments</i>. Smithsonian Environmental Research Center. <a href="https://platewatch.nisbase.org/">https://platewatch.nisbase.org/</a></p> <p>Sephton, D., Martin, J.L., LeGresley M., and Godin, K. 2016. Biofouling monitoring for aquatic invasive species (AIS) in DFO Maritimes Region, southwest New Brunswick: 2006-2011. <i>Canadian Technical Report of Fisheries and Aquatic Sciences</i> 3140: vi + 68 p.</p>
42	QIA 2022 NIRB M&AE# 31.	The Nunavut Impact Review Board (NIRB) hosted a Marine Monitoring and Marine Mitigation Workshop in Pond Inlet on May 24 and 25, 2023. During Baffinland's presentation of	Baffinland to provide additional information on the factors that led to two vessel deviations into "no-go" zones in	<b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body	Typically, deviations occur from ice obstructions in the shipping route but there were two instances in 2022 where ships followed old shipping routes near Bruce Head. The 2023 Standing Instructions and General Information for Masters of

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		<p>material, it noted that, of 35 route deviations in total, two were vessels using the old shipping route near Bruce Head.</p> <p>In the Annual Report, Baffinland summarizes 2022 route deviations (e.g., PC Condition 102, 103, 105, 120, s. 4.6.11, pp. 357-362, 365-372, 427-430, PDF pp. 413-418, 421-428, 483-486 of 703), and highlights that there are established "no-go" zones to avoid key sensitive areas and hunting camp areas, including the western shoreline of Milne Inlet (e.g., PC Condition 105, 120). The Annual Report does not appear to describe the two route deviations that Baffinland highlighted at the 2023 Marine Monitoring and Marine Mitigation Workshop in Pond Inlet.</p> <p>What happened for these two deviations into established "no-go" zones to occur? Are any new procedures going into place to address this in the future and help ensure it does not occur again?</p>	<p>2022 and on any new procedures that have been or will be implemented to ensure it does not happen in the future.</p>	<p><b>Section:</b> 4.6.11 Marine Wildlife (PC Terms and Conditions 99 through 128)</p> <p><b>Page:</b> 357 to 362, 365 to 372, 427 to 430 (PDF p. 413 to 418, 421 to 428, 483 to 486 of 703)</p>	<p>Vessels Loading at Milne Inlet addressed this and further instructions will be provided to vessel captains by Baffinlands port captain.</p> <p>The summary of Baffinland deviations discussed at the 2023 NIRB Marine Mitigation Workshop are as follows:</p> <ul style="list-style-type: none"> <li>35 of 49 alerts were for shipping route deviations (70%)</li> <li>27/35 route deviations occurred in Eclipse Sound where no 'no go' zones exist (77%)</li> </ul> <p>2/35 were ships in Milne Inlet following the old shipping route near Bruce Head (6%)</p>
43	QIA 2022 NIRB M&AE# 32.	<p>Baffinland collaborates with the Marine Mammal Observation Network (MMON) to run a marine mammal incidental sightings program. Participating vessels include the MSV <i>Botnica</i>, Nordic Bulk Carriers and Oldendorff Carriers (see PC Condition 103, 106, 121, 122, 123). In 2022, 14 vessels (1 icebreaker and 13 ore carriers) participated in the MMON program and recorded marine mammal sightings in August and September. Half of the incidental sightings (50%) were made by the MSV Botnica in the Regional Study Area, and most sightings (67%) consisted of ringed seal (see Tables 4.28 and 4.29, also Appendix G.6.4 for a map of sightings). Overall, there were six reported sightings, of 12 individual marine mammals.</p> <p>This program has the potential to provide useful monitoring data, especially in years when the SBO program does not run, but uptake by shipping companies appears limited to date. The data summarized include numbers and locations only, and it is uncertain as to whether any useful ancillary data (e.g., marine mammal behaviour) are collected through the MMON.</p>	<p>Baffinland to make efforts to increase participation in the MMON and increase the value of these data for marine monitoring and adaptive management.</p> <p>Baffinland to provide additional information on the sighting data collected, e.g., whether behavioural state of the marine mammal is recorded.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.11 Marine Wildlife (PC Terms and Conditions 99 through 128)</p> <p><b>Page:</b> 357 to 362, 365 to 372, 427 to 430 (PDF p. 413 to 418, 421 to 428, 483 to 486 of 703)</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Appendix G.6.4 - 2022 Incidental Marine Mammal Sightings</p> <p><b>Section:</b> N/A</p> <p><b>Page:</b> N/A (one map page)</p>	<p>Baffinland continues to make efforts to improve uptake in the Marine Mammal Observation Network (MMON) program for the 2023 shipping season. Baffinland informed vessel captains for re-supply vessels and fuel tankers of the MMON program on July 20th, 2023 and provided the necessary training documents and data sheets to participate in the program. Re-supply vessels and fuel tankers have not actively been included in the MMON program to date, as their voyage routes may differ due to community visits prior to/following transits to Milne Inlet. Baffinland recognizes that participation of these vessels requires oversight from NSSI and Petro-Nav upper management and is not guaranteed.</p> <p>Additionally, Baffinland provided MMON program materials to crews on board both of the tugs (Ocean Taiga and Ocean Tundra) on July 20th, 2023. Both crews confirmed their participation in the 2023 MMON program on July 25th, 2023 via email. Program materials were also provided to bulk carriers on July 20th, 2023 and participation in the 2023 MMON program was confirmed. The MSV Botnica, as well as the MSV Fennica (Baffinland's 2023 contingency ice breaker) confirmed their participation in the 2023 MMON program on July 20th, 2023. Baffinland acknowledges that crew members on board Project vessels are not designated marine wildlife observers and have mandatory duties on board the vessel that supersede participation in the MMON. Participation in this program is voluntary, but strongly encouraged by Baffinland.</p>

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		Baffinland is planning to continue with its incidental marine mammal sightings program in collaboration with MMON, and efforts to increase the value of this program should be taken.			<p>To aid with program uptake, Baffinland will make efforts to contact vessel captains throughout the 2023 shipping season upon entry into the Regional Study Area (RSA) based on the rolling shipping schedule to remind crews to document wildlife sightings in accordance with MMON. Additionally, Baffinland will inquire with MMON as to whether or not community members can participate in the program and will provide the necessary training documents and data sheets to the Pond Inlet Environmental Coordinator to distribute within the community if permitted.</p> <p>Sighting data collected for the MMON is determined by the Marine Mammal Observation Network, not by Baffinland. All observer members are provided with the same observer chart template and data collection protocol, which does not include behavioural state of marine mammals, but does include the distance and position of the marine mammal relative to the observing vessel. The observation chart includes: observer member name; vessel name; date of observation; time of observation; certification no.; wind speed; visibility; species; number of observed individuals; latitude and longitude of observation location; distance of animal from vessel; position of animal relative to vessel (ie. port vs. starboard); additional comments.</p>
44	QIA 2022 NIRB M&AE# 33.	<p>In the introduction to s. 4.6.11 (pg. 336, PDF pg. 392 of 703), Baffinland states that it received feedback from Inuit regarding the need for increased monitoring of ringed seal in 2020 and 2021, and that it addressed this concern through an aerial survey in 2021. QIA notes that harvesters were raising concerns about Project-related impacts to ringed seals well before 2020. Baffinland also has not provided any information on how a single aerial survey has addressed the concerns raised by harvesters. What adverse effects have hunters been observing, and how does a springtime survey address their concerns?</p> <p>Under PC Condition 101 (pp. 345-356, PDF pp. 401-412 of 703), Baffinland states that it will continue to collect ringed seal aerial survey data in the RSA at an appropriate sampling frequency. Baffinland's marine mammal consultants recommended against conducting a ringed seal aerial survey in 2022, and there is no survey planned for 2023 (PC Condition No. 119, pp. 424-426, PDF pp. 480-482 of 703). No information on what Baffinland considers to be an appropriate frequency is provided, nor is there any information on what, if any, related engagements (MEWG, HTOs, etc.) are planned.</p>	<p>Baffinland to provide a summary of the concerns and impacts harvesters have noted regarding ringed seals, and a discussion on 1) where these impacts are occurring in space and time, and 2) how these impacts are comprehensively addressed via a single springtime aerial survey.</p> <p>Baffinland to provide additional details on what it considers to be an appropriate survey frequency for ringed seals and what engagements and consultations are planned on this topic.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.11 Marine Wildlife (PC Terms and Conditions 99 through 128)</p> <p><b>Page:</b> 336, 345 to 356, 424 to 426 (PDF p. 392, 401 to 412, 480 to 482 of 703)</p>	<p>The impact of shipping operations on ringed seals was assessed as a non-significant impact based on a Level I magnitude for the effect of vessel noise with a high level of confidence (see Section 1.3; Baffinland, 2013). As a result, monitoring efforts were mainly focused on potential impacts to narwhal (Level I-II magnitude for the effect of vessel noise with a low level of confidence).</p> <p>Concerns regarding the impact of shipping operations on ringed seals, and ringed seal harvesting, were brought up during the Phase 2 review process. The lost harvesting opportunities were never quantified by hunters and the QIA has never provided specific examples of lost harvesting opportunities through submission to the hunter's compensation program. As a result, a ringed seal aerial survey monitoring program was conducted in the spring of 2021. The results of the 2021 survey indicated that ringed seal densities have overall remained stable since the onset of shipping operations in 2015, and since Project icebreaking activities began in the shoulder seasons in 2018 (Golder, 2022).</p> <p>These results confirm that mitigation measures are functioning as intended and that Project activities are being managed in a way that has not adversely affected the ringed seal population. Proposed monitoring programs for the upcoming shipping season are addressed annually during the winter/spring months. This is to ensure that MEWG members/observers are able to address any concerns with the proposed programs prior to the monitoring season. Since the 2021 ringed seal</p>

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					<p>aerial survey, there has been no feedback from MEWG members or observers indicating that an additional survey is required.</p> <p>Since the start of 2023, HTOs have indicated the following impacts to ringed seals:</p> <ul style="list-style-type: none"> <li>• During the February 15, 2023 MEWG meeting in Iqaluit and Ottawa, HTO members from Pond Inlet, Igloodik and Arctic Bay indicated that they were seeing less seals, with the Arctic Bay member tying the change to the presence of acoustic recorders deployed by Parks Canada</li> <li>• During the May 24 &amp; 25, 2023 Marine Workshop hosted by the NIRB, concerns regarding seals were raised only once by a representative of the MHTO, which related to underwater recorders affecting their abundance.</li> <li>• During the June 28, 2023 Pre-Season Shipping meeting an MHTO representative reconfirmed that seal enter Eclipse Sound and Milne Inlet through Navy Board Inlet and Baffinland should continue to use the current shipping route.</li> </ul> <p>Based on previous technical comments issued by the QIA, indicating a desire for Inuit led and IQ enriched monitoring programs, Baffinland agreed to fund an Inuit Stewardship Plan (ISP), and to provide QIA with approval over the adaptive management elements of management plans that relate to seal, including the development of Inuit specific objectives, indicators, thresholds and responses. Since those agreements Baffinland has released a revised draft Marine Monitoring Plan (MMP) (Baffinland,2023), inclusive of adaptive management elements for seal. Baffinland looks forward to working with QIA to satisfy the terms of our agreements with respect to the ISP and adaptive management by April 2024 and reporting back to the NIRB, as required under Appendix B of Project Certificate 005.</p> <p><u>References:</u></p> <p>Baffinland Iron Mines Corporation (Baffinland). 201. Final Environmental Impact Statement (FEIS).</p> <p>Baffinland Iron Mines Corporation (Baffinland). 2023. Marine Monitoring Plan (MMP).</p> <p>Golder Associates Ltd. (Golder), 2021 Ringed Seal Aerial Survey Report. 1663724-351-R-Rev0-41000. 31 August 2022.</p>
45	QIA 2022 NIRB M&AE# 34.	Project-related impacts to narwhal have been a significant concern for Inuit, regulators, and intervenors, and there has been a focus on monitoring and mitigating these impacts. Narwhal numbers (estimated via aerial surveys) increased in	Baffinland to provide an assessment of available information on external factors that it considers to be important drivers of narwhal abundance and distribution in	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> Popular Summary</p>	In Baffinland's 2022 Narwhal Adaptive Management Response Plan (Baffinland, 2022), Baffinland summarized available information on external factors that it considers to be potentially important drivers of narwhal abundance and distribution in the North Baffin region. Many of these factors are outside the scope of

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		<p>the Eclipse Sound study in 2022 after years of consecutive significant decline, but are still significantly lower than pre-Project survey estimates. Inuit harvesters have reported associated impacts to harvesting (additional cost and time to successfully harvest, etc.).</p> <p>Baffinland has provided conflicting information in the Annual Report on their conclusions regarding the role of Project-shipping in Eclipse Sound narwhal declines. In the Popular Summary it states (p. 12, PDF p. 15 of 703) that <i>“shipping cannot be ruled out as a contributing factor”</i>, whereas in the main report (e.g., Table 4.27, pp. 337-339, PDF pp. 393-395 of 703) it states that <i>“[a] holistic review of the data from the 2022 shipping season, in addition to data from previous years, does not conclude that the relatively lower number of narwhal observed in Eclipse Sound in 2020 and 2021 is Project-related”</i>.</p> <p>QIA agrees with Baffinland that external factors such as ice conditions, prey availability, and predation pressure (i.e., killer whale occurrence) all influence narwhal movements and distributions. This is widely known and accepted among Inuit. These factors are unlikely to be the main drivers of recent declines in Eclipse Sound narwhal abundance, and Baffinland has failed to provide conclusive evidence that they are the main drivers.</p> <p>Baffinland states that it has considered <i>“available IQ regarding the degree of exchange between narwhal groups on their summering grounds (NWMB 2016a, 2016b; QWB, 2022)”</i> and concluded that <i>“the observed changes in narwhal abundance in Eclipse Sound in recent years likely reflects a natural exchange between the two putative stock areas that began prior to Baffinland shipping operations, with animals shifting between Eclipse Sound and Admiralty Inlet based on where habitat conditions may be more favorable that season (e.g., ice coverage, prey availability, predation pressure)”</i>. QIA has reviewed the three sources cited, and has not seen any IQ reported there that supports widespread unidirectional shifts over multi-year time periods as a natural fluctuation between summering areas.</p>	<p>Eclipse Sound and Admiralty Inlet (sea ice trends, sea surface temperature trends, etc.).</p> <p>Baffinland to highlight the specific passages in the IQ source transcripts it has cited that support significant unidirectional shifts as being part of a natural distribution process for narwhal in Eclipse Sound and Admiralty Inlet.</p>	<p><b>Page:</b> 12 (PDF p. 15 of 703)</p> <p><b>Section:</b> 4.6.11 Marine Wildlife (PC Conditions 99 through 128)</p> <p><b>Page:</b> 337 to 339, 345 to 356, 365 to 372 (PDF p. 393 to 395, 401 to 412, 421 to 428 of 703)</p> <p>Chambault, P., K.M. Kovacs, C. Lydersen, O. Shpak, J. Teilmann, C.M. Albertsen, and M.P. Heide-Jørgensen. 2022. Future seasonal changes in habitat for Arctic whales during predicted ocean warming. <i>Science Advances</i> 8: eabn2422.</p> <p>Nunavut Wildlife Management Board (NWMB). 2016a. Public hearing to consider modifications to total allowable harvests for the Eclipse Sound and Admiralty Inlet Narwhal Management Units. 28 November 2016.</p> <p>Nunavut Wildlife Management Board (NWMB). 2016b. Public hearing to consider modifications to total allowable harvests for the Eclipse Sound and Admiralty Inlet Narwhal Management Units. 29 November 2016.</p> <p>Qikiqtaaluk Wildlife Board (QWB). 2022. Submission to the Nunavut Wildlife Management Board (NWBM). Regular Meeting No. RM 001-2022. 01 February 2022.</p>	<p>Baffinland's current monitoring programs, such as regional effects of climate change on regional ice conditions, predator/prey dynamics, prey availability (food web changes) and species distribution shifts due to a warming arctic.</p> <p>A review of available Inuit knowledge (NWMP 2016a, 2016b; QWB 2022) supports that the Admiralty Inlet and Eclipse Sound narwhal management units are actually one stock that shift between summering areas depending on many factors such as seasonal ice conditions, food availability, local predator/prey dynamics and vessel traffic. Baffinland notes to the Board that it has never stated that the IQ sources included the following specific wording 'significant unidirectional shifts'.</p> <p>References:</p> <p>Baffinland Iron Mines Corporation (Baffinland), 2022. 2022 Narwhal Adaptive Management Response Plan (NAMRP). Document # BAF-PH1-830-P16-0024. Rev1. 19 July 2022.</p> <p>Nunavut Wildlife Management Board (NWMB), 2016a. Public hearing to consider modifications to total allowable harvests for the Eclipse Sound and Admiralty Inlet Narwhal Management Units. 28 November 2016. 237 p.</p> <p>Nunavut Wildlife Management Board (NWMB), 2016b. Public hearing to consider modifications to total allowable harvests for the Eclipse Sound and Admiralty Inlet Narwhal Management Units. 29 November 2016. 237.</p> <p>Qikiqtaaluk Wildlife Board (QWB), 2022. Submission to the Nunavut Wildlife Management Board (NWBM). Regular Meeting No. RM 001-2022. 01 February 2022.</p>

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		<p>The IQ reported in these documents clearly speaks to animal movement between Eclipse Sound and Admiralty Inlet and evidence of one larger population unit, but we are unaware of any evidence in these documents for large, one-way changes in abundance having occurred naturally in the past. The Qikiqtaaluk Wildlife Board submission (QWB 2022) that Baffinland cites notes that narwhal move freely from one area to another and back again, which is unlike the one-way changes observed in Eclipse Sound prior to 2022, when some population increase was documented. A "natural exchange", as Baffinland states, implies movement between areas in both directions. QWB (2022) also clearly indicates that ships, and underwater noise, are factors influencing narwhal movements. Baffinland has reviewed all three of these sources as part of their Annual Report review, and should be able to highlight passages from these files that provide support for significant unidirectional shifts being part of a natural distribution process.</p> <p>With respect to other factors that could influence narwhal distribution changing environmental conditions and associated marine mammal responses are raised as considerations (e.g., s.4.6.11, PC Condition 101, pp. 345-356, PDF pp. 401-412), but with little supporting evidence. Arctic-scale assessments of sea ice trends are cited (S.4.6.11, PC Condition 101, pp. 345-356, PDF pp. 401-412 of 703; PC Condition 105, pp. 365-372, PDF pp. 421-428 of 703), but no assessment of sea ice conditions and trends in the north Baffin has been conducted. The cited sources, all published in 2012 and 2013, are also all missing the most recent decade of sea ice characteristics. Baffinland cites a number of studies related to shifts in species distributions for Arctic marine mammals and their prey. These studies are from research conducted in other Arctic regions, or global-scale assessments. All provide useful context for any assessment of environmental conditions as a factor in narwhal distribution changes, but do not provide information relevant to understanding how any recent environmental changes in Eclipse Sound and/or Admiralty Inlet might have affected narwhal distribution. Baffinland cites Chambault et al. (2022), who modeled</p>			

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>changes in narwhal distribution in 2100 under several climate change scenarios, and states that the changes they predicted "may already be underway in the Eastern Canadian Arctic and may affect Eclipse Sound and Admiralty Inlet differently" (pp. 356 and 372, PDF pp. 412 and 428 of 703). While this may be true, no evidence is presented.</p>			
46	<p><b>QIA 2022 NIRB M&amp;AE# 35.</b></p>	<p>Unmanned Aerial Vehicles (UAVs) have been used for three years (2020-2022) of focal follow monitoring at Bruce Head (PC Condition 101, pp. 345-356, PDF pp. 401-412 of 703; PC Condition 109, pp.382-389, PDF pp 438-445 of 703). Findings from the 3-year dataset provide some evidence that narwhal groups with immature animals spend less time engaging in critical activities such as social behaviours. Specifically, the amount of time immature narwhal engaged in nursing behaviour declined when in the presence of a vessel (with 5 km of focal group) (WSP 2023a). The effect was not significant, likely due to low sample size and high variability. WSP (2023a) recommended that additional focal follow monitoring be conducted to increase sample size and statistical robustness. Baffinland echoes these recommendations (e.g., p. 356, PDF p. 412 of 703) in the Annual Report. Baffinland also notes that it plans to consult with the MEWG on increasing emphasis on the UAV survey component of the Bruce Head Project (p. 356, PDF p. 412 of 703). QIA notes that this consultation must occur soon if Baffinland hopes to increase UAV survey effort in 2023.</p> <p>Baffinland uses the proportion of immature narwhal as an Early Warning Indicator (EWI) (see PC Condition Nos. 109-112, pp. 382-402, PDF pp. 438-458 of 703; also WSP 2023b). During 2022, the proportion of immature animals in the 1,523 narwhal groups observed in the Bruce Head Behavioural Study Area (BSA) was significantly lower than the baseline condition (as it was in 2021). Analysis of larger-scale EWI data from photographic aerial surveys did not find the same pattern (although low sample sizes added to uncertainty) (WSP 2023b). When coupled with the results of the UAV-based focal follows (decrease in critical behaviours in groups with immature animals), these results suggest that calve rearing is down in Milne Inlet, and animals have moved</p>	<p>Baffinland to provide the MEWG with details on the increased UAV-based focal follow effort in the Bruce Head program in a timely fashion.</p> <p>Baffinland to continue acoustic monitoring and work with Inuit to advance understanding of the methodology.</p> <p>Baffinland to make additional efforts to solicit IQ on narwhal life history functions such as birthing or calf rearing, including Inuit observations of change.</p> <p>Baffinland to provide MEWG members with advance notice of impending scientific publications and report on their findings in annual reporting to NIRB once publication acceptance is known.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.11 Marine Wildlife (PC Conditions 99 through 128)</p> <p><b>Page:</b> 345 to 356 and 382-402 (PDF p. 401 to 412 and 438 to 458 of 703)</p> <p>Qikiqtaaluk Wildlife Board (QWB). 2022. Submission to the Nunavut Wildlife Management Board (NWBM). Regular Meeting No. RM 001-2022. 01 February 2022.</p> <p>Radtke, C.L., J. M. Terhune, H. Frouin-Mouy, and P.A. Rouget. 2023. Vocal count responses of narwhals to bulk carrier noise in Milne Inlet, Nunavut, Canada. Marine Mammal Science, online early. Accepted: 17 April 2023, First published: 24 May 2023. <a href="https://doi.org/10.1111/mms.13028">https://doi.org/10.1111/mms.13028</a></p> <p>WSP. 2023a. 2022 Bruce Head Shore-based Monitoring Program – Final Report. Ref No. 1663724-438-R-Rev0-63000. April 27, 2023.</p> <p>WSP. 2023b. Proportion of immature narwhal (early warning indicator) in Eclipse Sound and Admiralty Inlet from 2022 aerial survey imagery. Reference No. 1663724-432-TM-Rev0-59000. 27 April 2023. 15 p.</p>	<p>Baffinland's recommendation for additional drone-based focal follow monitoring, as written in their 2022 Annual Report, states that Baffinland would consult with the MEWG with respect to 'increasing emphasis on the UAV survey component of the Bruce Head Program' (see p. 356 of Baffinland, 2023). The commitment, as written, was in reference to the fact that the 'behavioural response' study component of the Bruce Head Program was modified to focus on the drone-based focal follow surveys rather than the observer-based surveys which were confined to the 1-km Behavioural Study Area (BSA) below the observation platform. As part of this commitment, Baffinland discussed the benefit of undertaking repeat (i.e., multi-year) UAV focal follow surveys in order to increase the overall sample size of the UAV-based dataset and thereby increase statistical power of the associated analyses. This commitment was first made in the 2020 Bruce Head Annual Monitoring Report (see Section 9.0 - Recommendations in Golder, 2021) and then reiterated in the 2021 Bruce Head Annual Monitoring Report (Golder, 2022). The scientific rationale behind this recommendation has been clearly outlined in both of these reports. This same commitment was carried over in the 2022 Bruce Head Annual Monitoring Report (WSP 2023) and in Baffinland's 2022 Annual Report (Baffinland 2023), as noted above by QIA. This simply represents a repeat commitment first initiated in 2020, which was subject to prior consultation with the MEWG at the time it was first introduced. Baffinland's plans for 2023 are to continue implementing the drone-based surveys for the basis of the behavioural response study component of the Bruce Head Program, following the same protocols as in 2022. The field program includes a dedicated drone team running simultaneous and/or sequential focal follow surveys with two independent UAV systems (when conditions allow) over a 16-hour work day and throughout the full 4-week study period (weather permitting and in accordance with permitted pilot flight time). The anticipated UAV survey effort in 2023 is therefore likely near the maximum achievable for this program/study design.</p> <p>Baffinland has committed to continuing its acoustic monitoring in 2023 and will continue to work with Inuit to advance understanding of the methodology.</p> <p>Baffinland will continue to solicit IQ on narwhal life history functions such as birthing or calf rearing, including Inuit observations of change.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>elsewhere for critical aspects of their life history. IQ widely recognizes that narwhal will move as needed for their biological needs such as birthing, in response in factors such as food availability, predation pressure, and shipping traffic (QWB 2022). Baffinland's monitoring results (e.g., WSB 2023a, b) and Inuit observations and knowledge highlight the need for careful monitoring of Project-related effects on narwhal critical life history functions.</p> <p>A key question with respect to understanding Project shipping impacts on narwhal is whether animals will habituate to vessel noise, and PC Condition 109 (pp. 382-389, PDF pp. 438-445 of 703) requires that marine mammal noise disturbance monitoring be conducted for "a sufficiently lengthy period to determine the extent to which habituation occurs" for marine mammals including narwhal. A new peer-reviewed study, one that uses Baffinland's Passive Acoustic Monitoring (PAM) data from 2018 and 2019 deployments and co-authored by Baffinland consultants, concluded that there was no evidence of habituation to bulk carrier noise (Radke et al. 2023). The study recommended that acoustic monitoring continue, which QIA supports. Additional efforts to engage with Inuit on their observations of changes to critical life history functions such as birthing or calf rearing are also required.</p> <p>QIA supports efforts to increase UAV-based focal follow effort as part of the Bruce Head program.</p>			<p>Baffinland will provide MEWG members with advance notice of impending scientific publications and report on their findings in annual reporting to NIRB once publication acceptance is known.</p> <p>References:</p> <p>Baffinland Iron Mines Corporation (Baffinland), 2023. 2022 NIRB Annual Report. April 2023.</p> <p>Golder Associates Ltd. (Golder), 2021. 2020 Bruce Head Shore-based Monitoring Program – Final Report. Reference No.1663724-269-R-Rev0-33000. 31 August 2021.</p> <p>Golder Associates Ltd. (Golder), 2022. 2021 Bruce Head Shore-based Monitoring Program- Final Report. Reference No. 1663724-354-R-Rev0-43000. 06 October 2022.</p> <p>WSP, 2023. 2022 Bruce Head Shore-based Monitoring Program – Final Report. Reference No. 1663724-438-R-Rev0-63000. 27 April 2023.</p>
47	QIA 2022 NIRB M&AE# 36.	<p>Baffinland states, "In situ measurements of water temperature, dissolved oxygen, pH, specific conductance (i.e., temperature standardized conductivity), and turbidity were taken mid-column at all lotic (i.e., stream) stations and as a vertical profile at one metre (m) intervals at each lentic (i.e., lake) water quality monitoring station during routine monitoring conducted by Baffinland personnel. These in situ measurements were also collected at the surface and bottom (i.e., approximately 30 centimetres [cm] above the water-sediment interface) at all lake benthic invertebrate community (benthic) stations during biological sampling</p>	<p>Baffinland to include turbidity measurements 30 cm above the water-sediment interface as part of the in-situ measurements for the benthic invertebrate program to assess if the probe or Kemmerer unintentionally disturbed the sediment during water quality collection.</p>	<p><b>Document Name:</b> Appendix G.4.1 2022 CREMP Report</p> <p><b>Section:</b> 2.2.2.1 Sample Collection and Laboratory Analysis</p> <p><b>PDF Page:</b> 32 of 229 and p. 7 of the document</p>	<p>A total of three (3) 4-Port YSI sensors (DO, pH, SPC, NTU) are available on-site (used by Baffinland throughout the year). These meters will be used to record turbidity during sampling in 2023. Turbidity has been added as a record field in Minnow's CREMP-specific field sheets moving forward.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>conducted in August by Minnow personnel, except for turbidity."</p> <p>Turbidity measurements close to lake bottom would be of great importance to indicate if the probe and potentially water chemistry samples were influenced by unintentional sediment disturbances. Please reconsider the decision to not measure turbidity as part of in situ measurements for lake samples collected at benthic invertebrate community stations.</p>			
48	QIA 2022 NIRB M&AE# 37.	<p>Baffinland notes, "In situ specific conductance was consistently higher at CLT2 compared to the reference creeks during spring, summer, and fall monitoring events (Appendix Figure C.1; Appendix Tables C.1 to C.3), and similarly was significantly higher at the CLT2 downstream area compared to the Unnamed Reference Creek during biological studies in August 2022 (Figure 3.4; Appendix Tables C.12 and C.19)."</p> <p>Baffinland does not indicate if the significant difference in specific conductivity between the reference creeks and CLT2 suggests a mine related influence. While specific conductivity is not a parameter with an AEMP benchmark, the significant differences between reference and exposed area suggest a mine impact and should be discussed as such.</p>	<p>Baffinland to provide a discussion on the significance of differences in specific conductivity between reference sites, impact sites and baseline data to determine potential mine effects.</p>	<p><b>Document Name:</b> Appendix G.4.1 2022 CREMP Report</p> <p><b>Section:</b> 3.2.1 Camp Lake Tributary 2 (CLT2) Water Quality</p> <p><b>PDF Page:</b> 82 of 222 or p. 57 of the document</p>	<p>Acknowledged. Field measurements of specific conductance during the time of biological monitoring in August 2022 were significantly greater at CLT2 than at the reference creek. In addition, specific conductance at CLT2 in August 2022 was significantly higher than during baseline for measures taken in August (t-test p-value &lt;0.001). In turn, this suggested that a mine-related influence on water quality of CLT2 in August 2022 reflected by higher specific conductance. The mine-related influence on water quality at CLT2 was minor, though, as concentrations of all parameters of concern remained well below AEMP benchmarks and no effects on biota were evident. As part of future CREMP studies, Baffinland will evaluate changes in specific conductance (taking seasonality into account) for CLT2 as a means of assessing the potential for greater influence of mine operations on water quality of this tributary.</p>
49	QIA 2022 NIRB M&AE # 42.	<p>With regards to Mary River water quality Baffinland concludes, "Overall, no marked influences on water quality of Mary River were indicated in 2022 as a result of mine operations except for slight enrichment of nitrate and sulphate concentrations near the mine, albeit to levels that remained well below AEMP benchmarks." However, in the same paragraph just above the conclusions Baffinland states, "Elevated concentrations of nitrate and sulphate in Mary River appeared to be associated with mine deposits to MRTF (e.g., MS-08 effluent), as indicated by elevated concentrations at station F0-01 (Appendix Tables C.58 and C.59). In addition to elevated concentrations of nitrate and sulphate at MRTF, of the parameters with</p> <p>established AEMP benchmarks, concentrations of total ammonia and cobalt were also slightly elevated (i.e., 3- to 4-times higher) compared to the G0-09 reference area in spring</p>	<p>The available data on the Mary River Tributary and near-field sites in Mary River suggest there is a mine related impact in these areas. According to the adaptive management plan, this meets the requirements for low action trigger. A trend analysis and a special investigation should take place for these locations.</p>	<p><b>Document Name:</b> Appendix G.4.1 2022 CREMP Report</p> <p><b>Section:</b> 5.1.1 Mary River and Mary River Tributary-F</p> <p><b>Page:</b> 181 through 185 of the pdf</p> <p><b>Section:</b> Appendix C Water Quality Data</p> <p><b>PDF Page:</b> 120 of 278</p> <p>Figure C.23</p>	<p>The Aquatic Effects Monitoring Plan (Rev. 2) Section 5.1 "Steps in Data Assessment and Response" stipulates that a low action response is triggered if a measured change is lower than an AEMP benchmark but is "project-related" as determined "using EDA [exploratory data analysis] and subsequently using SDA [statistical data analysis]." The 2022 AEMP demonstrated a potential project-related response using EDA only and no subsequent SDA was performed (e.g., Kendall test). Before implementing a "low action response" (i.e., Step 3) it is reasonable to follow up with SDA (Kendall trend analysis) using all available data years, including 2023, for nitrate and sulphate. If SDA determines Project-related change, a low action response would be the next step. (see pg. 37 of 2022 CREMP)</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>and summer, respectively (Appendix Table C.59; Appendix Figure C.23)."</p> <p>Based on Figure C.23 concentrations of nitrate at the near-field site appear to be on an increasing trend since 2019 suggesting a potential mine influence. In addition, average concentrations of nitrate at the FO-01 station were consistently higher than concentrations at the reference site by 4.2 to 122 times while sulphate concentrations were between 15 and 82 times higher at FO-01 than the reference site.</p> <p>These data suggest there is a mine influence on the Tributary of Mary River and the near-field sites in Mary River meeting the low action requirements. It is recommended that trend analysis be completed on the near field site data and a special investigation be undertaken for Mary River Tributary.</p>			
50	QIA 2022 NIRB M&AE# 38.	Baffinland refers to the Magnitude of Difference in Table A.4 while comparing sedimentation rates, based on the footnote this is not the magnitude of the difference (as stated) but rather the relative difference (as a percentage).	Baffinland to use appropriate units in tables. The units in the caption (mg/cm2/yr) do not apply here, instead they should be presented as (%) – this comment also applies to several subsequent tables.	<p><b>Document Name:</b> Appendix G.4.2 – 2022 Lake Sedimentation Monitoring Report</p> <p><b>Section:</b> Appendix A - Table A.4: Statistical Comparison of Sedimentation Rate (mg/cm2/yr) among Sheardown Lake NW Stations for Ice-Cover 2021/2022 and Open-Water 2022 Periods, Lake Sedimentation Monitoring Study</p> <p><b>PDF Page: 29 of 38</b></p>	The formula used for calculating Magnitude of Difference (MOD) is directly from the Metal Mining Technical Guidance for EEM. It is correct that MOD is a percent difference.
51	QIA 2022 NIRB M&AE # 44.	Baffinland notes "The pattern in sedimentation rates at all Sheardown Lake NW study areas appeared to closely reflect patterns in dustfall reported for the Mary River Project Mine Site since 2014 as part of the dustfall monitoring program." No quantitative assessment was provided as the basis of this statement.	Baffinland to provide a quantitative comparison between the sedimentation rates observed at the Sheardown Lake NW study areas during the 2022 monitoring period and historical patterns to support statements made in the Lake Sedimentation Monitoring Report. A correlation analysis should be considered.	<p><b>Document Name:</b> Appendix G.4.2 – 2022 Lake Sedimentation Monitoring Report</p> <p><b>Section:</b> Section 3.1.2 Temporal Comparisons for the 2021/2022 Ice-Cover and 2022 Open-Water Periods</p> <p><b>PDF Page: 18 of 38</b></p>	The observation was qualitative based on general concordance in spatial patterns of sediment rates and dustfall rates. A quantitative analysis will be completed. Specifically, annual dustfall data from DF-M-02 (the closest dustfall monitoring station to Sheardown Lake NW) will be correlated with sedimentation rates. Additional correlations will be made between DF-M-01 and DF-M-03 (additional mine site locations). An annual spatial autocorrelation (e.g., Moran's I) may be the most appropriate test followed by an inter-year comparison using descriptive statistics.
52	QIA 2022 NIRB M&AE# 39.	Baffinland states "At SRC, the analysis of DBD was conducted using the pycnometer method."	Baffinland to provide a reference and description for "the pycnometer method".	<p><b>Document Name:</b> Appendix G.4.2 – 2022 Lake Sedimentation Monitoring Report</p> <p><b>Section:</b> Section 2 - Methods</p>	Reference: Flint, A.L. and L.E. Flint. 2002. 2.2 Particle Density. In: J.H. Dane and G. Clarke Topp (Eds.). Methods of Soil Analysis: Part 4 Physical Methods, Soil Science Society of America, Madison, WI. <a href="https://doi.org/10.2136/sssabookser5.4.c10">https://doi.org/10.2136/sssabookser5.4.c10</a>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
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53	QIA 2022 NIRB M&AE# 40.	In Table 2.1, Station Depth (m) was recorded as "nc" – indicates data not collected. This is valuable information when conducting a lake sedimentation study.	Baffinland to provide a reason why station depths were not measured and reported? Please ensure that this information is recorded during future studies.	Document Name: Appendix G.4.2 – 2022 Lake Sedimentation Monitoring Report Section: Section 2 - Methods PDF Page: 10 of 38	Deployment depths are/were not recorded, which was an omission/error. The 2023 field crew will measure depths, especially at the deep sediment trap locations. Approximate deployment depths can be estimated using the bathymetry map shown in Figure 2.1, which suggests deployment depths of approximately 8- 10 m at SL-SHAL1, 6 -8 m at SL-SHAL2, and 24 - 30 m at SL-DEEP1.
54	QIA 2022 NIRB M&AE# 41.	Baffinland states "factors contributing to the occurrence of significantly similar sedimentation rate between the profundal area and one or both littoral areas was uncertain...sedimentation rates were significantly higher during open-water period than the ice-cover period...potentially caused by deposition of more allochthonous sediment from surface runoff/dust deposition or increased deposition of autochthonous organic material due to higher within-lake productivity."	Baffinland to provide answers to the following questions: High (gross) sedimentation rates can occur because of wind-driven sediment resuspension; how was this controlled/corrected for? Is 1.5 m above the lakebed assumed to be sufficient to avoid this?	Document Name: Appendix G.4.2 – 2022 Lake Sedimentation Monitoring Report Section: Section 3 - Results PDF Page: 16 of 38	Some sediment suspension is expected to occur with wind- driven (or flow-driven) shear stress. However, shear stress required to drive suspension is quite high – on the order of 0.15 to 0.75 N/m <sup>2</sup> . We will complete a modelling exercise to evaluate shear stresses based on winds and flows relative to particle size and density in order to fully address QIA's questions and will be addressed in future reporting.
55	QIA 2022 NIRB M&AE# 42.	The results of statistical comparisons are described as significant or not-significant throughout the results section – it is not stated in the results or method sections what significant and not-significant means	Baffinland to add a sentence to Section 2.4 that states the p value below which results are considered significant.	Document Name: Appendix G.4.2 – 2022 Lake Sedimentation Monitoring Report Section: Section 3 - Results PDF Page: 16 to 21 of 38	The following statement will be added to Section 2.4 Data Analysis in future reports - "Statistical significance was defined by a p-value less than 0.05".
56	QIA 2022 NIRB M&AE# 43.	PC Condition 74 (s.4.6.9, pg. 256, pdf page 312 of 703) requires that Baffinland conduct follow-up monitoring of multiple bird species including common and king eider (also see PC Condition 108, s. 4.6.11, pp. 379-381, PDF pp. 435-437 re: seaduck monitoring). What monitoring of eiders is being conducted along the Northern Shipping Route? Shoreline surveys have not been conducted since 2013, and the ECCC-supported work in East Bay is along the southern route. The Shipboard Observer (SBO) program has not run since 2019 (Covid-related in 2020 and 2021, heavy ice in 2022). What alternative methods for Common Eider and King Eider monitoring are being considered or conducted?  Elsewhere in the Annual Report (e.g., PC Condition 107, s. 4.6.11, pp. 376-378, PDF pp. 432-434), Baffinland notes that they are supporting research by ECCC-CWS and various universities on a newly-funded seabird ecology and shipping research project, and field work is currently being planned for 2023. What species are being researched, and will this work	Baffinland to provide additional details on what monitoring is being conducted to meet Project Certificate requirements for eiders and other seaducks, and describe how the newly-funded ECCC project will monitor seaducks, if they are included in the proposal.	Document Name: Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body  Section: 4.6.9 Birds (PC Terms and Conditions 65 through 75)  Page: 256 to 261 (PDF p. 312 to 317 of 703)  Section: 4.6.11 Marine Wildlife (PC Terms and Conditions 99 through 128)  Page: 376 to 381 (PDF p. 432 to 437 of 703)	The status for this monitoring endpoint is listed in the revised draft Terrestrial Environment and Mitigation Monitoring Plan (TEMMP; Baffinland, 2023; pg.40-41), submitted to NIRB on May 15, 2023:  <ul style="list-style-type: none"> <li>• 4.2.2.1 — Peregrine Falcon and Gyrfalcon  Peregrine falcon and gyrfalcon (key indicators for cliff-nesting raptor species) are monitored during Project construction and operation. Monitoring is comprised of aerial survey during the nesting period and before fledging. Nest site occupancy and productivity relative to distance of the nest site to project infrastructure are then modelled to determine potential Project-effects. Monitoring occurred annually between 2005-2020, as outlined in Table 4.2. Based on findings, additional/follow-up investigations were not warranted or recommended.</li> <li>• 4.2.2.2 — Common Eider, King Eider and Red Knot  Baffinland is supporting baseline research by Environment Climate Change Canada and Canadian Wildlife Services (ECCC-CWS) examining the potential interactions between marine shipping and seabirds (primarily murrens). Nest</li> </ul>

Cmt. #	QIA Cmt. #	Reviewer’s Detailed Comment	QIA Recommendations	Reference Section	Baffinland’s Response
		<p>cover the Project Certificate requirements for monitoring of king and common eiders?</p>			<p>densities for Common Eider, King Eider, and Red Knot were surveyed along the Port Sites and appropriate control shorelines over three consecutive years (2012-2014). Table 4.6 summarizes the goals/objectives, thresholds and scope of monitoring for common eider, king eider and red know nesting. Detailed information is provided in Appendix C-5B — Migratory Bird Monitoring: Shipping Activity on Seabirds and Seaducks. <u>Based on findings, additional/follow-up investigations were not warranted/recommended.</u></p> <p>Reference: Baffinland Iron Mines Corporation (Baffinland), 2023. Terrestrial Environment Mitigation and Monitoring Plan. Ref. No. BAF-PH1-830-P16-0027, DRAFT. May 15, 2023.</p>
<b>TERRESTRIAL ENVIRONMENT</b>					
57	QIA 2022 NIRB TE# 1.	<p>Baffinland has designed and is implementing terrestrial environment monitoring programs. For several years, QIA has requested that Baffinland describe if and how IQ has informed terrestrial environment monitoring design, analysis and interpretation of results, as well as conclusions.</p> <p>In Baffinland’s response to QIA comments respecting the 2021 Annual Monitoring Report, Baffinland identified that <i>“as part of the Phase 2 submission, Baffinland summarized how Inuit Qaujimajatuqangit has been incorporated throughout the project, including monitoring programs”</i> (Baffinland Response to Comments Received for the 2021 Annual Monitoring Report PDF p. 27). This suggests that IQ has been incorporated into monitoring programs, however this is not evident from the 2022 Annual Monitoring Reports.</p> <p>In the 2022 Terrestrial Environment Annual Monitoring Report, Inuit Qaujimajatuqangit is mentioned only three times—</p> <ol style="list-style-type: none"> <li>1. “Work completed for the Terrestrial Environment Monitoring Program is guided by Inuit Qaujimajatuqangit and the Terrestrial Environment Mitigation and Monitoring Plan” (Appendix G.5.1 Pt 1, p. 41 of 160),</li> <li>2. “As caribou numbers increase, as is predicted by Inuit Qaujimajatuqangit (IQ), increased monitoring of caribou</li> </ol>	<p>Baffinland to include in its Annual Monitoring Report indication of which terrestrial, marine, and freshwater monitoring programs are designed with IQ, and which ones utilize IQ for analysis and interpretation of results. Baffinland should also indicate how IQ is being used, confirm that it meets Inuit expectations re: Ownership, Control, Access and Possession (OCAP) and from where that IQ was obtained.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Conditions 49 through 64)</p> <p><b>PDF Page:</b> 242 to 294 of 703</p> <p><b>Document Name:</b> Baffinland Response to Comments Received for Baffinland’s Production Increase Proposal Extension 2021 Annual Monitoring Report</p> <p><b>Section:</b> Table A.1: Response to QIA Comments on Baffinland’s 2021 Annual Report to the NIRB</p> <p><b>PDF Page:</b> 27 of 131</p> <p><b>Document Name:</b> Appendix G.5.1 Pt. 1 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Table 0 Summary of environmental effects monitoring and research activities at the Mary River Project in 2022, Overview, 8.3.1.4 Data Trends and Statistical Analysis</p> <p><b>PDF Pages:</b> 23, 41 of 160</p>	<p>On May 15, 2023 Baffinland submitted eight (8) revised draft management plans to the NIRB for public review in tandem with the 2022 Annual Report to NIRB, including the IQ Framework and Terrestrial Environment Mitigation and Monitoring Plan (TEMMP). The IQ Framework broadly identifies how Baffinland defines, collects and integrates IQ into its operations, including the Environmental Management System (EMS). The TEMMP provides additional terrestrial program specific descriptions of IQ integration. For example, Appendix C, Section C-10 describes the height of land survey experimental methodology and describes how the program was designed in collaboration with the MHTO. This same approach is used for the marine and freshwater programs, where program design is described in the associated management plans. Baffinland does not believe it is necessary to include descriptions of program design in each years Annual Report to NIRB unless a program design has been changed.</p> <p>With respect to IQ integration into terrestrial programs specifically, Baffinland would like to highlight the forthcoming North Baffin Caribou Study to be led by the QIA, which is anticipated to contribute a significant new source of IQ relevant to the Projects terrestrial monitoring program. Similarly, the QIA is responsible for completing the Pond Inlet Country Food Baseline Study and the CRLU Assessment, both of which will have broad application to the Project and its monitoring programs. Until these reports are produced and provided to Baffinland, Baffinland will continue to collect and integrate IQ into the EMS as described in the IQ Framework. At the same time, Baffinland welcomes any program specific recommendations from QIA that would enhance the integration of IQ into it’s monitoring program designs, and suggests the Terrestrial and Marine Environment Working Groups are the ideal forum to receive such recommendations.</p>

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		<p>movement across the roadway will be implemented" (Appendix G.5.1 Pt 1, p. 23 of 160),</p> <p>3. "The HOL survey methods were developed in consultation with the TEWG... and incorporated Inuit Qaujimagatuqangit into strategies for detecting caribou" (Appendix G.5.1 Pt2, p 102 of 268).</p> <p>QIA recognizes that IQ has been used to develop and implement monitoring programs, however, this is not reflected in Baffinland's Annual Monitoring Reports. Most of Baffinland's discussion is centered on western science integration into terrestrial, freshwater, and marine environment monitoring programs. Given that, as Baffinland states, IQ is a valuable component to the development of these programs, more information on how IQ has been incorporated into them should be included in Annual Monitoring Reports.</p>		<p><b>Document Name:</b> Appendix G.5.1 Pt. 2 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> 10.3 Height of Land Survey</p> <p><b>PDF Pages:</b> 102 of 268</p>	
58	QIA 2022 NIRB TE# 2.	<p>Table 8-4 shows that 23 of the total 43 dustfall monitoring stations yielded annual dustfall volumes above FEIS predictions. This represents over half of the monitoring stations and is an increase from the 2021 monitoring year where there were exceedances at 20 of the sites. Of these 23 exceedance locations, 4 were at Milne Port and 19 were along the Tote Road. Notably many (12) of the 20 sampling locations that did not exceed FEIS predictions were from stations where year-round sampling was not conducted and so annual dustfall values had to be extrapolated and added to the observed total. Despite these alarming results, Baffinland continues to downplay the results of dustfall monitoring, emphasizing that, in general total annual dustfall across the Project area in 2022 was within ranges observed in previous years (which also showed concerned dustfall results). In addition, Baffinland suggests that these results show that mitigation measures are working since production levels increased since last year, yet general annual dustfall in the project area is within the same range as previous years. Baffinland has not substantiated this hypothesis with data on the correlation between production activity and dustfall across the RSA. These results and conclusions are</p>	<p>In response to continued exceedances of FEIS predictions at dustfall monitoring locations, Baffinland must prioritize additional measures to mitigate dustfall, including those previously committed to through other avenues of discussion with QIA (e.g., PIPR, SOP). These measures include commitments 18A through 22K made during the February 2023 meeting on dustfall as outlined in the updated commitments table transmitted by QIA in April 2023. In sum, these include (but are not limited to):</p> <ul style="list-style-type: none"> <li>Establishing site specific thresholds for conditions that may increase dust dispersion, implementing corresponding mitigation (e.g., dust suppression, staged decrease in dust-generating site activities) and integrate these thresholds and response actions into the Air Quality and Noise Abatement Management</li> </ul>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.2 – Air Quality (PC Condition 10); Section 8.3.2.3 – Annual Dustfall Results</p> <p><b>PDF Page:</b> 138 to 141 of 703</p>	<p>Baffinland will continue to work with QIA and report on these commitments as part of 2023 annual reporting.</p> <p>Baffinland is and will continue to collect comprehensive data during 2023 in support of establishing site specific thresholds to meet the Dust mitigation objectives across the material handling chain. In order to fully understand and quantify all variables relating to dust dispersion, Baffinland will be expending much of it's data focus on collecting a variety of samples during a number of environmental conditions, as well as with and without various mitigations in place. This is critical to be able to establish meaningful thresholds to govern activities in the future.</p> <p>We will of course continue to utilize to the maximum extent reasonably practicable, any and all existing dust mitigations to ensure dust dispersion mechanisms, as we currently understand them, are minimized.</p> <p>Baffinland agrees that there could be value in consolidating the review of the AQNAMP and the proposed site specific mitigation program, if timing allows. In any event Baffinland and QIA agree that the TEWG must be involved in the final review of the program.</p>

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		<p>significantly concerning, as QIA and Inuit have repeatedly raised concerns about dustfall and urged the need to improve mitigation measures.</p> <p>PC Condition 10 states that the Proponent must update its Dust Management and Monitoring Plan, including (but not limited to) outlining plans for monitoring and identifying adaptive management measures when dust deposition is greater than predicted. While Baffinland has certainly made changes to this plan over the years in responses to exceedances and concerns raised (e.g., pilot of 0.5m dustfall monitors, implementing a dust audit, improving dustfall imagery analysis, etc.), QIA notes that the issue has not be fully addressed.</p>	<p>Plan. This is to be done in collaboration with the TEWG (PIPR Commitments 18A, 18B)</p> <ul style="list-style-type: none"> <li>Refining application rates of Dustblokr in accordance with manufacturer instructions, continue ongoing communications with the manufacturer to verify application procedures, researching the viability of applying water to supplement Dustblokr, and providing QIA with a summary of modifications and outcomes (PIPR Commitment 19A)</li> <li>Providing updates on blends of Dustblokr that will be used to help QIA determine potential toxicity concerns (PIPR Commitment 19B)</li> <li>Reporting on the effectiveness of the Dustblokr products for summer months, including information on quantity and frequency of dust suppressants used (PIPR Commitment 19C)</li> <li>Continually exploring and describing to QIA mitigations related to ore handling and drop distances in relation to Milne Port and the Mine Site (PIPR Commitment 20A, B)</li> <li>Progressing and providing QIA with updates regarding the feasibility studies on the installation of wind fencing, or alternative measures (e.g., applying spray product to ore to reduce dust emissions) at Milne Port (PIPR Commitment 20 C, D)</li> <li>Defining what operational practice improvements will be made to</li> </ul>		

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			<p>minimize dust from Milne Port based on the Dust Audit Report, clarifying with QIA how these will be implemented, and ensuring this is done without delay after receiving the necessary materials (PIPR Commitment 20E,F)</p> <ul style="list-style-type: none"> <li>• Completing updated, seasonal dustfall isopleth modelling with consideration for local topography and wind patterns, reviewing alignment of modelling results with monitoring data, considering the use of active air quality monitoring, and providing QIA with updates on changes to monitoring (PIPR Commitment 21A)</li> <li>• Resourcing annual snowpack sampling and monitoring through the Inuit-led dust monitoring program (PIPR Commitment 21B)</li> <li>• Expanding dustfall monitoring sites to include areas of community concern, based on guidance from QIA and HTOs (PIPR Commitment 21C)</li> <li>• Comparing monitored dustfall sites with FEIS predictions to confirm they meet their current low isopleth zone rankings and determining the spatial extent and magnitude of dust dispersion beyond the project area (PIPR Commitment 21D)</li> <li>• Adding dustfall monitoring locations, determined based on the results of updated isopleth modelling to help evaluate long-distance dust dispersion (PIPR Commitment 21E)</li> </ul>		

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			<ul style="list-style-type: none"> <li>• Developing a snow quality metric, integrating IQ as part of the development of Inuit OITRs (PIPR Commitment 21F)</li> <li>• Adding dustfall monitoring sites along Milne Inlet to investigate increasing dust extent documented by satellite imagery from 20124 – 2020 (PIPR Commitment 21G)</li> <li>• Expanding satellite imagery analysis beyond 20km (PIPR Commitment 21H)</li> <li>• Completing a desktop study on dust duration on the land to identify locations that may experience longer term dustfall effects (PIPR Commitment 21J)</li> <li>• Including dustfall monitoring stations within the scope of the annual dust audit. (PIPR Commitment 22A)</li> <li>• Working with NRCan on a pilot program to install and test passive vertical monitors (PIPR Commitment 22C)</li> <li>• Implementing methods for bi-weekly dustfall extent monitoring using satellite imagery as much as possible consideration limitations (PIPR Commitment 22E)</li> <li>• Committing to implement recommendations for dust monitoring improvements outlined in the final Dust Audit Report (PIPR Commitment 22F)</li> <li>• Reviewing dust control measures at all locations where ore is moving or being handled at the mine site and port sites</li> </ul>		

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			<p>to help determine whether additional measures are required (PIPR Commitment 22H)</p> <ul style="list-style-type: none"> <li>Exploring the feasibility of using UAV/satellite imagery methods to monitor lichen health (abundance/cover) (PIPR Commitment 22J)</li> <li>Ensuring discussion related to dust are a standing agenda item for TEWG and MEWG meetings moving forward (PIPR Commitment 22K)</li> </ul> <p>QIA recognizes that Baffinland has been attempting to control dust generation, but has continually failed to present convincing and comprehensive results that mitigations have been successful. Project Certification conditions require that Baffinland stay within predicted FEIS dustfall ranges, and until this is fulfilled Baffinland cannot be considered in compliance.</p>		
59	<b>QIA 2022 NIRB TE# 3.</b>	<p>PC Condition 37 specifies that Baffinland incorporate protocols for monitoring for the potential introduction of invasive vegetation species into its Terrestrial Environment Monitoring Plan. Baffinland's TEMMP further specifies that exotic invasive vegetation and natural regeneration monitoring are scheduled every 3 to 5 years, or as triggered by observations of exotic invasive plant species. The QIA notes that Baffinland's last routine exotic invasive species monitoring occurred in 2019 when a garden tomato plant was found near the sewage/effluent discharge pipe at the Mine Site. Targeted follow-up monitoring (i.e., not routine) was then conducted in 2020 in one specific location to confirm eradication of the tomato plant.</p> <p>Table 1-1 of the 2022 TEAMR notes that the next scheduled exotic invasive vegetation monitoring will occur in 2023, which will be four years since the last routine monitoring</p>	<p>Baffinland to determine a significance threshold for potential effects of exotic invasive species. Until this has been done, and the results of previous years monitoring have been determined to be under this threshold, Baffinland should commit to conservatively conducting exotic invasive vegetation species monitoring every 3 (rather than every 4-5 years) moving forward (e.g., in 2023, 2026, 2029, etc.).</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board; Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.6 – Vegetation Conditions (PC Condition 37); Table 1-1</p> <p><b>PDF Page:</b> 214 of 703; 42</p>	<p>The timeline and frequency for Exotic/Invasive Vegetation Monitoring is described in the revised draft TEMMP (Baffinland, 2023; cf. Table 4-1, pg. 31-33), submitted on May 15, 2023.</p> <p>Incidental surveys are/have been completed regularly during other terrestrial environment field programs (including vegetation abundance and soil/lichen-metals sampling) from 2012-2023. There have been no additional reported exotic/invasive species at the Project and there is no evidence to suggest more frequent 'weed surveys' are warranted.</p> <p><u>Reference:</u></p> <p>Baffinland Iron Mines Corporation (Baffinland), 2023. Terrestrial Environment Mitigation and Monitoring Plan. Ref. No. BAF-PH1-830-P16-0027, DRAFT. May 15, 2023.</p>

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		<p>program covering a wide variety of locations occurred. While QIA notes that this is within Baffinland’s specified 3–5-year interval, it would have been more prudent to monitor more frequently (every 3 years, therefore again in 2022) considering the most recent routine efforts detected an exotic invasive plant species, and due to the importance of swift detection and mitigation in successfully eradicating them. QIA also recognizes that no exotic invasive species were incidentally detected during 2022, but it is possible species were missed since targeted monitoring did not occur. It is QIA’s perspective that routine exotic invasive species monitoring should occur every 3 years.</p> <p>In Section 4.6.6, Baffinland concludes, “given that year-over-year vegetation trends have shown that invasive plants do not appear to be a significant potential effect of concern, no targeted exotic invasive plant monitoring was conducted in 2022” (p. 201). QIA notes that this is an arbitrary conclusion since Baffinland has not specified a significance threshold for the potential effects of exotic invasive species.</p>			
60	QIA 2022 NIRB TE# 4.	<p>Respecting recommendations and lessons learned for PC Condition 35, in Section 4.6.6. Baffinland states that an HTO representative suggested increasing the payment that the Government of Nunavut (GN) provides to hunters for each sample to further encourage caribou organ tissue sample collection, namely from communities closest to the Project (e.g., Pond Inlet). The QIA notes that no samples from Pond Inlet were obtained in the 2021/2022 harvest season. QIA recognizes that it has been recommended that Baffinland defer to data from the GN’s caribou health monitoring program to meet the requirements of PC Condition 35. From QIA’s perspective, it is still within Baffinland’s scope of responsibility to support GN with this program, including ensuring a sufficient supply of samples is provided.</p>	<p>Baffinland to make additional efforts to help increase uptake in the voluntary harvester sample program. This could include contributing funding to the GN’s health monitoring program for caribou on Baffin Island to increase the sample payment amount from \$60 to \$120 for four (4) samples, as recommended by HTO representatives, or other measures deemed sufficient based on discussions with Inuit.</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> Section 4.6.6 – Vegetation Conditions (PC Condition 35)</p> <p><b>PDF Page:</b> 212 of 703</p>	<p>Baffinland appreciates this recommendation and will consider it in its ongoing collaboration with the Government of Nunavut on caribou monitoring. It should be noted, however, that the GN has previously expressed at TEWG meetings that increasing incentives is not a preferred method to increase program participation.</p>
61	QIA 2022 NIRB TE# 5.	<p>PC Condition 39 and 40 relate to measures that Baffinland should take to develop progressive revegetation of disturbed areas that are no longer required for project operations (e.g., use of test plots, reseeding, replanting, erosion control considerations). While it is not an explicit requirement of PC</p>	<p>Baffinland to consider IQ and Inuit involvement in progressive and end of life reclamation planning activities. Baffinland is requested to identify whether and how</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board; Appendix G.5.2 – Revegetation</p>	<p>Baffinland’s Interim Closure and Reclamation Plan describes the proposed creation of a Mine Closure Working Group. The role of this Mine Closure Working Group will be to facilitate the integration of community representation and technical expertise by drawing on Inuit knowledge, arctic experience for similar mining operations, and</p>

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		<p>Conditions 39 or 40, QIA has previously requested that Baffinland involve Inuit and use IQ to inform reclamation pilot research, including defining reclamation goals, end land uses, reclamation techniques, and criteria/measurements to determine success. However, in Baffinland's reports on compliance with PC Conditions 39 and 40, there is no indication that they made any effort to involve Inuit or consider IQ in the 2022 revegetation surveying and reclamation pilot work. Appendix G.5.2. provides more detailed reporting on revegetation survey and preliminary reclamation trial activities completed in 2022, but again, does not include any indication that Inuit involvement or IQ was considered. Within the recommendations / lessons learned sections for these reports, there is no indication that Baffinland intends to do so in the future.</p>	<p>Inuit will be involved in this work in subsequent years.</p>	<p>Survey and Preliminary Reclamation Trial – 2022 Project Update</p> <p><b>Section:</b> Section 4.6.6 – Vegetation Conditions (PC Condition 39, 40)</p> <p><b>PDF Page:</b> 218 to 219 and 220 to 221 of 703</p>	<p>discussion of alternative uses for decommissioned facilities into the reclamation options for various Project components.</p> <p>Implementation of the Mine Closure Working Group will require development of a mandate and/or terms of reference in consultation with the QIA. Baffinland looks forward to working with the QIA on this initiative.</p>
62	QIA 2022 NIRB TE# 6.	<p>PC Condition 53 b. requires Baffinland to implement monitoring and mitigation measures at points where the railway, roads, trails, and flight paths pass through caribou calving areas, particularly during caribou calving times, and that these measures should be developed in conjunction with the TEWG.</p> <p>As outlined in Appendix G.5 and as summarized in Baffinland's report on compliance with PC Condition 53 b., caribou monitoring programs consist of HOL surveys, the use of remote cameras (at limited times of the year) at 6 HOL stations, snow track surveys, and support of various broader monitoring programs (e.g., GN caribou monitoring). In response to AMR reviews and during TEWG meetings, QIA has repeatedly raised concerns about the sufficiency of these monitoring programs, specifically citing Inuit observations that the caribou may be avoiding the Project at greater distances than the spatial scope of Baffinland's various monitoring programs. In addition, QIA has repeatedly raised concerns about the efficacy of these monitoring programs. More detailed information on specific concerns can be found in other enclosed comments (TE# 7 -13) Baffinland has repeatedly disregarded these concerns and pointed to low regional abundance as the primary reason why caribou are not being observed through these programs, and as a result,</p>	<p>Baffinland to implement the requested improvements to various monitoring programs (as discussed in TE # 7-13), such as testing their efficacy and expanding the spatial scope of these programs to test and measure Inuit observations. Until these concerns have been adequately addressed, QIA considers Baffinland to be out of compliance with PC Condition 53</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Condition 53, 54)</p> <p><b>PDF Page:</b> 258 to 266 of 703</p>	<p>Multiple indicators and approaches are being applied for surveillance monitoring of mammals at the Project. While the reviewer comment states that Baffinland has disregarded concerns by repeatedly pointing to low regional abundance as the primary reason why caribou are not being observed—this cannot be dismissed. North Baffin caribou are currently at a low point in their 60 to 80-year population cycle (Government of Nunavut, 2019), and caribou observations are recorded infrequently, incidentally or during surveys. The current survey approaches and frequency are appropriate for low caribou densities; if/when caribou densities increase the frequency of survey will be increased correspondingly. Baffinland acknowledges that an aerial survey was conducted in March of 2023, which will provide an updated abundance estimate for caribou populations within the vicinity of the Project, and ultimately allow Baffinland to modify study designs for caribou monitoring programs in the future, if warranted.</p> <p>All methods and approaches were, in fact, developed with input from the TEWG.</p> <p>Refer to response # 2 (GN AR #02) regarding additional studies and thresholds used to inform more targeted survey to determine potential impacts on caribou would be triggered if/when caribou densities increase.</p>

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		<p>QIA does not consider these measures to be sufficiently developed in conjunction with the TEWG.</p> <p>QIA maintains that Baffinland has not developed a monitoring protocol that is sufficient to capture the impacts of the project on caribou, including avoidance of the project and known calving areas.</p>			
63	QIA 2022 NIRB TE# 7.	<p>Baffinland reports that the mean total number of ore haul transits for 2022 (243.6) slightly exceeds what was predicted in the FEIS Addendum for the Production Increase Proposal (236), and notes that this exceedance also occurred in 2019 and 2020. It is concerning to QIA that this is the third time in the past four years that Baffinland has exceeded its ore haul transit predictions. Section 6 does not contain any information on corrective actions Baffinland is taking to stay below mean number of annual ore haul transits, nor does it provide any rationale as to why these repeated exceedances are negligible.</p> <p>QIA notes that Baffinland's repeated exceedance of FEIS predictions regarding vehicle transits (and lack of apparent concern about it) may be contributing to caribou avoidance of project components and adjacent calving areas. Until this, combined with deficiencies related to the caribou mitigation and monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53</p>	<p>To more effectively implement caribou mitigation measures and improve compliance with PC Condition 53, Baffinland to develop and implement measures for ensuring that the mean number of annual ore transits stays below FEIS Addendum predictions. If this is deemed unnecessary by Baffinland, a rationale as to why this will have a negligible effect (e.g., on dust emissions, wildlife disturbance) must be provided.</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 6.0 – Tote Road Traffic</p> <p><b>PDF Page:</b> 258 to 263 of 703; 77</p>	<p>The predicted value for the mean total number of ore haul transits in the FEIS Addendum for the Production Increase Proposal (236) was determined simply by calculating the number of ore haul truck transits that would be needed to transport 6 million tonnes of ore in one year. This number is not an effects-based prediction and should not be viewed as a hard cap on ore haul truck transits. Baffinland notes that there has been no significant exceedance of this number to date, that it is the operations best interest to ensure the fewest amount of transits are used to transport 6Mt each year, and that reporting will continue in future reports.</p> <p>It is recognized that there are environmental effects associated with ore hauling, however, other factors such as precipitation and temperature also play a role in effects such as dustfall. Any environmental effects associated with Tote Road traffic continue to be monitored through the Terrestrial Monitoring Program.</p>
64	QIA 2022 NIRB TE# 8.	<p>There is no information in Section 10.4 on the maximum detection range and orientation of remote cameras selected for this program, nor is there information on proximity of remote cameras to project components (e.g., X m west of the Tote Road). Now that the remote camera program is underway, it would be useful for Baffinland to start reporting on this information to assist with interpreting the results. In particular, it would be useful for Baffinland to quantify the maximum area covered by remote cameras, similar to the viewshed modelling and analysis that has been provided for HOL surveys. This context is necessary to interpret the results of remote camera monitoring, and whether study design is</p>	<p>To better understand how remote camera monitoring results provide insight on caribou avoidance of the project area and improve compliance with PC Condition 53, Baffinland to report on and analyze the following for the 2023 remote camera monitoring program:</p> <ul style="list-style-type: none"> <li>• maximum detection range for each type of camera used;</li> <li>• orientation of each remote camera deployed (e.g., north, east south, west);</li> </ul>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.4 – Remote Cameras</p> <p><b>PDF Page:</b> 258 to 263 of 703; 106 to 112</p>	<p>Experimental design parameters (and limitations) are described in the 2022 Terrestrial Environment Annual Monitoring Report (TEAMR; EDI, 2023; refer to 10.4 Remote Cameras, 10.4.1 Methods; pg.226-227). Analysis of field of view (aspect/orientation, coverage) was completed in 2021 and reported in Section 9.4 and Appendix E the 2021 TEAMR (EDI, 2022). The proposed suggestions will be considered as part of future reporting.</p> <p>References:          Environmental Dynamics Inc. (EDI), 2022. 2021 Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 2022.          Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>sufficient to maximize the potential for detection of caribou and other wildlife species.</p> <p>QIA notes that this unknown information contributes to QIA's overarching concerns regarding the effectiveness of Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53</p>	<ul style="list-style-type: none"> <li>if relevant, proximity of each remote camera / HOL station to project components, including distance and type of component. QIA notes that project components within at least 500m should be reported;</li> </ul> <p>This information should be used to quantify a maximum total viewshed for each camera and HOL station (a map of each remote camera viewshed, relative to the HOL viewshed would be also ideal) to assist with interpreting the findings of remote camera monitoring, including its spatial limitations.</p>		
65	QIA 2022 NIRB TE# 9.	<p>QIA has previously recommended that Baffinland take reasonable measures to prevent field of view obstructions due to blowing snow, ice, or fog. Examples provided to Baffinland in response to the 2021 TEAMR included installing a cover or shelf, using silica gel packs to prevent moisture build-up in cases, and applying anti-fogging products. There is no indication in Section 10.4 of the 2022 TEAMR that Baffinland attempted any of these measures and no rationale as to why they would be ineffective in the context of the Project has been provided in Baffinland's responses to QIA's 2021 TEAMR comments. As shown in Table 10-2 (p. 109) there are still a high number of days where the camera field of view is obstructed per remote camera and as such this is still a limitation on the method.</p> <p>While QIA acknowledges that weather events are beyond Baffinland's control, Baffinland should at least attempt to implement easy potential solutions or provide rationale and evidence that the proposed solution has not worked in the past in similar contexts. If the measures do not work, then this can be reported on in the following year's TEAMR. In addition, in Section 10.4.1, it is generally stated that cameras are to be periodically checked (2-4 times annually), but there is not reporting on how frequently each remote camera was checked in Section 10.4.2 or in Table 10-2, making it difficult</p>	<p>To maximize remote camera monitoring data to provide insight on caribou avoidance of the project area and improve compliance with PC Condition 53, Baffinland to implement measures to minimize field of view obstructions due to snow, ice, or fog, including:</p> <ul style="list-style-type: none"> <li>installing a protective case and shade on each deployed camera</li> <li>using silica gel packs to prevent moisture build-up within cases</li> <li>applying anti-fog products to camera lenses</li> </ul> <p>QIA also requests Baffinland report on the number of times (and date) when each remote camera was checked (on a per camera basis), whether servicing was required, and if so, what type (e.g. removal of obstruction, battery replacement, SD card collection, etc.).</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.4 – Remote Cameras</p> <p><b>PDF Page:</b> 258 to 263 of 703; 106-112</p>	<p>No field of view obstructions have been recorded. The proposed suggestions are not required based on evidence available to date.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>to assess the level of reasonable effort to minimize non-active days.</p> <p>QIA notes that these issues contribute to the integrity Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53</p>			
66	<p><b>QIA 2022 NIRB TE# 10.</b></p>	<p>In response to the 2021 TEAMR, QIA requested that Baffinland deploy remote cameras at all 24 HOL stations (vs. a sample of only 6), or if this was not possible, to select locations based on the best available IQ and western science. Since the purpose of the remote camera monitoring is to capture supplemental data on caribou movement in relation to the Project, locations should be selected based on maximizing the potential for detecting caribou. Baffinland responded that it was not feasible to deploy cameras at all 24 HOL stations due to accessibility considerations, mainly with ongoing maintenance requirements in mind. However, Baffinland has not provided a rationale for why HOL stations 1, 3, 4, 6, 10, and 16, specifically, were selected. Was this based primarily on feasibility/accessibility or maximizing the potential for caribou detections? Did Baffinland explicitly verify these locations with MHTO prior to deploying cameras? In addition, are these six HOL stations the only ones that can be accessed as required for maintenance (per Baffinland, 2-4 times per year)? QIA notes that HOL stations 1 – 16 are generally accessed on foot (Section 10.3.1). Has Baffinland considered deploying remote cameras at HOL stations subject to access constraints in an effort to capture at least some data (e.g., during seasons when caribou are known to be calving or migrating). QIA notes that all HOL stations are at least accessible during some portions of the year (i.e., when HOL monitoring typically occurs in June) and that remote cameras could be deployed at this time with the intention of collecting at least some data.</p>	<p>To respond to study design concerns regarding remote camera monitoring and improve compliance with PC Condition 53, Baffinland to provide the following:</p> <ul style="list-style-type: none"> <li>a rationale for why HOL stations 1, 3, 4, 6, 10, and 16 were selected for remote camera monitoring. Please also confirm whether or not MHTO was asked to comment on the use of these HOL stations prior to remote camera program initiation.</li> <li>clarify whether HOL stations 1, 3, 4, 6, 10 and 16 are the only ones that can be accessed 2-4 times a year, as needed for remote camera maintenance.</li> </ul> <p>Baffinland to make additional effort to deploy remote cameras at as many HOL stations as possible, even if this means only collecting data for limited periods of the year (due to maintenance inaccessibility).</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.4 – Remote Cameras</p> <p><b>PDF Page:</b> 258 to 263 of 703; 106-112</p>	<p>The Remote Camera program was developed with input from the Terrestrial Environment Working Group (TEWG).</p> <p>Sites 1, 3, 4, 6, 10 and 16 were selected to provide a regular distribution along/at the Project. Methods/experimental design are appropriate for current regional low-density of caribou. Refer to 2023 TEAMR, Map 10-2 (EDI, 2023; pg.224), shown below.</p> <p>Based on monitoring outcomes to date, additional Trap Camera deployment is not warranted.</p> <p>References:          Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>QIA notes that these study design questions regarding remote camera locations contribute to QIA's overarching concerns regarding the effectiveness of Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53</p>			
67	<p><b>QIA 2022 NIRB TE# 11.</b></p>	<p>QIA notes that Map 10-2 shows that Height of Land surveyors have a viewshed from the Tote Road, including in areas where there are gaps in the Height of Land station viewsheds. In Section 10.3.1, Baffinland states that, according to the viewshed model, a total of 227km<sup>2</sup> is surveyed, but it's not clear whether this includes the viewshed from both the Height of Land sites and from the Tote Road. There is no information in Section 10.3.1 on the amount of time spent surveying along the Tote Road, or what approach was taken in this portion of the total viewshed. QIA presumes these areas are surveyed by vehicle, in transit between HOL stations, with observers looking on either side of the road, not using equipment, etc. However, this isn't clear and needs to be confirmed. To confuse matters, QIA</p>	<p>To respond to concerns regarding HOL survey spatial scope and improve compliance with PC Condition 53, Baffinland to provide the following information regarding Height of Land survey effort:</p> <ul style="list-style-type: none"> <li>Confirmation that the 227km<sup>2</sup> viewshed includes viewshed from the Tote Road (not overlapped by HOL station viewshed)</li> <li>An overview of the approach used to survey for caribou from the Tote Road</li> </ul>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.3 – Height of Land Surveys</p> <p><b>PDF Page:</b> 258 to 263 of 703; 105</p>	<p>This comment has been addressed previously. Per response to #62 (QIA 2022 NIRB TE# 6), the survey effort is appropriate for low caribou distribution. Methods were developed with direct input from the Terrestrial Environment Working Group (TEWG).</p> <p><b>10.3 HOL Surveys, 10.3.1 Methods</b></p> <p>The Height of Land (HOL) survey methods were developed in consultation with the TEWG (specifically the Mittimatalik Hunters and Trappers Organization [MHTO]) and incorporated Inuit Qaujimagatuqangit into strategies for detecting caribou (EDI, 2019).</p> <p><b>Modifications to Survey Procedures</b></p> <p>In 2016, viewshed modelling and mapping were completed to determine the amount of viewable area at each HOL survey station. [...] Refer to Section 4.3.1 of the 2016</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>notes that in 2022, HOL stations were accessed exclusively by helicopter due to weather, logistics, and safety considerations.</p> <p>QIA notes that these questions regarding HOL survey spatial scope contribute to QIA's overarching concerns regarding the effectiveness of Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53.</p>	<p>(e.g., travel method, speed, number of surveyors, equipment used, etc.)</p> <p>A summary of survey effort and results from the 2022 monitoring season specific to the Tote Road portion of HOL monitoring (e.g., number of caribou observed, number of transits completed, total observation time, etc.)</p>		<p>Annual Monitoring Report for a detailed description of viewshed modelling and mapping (EDI Environmental Dynamics Inc. 2017). [...] In 2020, the survey time was increased (as it is presently) by conducting at least two station visits for 40 minutes (previously 20 minutes). To date, Baffinland will continue to consult with MHTO representatives on the program via the TEWG and other engagement methods.</p> <p>References:</p> <p>Environmental Dynamics Inc. (EDI), 2017. 2016 Terrestrial Environmental Annual Monitoring Report.</p> <p>Environmental Dynamics Inc. (EDI), 2019. 2018 Terrestrial Environmental Annual Monitoring Report.</p>
68	QIA 2022 NIRB TE# 12.	<p>In Section 10.3.2, Baffinland notes that two caribou were observed incidentally by Baffinland Environment Staff on June 11, while they were conducting other Project-related activities. It is also noted that these crew members did not have binoculars or a spotting scope but still documented caribou behaviour while within an observable. Baffinland makes a concluding statement that "the caribou did not show any obvious response or distress from vehicle traffic on the Tote Road".</p> <p>QIA is concerned that the crew members who documented this incidental observation are not sufficiently qualified to understand and interpret caribou behaviour. Considering this and the fact that this was an incidental (not systematic) observation, the conclusion that caribou did not show any obvious distress should be interpreted within the appropriate context. QIA notes that Baffinland has used incidental data in the past to broadly conclude that the Tote Road does not affect caribou. While we acknowledge that systematic caribou surveys (e.g., remote cameras, HOL, snow track, etc.) are not currently yielding many results, Baffinland must exercise restraint when interpreting incidental observations. It is misleading to report this information in a section focused on systematic wildlife surveys (e.g. Height of Land).</p> <p>QIA notes that these concerns regarding over-analysis of incidental observation results contribute to QIA's overarching concerns regarding the effectiveness of Baffinland's overall program to monitor the potential effects of the project on</p>	<p>To address this concern regarding incidental caribou observations and improve compliance with PC Condition 53, Baffinland to ensure that incidental caribou observations documented by crew members, who are not necessarily qualified professionals, should not be reported in a section on systematic wildlife survey (e.g., Height of Land) results. Instead, they should be reported only in the section on incidental observation and paired with appropriate qualifying statements about data limitations. QIA reiterates that incidental observations should never be used to make conclusions regarding the effects of the Project or the effectiveness of mitigation or monitoring measures.</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.3 – Height of Land Surveys</p> <p><b>PDF Page:</b> 258 to 263 of 703; 105</p>	<p>Incidental Reporting is consistent with the TEMMP and uses standard forms and procedures to facilitate consistency (i.e., even when reported by non-experts). Incidental wildlife observations are escalated through the Environment Department and vetted by Baffinland wildlife consultants. Where applicable, training is provided to Environment personnel. All environmental technicians at the Mary River Project are required to read relevant Management Plans (inclusive of the TEMMP and caribou decision framework) during the employee onboarding process and must attend an orientation that includes an overview of the Environmental Protection Plan (EPP). Additionally, there are academic requirements for on site positions, which ensure that staff are knowledgeable and trained.</p> <p>Per the 2022 TEAMR (EDI, 2023), wildlife reporting already/presently differentiates between survey observations (e.g., Snow Track Surveys, Snowbank Height Monitoring, Height of Land Surveys, Remote Cameras) vs. 'non-survey' observations (e.g., Incidental Observations, Hunter/Visitor Log).</p> <p>Baffinland confirms incidental observations have not been used to make any conclusions on Project-effects or the effectiveness of mitigations at the Project.</p> <p>References:</p> <p>Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.</p>

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		<p>caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53.</p>			
69	<p><b>QIA 2022 NIRB TE# 13.</b></p>	<p>As expressed in the past, QIA remains concerned that snow track surveys are insufficient for several reasons. This is a good example of a broader pattern where Baffinland has been dismissive of, or unwilling to implement, reasonable and relatively minor adjustments proposed by QIA. We reiterate the following concerns (and reasonable, minor recommendations), which were not effectively addressed by Baffinland in response to the 2021 TEAMR.</p> <p>First, QIA remains concerned about the study design of snow track surveys. QIA previously requested that Baffinland test the efficacy of these surveys by completing two simultaneously and comparing the results. Baffinland's response to this related to the need to complete surveys around the deposit of fresh snow. However, from QIA's perspective, instructions can be provided to surveyors to ensure they do not disrupt snowfall to the point that tracks are not identifiable. QIA maintains that efficacy testing should be done to assuage concern related to these results. There is no indication in Section 10.1 that Baffinland completed efficacy testing for snow track surveys.</p> <p>Second, QIA maintains that qualified professionals (e.g., biologists with knowledge of wildlife behaviour and experience identifying tracks) should be responsible for completing these surveys, not just Baffinland personnel. Baffinland personnel continued to be the ones responsible for conducting snow track surveys in 2022. Is there a reason why qualified professionals are not hired to do this?</p> <p>Third, QIA has requested that Baffinland determine species-specific thresholds at which deflections from roads can be considered significant for each species. Again, there is no consideration of significance in Section 10.1.2, which limits the usefulness of these findings.</p>	<p>To address concerns regarding snow track survey deficiencies and improve compliance with PC Condition 53, Baffinland to commit to the following, in relation to snow track surveys for the next monitoring period (e.g., fall 2023):</p> <ul style="list-style-type: none"> <li>• test the efficacy of snow track surveys by completing two simultaneously and comparing the results;</li> <li>• hire qualified professionals to complete snow track surveys; and</li> </ul> <p>conduct research regarding wildlife road crossings and significance thresholds and analyze survey results relative to these to improve the usefulness of this survey.</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 53); Section 10.1 – Snow Track Surveys</p> <p><b>PDF Page:</b> 258 to 263 of 703; 91-96</p>	<p>Wildlife track identification does not need to be performed by a wildlife biologist and this is not a typical practice at other projects. QIA Environmental Monitors participate in wildlife track surveys at every available opportunity. Baffinland disagrees that Baffinland or QIA onsite Environmental Monitors are not capable of identifying wildlife tracks along the tote road. QIA Environmental Monitors in particular are eager participants in the program and offer invaluable insight into the local flora and fauna native to Baffin Island and the project site.</p> <p>In addition, Baffinland employs full time Inuit environmental technicians that are avid land users and hunters. Again, Baffinland strongly refutes the assumption from QIA that Inuit or non_inuit staff are incapable of identifying wildlife tracks along the tote road.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>QIA notes that these deficiencies related to snow track surveys contribute to QIA's overarching concerns regarding the effectiveness of Baffinland's overall program to monitor the potential effects of the project on caribou, including their avoidance of project components and calving areas. Until this, and other deficiencies related to the caribou monitoring program are addressed, QIA does not consider Baffinland to be in compliance with PC Condition 53.</p>			
70	<p><b>QIA 2022 NIRB TE# 14.</b></p>	<p>In its report on compliance with PC Condition 60, Baffinland states that "no wildlife has been knowingly harmed or disturbed by blasting activities during construction". However, there is no information to substantiate this claim and nothing in the 2022 TEAMR to indicate that Baffinland makes an effort to monitor for potential effects of blasting on wildlife, including to caribou during sensitive timing windows (e.g., calving, post-calving). Baffinland states that personnel are required to scan for and report the presence of wildlife sightings, but no such log has been provided or summarized. This makes QIA concerned that it is possible these effects are occurring and Baffinland is simply unaware of it due to monitoring program constraints.</p> <p>QIA has repeatedly requested the Baffinland provide evidence that wildlife are not harmed by blasting and to work with the MHTO and TEWG to evaluate concerns about the impacts of explosives on caribou and identify periods when explosive use is not permitted. Similarly to Baffinland's responses to many other concerns raised by QIA, there's no indication that Baffinland has made any targeted effort (e.g., outside of limited TEWG meetings with full agendas) to have these discussions in order to ensure compliance with PC Condition 60.</p>	<p>Baffinland must provide data logs to substantiate their claims that project personnel scan for and report wildlife presence (prior to blasting proceeding).</p> <p>Baffinland must also commit to undertaking targeted engagements with MHTO to evaluate concerns about the impacts of explosive use of caribou and identify periods when explosives may not be used.</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 60)</p> <p>PDF Page: 287 of 703</p>	<p>BIM-5200-SOP-0003 Reporting Procedure for Wildlife Incidents outlines requirements for reporting wildlife incidents and mortalities. Baffinland can confirm that no wildlife has been harmed or disturbed by blasting activities.</p> <p>In consultation with the TEWG of which the MHTO is a member, Baffinland has developed a draft Interim Quarry blasting caribou mitigation hierarchy document, which is undergoing internal review. Once approved it will be issued to the TEWG and may be adjusted further.</p>
71	<p><b>QIA 2022 NIRB TE# 15.</b></p>	<p>Baffinland states that "Out of 2,691 transits flown from May to September, 112 (4%) intersected the Snow Geese area during the moulting season, and only 22 hours (1%) of a total flight time of 1,694 hours were flown within the Snow Geese area during the moulting season." (p. 284). This approach to reporting is highly misleading as it compares the amount of "rule breaking" (i.e., times when pilots flew over the Snow</p>	<p>For subsequent TEAMR and NIRB AMR reporting, Baffinland should only express periods (transits and flight hours) of non-compliance with the 1,500m horizontal buffer around the Snow Geese area portion of PC Condition 59 relative to the periods when this rule was applicable. This will</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board; Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p>	<p>Future TEAMR and NIRB AMR reporting will be adjusted as requested in this comment.</p>

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		<p>Geese area) to flight transits and hours that occurred during periods when this “rule” did not apply (i.e., May, June, September). Presenting results this way creates a significant underestimate of the proportion of time when Baffinland’s helicopters were not in compliance with the 1,500m horizontal buffer portion of PC Condition 59. Baffinland should not be claiming credit for not breaking the rules during times when they were not applicable.</p>	<p>avoid significantly under-estimating non-compliance in year-end reporting to NIRB.</p>	<p><b>Section:</b> Section 4.6.8 (PC Condition 59) <b>PDF Page:</b> 281 to 286 of 703</p>	
72	<p><b>QIA 2022 NIRB TE# 16.</b></p>	<p>QIA continues to disagree with Baffinland’s approach to reporting on compliance with PC Condition 59, specifically that flights not adhering to vertical (650 or 1100 magl) and horizontal (1500m) restrictions are ultimately counted as compliant when accompanied by a rationale (“compliant with rationale”). QIA recognizes that the language of PC Condition 59 allows exceptions to account for unavoidable operational needs and pilot discretion regarding safety. However, these outcomes have consistently been closer to the rule than the exception, representing anywhere from 51.97 to 79.03 percent of all flights subject to 1100 magl cruising altitude requirements between 2017 and 2021, and anywhere from 40.94 to 68.73 percent of all flights subject to 650 magl cruising altitude requirements in the same period. Ultimately, the intent of PC Condition 59 is to minimize disturbance to breeding migratory birds and Snow Geese during their moulting period and, contrary to Baffinland’s conclusions regarding compliance, this is not being met most of the time.</p> <p>QIA recognizes that health and safety is paramount and that there may not be feasible alternative measures to key project operations (such as slinging), but additional efforts must be made to investigate the impact this is having on breeding migratory birds and moulting Snow Geese. As shown on pg. 285, Baffinland has no plans to study migratory bird and snow goose response to helicopter disturbance.</p>	<p>When making conclusions regarding compliance with PC Condition 59, Baffinland may continue to count “compliance with rationale” as compliant but only when accompanied by clear qualifying statements that the exceptions in PC Condition 59 needed to be exercised and conservatively convey that this results in disturbance to migratory birds and snow geese.</p> <p>Baffinland to conduct research on the effect of non-compliance and compliance with rationale flights on migratory bird breeding and snow goose moulting. This should be captured in the “Recommendations / Lessons Learned” section of Section 4.6.8, PC Condition 59, Until this research has been conducted and findings demonstrate no significant impact of low-level flying, Baffinland must continue to conservatively assume and disclose that its operations are harmful to breeding migratory birds and snow goose moulting.</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board; Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 (PC Condition 59); Section 5 – Helicopter Overflights</p> <p><b>PDF Page:</b> 281 to 286 of 703; 59-76</p>	<p>Current mitigation plans state that there is a known Snow Goose moulting area south and west of the Mary River Deposit No. 1. This area has moulting geese, and consequently flight restrictions apply in July and August. During this timing window, helicopters are required to maintain 1,100 m above ground level vertical and/or 1,500 m horizontal distance from observed concentrations of migratory birds. Pilots are required to keep an eye out for groupings of birds and avoid them to the extent possible.</p> <p>Baffinland encourages the QIA to share a recommended study design to better understand what research is being proposed. Baffinland acknowledges that conducting research in the snow goose moulting area would only warrant the additional use of helicopters, further contributing to flights within the snow goose moulting area, and at low levels below the 1,100 m threshold during mandatory research program activities such as slinging, personnel drop-off/pick-up, data collection at various site locations. Baffinland is currently not planning any research on the effect of non-compliance with rationale flights on migratory bird breeding and snow geese moulting.</p> <p>Acceptable rationale for low-level helicopter flights was discussed in a helicopter flight specific meeting on January 5, 2023 between Baffinland/EDI and the GN, and again at the TEWG meetings on February 14 -16, 2023. Amendments to helicopter overflight definitions and reporting requirements, including acceptable rationale for low level flights (ie. compliant with rationale) developed during these meetings/discussions will be applied to all conclusions regarding compliance. The revised table of acceptable rationale for low-level flights was included as Attachment 1 in Appendix E of the 2022 NIRB Annual Report (Baffinland, 2023), which was made available for public comment, inclusive of TEWG members and the QIA.</p> <p>Baffinland updated their helicopter overflight caribou mitigation procedure in June 2023 to reflect resolutions and discussions with GN and QIA from the meetings earlier in 2023.</p> <p><u>References:</u></p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
					Baffinland Iron Mines Corporation (Baffinland), 2023. 2022 Annual Report to the Nunavut Impact Review Board. April 30, 2023.
73	QIA 2022 NIRB TE# 17.	<p>QIA notes that 2022 represented the third consecutive year where Baffinland has not been able to confirm alternate locations for the HOL stations with the MHTO (the concern was first brought up in June 2019). Baffinland has never paired this note in the annual TEAMR with a summary of its efforts to work with MHTO to solve this specific issue, nor is there an indication that this occurred in 2022, per Appendix B.1 or C.2. Given the limited number of meetings, time constraints, and high number of items that often need to be discussed during TEWG meetings, this may not be the best avenue for obtaining guidance from MHTO on potential alternative HOL locations; additional engagement effort may be necessary.</p> <p>Until this known issue is actively addressed, QIA considers Baffinland to be out of compliance with PC Condition 63.</p>	<p>Prior to the commencement of the next HOL surveying period (presumably will be the 2024 program due to the timing of these responses), Baffinland must engage in specific and targeted efforts to review the HOL stations and consider alternative locations, as well as make reasonable efforts to address any barriers to having these discussions (e.g., funding, logistics, scheduling, acquiring / reviewing data sources, identifying candidate locations through desktop review/modelling, etc.). If this still cannot be done prior to the initiation of 2024 HOL surveys, Baffinland must provide a record of its attempts to mitigate the issue in order to demonstrate that it has attempted to maintain compliance with PC Condition 63.</p>	<p><b>Document Name:</b> Baffinland Iron Mines Corporation Mary River Project 2022 Annual Report to the Nunavut Impact Review Board, Appendix G.5.1 – 2022 Final Terrestrial Environment Annual Monitoring Report</p> <p><b>Section:</b> Section 4.6.8 – Terrestrial Environment (PC Condition 63); Section 10.3 – Height of Land Surveys</p> <p><b>PDF Page:</b> 290 to 291 of 703; 103</p>	<p>Baffinland is open to discussing potential changes to HOL survey locations, but requires the QIA to propose alternative locations that they deem satisfactory, with supporting justification as to why the proposed locations are more suitable than the current locations. As discussed in responses #66-67 (QIA 2022 NIRB TE# 10-11), HOL locations were established jointly with the TEWG, inclusive of MHTO and QIA. Stations are currently positioned at the highest points on land to ensure optimal conditions for data collection. The 2023 HOL program, including station locations, was discussed at the February TEWG meeting and no concerns regarding the proposed surveys were raised by the QIA or other TEWG members. The purpose of sharing tentative studies for the following monitoring season during these Working Group meetings is to receive and incorporate member feedback into the study design, and ensure that the study design is deemed adequate by the Working Group. If members are unable to provide program modification suggestions, and substantiated statements for those proposed modifications, then Baffinland will continue with the current study design for monitoring programs that were previously determined with the TEWG.</p>
74	QIA 2022 NIRB TE# 18.	<p>PC Condition 57 requires annual reporting of "An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries" (s.4.6.8, PDF p. 270 of 703).</p> <p>In 2022 winds at the Mine site were similar in strength and direction to those of the 2013-2021 means (s.4.2.1, Figs. 4-5 and 4-6, PDF p. 54 and 55 of 160). In contrast winds, at Milne Port were quite different in strength and direction than the 2013-2021 means (s.4.2.2, Figs. 4-7 and 4-8, PDF p. 57 of 160). Precipitation patterns at Milne Port were also different than the means, with July substantially drier and September "most unusually rainy" (both in depth and frequency) (s.4.1.2, p. 11, PDF p. 51). Baffinland considered the temperature and precipitation data to be accurate and reliable in 2022 (s.4, PDF p. 47 of 160) and the wind records were complete (s.4.2.2, PDF p. 56 of 160). These weather changes could have implications for the interpretation of other monitoring data.</p>	<p>Baffinland to clarify whether it considers changes to be natural or Project-related (e.g., changes in instrument reliability, location, etc), what factors may be driving these changes, and how the changes may alter the interpretation of other 2022 monitoring data.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Condition 57)</p> <p><b>Page: 214 to 219 (PDF p. 270 to 275 of 703)</b></p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.5.1 TEAMR</p> <p><b>Section:</b> 4 Climate</p> <p><b>Page: 7 (PDF p. 47 of 160)</b></p> <p><b>Section:</b> 4.1.2 Milne Inlet</p> <p><b>Page: 11 (PDF p. 51 of 160)</b></p> <p><b>Section:</b> 4.2.1 Mine Site, Figs. 4-5 and 4-6</p> <p><b>Page: 14 and 15 (PDF p. 54 and 55 of 160)</b></p>	<p>This request (i.e., determining what factors may be driving climatic and/or environmental change) is outside scope of the TEAMR/TEMMP.</p> <p>Environmental/weather conditions are summarized in the TEAMR. Previous studies and discussion forums (via the TEWG) have addressed timing of field campaigns to optimize (to the extent possible) data capture.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
				<p><b>Section:</b> 4.2.2 Milne Inlet</p> <p><b>Page:</b> 15 (PDF 56 of 160)</p> <p><b>Section</b> 4.2.2 Milne Inlet, Figs. 4-7 and 4-8</p> <p><b>Page:</b> 17 (PDF p. 57 of 160)</p>	
75	QIA 2022 NIRB TE# 19.	<p>Are the total annual ore shipment data presented in the 2022 Annual Report (Figure 4.7, PDF p. 273) and the 2022 TEAMR (Figure 6.1, PDF p. 78 of 160) figures the totals for marine shipping - as the ca. 4.7 Mtpa shipped in 2022 suggests, or are they the amounts transported by truck, which would be more informative for assessing the terrestrial impacts?</p> <p>The same uncertainty affects Figure 4.10 (PDF p.278) of the 2022 Annual Report, and Figure 8-13 (s.8.3.3.2, PDF p. 125 of 160) of the 2022 TEAMR which describes the "total ore shipped" axis in the caption as "total ore mined and hauled to Milne Port".</p> <p>Also in Figure 6.1, replacing the single box and whisker points for each year (i.e. total truck transits) with three box and whisker points in for each year (i.e., ore haul, no-ore haul, and total truck transits) would be much more useful for interpreting related impact data elsewhere in this report.</p>	<p>Baffinland to:</p> <ul style="list-style-type: none"> <li>clarify whether the "ore shipped" in these figures is referring to truck transport or marine transport,</li> <li>provide a revised version of Figure 6-1 that includes annual box and whisker points for ore haul, no-ore haul, and total truck transits, and data on the amount of ore trucked to Milne Port during each calendar year, and</li> </ul> <p>provide a revised version of Figure 8-13 that includes data on the amount of ore trucked to Milne Port during each calendar year</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Condition 57)</p> <p><b>Page:</b> 214 to 219 (PDF p. 270 to 275 of 703)</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Condition 58)</p> <p><b>Page:</b> 220 to 224 (PDF p. 276 to 280 of 703)</p> <p><b>Document Name:</b> Baffinland 2022 Annual Report to NIRB, Appendix G.5.1 TEAMR</p> <p><b>Section:</b> 6 Tote Road Traffic, Fig 6.1</p> <p><b>Page:</b> 38 (PDF p. 78 of 160)</p> <p><b>Section:</b> 8.3.3.2 Total Annual Dustfall, Figure 8-13</p> <p><b>Page:</b> 85 (PDF p. 125 of 160)</p>	<p>In Figure 6.1 "Ore shipped" represents marine transport. Below is a revised version Figure 6-1 with ore hauled from the Mine Site to Milne Port.</p> <p>Figure 6-1. Mean ore haul and non-haul vehicle transits per day and total ore hauled from the Mine Site to Milne Port between 2015 and 2022.</p> <p>Below is a revised version of Figure 8-13 with ore hauled from the Mine Site to Milne Port</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
76	QIA 2022 NIRB TE# 20.	<p>PC Condition 50 states, "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)."</p> <p>QIA believes the information provided to be insufficient. The objective of this PC Condition is "To ensure appropriate and responsive adaptive management." The report includes a detailed summary of the Terrestrial Environment Annual Monitoring Report (TEAMR), but only includes two mentions of indicators and thresholds and does not identify mitigation and management measures in the case that indicators or thresholds are triggered.</p>	<p>Baffinland to develop a more robust adaptive management program for project-specific monitoring of effects on the terrestrial environment. Adaptive management requires indicators, thresholds, and management</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.8, PC Condition 50</p> <p>Page: 193-197 (PDF p. 249 to 253 of 703)</p>	<p>Baffinland's approach to adaptive management — including indicators, thresholds and pre-defined responses — is described in the recently revised/updated draft Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2023), which was submitted to NIRB for public review on May 15, 2023 for. Specifically, the Trigger-Action Responses Plan (therein) provides a data assessment and response framework if/where thresholds for the terrestrial environment are triggered.</p> <p><u>References:</u></p> <p>Baffinland Iron Mines Corporation (Baffinland), 2023. Terrestrial Environment Mitigation and Monitoring Plan. Ref. No. BAF-PH1-830-P16-0027, DRAFT. May 15, 2023.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
77	<b>QIA 2022 NIRB TE# 21.</b>	<p>PC Condition 57, "The Proponent shall report annually regarding its terrestrial environment monitoring efforts, with inclusion of the following information:</p> <ul style="list-style-type: none"> <li>e. Description of all updates to terrestrial ecosystem baseline data;</li> <li>f. A description of the involvement of Inuit in the monitoring program;</li> <li>g. 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>h. 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>i. Results of the annual monitoring program, including field methodologies and statistical approaches used to support conclusions drawn;</li> <li>j. A summary of the chronology and level of mine activities (such as vehicle frequency and type);</li> <li>k. An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries;</li> <li>l. 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> </ul> <p>QIA believes the information provided to be insufficient. Item (h) is not addressed in the report.</p>	<p>Baffinland to report on proposed changes to terrestrial monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.8, PC Condition 57</p> <p>Page: 214-219 (PDF p. 270 to 275 of 703)</p>	<p>This request has been addressed in the 2022 TEAMR (EDI, 2023), which describes methods, assumption, adaptive management approaches in relation to different monitoring end-points.</p> <p>Historical changes to assessment protocols are also outlined. For examples, in the 2022 TEAMR:</p> <ul style="list-style-type: none"> <li>• Section 5.1.1 (Helicopter Overflights) Monitoring History and Changes in Analytical Procedures (pg.19)</li> <li>• Section 7.1.2 History of Noise Modelling and Monitoring (at the Project) (pg.41)</li> <li>• Section 8.1 History of Dustfall Monitoring at the Project</li> <li>• Section 8.2 Dustfall Suppression and Mitigation</li> <li>• 9.1.1.1 (Vegetation and Soil Base Metals Monitoring) Monitoring History and Changes in Sampling Procedures.</li> </ul> <p>References: Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.</p>
78	<b>QIA 2022 NIRB TE# 22.</b>	<p>The y-axes are different on each panel of Figure 8-4, which illustrates the 2022 mean daily dustfall by site and month. This prevents direct comparisons and makes it unnecessarily difficult to compare the sites. The purpose of these figures should be to communicate the information clearly, not to have matching panels that obscure the fact that dustfall is much</p>	<p>Baffinland to provide figures that are directly comparable. QIA has requested this many times through NIRB Annual Report reviews and TEAMR reviews.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.6.8 Terrestrial Environment (PC Condition 58)</p>	<p>This request has been raised and amended previously. The following figures demonstrate standardized y-axes to facilitate direct comparisons (i.e., between different Project areas), albeit to the detriment of interpretive resolution. Alternatively, the variable axes (i.e., fit to the data) provide a more focused presentation of potential trends/differences within each Project area.</p>

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		<p>higher at the South Crossing and much lower at Milne Port than it is at the North Crossing or Mine Site. The same problem exists with the panels of Figures 8-5 and 8-6 (PDF p. 115).</p>		<p>Page: 220 to 224 (PDF p. 276 to 280 of 703)</p> <p>Document Name: Baffinland 2022 Annual Report to NIRB, Appendix G.5.1 TEAMR</p> <p>Section: 8.3.2.2 Seasonal Comparisons of 2022 Dustfall, Fig. 8-4</p> <p>Page: 74 (PDF p. 114 of 160)</p>	<p>Figure 8.4. 2022 mean daily dustfall (mg/dm<sup>2</sup>-day) by site and month (time series or category) or season (category) across the Project.</p> <p>Figure 8.5. 2022 mean daily dustfall (mg/dm<sup>2</sup>-day) by site and month at the Tote Road crossings (KM 28, KM 78).</p>

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					<p>Figure 8.6. 2022 mean daily dustfall (mg/dm<sup>2</sup>·day) by site and season (summer and winter) at the Tote Road Crossings (KM 28, KM 78).</p>
79	QIA 2022 NIRB TE# 23.	<p>PC Condition 49 states, “The Terrestrial Environmental Working Group (TEWG) will provide advice, guidance and enforceable recommendations regarding: adding to and improving baseline information, mitigation measures for the protection of the terrestrial environment, monitoring of effects on the terrestrial environment, assessing the accuracy of impact predictions, the development and implementation of adaptive management plans, sharing of relevant Inuit Qaujimagatuqangit, scientific and/or technical knowledge and industry best practice, and, consideration of project changes that may be required to make sure the management of negative impacts is effective and that lasting damage to the terrestrial environment is prevented. 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.”</p> <p>Baffinland states, “In its most recent draft Terms of Reference (ToR) for the Working Groups Baffinland presented a reasonable path forward that would result in meaningful changes to the Groups’ current structure, operational schedule, and ability to influence the Project. It is expected that this should improve Members’ expectations, communication within the Group and outcomes. Baffinland will continue to engage with the Working Groups on the development of a revised Terms of Reference throughout</p>	<p>Baffinland to utilize adaptive management and/or monitoring, learning, and evaluation to implement changes to the terms of reference as well as expectations, communication, and outcomes.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.6.8, PC Condition 49</p> <p><b>Page:</b> 188 to192 (PDF p. 244 to 248 of 703)</p>	<p>The submission of the revised Terms of Reference for both the Marine Environment Working Group (MEWG) and Terrestrial Environment Working Group (TEWG) has been delayed to ensure that member and observer feedback is effectively incorporated into the TOR and the majority of parties are satisfied with the revisions prior to final submission.</p> <p>Baffinland released an initial revised TOR to the MEWG on August 22nd, 2022. On August 23rd, 2022, Baffinland requested that all members and observers submit their comments on the initial draft by September 30th, 2022. Comments were not received from all parties until February 9th, 2023, which prevented Baffinland from meeting the timeline that had previously been committed to. Baffinland requested to meet with multiple organizations following their review of comments on the initial TOR draft to ensure that feedback was understood and to allow for improved revisions on the second draft. Only two observer groups, Oceans North (ON) and World Wildlife Fund (WWF), agreed to meet with Baffinland to discuss their comments.</p> <p>The second revision of the TOR, which incorporated member feedback received on the first draft, was released to the MEWG on April 3rd, 2023. This version also served as the initial draft for the revised TEWG TOR. This draft included a Table of Concordance, which provided an explanation as to why certain feedback was not incorporated into the second draft. The original intention was to submit the second draft to the NIRB, however, Baffinland hosted a combined MEWG/TEWG teleconference on April 19th, 2023 from 1:00 – 4:00 pm to further discuss comments on this draft and concerns were raised regarding this submission. Members felt as though parties could reach a better agreement by developing a third draft for subsequent review. Baffinland agreed to accommodate this request and committed to developing a third draft for member review, which has not been released at the</p>

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		<p>2023 in hopes of resolving any outstanding concerns raised by members to date.”</p> <p>QIA agrees with Baffinland's assessment of compliance.</p>			<p>time of this submission. Members and observers were asked to submit their comments to Baffinland on the second draft by May 1st, 2023. This deadline was extended until May 5th, 2023 to further accommodate members and observers with competing priorities. At the July 12th, 2023 MEWG meeting, Baffinland committed to circulating the third draft of the TOR to the TEWG as well. Once the MEWG TOR has been finalized and submitted to the NIRB, Baffinland will work with the TEWG to make any necessary revisions the TOR to accommodate the TEWG prior to finalization. Baffinland recognizes that all TEWG members belong to the MEWG, with the exception of Natural Resources Canada (NRCan), who are an observer group, as well as different personnel belonging to the group from Environment and Climate Change Canada (ECCC) and Qikiqtani Inuit Association (QIA).</p> <p>The aforementioned engagements with the Working Groups indicate that Baffinland is communicating effectively by responding to concerns of members and observers to ensure that the desired outcomes and expectations related to the TOR are achieved. Additionally, Baffinland has extended the TOR revision process in an effort to develop a draft that is agreed upon by the majority of members and will allow for improved functionality of the Working Groups, where monitoring and learnings can be discussed.</p> <p>With regards to adaptive management, Baffinland developed a draft Adaptive Management Plan (AMP), which was submitted to the NIRB on May 15th, 2023. Members and observers from both the MEWG and TEWG are able to provide comments on the draft AMP through the NIRB public registry. NIRB registry file no., application no., and identification no. for this document were provided to the Working Groups via email on June 9th, 2023 (08MN053, 125710, and 344993, respectively). The AMP highlights Baffinland's Adaptive Management Response Framework, including the development of low, moderate, and high action level responses, as well as a summary of how adaptive management has been integrated into Baffinland's various Management Plans, which are used to guide monitoring and on site activities. Baffinland will continue to use adaptive management to inform decisions and encourages members and observers on the Working Group to address any concerns on the current Adaptive Management Framework through the NIRB registry process. Additionally, adaptive management approaches are/have been integrated in the draft 2023 TEMMP (Baffinland, 2023). Recently updated/ revised TEMMP presently includes Trigger-Action Response Plan with pre-defined responses to risk (per various monitoring end-points).</p> <p>References:</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
					Baffinland Iron Mines Corporation (Baffinland), 2023. Terrestrial Environment Mitigation and Monitoring Plan. Ref. No. BAF-PH1-830-P16-0027, DRAFT. May 15, 2023.
<b>SOCIOECONOMIC ENVIRONMENT</b>					
80	<b>QIA 2022 NIRB SE# 1.</b>	<p>PC Condition 129 states, "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."</p> <p>No engagement took place in lieu of a Qikiqtaaluk Socio-Economic Monitoring Committee meeting that the Government of Nunavut cancelled given difficulty securing a venue.</p> <p>QIA expects greater in-person engagement in the coming year.</p>	<p>QIA requests a minimum of two Qikiqtaaluk Socio-Economic Monitoring Committee meetings in 2023 to ensure concerns for 2021 and 2022 are discussed and recorded for NIRB's consideration, and to facilitate the working relationship of the Committee.</p> <p>QIA notes that a similar request was made last year.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.1, PC Condition 129</p> <p><b>Page:</b> 453 to 454 (PDF p. 509 to 510 of 703)</p>	<p>2023 marked the first year since the pandemic began that the QSEMC was able to meet in person, in Iqaluit. Baffinland attended and provided a comprehensive update on our socio-economic monitoring program results and trends from over the years. A thorough discussion followed, which will be integrated into the 2023 Socio-Economic Monitoring Report.</p> <p>With no SEMC meeting scheduled in 2022, Baffinland engaged with QSEMC members via electronic correspondence on November 11 2022, providing committee members opportunity to review and provide comment(s) on its 2021 socio-economic monitoring results. A similar process was undertaken in 2020 in lieu of there being an person meeting.</p> <p>To assist the QSEMC with its review of the monitoring results a slide deck, Baffinland developed a guidance document inclusive of socio economic-related questions for consideration by members.</p> <p>Baffinland and QIA are both participants to the QSEMC, and the frequency at which the QSEMC meets is at the discretion of the Government of Nunavut, who chairs and organizes these meetings.</p>
81	<b>QIA 2022 NIRB SE# 2.</b>	<p>PC Condition 132 states, "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 preexisting, 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."</p> <p>QIA agrees with Baffinland's assessment of compliance.</p>	<p>Baffinland to continue to expand upon the suite of programs which encourage Inuit to continue living in their home communities while seeking ongoing and progressive training and development.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.1, PC Condition 132</p> <p><b>Page:</b> 459 to 460 (PDF p. 515 to 516 of 703)</p>	<p>Baffinland will continue to explore avenues to expand upon the suite of programs which encourages Inuit to continue living in their home communities while seeking ongoing and progressive training and development.</p>
82	<b>QIA 2022 NIRB SE# 3.</b>	<p>PC Condition 133 states, "The Proponent is encouraged to work with the Qikiqtaaluk Socio-Economic Monitoring</p>	<p>Baffinland to provide a nominal incentive to improve survey response rate.</p>	<p><b>Document Name:</b></p>	<p>Baffinland will explore means to increase survey response rate, which may take form as a nominal incentive. Baffinland will discuss this item before implemented with the</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>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."</p> <p>Baffinland states, "In total, 55 surveys were completed. Applying the same methodology as used in the 2020 Inuit Employee Survey Report, based on the number of Inuit Project employees on staff in Q3 2022, the survey response rate was 18%. This compares to the 32.5% response rate achieved in 2020."</p> <p>QIA agrees with Baffinland's assessment of compliance.</p>		<p>Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.1, PC Condition 133</p> <p>Page: 461 to 464 (PDF p. 517 to 520 of 703)</p>	<p>Mary River Socio-Economic Working Group, which the QIA is a member of, and report on any incentive(s) used in 2023 in the Company's 2023 reporting period.</p>
83	<b>QIA 2022 NIRB SE# 4.</b>	<p>PC Condition 134 states, "The Proponent shall include with its annual reporting to the NIRB a summation of employee origin information as follows:</p> <ul style="list-style-type: none"> <li>m. The number of Inuit and non-Inuit employees hired from each of the North Baffin communities, specifying the number from each;</li> <li>n. The number of Inuit and non-Inuit employees hired from each of the Kitikmeot and Kivalliq regions, specifying the number from each;</li> <li>o. 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; and</li> </ul> <p>The number of non-Canadian foreign employees hired, specifying the locations and number from each foreign point of hire." QIA disagrees with Baffinland's assessment of</p>	<p>Baffinland to provide all required information identified in PC Condition 134. Baffinland to include all required information in future Annual Reports.</p> <p>QIA notes that this is the same request as last year.</p>	<p><b>Document Name:</b></p> <p>Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.1, PC Condition 134</p> <p><b>Page:</b> 465 to 468 (PDF p. 521 to 524 of 703)</p>	<p>Table 3 of the 2022 Socio-Economic Monitoring Report (SEMR) and Table 4.41 of the 2022 NIRB Annual Report provides detailed Baffinland and contractor employment data, including Inuit and non-Inuit employment by North Baffin communities, other Nunavut regions, outside Nunavut and internationally. This information provides actual levels of employment for a given year. It is unclear why the author has characterized this portion of Baffinland's Annual Report despite the information that is readily available for their review. Baffinland is compliant with PC Term and Condition No. 134 for 2022.</p> <p>Baffinland suggests the QIA walk Baffinland through this comment at the next meeting of the Mary River Socio-Economic Monitoring Working Group (MRSEMWG) meeting.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		compliance. Baffinland does not provide the information required by this PCC. Specifically, Baffinland provides Full-Time Equivalents (FTE) for its employees and contractor employees with some community breakdowns but does not provide an annual indication of where people are being hired from. No information is provided for the Kitikmeot, or for non-Canadian foreign employees. It is not possible to compare predictions of labour availability and employment opportunities with actual levels of employment from various demographic segments over different geographical areas, per the objective of the PCC.			
84	QIA 2022 NIRB SE# 5.	<p>PC Condition 135 states, "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)."</p> <p>QIA believes the information provided to be insufficient. Baffinland does not provide the information required by this PCC. Specifically, Baffinland describes certain training offerings, including site-based, online and in communities, but does not describe any "work/study programs" for Project employees. It appears Baffinland considers this PC Condition met by virtue of the suite of training offered, but there is little evidence offered that the objective of the condition is being satisfied. Participation and outcomes for the training initiatives described are not provided.</p> <p>QIA notes this is the same comments as provided in the review of the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p>Baffinland to bring reporting into compliance with the PC Condition, by indicating where additional opportunities for work/study programs have been considered (if at all) and/or request how Baffinland is interpreting this condition, rather than repeating descriptions of its general suite of training and/or those trainings required under other agreements like the IIBA.</p> <p>QIA notes this is the same request as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.2, PC Condition 135</p> <p><b>Page:</b> 470 to 471 (PDF p. 526 to 527 of 703)</p>	<p>Baffinland considers 'work/study' programs to be 'training', and does not treat them as a distinct group or sub-set of training options. A number of training programs are available to Baffinland employees and are discussed in detail in PC Condition No. 135 on p. 470-471 of the 2022 NIRB Annual Report. Baffinland is therefore compliant with PC Term and Condition No. 135 for 2022.</p> <p>Baffinland would like to highlight that the author has not provided any additional information, or indicated a deficiency with Baffinland's previous response. Baffinland has no additional information to provide at this time.</p> <p>Baffinland also notes that the PC Term and Condition 'encourages' the consideration of offering programs. No doubt Baffinland has met this expectation. If the QIA desires more specific training options be provided Baffinland suggests the IIBA Employment Committee would be a better forum for this discussion.</p>
85	QIA 2022 NIRB SE# 6.	<p>PC Condition 137 states, "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."</p>	<p>Baffinland to provide a list of which training certifications and licences would be transferable to a similar job site within Nunavut.</p> <p>QIA notes this is the same request as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.2, PC Condition 137</p> <p><b>Page:</b> 475 to 476 (PDF p. 531 to 532 of 703)</p>	<p>Baffinland would like to highlight that this term and condition is applicable to the Construction period only, which can reasonably be considered to have ended in 2015. Baffinland has no obligation to continue to report on this as a matter of compliance.</p> <p>Despite the above, a list of qualifications and certifications employees can obtain while working at Baffinland is provided in the methods section of PC Term and Condition No. 136 in the 2022 NIRB Annual Report. The list outlines types of training that are directly transferrable to another organization. It is unclear why the author has characterized this portion of Baffinland's Annual Report the way it has given the information that is readily available for their review.</p>

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		<p>The list provided by Baffinland does not indicate which certifications would be transferable to other employment. Baffinland states that training it provides is job-specific, which runs counter to the objective of this PC Condition; the objective being encouraging efforts to strengthen long-term employability beyond the Project. This is a legacy benefit that is important to Inuit and not being pursued adequately by Baffinland.</p> <p>QIA notes this is the same comments as provided in the review of the 2020 and 2021 Annual Monitoring Report Reviews.</p>			
86	<p><b>QIA 2022 NIRB SE# 7.</b></p>	<p>PC Condition 141 states, "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."</p> <p>QIA believes the information provided to be insufficient. Baffinland reporting does not specifically address what is being sought by NIRB through this PC Condition. Inuit being hired to serve as employees in monitoring or other such capacity is not addressed.</p> <p>QIA notes this is the same comment as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p>Baffinland to identify initiatives to provide training to Inuit to serve as employees for monitoring programs.</p> <p>QIA notes this is the same request as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p><b>Document Name:</b>          Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.2, PC Condition 141</p> <p>Page: 489 to 490 (PDF p. 545 to 546 of 703)</p>	<p>Baffinland would like to highlight that this term and condition is applicable to the Construction period only, which can reasonably be considered to have ended in 2015, Baffinland has no obligation to continue to report on this as a matter of compliance. It is also worth noting that this information is available to the QIA through the annual implementation of the Mary River Inuit Impact Benefit Agreement, specifically under Article 8, making any commentary that indicates otherwise disingenuous.</p> <p>Despite that this same request was provided in relation to the 2021 Annual Report and the author has not provided any additional information, or indicated a deficiency with Baffinland's previous response, Baffinland will highlight that there are four (4) full-time Qikiqtani Inuit Association (QIA) environmental monitor positions at the Project. The QIA environmental monitors work directly with the site environment department. Additionally, the environment department at Baffinland adheres to the Minimum Inuit Employment Goal (MIEG) and employs full-time Inuit environmental technicians and two full-time Inuit environmental technician-in-training. Through these roles, Inuit receive direct training related to both environmental sciences and engineering, and are well qualified to work in site-based environmental monitoring programs. Refer to the Terrestrial Environmental Monitoring Reports and Annual Marine Reports for additional information pertaining to program-specific requirements.</p> <p>With regards to terrestrial monitoring, note that EDI reports annually on Inuit involvement. Inuit involvement is emphasized for all field programs with a goal of 1:1 (EDI:Inuit) team ratios. Inuit participation (shown below) is typically commensurate to size/scale of the field campaigns.</p> <p>Per Section 3 Inuit Participation (pg.5-6) of the 2022 TEAMR (EDI, 2023):</p>

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					<p>Likewise, Inuit participation in marine monitoring programs is reported on in annual marine monitoring reports and presented at post-shipping season meetings with the MEWG. Baffinland, WSP and EDI are committed to ongoing recruitment of Inuit participants in our field programs at the Project.</p> <p><u>References:</u>          Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.</p>
87	QIA 2022 NIRB SE# 8.	<p>PC Condition 142 states, “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.”</p> <p>QIA believes the information provided to be insufficient. Baffinland does not address the requirements in the PC Condition. While there is a policy and certain practices in place, they do not justify a claim that language barriers or alienation is proactively addressed. Baffinland relies on historical IIBA Workplace Conditions Review information as a source of feedback from employees, but does not acknowledge that Inuit employees cite language as a significant barrier to socialization between Inuit and non-Inuit coworkers.</p>	<p>Baffinland to share the Annual Inuit Employee Survey with QIA. QIA may have input on the survey questions that will provide a better understanding of the effectiveness of Baffinland’s actions to address this PC Condition.</p>	<p><b>Document Name:</b>          Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.3, PC Condition 142</p> <p>Page: 493-495 (PDF p. 549 to 551 of 703)</p>	<p>Baffinland disagrees with the assertion that there is a compliance issue here. Baffinland continues to work to reduce barriers between employees of different cultures and languages. Initiatives implemented to proactively address direct and indirect effects are discussed in the methods section of PC Term and Condition No. 142 (p. 493). In the spirit of continuous improvement, however, Baffinland is open to working with the QIA to determine the next Workplace Conditions Review, with the intent to provide a more current understanding of any potential issues in this area in an effort to identify the need for additional actions.</p> <p>Baffinland administers its Inuit Employee Survey on an annual basis, where Mary River Socio-economic Monitoring Working Group members, including the QIA, are provided opportunity to review and provide feedback on said Survey. In 2022, Baffinland did not receive comment from the QIA on the Survey. Baffinland has circulated the draft 2023 Inuit Employee Survey it plans to administer to working group members for review and comment. Baffinland looks forward to reviewing QIA input on the 2023 Survey.</p>

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88	QIA 2022 NIRB SE# 9.	<p>PC Condition 143 states, “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.”</p> <p>QIA believes the information provided to be insufficient. Baffinland states that internet and telephone access is available, but that bandwidth and utilization levels may limit their use. Innovative technologies or additional efforts to keep Inuit employees connected to their families are not mentioned. Baffinland has acknowledged that exit interviews indicate that family impacts are often cited as reasons for resigning, though little effort seems to be made relative to this PC Condition (e.g., innovative technologies).</p> <p>QIA notes this is the same comments as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p>Baffinland to provide a discussion on the current state of internet and telephone access for Inuit employees on site, including information they have regarding Inuit employee feedback on this access and any barriers to access. Baffinland to provide a discussion on how they will improve technologies to better support Inuit working on site.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.3, PC Condition 143</p> <p>Page: 496 (PDF p. 552 of 703)</p>	<p>Baffinland has been dedicated to enhancing the connectivity and communication options available to our workforce. Our Voice over internet phone (VoIP telephone service) at the mine-site remains a priority onsite and the phone lines are actively maintained by the IT department for use by employees on-site to ensure communication is accessible for everyone.</p> <p>In early, 2023, Baffinland installed a satellite internet service on-site. With this new satellite internet service, our employees have experienced improved access to various online platforms, such as Zoom, WhatsApp, and Viber, enabling them to connect more effectively with their families, friends, and colleagues via video calls. As part of an ongoing improvement, we continue to assess the effectiveness of new satellite internet service and gather feedback from our employees, contractors and visitors on-site.</p> <p>This enhancement at Baffinland’s mine site will significantly contribute to the overall well-being and job satisfaction of our Inuit employees, contractors and visitors, enabling them to stay connected with their communities and access essential services while working at our site.</p> <p>Baffinland remains committed to fostering a positive and sustainable accessibility for our employees and their families at home and will continue to work with them to ensure any future developments on our internet services are communicated transparently. Baffinland is in compliance with PC Term and Condition No. 143.</p>
89	QIA 2022 NIRB SE# 10.	<p>PC Condition 145 states, “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.”</p> <p>QIA disagrees with Baffinland’s assessment of compliance. Baffinland notes its Inuit Women Advisory Committee, including some actions and activities, that provides advice and suggestions on effective methods of reducing barriers for Inuit and female employees. However, the activities of the Inuit Women Advisory Committee are presumed to be based on a historical Arnait Action Plan, developed through the IIBA, that requires review and implementation through an Inuit Women-specific lens and not Inuit generally. Further, Baffinland notes that the QSEMC did not meet in 2021 or 2022.</p>	<p>Baffinland to provide details on activities of the QSEMC as it relates to a relative action plan for Inuit Women and childcare barriers as well as its relationship with Government of Nunavut and Baffinland’s Inuit Women Advisory Committee.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.3, PC Condition 145</p> <p>Page: 498-501 (PDF p. 554 to 557 of 703)</p>	<p>This Qikiqtani Inuit Association (QIA) request of providing details on activities of the QSEMC is directed towards the Government of Nunavut as the Chair and administrator of the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC).</p> <p>As noted in the 2022 NIRB Annual Report (p. 500) the Arnait Action Plan committee has identified that inadequate access to childcare in the LSA may be creating some barriers to increased employment of women at the Project. Baffinland has incorporated and addressed areas identified in the Action Plan since 2020, although with some delay due to the COVID-19 pandemic and turnover due to operational uncertainty. Baffinland will be re-establishing work as identified in the Plan, commencing the Year 1 core initiatives related to female employment recruitment barriers in 2023, moving forward with the remaining 2 core areas for retention and advancement barriers to subsequently roll-out in 2024 and 2025.</p> <p>The Company would like to note that it did engage with the QSEMC, including the Government of Nunavut, on the topic of barriers to employment for women, specifically with respect to childcare in its November 11, 2022 letter sent to the QSEMC via electronic correspondence. In this letter, Baffinland asked the QSEMC: What is the availability of childcare (within families and at centres) in your</p>

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					<p>community? Are these available and affordable for Mary River workers? In your view, are there other barriers to employment for women that should be considered?</p> <p>Further, Baffinland administered its Inuit Employee Survey in Q4 of 2022, where a similar question was posed to Inuit employees at Mary River. This is one of the several avenues Baffinland is able to track the barrier of childcare availability.</p>
90	<b>QIA 2022 NIRB SE# 11.</b>	<p>PC Condition 147 states, "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."</p> <p>QIA agrees with Baffinland's assessment of compliance.</p>	<p>NIRB to request that more details be shared with respect to the Memorandum of Understanding between Baffinland and the Government of Nunavut.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.3, PC Condition 147</p> <p><b>Page:</b> 503-504 (PDF p. 559 to 557 of 560)</p>	<p>Baffinland has no additional information to provide at this time. As the Memorandum of Understanding (MoU) progresses, Baffinland and the Government of Nunavut will report to the Nunavut Impact Review Board, where appropriate.</p>
91	<b>QIA 2022 NIRB SE# 12.</b>	<p>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.</p> <p>QIA believes the information provided to be insufficient. Baffinland provides some information about their own employees' food security and harvesting time but fails to provide information on food security, harvesting interactions or dietary habits outside of its own employees. Baffinland does not discuss specific Project interactions with harvesting in this section, aside from the Wildlife Compensation Fund and environmental monitoring programs.</p> <p>QIA recognizes that Baffinland has provided funding and support to QIA to conduct a Pond Inlet Country Food Baseline Study, which commenced in 2021. This community-based study is an important starting point for a robust Inuit led monitoring program with direct links to adaptive management responses.</p>	<p>Baffinland to provide information on food security, and harvesting interactions for Inuit, including Inuit who are not employees of Baffinland. Baffinland to discuss specific Project interactions with harvesting.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.4, PC Condition 148</p> <p><b>Page:</b> 507-511 (PDF p. 563 to 567 of 703)</p>	<p>Baffinland has been waiting for the submission of the Pond Inlet Country Food Baseline Study, the CRLU Assessment and the Inuit Stewardship Plan before making any amendments to its own monitoring programs. It is important Baffinland and QIA do not duplicate efforts and add any unnecessary consultation requirements on Inuit. Baffinland encourages QIA to complete the work it has assumed so all parties can benefit from the information that has been collected since 2020 that could address the issues identified in this comment.</p>
92	<b>QIA 2022 NIRB SE# 13.</b>	<p>PC Condition 151 states, "The Proponent is encouraged to investigate measures and programs designed to assist Project employees with homeownership or access to affordable housing options."</p>	<p>NIRB to request that more details be shared with respect to the Memorandum of Understanding between Baffinland and the Government of Nunavut.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p>	<p>Baffinland has no additional information to provide at this time. As the Memorandum of Understanding (MoU) progresses, Baffinland and the Government of Nunavut will report to the Nunavut Impact Review Board, where appropriate.</p>

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		<p>QIA believes the information provided to be insufficient. Baffinland does not appear to have implemented measures specific to assisting with homeownership and improving access to affordable housing, and notes that it is not its responsibility. For example, the 2022 Employee Survey showed that 75% of respondents were not aware of the Nunavut Down Payment Assistance Program, though Baffinland does not appear to have used that finding to work with NHS to improve awareness among employees of this available support.</p> <p>QIA notes this comment is the same as that provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>		<p><b>Section:</b> 4.7.4, PC Condition 151          Page: 516-517 (PDF p. 572 to 573 of 703)</p>	
93	<p><b>QIA 2022 NIRB SE# 14.</b></p>	<p>PC Condition 154 states, "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."</p> <p>QIA believes the information provided to be insufficient. Baffinland presents information where available but does not describe efforts beyond the QSEMC process to develop indicators for the indirect effects where data does not currently exist. For example, no information is presented on gambling, marital problems, teenage pregnancy, or family violence. Understanding the QSEMC was unable to meet in 2021 or 2022, if the QSEMC process is not capable of producing community level data to advance discussion and solutions to these critical topics, this emphasizes the importance of advancing an Inuit-led social monitoring program. Further, if Baffinland is capable of using evidence to make VSEC predictions in an EIS, NIRB should ensure that the data is generated to monitor and assess Project impacts against these predictions. This speaks to a clear need for Inuit-led monitoring with direct links to adaptive management responses.</p>	<p>Baffinland to consider Inuit-led monitoring programs to track potential indirect effects of the Project, filling in gaps the QSEMC process is not achieving.</p> <p>QIA notes this is the same request as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p><b>Document Name:</b>          Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.5, PC Condition 154          Page: 526-528 (PDF p. 582 to 584 of 703)</p>	<p>Baffinland has been waiting for the submission of the Pond Inlet Country Food Baseline Study, the CRLU Assessment and the Inuit Stewardship Plan (ISP) before making any amendments to its own monitoring programs. To be clear, Baffinland and QIA have already agreed that QIA will lead Inuit led monitoring through the ISP. It is important Baffinland and QIA do not duplicate efforts and add any unnecessary consultation requirements on Inuit. Baffinland encourages QIA to complete the work it has assumed so all parties can benefit from the information that has been collected since 2020, and the Inuit led monitoring programs it will support that could address the issues identified in this comment.</p>

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		<p>QIA notes this is the same comment as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p> <p>In 2019, the National Inquiry into Missing and Murdered Indigenous Women and Girls released its Final Report, Reclaiming Power and Place, with 231 Calls for Justice, including Inuit, Métis and 2SLGBTQIA+ specific Calls for Justice. It states, "In particular, the increasing rates of violence that ensue within the context of transient and temporary workforces are an issue that witnesses talked about as engaging many of the pathways to maintaining colonial violence documented so far in this Final Report," and, "Moreover, extractive development can pose additional threats to Inuit women's security, as the high number of transient workers at mining camps can create working and living environments where sexual harassment and abuse of Inuit women take place."3</p>			
94	QIA 2022 NIRB SE# 15.	<p>PC Condition 155 states, "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."</p> <p>QIA believes the information provided to be insufficient. Baffinland does not provide NIRB with an updated report as strongly encouraged in the PC Condition. The initiatives that Baffinland describes are affirmative in that they seek to create conditions where conflict is less likely. However, Baffinland does not readily acknowledge that conflict is possible and describe actions that can be taken if conflict does arise.</p> <p>QIA notes this is the same comment as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p>Baffinland to bring reporting into compliance with the PC Condition by providing an updated report that includes a description of actions that can be taken if conflict arises.</p> <p>QIA notes this is the same request as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p><b>Document Name:</b>          Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.5, PC Condition 155</p> <p>Page: 529-531 (PDF p. 585 to 587 of 703)</p>	<p>The author has not provided any additional information, or indicated a deficiency with Baffinland's previous response. Baffinland has provided a list of mitigation measures whose aim are to encourage on-site cohesion of employees through cultural awareness and social programs, which are found in pp. 529-531 of the 2022 NIRB Annual Report. Baffinland is therefore in compliance with PC Term and Condition No. 155.</p> <p>Baffinland has no additional information to provide at this time.</p>
95	QIA 2022 NIRB SE# 16.	<p>PC Condition 157 states, "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."</p>	<p>Baffinland to report on the status of alcohol and narcotic anonymous programs at Project sites in 2023 NIRB Annual Monitoring Report.</p> <p>QIA notes that this is the same request as last year.</p>	<p><b>Document Name:</b>          Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.5, PC Condition 157</p> <p>Page: 534-535 (PDF p. 590 to 591 of 703)</p>	<p>Baffinland continues to look into resources to support this objective. The Employee Family Assistance Program (EFAP) is being utilized for support involving substance abuse, addiction, etc. If an employee communicates that they are having issues such as substance abuse, Baffinland will assist the employee in getting a support worker through the EFAP. This support worker will work directly with the affected employee.</p>

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		<p>QIA agrees with Baffinland's assessment of compliance. However, in the 2020 and 2021 NIRB Annual Reports, Baffinland indicated it would investigate the establishment of alcohol and narcotic anonymous programs at Project sites.</p>			<p>Further, as noted in on p. 525 of the 2022 NIRB Annual Report, Baffinland hired two (2) on-site mental health counsellors who work with employees and provide counselling services. There are no longer plans to start an alcohol and narcotic anonymous site-based program as these counsellors are able to meet one-on-one with employees for counselling support.</p>
96	<p><b>QIA 2022 NIRB SE# 17.</b></p>	<p>PC Condition 159 states, "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."</p> <p>QIA believes the information provided to be insufficient. There is no indication that an effects monitoring program is in place for community infrastructure and airport infrastructure. Rather this is covered through the work of the QSEMC and QSEMWG. Baffinland does provide data on the number of aircraft movements in point of hire communities and acknowledges that the Project puts "incremental pressure" on airport infrastructures but concludes that it is not significant given it represented only 8.4% of total movements in 2018. In the three years prior to 2020, when the pandemic significantly reduced airport traffic, traffic had been steadily increasing. This would have associated increases in direct and indirect impacts to the airports (and travelers), but this is not examined.</p> <p>QIA notes this is the same comment as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p>Baffinland to monitor and report on Project-related effects to community infrastructure and airport infrastructure.</p> <p>QIA notes this is the same request as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.6, PC Condition 159</p> <p>Page: 541-542 (PDF p. 597 to 598 of 703)</p>	<p>The author has not provided any additional information or indicated a deficiency with Baffinland's previous response, which is listed below. Baffinland has no additional information to provide at this time.</p> <p>Baffinland continues to engage with the Government of Nunavut (GN) through various platforms on the Project's socio-economic monitoring program, which monitors Project-related impacts to infrastructure (i.e. aircraft movements) within the Local Study Area (LSA) communities. Baffinland is therefore in compliance with PC Term and Condition No.159.</p>
97	<p><b>QIA 2022 NIRB SE# 18.</b></p>	<p>Baffinland provides a summary of valued components, effects, observations made through monitoring programs, and a statement on whether impact predictions made in the FEIS are consistent with these observations (2022 AMR, Table 4.56, pp. 602 of 703). It is not clear how Baffinland has concluded the observed effects are consistent with the FEIS predictions for the following values:</p> <ul style="list-style-type: none"> <li>• Inuit Harvesting of Wildlife</li> <li>• Travel and Camps</li> </ul>	<p>Baffinland to revisit its conclusions on FEIS predictions, considering the quality and type of data available as well as what Inuit are saying and observing re: changes to culture, resources and land use in multiple fora.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.7 Culture, Resources &amp; Land Use (PC Condition 162 through 166)</p> <p><b>PDF Page:</b> 602 to 616 of 703</p> <p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact</p>	<p>QIA is currently leading the completion of a CRLU Assessment in relation to the existing and approved Mary River Project with funding and technical support provided by Baffinland. This Assessment should produce its own predictions regarding values like Inuit Harvesting of Wildlife and Travel and Camps based on the most currently available information, which includes two years of IQ studies carried out by the QIA specifically in support of the CRLU Assessment between 2020 and 2021. The results of the CRLU Assessment can be considered against the original FEIS, ERP FEIS Addendum and SOP FEIS Addendum (should the SOP be approved) predictions before relevant Baffinland led monitoring programs and management plans are updated. It is expected that the CRLU Assessment results will also inform</p>

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		<p>For example, Baffinland concludes that impacts to Inuit harvesting, and travel and camps are within the FEIS predictions because land user visits were recorded. As QIA has stated many times, land user visits do not adequately provide a proxy indication of total or even a small proportion of impacts on culture, resources and land use, especially if one considers the reasons visitors provided for the reason of their visit, e.g., hunting, collecting fuel, having a meal, repairing/picking up snowmobiles, etc. (Appendix G.7.1, p. 102 of 210). QIA continues to advance the studies that will help Baffinland and QIA better understand the effects to Inuit harvesting and camps, but those studies are not complete so that information is not yet available.</p> <p>Inuit have observed in multiple forums that impacts have been greater than expected re: ability/willingness to drink water from the land, dust distribution, willingness to harvest, sense of enjoyment out on the land, amount of narwhal and seal and changing body condition, among other considerations.</p> <p>We know as well that the NIRB Phase 2 Recommendations Report has found that impacts on Inuit Harvesting of Wildlife are being reported by Inuit and these impacts are of a potentially significant nature. This is direct contradiction with the Proponent's statement that Inuit harvesting of wildlife has stayed within predictions made in the FEIS, which were of insignificant adverse effects on Inuit harvesting of wildlife.</p>		<p>Review Board, Appendix G.7.1, 2022 Socio-Economic Monitoring Report</p> <p><b>Section:</b> 8, Resource and Land Use; Appendix B Socio-Economic Monitoring Indicators (related to PC Condition 148)</p> <p><b>Page:</b> 82 (p. 102 of 210); PDF p. 568 to 569 of 703</p> <p><b>Document Name:</b> Nunavut Impact Review Board Reconsideration Report and Recommendations for Baffinland's Phase 2 Development Proposal, May 2022.</p> <p><b>Section:</b> 5.2.1.3 Food Security</p> <p>Page: 222</p>	<p>the development of the CRLU and Social monitoring programs under the Inuit Stewardsip Plan (ISP).</p>
98	<b>QIA 2022 NIRB SE# 19.</b>	<p>PC Condition 162 states, "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."</p> <p>QIA agrees with Baffinland's assessment of compliance. However, efforts to obtain and include Inuit Elder and community member input into Project decision making is still a primary contributor to Inuit dissatisfaction with the Project.</p>	<p>Baffinland to continue to advance Inuit-led monitoring programs that include a framework for tracking and integrating Elder and community engagement, so community level input can be demonstrably integrated into Baffinland monitoring programs and mitigative measures.</p> <p>QIA notes that this is the same request as last year.</p>	<p><b>Document Name:</b></p> <p>Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.7, PC Condition 162</p> <p>Page: 549-551 (PDF p. 605 to 607 of 703)</p>	<p>Baffinland is committed to funding the development and implementation of QIA's Inuit Stewardship Plan. Baffinland looks forward to receiving an ISP Work Plan in the near future for review and approval, and expects the monitoring programs under the ISP to supplement Baffinland's ongoing efforts to further integrate Elder and community engagement into Project decision making. Baffinland also notes that on May 15, 2023 a revised draft IQ Framework was submitted to NIRB for public review in tandem with the 2022 Annual Report to NIRB. The IQ Framework broadly describes how Baffinland defines, collect and integrates IQ into its operations, including its Environmental Management System (EMS).</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		QIA acknowledges the improvements that have been made, and maintains that Inuit-led monitoring should be the primary focus. QIA acknowledges that advancement of Inuit Certainty Agreement implementation may help to rectify concerns.			
99	<b>QIA 2022 NIRB SE# 20.</b>	<p>PC Condition 163 states, "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."</p> <p>QIA believes the information provided to be insufficient. Baffinland's ineffective efforts to provide Inuit with input into Project decision making is a primary contributor to Inuit dissatisfaction with the Project. It is QIA's hope that this is addressed through the Inuit Certainty Agreement.</p> <p>QIA acknowledges that Baffinland hired Inuit Knowledge Holders and Community Relations Guides toward the end of 2022.</p>	<p>Baffinland to include in the report demonstrable evidence that Inuit Knowledge Holders and Community Relations Guides are informing the Project's management and monitoring plans as well as the public.</p> <p>Baffinland to advance Inuit-led monitoring programs</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.7, PC Condition 163</p> <p>Page: 552-553 (PDF p. 608 to 609 of 703)</p>	<p>Baffinland requests that the QIA expand on why it 'believes the information provided to be insufficient'. The purpose of Article 14 of the IIBA is to promote a cooperative relationship between Inuit and the Company with respect to Inuit engagement in identifying and addressing Project related matters that may affect Inuit throughout the life of the Project until Project Termination.</p> <p>Via the Annual Project Review Forum (APRF), in addition to concurrent regulatory processes requiring engagement with Inuit, information is shared about or arising from the Project, including impacts and residual effects by Baffinland and QIA with affected communities. Advice is provided to the Joint Executive Committee via outcomes of discussions and action items arising from the APRF. Note, the APRF had not occurred since 2019 until May 2023.</p> <p>Baffinland appreciates QIA's acknowledgement of hiring of the Inuit Knowledge Holders and Community Resource Guides as they are valuable members to our team who provide advice and Inuit Qaujimagatuqagit to Baffinland's operations and support Baffinland with meaningful engagement with Inuit on a local level.</p> <p>With respect to the request for Baffinland to advance Inuit led monitoring, Baffinland has provided ample funds to QIA to complete the Inuit Stewardship Plan, it is within QIA's power to complete that initiative. Please see response to QIA SE3 15 for additional details.</p> <p>Baffinland is in compliance with PC Term and Condition No. 163.</p>
100	<b>QIA 2022 NIRB SE# 21.</b>	<p>PC Condition 165 states, "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." QIA believes the information</p>	<p>QIA requests Baffinland provide usage data on existing emergency shelter purposes and an analysis on whether the number and location of shelters is adequate.</p> <p>QIA notes that the same request was made last year.</p>	<p><b>Document Name:</b> Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.7, PC Condition 165</p> <p>Page: 557-558 (PDF p. 613 to 614 of 703)</p>	<p>Baffinland has 4 Refuge stations along the Tote Road at Km 33, Km 40, Km 60, Km 69. These are equipped with emergency supplies. These have not been used for any over night emergency for the life of the Project. On one occasion in 2018 during a white out, 6 drivers met at the Km 33 refuge station so that they could all be in a central location for pick up/ escort back to camp. No emergency supplies were utilized.</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>provided to be insufficient. Baffinland has 4 refuge stations, and 11 sea can structures, which is far less than what is recommended in this PC Condition. No usage data or analysis is offered to suggest that what is in place is adequate aside from reporting that no Project related health and safety incidents with hunters and visitors occurred in 2022</p>			
101	<p><b>QIA 2022 NIRB SE# 22.</b></p>	<p>PC Condition 168 states, "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."</p> <p>QIA believes the information provided to be insufficient. Baffinland presents information where available but does not describe efforts beyond the QSEMC process to develop indicators for the indirect effects where data does not currently exist. For example, no information is presented on gambling, marital problems, teenage pregnancy, or family violence. Understanding the QSEMC was not able to meet in 2021 or 2022, if the QSEMC process is not capable of producing community level data to advance discussion and solutions to these critical topics, this emphasizes the importance of advancing an Inuit-led social monitoring program. Further, if Baffinland is capable of using evidence to make VSEC predictions in an EIS, NIRB should ensure that the data is generated to monitor and assess Project impacts against these predictions. This speaks to a clear need for Inuit-led monitoring with direct links to adaptive management responses.</p> <p>QIA notes this is the same comment as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p>Baffinland to develop indicators that can be monitored to fill gaps in the QSEMC process.</p> <p>QIA notes this is the same request as provided in the 2020 and 2021 Annual Monitoring Report Reviews.</p>	<p><b>Document Name:</b>          Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board Main Body</p> <p><b>Section:</b> 4.7.9, PC Condition 168</p> <p>Page: 565-567 (PDF p. 621 to 623 of 703)</p>	<p>The author has not provided any additional information, or indicated a specific deficiency with Baffinland's previous response. Baffinland has previously described the limitations in available community level socio-economic data. Recommending Baffinland 'develop indicators' without any further guidance is likely a product of the same issue, where neither Party is in a position to address the gaps that remain in meeting the suggested considerations of this term and condition.</p> <p>Please see response to QIA SE# 15 for additional details on the multiple programs Baffinland has funded the QIA to complete that would assist in this area.</p> <p>Baffinland has no additional specific information to provide at this time.</p>
102	<p><b>QIA 2022 NIRB SE# 23.</b></p>	<p>PC Condition 169 states, "The Proponent provide an annual monitoring summary to the NIRB on the monitoring data related to the regional and cumulative economic effects</p>	<p>Baffinland to ensure subsequent years' annual monitoring summary respecting PC Condition 169 includes findings of the Inuit</p>	<p><b>Document Name:</b></p>	<p>Baffinland will continue to include findings of its Inuit Employee Survey and efforts of the QSEMC in its annual NIRB Annual Report and Socio-Economic Monitoring</p>

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>(positive and negative) associated with the Project and any proposed mitigation measures being considered necessary to mitigate the negative effects identified.”</p> <p>QIA agrees with Baffinland's assessment of compliance. However, Baffinland summarizes that no negative regional or cumulative socio-economic effects directly associated with the Project were identified in 2022. This statement requires verification through the anticipated additional community engagements and QSEMC meetings, who did not meet in 2021 or 2022.</p>	<p>employee survey, efforts of the QSEMC, as well as COVID-19 related impacts that are associated with the Project.</p>	<p>Baffinland Iron Mines 2022 Annual Report to the Nunavut Impact Review Board</p> <p><b>Section:</b> 4.7.9, PC Condition 169</p> <p><b>Page:</b> 568-569 (PDF p. 624 to 625 of 703)</p>	<p>Report. Impacts the COVID-19 Pandemic had on the Baffinland workforce in 2022 are discussed in detail in the 2022 Socio-Economic Monitoring Report (p.13).</p>

Table A.2: Response to GN Comments on Baffinland's 2022 Annual Report to the NIRB

Cmt. #	GN Cmt. #	Reviewer's Detailed Comment	GN Recommendation	Reference Section	Baffinland's Response
<b>HELICOPTER TRAFFIC</b>					
1	GN AR #01	<p>In 2022, between May and September, 2,691 helicopter flights (totaling 1693 hours of flying) were made to support Project-related activities (EDI 2023, Tables 5-2, 5-5). Of these flights, 58% were below the minimum altitudes set by Project terms and conditions for reducing disturbance of migratory birds and established in the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) to avoid disturbance of other wildlife (EDI 2023, Table 5-5; BIMC 2016, Section 3.3.2).</p> <p>Although most of these low-level flights had a rationale for flying below minimum altitude thresholds (and were therefore deemed compliant with Project terms and conditions), low level helicopter flights are a potential source of disturbance to wildlife such as caribou (e.g. Wolfe et al. 2000; Wilson and Wilmhurst 2019).</p> <p>In the 2022 Annual Report, the proponent provides a summary of the various rationales provided by pilots to justify flying below the minimum altitude thresholds. The most common justification provided was the short distance of a flight. Following up on comments made regarding the 2021 Annual Report (GN 2022 -GN AR Comment #3), the GN seeks to further understand how flights are being classified as 'short distance' to determine whether this is an appropriate justification for what amounted to 48% of total flying time in 2022.</p> <p>Given the relatively high intensity of Project-related helicopter traffic, and the expectation that this will continue, it is important to understand the basis upon which low level flying is being justified. In this regard the following comments are noted:</p> <p>1. Table 5-5 (EDI 2023) indicates that 52% of helicopter hours flown in 2022 were below minimum altitude requirements set in the Project certificate and/or specified in the TEMMP but were classified as compliant because an appropriate justification for low level flying was provided by the pilot. Forty-eight percent of total flying hours in 2022, were below minimum altitude requirements but classified as compliant based on the justification that they were short distance flights (Table 5-7).</p>	<p>The GN recommends that the Proponent:</p> <ol style="list-style-type: none"> <li>1. Clarify the definition of a short distance helicopter flight, as used in classifying helicopter flights as compliant or non-compliant, in terms of a specific distance threshold. Please confirm whether short distance flights are defined, for the purpose of the Proponent's annual reporting, as those less than 15 nautical miles.</li> <li>2. Add to the reporting of helicopter flights, in the current and future annual reports, descriptive statistics of distance for the flights classified as compliant because of short distance. This should include the mean, standard deviation, minimum and maximum distances of the short distance flights.</li> </ol>	<ul style="list-style-type: none"> <li>• Baffinland Iron Mines Corporation (BIMC). (2016). Terrestrial Environment Mitigation and Monitoring Plan.</li> <li>• Baffinland Response to Comments Received for Baffinland's Production Increase Proposal Extension 2021 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2023). Mary River Project Terrestrial Environment 2021 Annual Monitoring Report.</li> <li>• Government of Nunavut (GN). (2019a). Comments on Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board.</li> <li>• Wolfe et al. (2000). Polar Research 19: 63-13.</li> <li>• Wilson and Wilmhurst (2019) Rangifer, 39: 27-42. DOI 10.7557/2.39.1.4586</li> </ul>	<p>This issue/request has been previously addressed via multiple discussions and dedicated meetings between the GN, Baffinland and EDI.</p> <ol style="list-style-type: none"> <li>1. Short distance flights are determined at the discretion of the pilot who is operating the aircraft during the flight. The pilot will consider the distance travelled during a flight as well as other contributing factors, and then determine whether gaining an altitude of 650 magl is unreasonable, unsafe, or impractical. These types of trips are generally associated with specific monitoring programs that are MANDATORY and there are no other practical ways of completing them (water sampling locations not accessible by foot or boat, dustfall sampling, wildlife observations, noise sampling, etc. also prospecting).</li> </ol> <p>Amendments to helicopter overflight definitions and reporting (per resolutions from meetings/discussions held on January 5 and February 14-16, 2023) including applicable short distance flight statistics will be applied henceforth.</p>

Cmt. #	GN Cmt. #	Reviewer's Detailed Comment	GN Recommendation	Reference Section	Baffinland's Response
		<p>2. Table 5-6 of the (EDI 2023) describes short distance flights as: "The short distance between take-off and landing sites does not allow enough time to gain 650 magl [meters above ground level]."</p> <p>3. In comments on the 2021 Annual Report, the GN asked the Proponent to clarify what criteria (distance and/or time) are used to determine when a flight is of short enough distance or duration to justify being classified as short distance and thus deemed compliant with altitudes specified in Project Certificate. (GN 2022: GN-ARC-03, part (2)).</p> <p>In response, the Proponent provided the following information:</p> <p>"The helicopter's average airspeed when not slinging is much faster than while slinging, therefore the pilots aren't expected to be able to reach and come down from 2,132 ft on a distance lower than 15 NM [nautical miles]." (BIMC 2022)</p> <p>Based on this response, it seems for the purpose of classification that a short distance flight is defined as one less than 15 nautical miles. However, this is not explicit in Proponent's response and should be clarified.</p> <p>4. Given the high number of short distance flights conducted in 2022, 906 hours from a total 1,693 flown, it is important to understand whether the distance of these flights fit the definition of short distance provided by the Proponent to justify low level flying. This information is not provided in the annual report.</p>			
<b>CARIBOU MONITORING</b>					
2	GN AR #02	<p>For monitoring caribou, the Project currently relies on snow track and Height-of-Land (HOL) surveys, as well as the recent addition (in 2021) of a pilot remote camera program. Since 2014, these monitoring programs have recorded no caribou observations, thus leaving the Proponent unable to conclude whether impacts on caribou are occurring despite community concerns that they are witnessing impacts (EDI 2023, Table O; NIRB 2022). Further, the Proponent has concluded that caribou numbers in the vicinity of the Project are too low to warrant either mitigation through adaptive management (e.g. through measures such as road or helicopter traffic management) or the implementation of more in-depth caribou monitoring at a more intensive or regional scale (e.g. EDI 2022a). As reported in the 2022 Terrestrial Environment Monitoring Report (EDI 2023), the Proponent</p>	<p>The GN recommends that:</p> <ol style="list-style-type: none"> <li>The Proponent clarify the purpose of the snow track and HOL surveys in terms of surveillance or monitoring impacts on caribou.</li> <li>If current monitoring programs are for caribou surveillance rather than impact assessment, the Proponent should identify which programs are currently monitoring Project effects on caribou.</li> </ol>	<ul style="list-style-type: none"> <li>Agnico Eagle Mines (AEM) Ltd. (2015). Terrestrial Environment Management and Monitoring Plan - Meliadine Gold Project, Nunavut.</li> <li>Agnico Eagle Mines (AEM) Ltd. (2019). Meadowbank Division Terrestrial Ecosystem Management Plan, Version 7.</li> <li>Baffinland Iron Mines Corporation (BIMC). (2016).</li> </ul>	<ol style="list-style-type: none"> <li>Purpose of the snow track and HOL surveys in relation to Project Conditions and Commitments are described in the 2022 TEAMR (EDI, 2023). <ul style="list-style-type: none"> <li>Section 10.1.1 (Snow Track Survey, pg.211-12): "The purpose of snow track surveys is to monitor the patterns of movement and response of caribou and other wildlife to Project-related activities based on their observable tracks in proximity to roadways.</li> <li>Section 10.3 (Height of Land Survey, pg.222): "The HOL surveys are intended to examine if/how caribou (especially cows with calves) respond to Project-related activities and infrastructure. [...] The HOL surveys will support long-term surveillance monitoring of caribou behaviour throughout the life of the Project and provide information to verify predicted Project-related effects on caribou movement and habitat use.</li> </ul> </li> </ol>

Cmt. #	GN Cmt. #	Reviewer’s Detailed Comment	GN Recommendation	Reference Section	Baffinland’s Response
		<p>conducted 4 snow track surveys and 36 hours of HOL surveys in 2022. This yielded zero caribou observations leading the Proponent to conclude again that: “[B]ecause no caribou tracks were identified during snow track surveys in 2022, it cannot be determined whether Project infrastructure is impacting caribou movement.” And “To date, insufficient caribou observations during HOL surveys have occurred to assess any Project-related effects on caribou behaviour or habitat use.” (EDI 2023a, Table O)</p> <p>As detailed in comments on six previous annual reports (e.g. GN 2019a, 2020, 2022) and during review of the Final Environmental Impact Assessment for the Phase 2 Development Proposal (GN 2019b, 2019c), the Government of Nunavut (GN) has repeatedly expressed concern that these snow track and HOL surveys continue to fail in meeting the objective of detecting caribou for the purposes of mitigating and monitoring project related effects. The fact that no caribou were observed during the last 9 years of these surveys could be a result of the following:</p> <ol style="list-style-type: none"> <li>1) Caribou were not detected because they are simply not present in the area during the survey, owing to low population density or low survey effort.</li> <li>2) Caribou were not detected due to avoidance behaviour and/or deflection from Project infrastructure and activities.</li> </ol> <p>The GN remains concerned that the current survey methods and level of survey effort do not offer the power to distinguish between these two possibilities. The snow track and HOL surveys have insufficient detection range and are conducted so infrequently that they are very unlikely to detect caribou present near the Project. Contrary to the Proponent’s view, the GN deems these monitoring methods inadequate as surveillance mechanisms for triggering mitigation of Project effects on caribou or for acting as an early warning mechanism triggering additional monitoring programs. As such, the GN deems BIMC to be non-compliant with Project Certificate Terms and Conditions 53 (b) and (c), and 58 (b).</p> <p>In addition to expressing on-going concern about the adequacy of current caribou monitoring methods employed by the Project, the GN seeks clarification from the Proponent about the purpose and objectives of snow track and height-of-land surveys, having noticed</p>	<p>3. To verify the Proponent’s assertion that the current low level of survey effort is not impeding the ability to detect project effects on caribou, snow track surveys along the Tote Road should be conducted twice weekly during snow cover seasons for a period of 2 years.</p>	<p>Terrestrial Environment Mitigation and Monitoring Plan.</p> <ul style="list-style-type: none"> <li>• Baffinland Iron Mines Corporation (BIMC). (2022). Baffinland Response to Comments Received for Baffinland’s Production Increase Proposal Extension 2021 Annual Monitoring Report.</li> <li>• Baffinland Iron Mines Corporation (BIMC). (2023). Mary River Project – Sustaining Operations Proposal, NIRB File No. 08MN053</li> <li>• Environmental Dynamics Inc (EDI). (2023). Mary River Project Terrestrial Environment 2021 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2015). Mary River Project Terrestrial Environment 2014 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2016). Mary River Project Terrestrial Environment 2015 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2017). Mary River Project Terrestrial Environment 2016 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2018). Mary River Project Terrestrial Environment 2017 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2019). Mary River Project</li> </ul>	<ol style="list-style-type: none"> <li>2. Per the 2023 TEAMR (Section 10 Mammals, pg.211): <ul style="list-style-type: none"> <li>“North Baffin caribou are currently at a low point in their 60 to 80-year population cycle (Government of Nunavut 2019), and caribou observations are recorded infrequently, incidentally or during surveys. The current survey approaches and frequency are appropriate for low caribou densities; if/when caribou densities increase the frequency of survey will be increased correspondingly.”</li> <li>Presently, wildlife monitoring applies surveillance methods/approaches to determine if/where caribou are interacting with the Project. Per the TEMMP, more targeted survey to determine potential impacts on caribou would be triggered if/when caribou densities increase. In early 2020 — following discussions of the Terrestrial Environment Working Group (TEWG, including representatives of governments and community Hunter and Trapper Organizations) — a decision framework and defined numerical triggers to initiate more comprehensive caribou monitoring (i.e., a GPS collar program to evaluate caribou movements and habitat selection in relation to the Project) to be informed by an aerial survey of the Regional Study Area (RSA) for wildlife (EDI Environmental Dynamics Inc. 2022). A late-winter aerial survey was completed (March 2023) to assess the occurrence (presence/absence), distribution, and total counts of north Baffin caribou within the Wildlife RSA and nearby areas of interest (defined further, below). The objective of this aerial survey was to estimate the abundance and density of north Baffin caribou in the northern (i.e., active Project area) and southern (i.e., planned/future Project area) subregions of the RSA in relation to the predefined monitoring triggers. Outcomes of the aerial survey will be included in the 2023 TEAMR.</li> </ul> </li> <li>3. Snow track surveys must be completed within 24 hours of snowfall and are therefore done opportunistically and completion cannot be guaranteed, especially with the proposed frequency of 2x weekly. Additionally, increasing snow track surveys to twice a week would not increase the number of caribou track encounters. North Baffin Island caribou occur at very low densities (compared to other projects that the GN cross-references), they are non-migratory (i.e. their annual movements are minimal), and there are very few caribou encounters with the Tote Road throughout the year. Caribou track encounters will increase only when caribou densities increase, and those caribou interact with the Project.</li> </ol> <p><u>References:</u></p>

Cmt. #	GN Cmt. #	Reviewer's Detailed Comment	GN Recommendation	Reference Section	Baffinland's Response
		<p>inconsistency between the annual reports and recent documents submitted by the Proponent to NIRB.</p> <p>Detailed supporting rationales for the GN's concerns regarding the Project's caribou monitoring programs have been previously provided and are not repeated here (see GN for example GN 2019a, 2020, 2021). Instead, the GN notes some inconsistency in the Proponent's statements regarding the purpose and objectives of these programs.</p> <p>In response to the GN's comments on caribou monitoring in the 2021 annual report (GN 2022), the Proponent provided the following response: "Regarding the Government of Nunavut's (GN's) comment: "Since 2014, these monitoring programs have recorded no caribou observations, thus leaving the Proponent unable to conclude whether impacts on caribou are occurring despite community concerns that they are witnessing impacts..." Baffinland is disappointed to see this statement given the number of times Baffinland has engaged with the GN to discuss the objective and intent of the current monitoring programs. Baffinland has been very clear that surveillance monitoring (e.g., Height of Land (HOL) and snow track surveys) is not meant to assess Project impacts but rather the presence of caribou in the area." (BIMC 2022)</p> <p>This statement indicates that snow track and HOL survey are for surveillance purposes rather than impact monitoring. However, this response contradicts other information that has been provided about these programs. For example:</p> <ul style="list-style-type: none"> <li>• Over the last 9 years, successive annual reports for the Project, including the 2021 report, have concluded that:</li> </ul> <p>"[B]ecause no caribou tracks were identified during snow track surveys in 2022, it cannot be determined whether Project infrastructure is impacting caribou movement."</p> <p>and</p> <p>"To date, insufficient caribou observations during HOL surveys have occurred to assess any Project-related effects on caribou behaviour or habitat use." (EDI 2023a, Table O)</p> <p>These statements suggest that snow track and HOL surveys are indeed the means of monitoring project impact.</p>		<p>Terrestrial Environment 2018 Annual Monitoring Report.</p> <ul style="list-style-type: none"> <li>• Environmental Dynamics Inc (EDI). (2020). Mary River Project Terrestrial Environment 2019 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2021). Mary River Project Terrestrial Environment 2020 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2022a). Mary River Project Terrestrial Environment 2021 Annual Monitoring Report.</li> <li>• Environmental Dynamics Inc (EDI). (2022a). Mary River Project Caribou Monitoring: Triggers and Recommendations.</li> <li>• Government of Nunavut (GN). (2019a). Comments on Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board.</li> <li>• Government of Nunavut (GN). (2019b). Technical Review Comments for Baffinland Iron Mines Corp.'s (BIMC) "Phase 2 Development" project proposal.</li> <li>• Government of Nunavut (GN). (2019c). Final Written Submissions for Baffinland's (BIMC) "Phase 2 Development" Project Proposal</li> <li>• Government of Nunavut (GN). (2020). Comments on Baffinland Iron Mines 2019 Annual Report</li> </ul>	<p>Environmental Dynamics Inc. (EDI), 2023. 2022 Final Mary River Project Terrestrial Environment Annual Monitoring Report - Prepared for Baffinland Iron Mines Corporation. April 28, 2023.</p>

Cmt. #	GN Cmt. #	Reviewer's Detailed Comment	GN Recommendation	Reference Section	Baffinland's Response
		<p>• In the Mary River Project – Sustaining Operations Proposal currently under review by NIRB, the Proponent identifies snow track surveys as the only monitoring program to verify the prediction that “The Project will have a not significant effect on caribou movements across Project infrastructure.” (Table 6.12, BIMC 2023). Furthermore, when a threshold level of deflections of caribou by the Project is reached (as measured by snow track surveys), adaptive management is to be triggered.</p> <p>These statements from the Proponent indicate that snow track and HOL surveys are for the purpose of impact monitoring yet the Proponent's response to the GN's comments on the 2021 state that this is not their purpose. These conflicting statements should be clarified by the Proponent. Additionally, if these monitoring programs are for surveillance only and not impact monitoring, the Proponent should clarify what monitoring programs are currently in place to address Inuit concerns about the Project's current impacts on caribou.</p> <p>Finally, while the GN accepts the Proponent's view that lack of caribou observations from snow track and HOL surveys over the last 9 years may be due to low caribou densities, the Proponent has not accounted for the effect of low survey effort on caribou observations. For example, in 2022, a total 4 snow track surveys were conducted along the Tote Road and no caribou tracks were found. Regardless of the number of caribou near the Project, and without further analysis, this level of monitoring is unlikely to yield useful results. Surveying the road for 4 days in a year for signs of deflection is not sufficient. For comparison, caribou-related road surveys at other mines in Nunavut, such as those in the Kivalliq region, are conducted at least twice weekly (AEM 2015, 2019).</p> <p>The GN is concerned that this key indicator for adaptive management is not being properly monitored. A substantial increase in monitoring effort is warranted, at least on an interim basis, to prove that current the monitoring efforts are not failing to detect project impacts.</p>		<p>to the Nunavut Impact Review Board.</p> <ul style="list-style-type: none"> <li>Government of Nunavut (GN). (2022). Comments on Baffinland Iron Mines 2021 Annual Report to the Nunavut Impact Review Board.</li> <li>Nunavut Impact Review Board (NIRB). (2022). Reconsideration Report and Recommendations for Baffinland's Phase 2 Development Proposal.</li> </ul>	
<b>SNOW SAMPLING PILOT STUDY</b>					
3	GN AR #03	<p>The Proponent is currently monitoring dust fall via passive samplers which assume, in monitoring project-related dust fall, there is no redistribution dust following its initial deposition on the land. However, this assumption is somewhat tenuous in the environment of north Baffin where deposited dust could be resuspended during windy</p>	<p>The GN recommends that:</p> <ol style="list-style-type: none"> <li>The snow sampling pilot study be continued into 2023 and 2024 and that the future results be</li> </ol>	<ul style="list-style-type: none"> <li>Environmental Dynamics Inc (EDI). (2023). Mary River Project Terrestrial Environment 2021 Annual Monitoring Report.</li> </ul>	<p>Baffinland confirms that the snow sampling pilot study will be continued into 2023 and 2024 and that the future results will be reported on in future annual reports.</p>

Cmt. #	GN Cmt. #	Reviewer's Detailed Comment	GN Recommendation	Reference Section	Baffinland's Response
		<p>periods and thus transported greater distances than predicted by dust fall models or passive sampling. In 2022, the Proponent initiated a snow sampling pilot study linking a satellite-derived dust fall index with ground-based measurements of snow dust content. Although, sampling was limited in 2022, results from this study suggest there may be a strong relationship between the satellite-derived Snow Darkening Index (SDI) and ground-based measurements of snow dust content. The annual report does not indicate whether this pilot study will continue in 2023. Given the preliminary results, the GN strongly recommends that this pilot study continue with a greatly enhanced sampling effort. If validated through this pilot study the SDI may prove to be a valuable tool in project monitoring.</p> <p>In 2022, the Proponent conducted a pilot study (the Surface Snow Sampling Pilot Study) looking at the relationship between a satellite-derived index of dust fall, the SDI, and the measured dust content of snow around the Project. As noted in Section 8.4.1.6 of the annual report:</p> <p>"[Calculated dustfall accumulation from the passive dustfall monitor deposition rates can provide an estimate of dustfall concentration to apply to the SDI values. This approach assumes no redistribution of dust after deposition and relies on estimating a period over which accumulation occurs. However, the SDI is a measure of the magnitude of mineral dust concentration on the snow surface at the time of image acquisition, which is the result of dust deposition and redistribution." (EDI 2023)</p> <p>This section of the report acknowledges that the passive dust monitoring program does not provide an accurate picture of the full extent of dust-fall generated by the Project since it doesn't account for redistribution of dust following its initial deposition. In the often-windy environment of north Baffin, the potential for dust to spread beyond its initial site of deposition is high. Understanding the full extent of dust-fall is important in assessing the impacts of the Project on people and wildlife. The GN thus emphasizes the importance of this pilot study.</p> <p>The annual report states that there is no significant relationship between SDI and snow dust concentration. However, sample sizes were low (with only 10 samples). Despite this, Figure 8-23 of the report suggests there may be a strong relationship between the SDI</p>	<p>presented to the Project's Terrestrial Ecosystem Working Group and future annual reports.</p>		

Cmt. #	GN Cmt. #	Reviewer's Detailed Comment	GN Recommendation	Reference Section	Baffinland's Response
		and snow dust concentration. If so, accurate monitoring of Project-related dust fall could be reliably accomplished via satellite-based monitoring rather than passive dust fall monitoring; which appears to underestimate dust distribution extent.			

Table A.3: Response to ECCC Comments on Baffinland's 2022 Annual Report to the NIRB

Cmt. #	ECCC Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
<b>COMPLIANCE MONITORING</b>					
1	N/A	<p>NIRB requested Regulatory Authorities provide a summary of any compliance monitoring and/or site inspections undertaken in association with the Mary River Project. ECCC's summary related to compliance monitoring is provided below.</p> <p>No authorizations from ECCC have been issued.</p> <p>The Mary River Project is captured under several pieces of ECCC legislation such as subsection 36(3) of the Fisheries Act (FA), Metal and Diamond Mining Effluent Regulations (MDMER), Canadian Environmental Protection Act (CEPA), Environmental Emergency Regulations (E2 Regs), Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (CBX), Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (STSR), Sulphur in Diesel Fuel Regulations (SIDFR), and Greenhouse Gas Pollution Pricing Act/Output-Based Pricing System Regulations.</p>	N/A – for information only.	Comment Request for Baffinland Iron Mines Corporation's Mary River Project 2022 Annual Report (Email from NIRB, May 26, 2023)	No response required.
<b>UNIT INCONSISTENCIES FOR NO2 CONCENTRATIONS</b>					
2	N/A	Table 1.1, Standards and Objectives for Ambient Air Quality correctly indicates the NO2 1- hour 2020 Canadian Ambient Air Quality Standards (CAAQS) of 113 µg/m <sup>3</sup> as converted from 60 parts per billion (ppb). Table 2.2 and Figure 2.2 imply that the NO2 1-hour 2020 CAAQS is exceeded for seven of the months, and Table 2.4 and Figure 2.4 imply that the NO2 1-hour 2020 CAAQS is exceeded for six of the months. However, the text in sections 2.2.1.2 and 2.2.2.2 indicate that this CAAQS is exceeded for only two and three occurrences respectively, with the highest values of 122.0 and 131.4 ppb. It appears that this text, the tables, and the vertical axes of the figures should be labelled in µg/m <sup>3</sup> rather than ppb.	ECCC recommends that the text in sections 2.2.1.2 and 2.2.2.2, Tables 2.2 and 2.4, and Figures 2.2 and 2.4 be checked to ensure that the NO2 concentrations are indicated in the correct units.	Mary River Project, 2022 NIRB Annual Report, Appendix G.2.1 2022 Air Quality, Dustfall, and Meteorology Report (Nunami Stantec Limited; April 21, 2023)	The calculation was originally based on 113 ug/m <sup>3</sup> when it should have been based on 60 ppb. Text and tables have been recalculated and updated to reflect CAAQS hourly data in parts per billion. See Attachment 2 (2022 Annual Air Quality, Dustfall and Meteorology Report).
<b>ERROR IN FIGURE 2.4</b>					
3	N/A	Table 2.4 'Hourly Summary of NO2 Concentrations for PSC Ambient Air Quality Monitoring Station (ppb)' have monthly maximum values of NO2 which are consistent with the annual average. However, Figure 2.4 has a value for November that is inconsistent with Table 2.4.	ECCC recommends that Figure 2.4 be corrected to remove the November spike in maximum values.	Mary River Project, 2022 NIRB Annual Report, Appendix G.2.1 2022 Air Quality, Dustfall, and Meteorology Report (Nunami Stantec Limited; April 21, 2023)	The calibration outlier has been removed and graph updated See Attachment 2 (2022 Annual Air Quality, Dustfall and Meteorology Report).

Cmt. #	ECCC Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
<b>MIGRATION OF CONTAMINANTS IN GROUNDWATER NEXT TO LANDFILL</b>					
4	N/A	<p>The 2022 Groundwater Monitoring Program involved soil sampling, leachate collection from test pits in the landfill, installation of eight monitoring standpipes, hydraulic tests, water level measurements and groundwater sampling.</p> <p>Section 5.1 of the report states that leachate within the landfill facility had elevated dissolved parameter concentrations "relative to upgradient water quality results and when compared to guidelines" for chloride, fluoride, sulphate, boron, iron, manganese and zinc. Downgradient standpipes also had elevated dissolved parameter concentrations for chloride, sulphate, boron, cadmium, copper, manganese, nickel, uranium and zinc at MS-LF-GW1 and sulphate and boron at MS-LF-GW3". Additionally, "dissolved sulphate concentration at MS-LF-GW1 is exhibiting a continuous increasing trend since 2017."</p> <p>The migration of contaminants in landfill leachate is evoked in Section 4.2.1 of the Core Receiving Environment Monitoring Program Report: "Increasing trends in concentrations of sulphate (2018 to 2022) and dissolved uranium (2018 to 2021) were recently shown for groundwater adjacent to Sheardown Lake, suggesting that a nearby landfill was a possible source of these parameters to Sheardown Lake NW via shallow groundwater flow pathways. Concentrations of chloride, sulphate, and dissolved uranium have also increased in surface water at Sheardown Lake NW over the mine operational period from 2015 to 2022."</p> <p>Development of a conceptual contaminant transport model is outlined in a memorandum which concludes there is currently insufficient data to populate the model and "additional data can be collected during the 2023 summer season, and a completed contaminant transport model can be provided at the end of 2023." Understanding potential migration of landfill leachate to Sheardown Lake will be critical to understanding any impacts and assessing effective measures to mitigate those impacts.</p>	<p>ECCC recommends the Proponent:</p> <ul style="list-style-type: none"> <li>confirm they intend to collect sufficient additional groundwater data in 2023 to complete the contaminant transport model, and</li> <li>discuss potential mitigation measures should the model find landfill leachate is impacting Sheardown Lake.</li> </ul>	<ul style="list-style-type: none"> <li>Mary River Project, 2022 NIRB Annual Report, Appendix G.3.1 (NWB Appendix E.12.1) 2022 Groundwater Monitoring Program Report (Knight Piésold Consulting; March 27, 2023)</li> <li>Mary River Project, 2022 NIRB Annual Report, Appendix G.3.3 (NWB Appendix E.12.3) Groundwater Conceptual Level Contaminant Model (Knight Piésold Consulting; March 28, 2023)</li> <li>Mary River Project, 2022 NIRB Annual Report, Appendix G.4.1 (NWB Appendix E.9.1) 2022 Core Receiving Environment Monitoring Program Report (Minnow Environmental Inc.; March 2023)</li> </ul>	<p>Baffinland intends to collect sufficient additional groundwater data in 2023 to complete the contaminant transport model. The scope of this program is described above in response to QIA #20.</p> <p>In the absence of the results of the contaminant transport model, potential mitigation measures could include:</p> <ul style="list-style-type: none"> <li>A complete audit of the waste entering the landfill to evaluate the contributing factor to the creation of the leachate. Upon completion of the audit, a detailed manifest of waste entering the landfill will be completed to ensure further impactful waste is not added to the landfill.</li> <li>A berm may be constructed surrounding the landfill facility. This berm will be constructed of native soils and approximately 2.5 m above the elevation of the landfill. This berm will cause the active layer to rise, and groundwater will be unable to leave the landfill facility area due to the permafrost barrier. This should stop impacted groundwater migration into Sheardown Lake.</li> <li>Installation of a cover as part of landfill closure, which should aggregate the permafrost into the landfill.</li> </ul>
<b>GROUNDWATER FLOW DIRECTION AT HAZARDOUS WASTE BERM</b>					
5	N/A	<p>Groundwater flow direction at the Hazardous Waste Berm (HWB) Facility is described in Section 3.1.2 of the Report as "in the north to northeast direction with a shallow horizontal hydraulic gradient of 0.002 m/m." Groundwater elevations for the area are presented and contoured in Figure 3.2.</p>	<p>ECCC recommends the Proponent measure groundwater depths and re-evaluate groundwater flow directions at the HWB Facility before siting additional groundwater monitoring locations. ECCC recommends the</p>	<ul style="list-style-type: none"> <li>Mary River Project, 2022 NIRB Annual Report, Appendix G.3.1 (NWB Appendix E.12.1) 2022 Groundwater Monitoring Program Report (Knight</li> </ul>	<p>Baffinland will re-measure groundwater elevations in 2023 and re-evaluate groundwater flow directions at the HWB facility. Additional groundwater wells will be located based on updated groundwater elevation data. The specific HWB identified as a source will be specified in subsequent documentation.</p>

Cmt. #	ECCC Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
		<p>In Figure 3.2, the contours do not always match the data, specifically MS-HWB-GW8 has a groundwater elevation of 172.97 metres above sea level (masl) and is right next to the 173.3 masl contour, over 75 meters from a 173.0 masl contour (not drawn on the map). As well, it is unclear why the contours curl to the southeast to create a trough in the groundwater table between MS-HWB-GW-REF2 and MS-HWB-GW9.</p> <p>It is difficult to determine groundwater flow direction at the HWB facility given the shallow gradients. However, this information is critical when trying to position standpipes and sample groundwater downgradient of potential sources of contamination.</p> <p>Section 6.2 of the report recommends "two additional groundwater monitoring locations ... in the area of MS-HWB-GW7 to investigate if another source other than the HWB Facility is affecting the groundwater quality" and MS-HWB-GW7 is defined as downgradient. It is not clear which HWB is being considered as the potential source because in Figure 3.2, MS-HWB-GW7 is located cross-gradient from HWB1, which is identified as having potential liner damage in Section 2.2a) of the Geotechnical Inspection Report.</p>	Proponent specify which of the six berms at the HWB Facility they are considering as potential sources.	<p>Piésold Consulting; March 27, 2023)</p> <ul style="list-style-type: none"> <li>Mary River Project, 2022 NIRB Annual Report, Appendix G.2.4.1 (NWB Appendix C.2.1) 1st 2022 Geotechnical Inspection Report (Wood; August 21, 2022)</li> </ul>	
<b>GROUNDWATER MONITORING PROGRAM ASSESSMENT</b>					
6	N/A	The Assessment provided "a comprehensive review of its mine site groundwater monitoring program at the Mary River Project." Areas evaluated in Table 3.1 included facilities found only on the mine site, however several similar facilities exist at the Milne Port site as well, such as tank farm, landfarm, snow stockpile, HWB and polishing waste stabilization pond, but these were not evaluated. It is not clear why the facilities at the Milne Port site were not considered.	ECCC recommends the Proponent clarify why groundwater monitoring is not warranted at any Milne Port facility locations.	<ul style="list-style-type: none"> <li>Mary River Project, 2022 NIRB Annual Report, Appendix G.3.2 (NWB Appendix E.12.2) Groundwater Monitoring Program Assessment (Knight Piésold Consulting; March 28, 2023)</li> </ul>	Baffinland plans to expand the Risk Assessment in 2023 to include Milne Port sites.
<b>MANAGING TOTAL SUSPENDED SEDIMENT IN RUNOFF AND EFFLUENT</b>					
7	N/A	<p>Controlling erosion and sedimentation on site during freshet continues to be challenging. In 2022, ten of the reported spills were sediment releases, with three of these resulting from unauthorized releases at two facilities. Water management pond capacity appears to be an issue, since releases at the Mine Site Crusher Facility and KM105 Surface Water Management Pond were initiated "due to the timing of pond melt, recent heavy snow accumulation and limited remaining capacity in the pond".</p> <p>Corrective actions are outlined for the Crusher Facility, "Baffinland plans to construct a new surface water management pond downstream of the</p>	ECCC encourages the Proponent to continue implementing its Long Term Water Management Plan around the mine site and recommends the Proponent clarify how capacity will be managed at the KM105 surface water management pond to avoid release of water that does not meet effluent quality criteria.	<ul style="list-style-type: none"> <li>Mary River Project, 2022 NIRB Annual Report, Main Body Section 4.6.5 (2022 QIA and NWB Annual Report for Operations, Sections 6.1, 7.3.4, 7.3.5, 7.3.6)</li> </ul>	<p>Acknowledged. Baffinland remains committed to the timely implementation of the Long Term Water Management Plan.</p> <p>The KM 105 Pond and other Long-Term Water Management plan infrastructure were designed for to accommodate the Environmental Design Flood capacity to hold a 1 in 100 year snowpack melt event plus the average June rainfall volume for each catchment area reporting to the facility.</p> <p>It is important to note that the 2022 controlled discharges were not specifically due to the capacity of the ponds, but due to the required settling time for solids removal within</p>

Cmt. #	ECCC Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
		<p>Crusher Facility to collect runoff from a large portion of the mine infrastructure area including the existing Crusher Facility." It is not clear what actions will be taken for the KM105 Pond.</p> <p>Elevated concentrations of suspended sediment degrade water quality and controlling releases are particularly important around the mine site as sediment will likely have high metal concentrations.</p>			<p>the ponds. It was discovered in 2022 (the first year of operation of the KM 105 Pond) that the suspended solids took longer than the designed-for 3 days to settle, and that they required chemical dosing of the influent to achieve proper settling. Baffinland began chemical dosing in June 2022 when this issue became apparent, however was unable to achieve proper settling before a controlled discharge was initiated as per the Metal and Diamond Mining Effluent Regulation Emergency Response Plan. Baffinland has since procured an engineered pre-treatment dosing system for this facility as well as a post-settling clarification system to ensure maximum capabilities to discharge compliant water before the pond reaches capacity. Baffinland has also obtained authorization from ECCC for inter-pond transfers in order to maximize available storage capacities in all of the ponds and direct non-compliant discharges to larger ponds for additional treatment/settling time.</p>
<b>REPORTING REQUIREMENTS</b>					
8	N/A	<p>As per section 3.2.2 Migratory Bird Mortality Reporting Procedure, the Proponent is to provide notice of "mortality of migratory bird (or birds)" to ECCC once the incident has been investigated.</p> <p>ECCC appreciates the Proponent's reporting of avian incidents to our Wildlife Enforcement in a timely manner. As a reminder, ECCC notes that all incidences involving migratory birds and avian species at risk should be reported directly to ECCC's Canadian Wildlife Service and not Wildlife Enforcement.</p>	<p>ECCC requests that the Proponent report all avian mortalities to ECCC, via cwsnorth- scfnord@ec.gc.ca, as indicated in the mitigation and monitoring plan and in a detailed and timely manner. The Proponent should ensure that this contact information is updated and all relevant monitors are notified to ensure reports are submitted to the correct groups.</p>	<ul style="list-style-type: none"> <li>Mary River Project, 2022 NIRB Annual Report, Terrestrial Environment Mitigation and Monitoring Plan</li> </ul>	<p>Baffinland acknowledges this feedback from ECCC and confirms that Baffinland will continue to follow this established process, documented in Baffinland's Reporting Procedure for Wildlife Incidents, and report all Project related avian mortalities to ECCC via e-mail to the e-mail address referenced by ECCC in a detailed and timely manner following investigation of the incident.</p> <p>As per Baffinland's Reporting Procedure for Wildlife Incidents, e-mail notification of a Project-related mortality of a migratory bird or birds is to be provided to ECCC, ideally within a day or two after the incident has been investigated, to enable ECCC Conservation Officers to review the report and associated photos.</p> <p>All bird carcasses shall be bagged, tagged, and frozen until ECCC Conservation Officers have reviewed the notification report and associated photos and advised on whether further testing is needed.</p>
<b>INCONSISTENT BIRD BREEDING WINDOWS</b>					
9	N/A	<p>In section 3.2.2.3 Nest Management of the Terrestrial Environment Mitigation and Monitoring Plan, the Proponent indicates that the nesting season is from May 26 to August 18.</p> <p>In section 4.6.9 Birds (PC Terms and Conditions 65 through 75) of the 2022 Annual Report Main Body, the Proponent indicates that the nesting season is between mid-May and late August.</p> <p>The bird nesting season is inconsistent between the two documents.</p> <p>The Project is located within nesting zone N10 which has a nesting window from late May to mid-August.</p>	<p>ECCC recommends the Proponent utilize the nesting window from late May to mid-August when applying mitigations. The Proponent should ensure future documents are updated to reflect these mitigations and ensure consistency in the breeding windows.</p>	<ul style="list-style-type: none"> <li>Mary River Project, 2022 NIRB Annual Report, Terrestrial Environment Mitigation and Monitoring Plan</li> <li>Mary River Project, 2022 NIRB Annual Report, Main Body Section 4.6.9</li> </ul>	<p>Baffinland reviews the ECCC nesting calendar in advance of the nesting period each year and in consultation with external wildlife biologists to ensure Project land disturbance Active Migratory Bird Nest Surveys (AMBNS) and mitigations apply to the appropriate nesting window, which changes periodically.</p> <p>This is an example of adaptive management by Baffinland whereby adoption of a regular review was implemented to ensure periodic changes to the nesting window are identified and captured throughout Project activities. Future revisions of the Terrestrial Environment Mitigation and Monitoring Plan will reflect this process as opposed to providing the nesting window in place at the time of the revision; ensuring continual review and implementation of the applicable nesting window as it changes periodically over time. As ECCC advised, the Project is located within nesting zone N10. The 2022/current</p>

Cmt. #	ECCC Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
					<p>N10 nesting zone nesting window is May 17 to August 19. The current (May 17 to August 19) nesting window was referenced in the 2022 NIRB Annual Report as well as in the 2022 Final Terrestrial Environment Annual Monitoring Report (EDI, 2023).</p> <p>Baffinland acknowledges that the more general nesting season terminology of between mid-May and late August was also referenced throughout the general discussion in Section 4.6.9 Birds (PC Terms and Conditions 65 through 75) in the 2022 NIRB Annual Report, however, as ECCC identified, the correct ECC regional nesting period is "Late May – Mid-August", as per ECCC Table 1e. Regional nesting period table in Canada, technical information for planning purposes; Nesting zone N.</p> <p><a href="https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#ZoneN">https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#ZoneN</a></p>

Table A.4: Response to DFO Comments on Baffinland’s 2022 Annual Report to the NIRB

Cmt. #	DFO Cmt. #	Reviewer’s Detailed Comment	Reviewer Comment	Reference Section	Baffinland’s Response
<b>DFO TECHNICAL COMMENTS ON BAFFINLAND’S 2022 ANNUAL REPORT –MARINE ENVIRONMENT – NARWAL AND EARLY WARNING INDICATORS</b>					
1	DFO-1	<p>2. DFO recommends reassessing the data analyses of summer stock narwhal abundance estimates, as current practices use higher estimates when differences are found between observers, and overestimates in photographic analyses. DFO recommends implementing best practices and using the average of survey repeats and recommend avoiding using the highest estimate. (i.e., recommend using the average estimates from Marcoux, 2022 “..an estimate of 4,381 (CV 0.14) and 2,081 (CV 0.17) narwhals for Eclipse Sound 2020 and 2021 respectively. For admiralty Inlet, I recommend using 25,166 (CV 0.15) and 48,652 (CV 0.16) for 202 and 2021 respectively” (Review of the 2020 and 2021 narwhal surveys in Eclipse Sound and Admiralty Inlet conducted by WPS Golder Inc.) instead of the Annual Report “Eclipse sound ... 2020 abundance estimate of 5,018 (CV = 0.03, 95% CI of 4,736–5,317; Golder 2021a)...2021 estimate of 2,595 (CV = 0.33, 95% CI of 1,369–4,919; Golder 2022)” And “Admiralty Inlet... the 2020 Baffinland estimate of 31,026 (CV = 0.14, 95% CI of 23,406– 41,126)... and 2021 Baffinland estimate of 72,582 (CV = 0.09, 95% CI of 61,333–85,895)” (Annual Report pg338)).</p> <p>3. The co-efficient of variation (CV) of the surveys should be recalculated as they are currently too low, reflecting a low CV for the correction factor for availability bias. Based on new research now available, DFO recommends using 20%CV for the availability bias. A discussion on the topic can be found on p. 6-7 of the report below. We further recommend that all values dependent on the current CVs be recalculated. Additionally, DFO asks the Proponent to justify the use of a one-tailed t-test used in the Ariel Survey Report, and how the direction of the difference can be determined.</p> <p>NAMMCO-JCNB Joint Working Group (2021). Report of the Joint Working Group Meeting of the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic and the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga Scientific Working Group. December 2021, Winnipeg, Canada.</p>	<ul style="list-style-type: none"> <li>DFO recommends the Proponent consider all project related shipping, including the construction and trial shipping phases, when referring to baseline conditions, as current baseline data refers to 2014 conditions, however, project related shipping was occurring prior to this, beginning in 2006. DFO requests that the Proponent identify a baseline period, and adhere to that for future baseline comparisons.</li> <li>DFO requests that the Proponent use best practices when analysing; including, but not limited in, the application to the average of survey repeats.</li> <li>DFO supports QIA’s recommendation within the SOP on Adaptive Management (AM-1); “QIA and Baffinland to jointly develop and approve the adaptive management elements for monitoring programs, including both Inuit and non-Inuit Objectives, Indicators, Thresholds and Responses for the Adaptive Management Plan.” DFO recommends that in the future BIM work with QIA and DFO on scale and scope of EWI Monitoring Programs to maintain consistency to see any localized changes and group composition of narwhal;</li> </ul>	<p>BIM 2023. 2022 NIRB Annual Report – Appendix G.6.2 Final Marine Mammal Aerial Survey Program.</p> <p>BIM. 2023. 2022 Annual Report – Appendix G.6.3 NAMMP – Section 4.2.3</p> <p>Marcoux, M. 2022. Review of the 2020 and 2021 Narwhal Surveys in Eclipse Sound and Admiralty Inlet Conducted by WSP Golder Inc.</p> <p>Tervo, O.M., Blackwell, S.B., Ditlevsen, S., Conrad, A.S., Samson, A.L., Garde, E., Hansen, R.G., and Mads Peter, H.-J. 2021. Narwhals react to ship noise and airgun pulses embedded in background noise. Biol. Lett. 17(11): 20210220. Doi:10.1098/rsbl.2021.0220.</p> <p>WSP Canada Inc 2023. 2022 Bruce Head Shore-based Monitoring Program.</p>	<ol style="list-style-type: none"> <li>By combining surveys flown in optimal and sub-optimal survey conditions, Baffinland would be underestimating narwhal abundance estimates. Previous papers have stated that abundance estimation tends to be lower as the Beaufort (BF) sea state increases (Gosselin et al. 2007). High sea states have a negative effect on cetacean counts (DeMaster et al. 2001; Gosselin et al. 2007). DeMaster et al. (2001) found the probability of sighting beluga whales in BF sea state 1 is significantly greater than that for sighting beluga whales in BF sea state 2, 3, and 4. Lower abundance estimates are driven by a reduction in encounter rate associated with increasing average daily BF condition (Gosselin et al. 2007). Another effect that might intuitively be expected with increasing BF is a reduction in effective strip half width as whales may not be visible as far away from the plane in bad sea conditions. Based on the rationale stated above, it is WSP’s position that aerial surveys flown in areas of high BF sea states have a high probability of missed animal detections in the survey area and by extension, negatively biasing the associated abundance estimate. Aerial surveys are excluded from the analysis if a statistically significant difference is found between two abundance estimates.</li> <li>In regard to the data used to derive the narwhal availability bias correction factor currently incorporated by WSP, Watt et al. (2015) indicates “As dive behavior can vary based on location and season, an updated estimate of narwhal availability, specific to the region and time of the aerial surveys, was needed.”. Watt et al. (2015) goes on to describe the process of creating a correction factor from tagging data collected in Admiralty Inlet and Eclipse Sound (n=23 whales). The new correction factor described in the NAAMCO (2022) document was based on the tagging data of a single whale in eastern Greenland. Additionally, the at depth visibility data was collected in northwest Greenland Fjord and southern Foxe Basin, with recommended correction factor representing an average of the two location’s visibility data. How does DFO reconcile that the data from a single whale in eastern Greenland is representative of narwhal behaviour in Canadian waters? Although not detailed in the 2022 NAMMCO report, Working Paper 7 also presents correction factors based on water clarity, specific to the Greenland or Foxe Basin locations, having differing CVs but also correction factors that differ from that originally proposed by Watt et al. (2015). Can DFO comment on the comparison of water clarity between southern Foxe Basin, a Greenland fjord and the Eclipse Sound and Admiralty Inlet regions? (i.e., is the water clarity of Eclipse Sound and Admiralty Inlet likely to be similar to that of the Greenland Fjord due the presence of glacial input in these regions?). If applicable, WSP assumes that the use of a correction factor specific to local water clarity is more appropriate than an averaged value.</li> </ol>

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		<p><a href="https://nammco.no/wp-content/uploads/2022/04/report_jwg_2021.pdf">https://nammco.no/wp-content/uploads/2022/04/report_jwg_2021.pdf</a></p> <p>4. Appendix G.6.2 pg iii, please clarify how the total combined abundance of Narwhal is calculated, as the numbers do not add up: “For Eclipse Sound stock alone, the narwhal abundance estimate was 4,592 narwhal (CV = 0.10, 95% CI of 3,754–5,617)...For Admiralty Inlet stock alone, the narwhal abundance estimate was 43,042 narwhal (CV = 0.15, 95% CI of 32,218–57,502)...The 2022 narwhal abundance estimate for the combined Eclipse Sound and Admiralty Inlet stocks was 46,408 narwhal (CV = 0.13, 95% CI of 36,129-59,611)” DFO recommends reassessing how the abundance measurement is calculated, noting that best practice is to average all the study replicates.</p> <p>5. Narwhal abundance within Eclipse Sound continues to decline. DFO contests the proponent’s assessment of Narwhal abundance, behavioural responses and group composition, and lack of relation to project activities. DFO agrees with QIA’s response in the SOP of; “The deferral/deflecting of responsibility regarding narwhal remains a serious issue in this SOP application. The Proponent considers open-water shipping to not be a major factor driving the significant decline in narwhal abundance in Eclipse Sound. Other intervenors disagree with this assertion, and the Proponent has provided very limited evidence to support its position.” DFO recommends further investigation into the decline of narwhal within Eclipse sound.</p> <p>6. DFO recommends further monitoring of narwhal exchange between Eclipse sound and Admiralty Inlet, as tagging programs were not conducted during the 2022 monitoring program, which would provide evidence for the Proponent claiming; “The observed changes in narwhal abundance in Eclipse Sound in recent years likely reflects a natural exchange between the two putative stock areas that began prior to Baffinland shipping operations, with animals shifting between Eclipse Sound and Admiralty Inlet based on where habitat conditions may be more favorable that season (e.g., ice coverage, prey availability, predation pressure).” (Annual Report Appendix G.6.2 piii). DFO suggest the Proponent provide data or references that are specific to Eclipse Sound and Admiralty Inlet, as previously suggested in 2021; currently there is no support for the hypothesis that the conditions are vastly different between Eclipse Sound and Admiralty</p>	<p>improving the Adaptive Management framework.</p> <ul style="list-style-type: none"> <li>DFO continues to recommend additional PITs beyond calf/cow proportion to better mitigate inter annual variation of tracked indices, as stated in our review of the 2020 and 2021 Annual Report. The Proponent should work with the MEWG and QIA to select additional PITs to ensure that the full suite of potential impacts on narwhal are fully captured in monitoring.</li> </ul>		<p>The two-tailed t-test is the more appropriate result to use for comparisons but the one-tailed test was included to increase the sensitivity of detecting a potentially decreasing result. A significant decreasing result is required for activating mitigation within the framework of the Trigger Action Response Plan (TARP). For clarity, the results table in subsequent reports will only test for decreasing results in regard to the one-tailed test.</p> <p>3. Because narwhal move between Eclipse Sound and Admiralty Inlet, only surveys that are flown in the combined Eclipse Sound and Admiralty Inlet area over a short period of time (preferable 2-3 days) were used to calculate the abundance for the combined stocks.</p> <p>For the combined Eclipse Sound and Admiralty Inlet stock, the narwhal abundance estimates calculated for the two survey replicates (Survey 2 and 3) ranged from 46,076 to 46,408 narwhal. The portion of Survey 2 flown in the Eclipse Sound grid was considered to be an inaccurate representation of the Eclipse Sound narwhal abundance due to high sea states (&gt;4 BF), therefore Survey 3 was selected as the best abundance estimate of the combined Eclipse Sound and Admiralty Inlet stock with an abundance estimate of 46,408 narwhal (CV = 0.13, 95% CI of 36,129-59,611).</p> <p>See response #1 (above) for why averaging survey replicates is not recommended in certain cases.</p> <p>4. The 2022 abundance estimate for the Eclipse Sound narwhal stock was 4,592 narwhal (CV = 0.10, 95% CI of 3,754–5,617) which is statistically higher than the 2021 estimate of 2,595 (CV = 0.33, 95% CI of 1,369–4,919; Golder 2022a) (t-test = 2.017, p = 0.049), indicating that narwhal numbers in Eclipse Sound appear to be increasing from the low numbers observed in 2021. However, the 2022 estimate remains statistically lower than the 2016 estimate of 12,039 (CV = 0.23, 95% CI of 7,768–18,660; Marcoux et al. 2019) (t-test = 2.651, p = 0.038) and the 2019 abundance estimate of 9,931 (CV = 0.05, 95% CI of 9,009–10,946; Golder, 2020a) (t-test = 7.808, p &lt; 0.001), indicating that narwhal numbers in Eclipse Sound have not yet rebounded to 2016 and 2019 levels.</p> <p>5. The degree of narwhal exchange between the Eclipse Sound and Admiralty Inlet management areas is best determined through a comprehensive tagging program. Baffinland has formally proposed to continue its narwhal tagging program over the last few years to fill this data gap, although the MHTO has responded by stating they are not supportive of a tagging program being undertaken by Baffinland or its professional consultants. Baffinland will continue to work with the MHTO and MEWG members to develop a tagging program that the MHTO may support in order to fill the identified data gap on the degree of exchange between the neighboring narwhal management areas.</p> <p>6. Baffinland can confirm that it did initiate an adaptive management response based on the 2022 Bruce Head EWI results. This included further investigating the trend over time and initiating targeted follow-up studies. The follow-up investigation involved undertaking an</p>

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		<p>Inlet and are the cause of the change in distribution of narwhals. DFO acknowledges that there is some movement of narwhals between Eclipse Sound and Admiralty Inlet summer stocks (30%), but DFO still recommend to manage the two stocks separately. Narwhals are managed at the stock level to avoid local depletion.</p> <p>Information related to the delineation of the Eclipse Sound and Admiralty Inlet narwhal stocks. Canadian Science Advisory Secretariat , Science Advisory Report 2020/048. <a href="https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40951881.pdf">https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40951881.pdf</a></p> <p>7. DFO recommends further investigation into the results of the Bruce Head study, which demonstrates there is a localized effect on the group composition of narwhal; an observed decrease in the ratio of immature narwhal (an early warning indicator (EWI)). The EWI has been triggered, as it has surpassed the threshold of a 10% decline from baseline (2014, 0.152), and to present (2022, 0.105), which demonstrates a 32% decrease in the proportion of immature narwhal at Bruce Head. “In summary, there appears to be variability between years, but while the EWI data collected at Bruce Head suggested a localized change in narwhal group composition, the equivalent EWI analysis derived from the spatially broader photographic aerial survey dataset provides no indication that the proportion of immature narwhal in the RSA has declined compared to 2021–2020” (Annual Report p394). DFO agrees that a localized change in narwhal group composition at Bruce Head is being observed. However, DFO does not agree that there is enough supporting evidence to definitively conclude that the proportion of immature narwhal in the RSA has not been negatively affected. DFO recommends further investigation into the localized effects at Bruce Head, as this is an indication of changes in Narwhal group composition. The 32% decline seen in 2022, with the support of the 24% decline in 2021, should trigger an Adaptive Management response along with mitigation measures, as this is meant to be an early warning indicator</p>			<p>EWI analysis of the 2020 to 2022 aerial survey data using dedicated 1,000-foot (305 m) aerial survey data (WSP 2023). Findings from the aerial EWI indicated that the proportion of immature narwhal in Eclipse Sound in 2022 (0.124) was within the range of the 2014/2015 baseline condition (0.150 in 2014 and 0.110 in 2015), although a statistical analysis was not possible since the raw data from 2014/2015 aerial surveys were not available. Both Bruce Head and aerial-based EWI datasets were associated with high variability and low sample sizes, resulting in high uncertainty in the EWI estimates. In summary, while the EWI data collected at Bruce Head suggested a localized change in narwhal group composition, the equivalent EWI analysis derived from the spatially broader aerial survey dataset provided no indication that the proportion of immature narwhal had declined in the broader RSA since the start of shipping operations (2014/2015) (WSP, 2023). Baffinland is committed to continuing ongoing EWI monitoring through both the Bruce Head Shore-based Monitoring Program and Marine Mammal Aerial Survey Program moving forward (including in 2023).</p> <ol style="list-style-type: none"> <li>a. Baffinland started shipping ore in 2015. Prior to 2015 is considered baseline conditions for most purposes. Although some sealifts did occur prior to 2015, the numbers were low along with other non-Baffinland activities, including cruise ship, navy vessels, community sea lifts, etc.</li> <li>b. By combining surveys flown in optimal and sub-optimal survey conditions Baffinland would be underestimating narwhal abundance estimates. Previous papers have stated that abundance estimation tends to be lower as Beaufort (BF) sea states increases (Gosselin et al., 2007). High sea states have a negative effect on cetacean counts (DeMaster et al., 2001; Gosselin et al., 2007). DeMaster et al. (2001) found the probability of sighting beluga whales in BF sea state 1 is significantly greater than that for sighting beluga whales in BF sea state 2, 3, and 4. Lower abundance estimates are driven by a reduction in encounter rate associated with increasing average daily BF condition (Gosselin et al., 2007). Another effect that might intuitively be expected with increasing BF is a reduction in effective strip half width as whales may not be visible as far away from the plane in bad sea conditions. It is WSP’s position based on the papers stated above that surveys flown in areas of high BF sea states have a high probability of negatively biasing the number of animals present and are excluded from the analysis if a statistically significant difference is found between two abundance estimates.</li> <li>c. The MEWG is an ideal forum to discuss data analysis practices and welcomes DFO’s active and positive contributions to the group.</li> </ol> <p><u>References:</u></p> <p>DeMaster, D.P., Lowry, L.F., Frost, K.J., and Bengston, R.A. 2001. The effect of sea state on estimates of abundance for beluga whales (<i>Delphinapterus leucas</i>) in Norton Sound, Alaska. <i>Fish. Bull.</i> 99: 197–201.</p>

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					<p>Gosselin, J.-F., Hammill, M.O., and Lesage, V. 2007. Comparison of photographic and visual abundance indices of belugas in the St. Lawrence Estuary in 2003 and 2005. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/025. ii + 27 p.</p> <p>Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (<i>Monodon monoceros</i>) in the Canadian High Arctic. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/044. v + 13 p.</p> <p>WSP. 2023. Proportion of immature narwhal (early warning indicator) in Eclipse Sound and Admiralty Inlet from 2022 aerial survey imagery. Reference No. 1663724-432-TM-Rev0-59000. 27 April 2023. 15 p.</p>
<b>DFO TECHNICAL COMMENTS ON BAFFINLAND’S 2022 ANNUAL REPORT – MARINE ENVIRONMENT – AQUATIC INVASIVE SPECIES AND NON-INDIGENOUS SPECIES</b>					
2	DFO-2	<p>1. Has the proponent developed a response plan to the findings of the 2022 ASI/NIS Monitoring Program which flagged species within the “detected 29 taxa that had not been identified previously at Milne Port during baseline sampling” (Annual Report, p 266), along with the “unidentified specimens from the genus <i>Hesperonoe</i> were found in benthic infauna samples.” (Annual Report, p313), as well as adding these species to a trigger list? DFO agrees with the Proponent’s recommendation under T/C 87, of “sampling across multiple trophic levels continues in 2023, that the taxonomic inventory for Milne Inlet continue to be expanded upon, and that all flagged specimens continue to be screened for known geographic ranges and NIS/AIS status” (Annual Report pg35). DFO also suggests further investigation into the long-term effects of the introduction of these non-indigenous species and the cumulative effects on the biome, and the development of future mitigation and avoidance of introducing further non-indigenous taxa into Milne Port.</p> <p>2. DFO has concerns with the lack of targeted sampling for flagged species in 2022 and the proposal to look at previous year’s samples (“subfractions remaining following analysis of samples collected for genetic analysis in 2021 will be sorted for targeted organisms”) as an alternative. The premise behind the targeted sampling is not only to collect specimens but also to track changes in densities of organisms of concern over time to see if they show changes characteristic of establishment and spread (as indicated in figure 8-3- ‘watch list - heightened monitoring’). Thus sampling must be conducted annually (as stated in Fig 8-3) at existing sites regardless of whether</p>	<ul style="list-style-type: none"> <li>DFO recommends the development of proactive measures and a response plan for <i>Marenzelleria</i> sp. identified, during the 2022 NIS/AIS sampling.</li> <li>DFO suggests that a number of newly detected species should be considered for inclusion on the trigger list given many were not previously found in baseline studies (criteria given in Figure 8-3).</li> <li>DFO recommends that the Proponent investigate other technologies and methodologies to monitor ballast water/biofouling and achieve species-level identification. However, until these methodologies can be achieved DFO strongly recommends the Proponent reinstate the previous ROV surveys to continue to collect samples for biofouling, as well as carry out further sampling at</li> </ul>	<p>Bailey, S.A., Brydges, T., Casas-Monroy, O., Kydd, J., Linley, R.D., Rozon, R.M., and Darling, J.A. 2022. First evaluation of ballast water management systems on operational ships for minimizing introductions of nonindigenous zooplankton. <i>Mar. Poll. Bull.</i> 182, 113947. <a href="https://doi.org/10.1016/j.marpolbul.2022.113947">https://doi.org/10.1016/j.marpolbul.2022.113947</a></p> <p>BIM. 2023. 2022 NIRB Annual Report – Appendix G.6.9 2022 Final Marine Environmental Effects Monitoring Program Report</p> <p>BIM. 2023. 2022 NIRB Annual Report – Appendix G.8.1 Ballast</p>	<p>1. Potential introductions of non-indigenous species are taken very seriously by Baffinland. Identification of taxa that had not been identified during baseline sampling does not indicate that the taxon is not native to the region, only that it was not previously detected. Since the biodiversity of the eastern Canadian Arctic is not well studied, it is likely that the intensive monitoring conducted by Baffinland will detect species not previously sampled from the region. To date, approximately 880 taxa of marine animals and plants have been detected by Baffinland’s monitoring program. Each newly detected taxon is investigated to determine if it represents a native species, non-indigenous species or an aquatic invasive species that would require a response. The scientific literature is searched for geographic range data for the taxon and if it has a history of invasion. From this investigation, each taxon is characterized by its worldwide geographic distribution and its risk of invasion. Only species that are determined to be non-indigenous and pose a high risk of invasion will be placed on the Trigger List and require a response plan. No species have been placed on the Trigger List therefore no response plans have been required or prepared. Some taxa have been placed on a Watch List which simply means an enhanced level of monitoring, so that the taxon is being watched to make sure it is not showing any signs of invasiveness, or because the identification of the taxon may require additional verification. In the event that non-indigenous species were shown to become established in the environment with the potential for effects on the environment, expansion of the current program to incorporate additional studies of effects would be considered in development of the response plan.</p> <p>Baffinland’s management of shipping to prevent introduction of aquatic invasive species exceeds what is currently required by Transport Canada or international standards. Vessels are required to conduct ballast water exchange followed by ballast water treatment if a treatment system is onboard. At this time, all Baffinland vessels scheduled for the 2023 season are anticipated to have a treatment system on board. Baffinland will consider all future technological or operational improvements that mitigate or reduce introductions of non-indigenous species. In 2023, Baffinland is collaborating with DFO to undertake a</p>

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		<p>“additional locations are identified for potential flagged taxa”. Given the small number of target sites it is unclear why original samples from 2021 were not fully sorted in the first place: this should be quite feasible and would increase chances of finding suitable specimens for flagged target taxa. DFO recommends continuing targeted sampling at existing sites and doing complete sorts on these samples in future monitoring.</p> <p>3. DFO disagrees with the results in the Marine Environmental Effects Monitoring Program Report, and the statement that <i>Marenzelleria wireni</i> is previously known from Milne port –this statement implies it has always been there when in fact it is a new species not found in previous baseline studies. It is only known from Eurasia (CABI compendium 2023; Radashevsky 2022). It is also a well-established known invader in northern Europe (where ships originate) together with several other species in the <i>Marenzelleria</i> species complex including <i>M. arctia</i>; both species are listed in the CABI invasive species compendium and in other publications describing invasions in northern Europe.</p> <p><a href="https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.115493">https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.115493</a></p> <p>4. DFO is pleased to see zooplankton sampling has been reinstated in the MEEMP and AIS monitoring in 2022 together with expansion of the basket and plate methods for sampling for fouling organisms, but note that plankton sampling was temporally limited (Table 8-3) - DFO recommends this to be expanded to include different seasons to get more robust coverage of different taxa and improve chances detecting introduced species and other types of project effects on the plankton community. Both are important- introductions or other kinds of project effects on the plankton community could affect the food-web with consequences for fish and marine mammals. DFO notes that the proponent shared a design to include season zooplankton sampling, sought input and has made changes based on DFO recommendation with plans for implementation in 2023 monitoring.</p> <p>5. For ballast water management systems using an active substance for disinfection (e.g., chemical agent) will any monitoring be in place to confirm neutralization? Discharges of large volumes of highly chlorinated water has not been modelled and may need to be</p>	<p>Ragged Point as it was not completed in 2022.</p> <ul style="list-style-type: none"> <li>As noted in our comments in 2021, DFO requests details of what specific datasets were used to generate the map in figure 8-6 of Appendix G.6.9. DFO did not find specific occurrence data in ArcOD, but rather links to the Global Biodiversity Information Facility(GBIF; hosts the Global Invasive Species Database) and Ocean Biodiversity Information System (OBIS). These datasets contain many occurrences within Canadian Arctic waters so it seems the map in 8-5 may be biased by missing substantial occurrences from this region.</li> <li>DFO recommends the use of biogeographic information in combination with knowledge of circulation patterns to better develop criteria for “surrounding region” and distribution categories.</li> </ul>	<p>Water Management, 1.4 AIS and Shipping. Pg 5</p> <p>BIM. 2023. 2022 NIRB Annual Report – SMWMP 3.3.4.2 Anti-Fouling Management. Pg 54</p> <p>Brinklow, T.R., Chan, F.T., Etemad, M., Deb, J.C., Bailey, S.A. 2022. Vessel Biofouling as a Vector for Nonindigenous Species Introductions in Canada. Canadian Science Advisory Secretariat. Research Document 2022/072</p> <p>Cardeccia A, Marchini A, Occhipinti-Ambrogi A, Galil B, Gollasch S, Minchin D, Naršćius A, Olenin S, Ojaveer H (2018) Assessing biological invasions in European Seas: Biological traits of the most widespread non-indigenous species. Estuarine, Coastal and Shelf Science 201: 17–28.</p> <p>Galil BS, Marchini A, Occhipinti-Ambrogi A, Minchin D, Naršćius A, Ojaveer H, Olenin S (2014) International arrivals: widespread</p>	<p>biological ballast water study of vessels arriving at Milne Port and will reassess its risk assessments once that study is completed.</p> <p>2. The only targeted sampling that could not be completed in 2022 (due to timing restrictions related to weather) was sampling to collect additional genetic material for analysis. Targeted sampling to assess organism abundance and distribution was completed as planned. The proposed examination of 2021 samples was intended to provide additional specimens to taxonomic specialists. All samples are scanned in their entirety for rare taxa when they are originally processed in the laboratory, but specimens are not necessarily extracted unless there is an identified need for them. In this case, it was expected that additional specimens would be available in 2022 but this turned out not to be the case, therefore the 2021 specimens were not removed at the time of sorting.</p> <p>3. <i>Marenzelleria wireni</i> and <i>M. arctia</i> are Arctic species and their recorded distribution includes areas to the east and west of the Canadian Arctic although they had not been sampled in Canada. In the case of <i>M. arctia</i>, the Canadian Arctic Expedition of 1913-1918 detected 150 km west of the Canadian border, in Alaska. The expert opinion of Dr. Vasily Radashevsky, a specialist in the global distribution and biogeography of <i>Marenzelleria</i> species and related polychaete worms, is that Canada is part of the native distribution of both <i>M. wireni</i> and <i>M. arctia</i>. Historical collections of <i>Marenzelleria</i> in the Eastern Canadian Arctic that have been reported in the scientific literature have identified those specimens as <i>M. viridis</i> but this appears to be incorrect, as has previously been acknowledged by DFO. The likelihood is that these misidentified specimens represented one of the known Arctic species.</p> <p>4. The 2023 zooplankton sampling program will include sampling events during the open water season, with an additional sampling event added in September to improve temporal variability. An additional sampling location has also been added to improve spatial variability. As indicated by the reviewer, this study design was discussed and approved by DFO.</p> <p>5. Water quality monitoring in place for 2023 does not specifically address the neutralization or release of chlorinated water from vessels, but would detect any salinity anomalies or other water quality changes in the vicinity of the ore dock during the monitoring period.</p> <p>6. Vessels engaged by Baffinland are in possession of an International Anti-Fouling System Certificate, which is a mandate of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships and certifies that the vessel’s anti-fouling system meets requirements. All required documentation is reviewed by the Fednav boarding clerks during post-arrival formalities at Milne Port.</p> <p>7. Taxa were identified to the lowest taxonomic level that could be reliably identified with the specimens collected. <i>Myrianida</i> sp., despite the specimens being unidentifiable at the species level, is classified as ‘no risk’ because there are collection records of <i>Myrianida</i></p>

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		<p>evaluated for effects on the marine environment. (see BIM 2023 Appendix G.8.1, p38). DFO encourages further investigation and modelling for the larger vessels that are proposed to commence shipping to Milne Port, to identify if the dispersion models change, or if larger pulses are experienced during ballast water exchange.</p> <p>6. The Proponent states “in order to reduce or eliminate the risk of invasive aquatic species and pathogens being introduced into Canadian waters as a result of ship hull biofouling, an anti-fouling coating will be in applied to the hulls of all Project Vessels that will Arrive and depart from Milne Port. The anti-fouling coating used will comply with the anti-fouling convention as well as be approved under the Pest Management Regulatory Agency of Canada and Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals. This convention prohibits the use of dangerous organotin chemicals in anti-fouling systems.” (Annual Report pg332). DFO requests the Proponent confirm that the vessels are meeting the regulation standards for the anti-fouling coating, as well as provide monitoring data to confirm compliance with the convention. DFO recommends the Proponent establish adequate monitoring of the hull and biofouling system (Term and Condition 91) as the Proponent stated that “Ship hull surveys were not conducted during the 2022 open water season as an options analysis for hull fouling monitoring is in progress, following the conclusion that results from the three-year ROV-based ship hull biofouling program demonstrated that the ROV-based video surveys do not allow for adequate taxonomic resolution” (Annual Report p323).</p> <p>7. Why was Myrianida sp. only identified to the level of genus; given that at least one species in this genus is known to be introduced elsewhere and that this genus has been detected at Milne Port for the first time, will efforts be made to send the specimen(s) for further verification? Further verification to species level is needed and there is insufficient evidence to state, with any confidence, that “Myrianida sp. is not considered a taxon of concern in Milne Port” (P.35); likewise, more information is required before making similar statements with genus level taxa for which NIS of the same genus are known elsewhere (e.g., Ulvella sp.; cf. Hincksia sp.; cf. Punctaria sp.; Stictyosiphon sp./cf. Stictyosiphon sp.; cf. Erythrotrichia sp.; cf. Polysiphona sp.; Buguloidea indet.). Given that both Punctaria latifolia and cf Stictyosiphon soriferus are new detections, not previously</p>		<p>bioinvasions in European Seas. <i>Ethology Ecology &amp; Evolution</i> 26(2– 3): 152–171.</p> <p>Golubkov, S., Tiunov, A., Golubkov, M. 2021. Food-web modification in the eastern Gulf of Finland after invasion of <i>Marenzelleria arctica</i> (Spionidae, Polychaeta). doi:10.3897/neobiota.66.63847.</p> <p>Radashevsky, V.I., Pankova, V.V., Neretina, T.V., Tzetlin, A.B. 2022. Canals and invasions: a review of the distribution of <i>Marenzelleria</i> (Annelida: Spionidae) in Eurasia, with a key to <i>Marenzelleria</i> species and insights on their relationships. <i>Aquat Invasions</i> 17(2): 186-206.</p> <p>Spalding, M.D., Fox, H.E., Allen, G.R., Davidson N., Ferdaña, Z.A., et al. 2007. Marine Ecoregions of the World: A Bioregionalization of Coastal and Shelf Areas. <i>BioScience</i>. 57(7):573-583. <a href="https://doi.org/10.1641/B570707">https://doi.org/10.1641/B570707</a></p>	<p><i>prolifera</i> throughout the Canadian Arctic including Iqaluit, Churchill and Ungava Bay, and the one species of <i>Myrianida</i> with a history of introduction is native to Australia and the Indo-Pacific and the places where it is NIS are Florida, California and Ha’wail. Similar lines of evidence were used to assess the other taxa with respect to their geographic distribution and risk classifications. Further review of species may entail one or more of several steps necessary for evidence-based assignment of a geographic and risk classification: independent verification of taxonomic identification, review of the literature and expert opinion(s) about the distribution and ecology of the taxon, and/or targeted field collection of additional specimens for identification and population tracking. In 2023, there will be a new collaboration started with an expert in the taxonomy and biogeography of Canadian Arctic macroalgae.</p> <p>8. Numbers representing the ecoregions where taxa have been recorded can be added to the 2023 report. At the moment, the earliest zooplankton baseline data we are aware of were collected in 2014, but should any earlier data be located an additional column could be added to Table 8-7.</p> <p>9. There are no recorded NIS or AIS within the genus <i>Ampharete</i>. This is a widespread genus recorded from the Canadian Arctic, but most specimens were collected and identified in the 1980s and the species <i>Ampharete petersenae</i> was more recently described, in 1997. Potentially some of these specimens from the earlier collections would be classified today as <i>A. petersenae</i>. Representatives of the species have been reported in areas adjacent to the Canadian Arctic.</p> <p>10. Where logistically possible, split samples are being preserved in both formaldehyde and ethanol in 2023, to allow for DNA barcoding of specimens as well as traditional microscopic techniques of identification. It is hoped that this approach will augment existing DNA libraries.</p> <p>11. Please see response to item 3, above.</p> <ul style="list-style-type: none"> <li>○ As noted above under item 2, the targeted sampling that was not conducted in 2022 was the collection of ethanol-preserved samples for DNA analysis. Targeted sampling to detect trends in population abundance and distribution was carried out as planned.</li> <li>○ Considering distribution in the Canadian Arctic as a whole, there are records of the genus <i>Marenzelleria</i> from at least four locations, including specimens identified as <i>Marenzelleria viridis</i> and described as a characteristic species of nearshore waters of Gjoa Haven and Banks Island, found on sandy bottoms in depths&lt;10m (Brown 2007; Brown et al. 2011). Baffinland agrees that identifications of <i>Marenzelleria viridis</i> in the Canadian Arctic are likely to be misidentifications at the species level but consider these</li> </ul>

Cmt. #	DFO Cmt. #	Reviewer's Detailed Comment	Reviewer Comment	Reference Section	Baffinland's Response
		<p>known from the project region, or the Canadian Arctic, both are found in northern Europe where ships originate and known to be introduced elsewhere, they pose a concern and potential risk. What will "further review" of these species entail?</p> <p>8. It would be preferable to include ecoregions where taxa were previously found/known to be distributed (e.g., numbered ecoregions in Spalding et al. 2007). These could be included in brackets after written descriptions (e.g., Ellesmere Baffin Island area) or after the numbered references to help readers in evaluating what is being considered the "surrounding region" for previous occurrence records and to have a more precise understanding of the known distributions of each species.</p> <p>In reference to Results Tables 8-7, if there are earlier baseline data (prior to 2014) it would be helpful to include this in a column. If space is an issue, it could just be shown in a single column as presence/absence prior to 2014.</p> <p>9. DFO does not agree with rationale for removing <i>Ampharete petersenae</i> from the "Watch List" based on presence in the European Arctic. This species has not previously been detected in the Canadian Arctic, was not found in Baffinland baseline studies and appears to be relatively common in northern Europe where Project ships originate; it therefore could be a potential introduction and fits the description of species that should be included on the watch list.</p> <p>10. Given that many of the taxa are being identified from early life stages and therefore lack characteristics for species-level identifications, the proponent should consider preservation to allow for bar-code identifications of the numerous taxa that were only identified at the genus level. This level of identification is far more informative for early detection of NIS/AIS.</p> <p>11. For reasons outlined above in comment 3, DFO disagrees with the conclusion that "<i>Marenzelleria wireni</i> and <i>Marenzelleria arctica</i> are designated No Risk and are not considered taxa of concern in Milne Port." These species should remain on the watch list and be considered for inclusion on a trigger list given the known invasion history of this species complex. Previous annual reports have documented an increase in abundance and some spread from the original detection site, two of three important indicators that a species is becoming established and has potential to be invasive.</p>			<p>reliable at the genus level. It is likely that such specimens represent one of the Arctic species in the genus <i>Marenzelleria</i>.</p> <p>Baffinland is collaborating with DFO to examine the performance of a ballast water biological monitoring technology to be trialed at Milne Port in Sept/Oct 2023. The ROV surveys previously conducted did not achieve the objectives of the surveys as they were not able to provide imagery that was adequate to identify hull fouling organisms at a taxonomic resolution suitable for evaluating risk. Ragged Island sampling is planned for 2023, but as in all years it is subject to logistical feasibility (e.g., weather, ice conditions, or equipment delays to the monitoring program).</p> <p>Figure 8-6 was included for illustrative purposes only and was sourced from ArcOD. It is not meant to represent the datasets that were accessed for this project, which are listed in the report.</p> <p>The criteria for distribution categories were based on those used by Goldsmit et al. (2014), however, Baffinland will re-examine these relative to biogeographic and circulation knowledge.</p> <p><u>References:</u></p> <p>Brown, T.M. 2007. Benthic biology of two near-shore Arctic locations, and potential impacts of sea level change, coastal erosion, and climate change. M.Sc. Thesis, Biology, Memorial University of Newfoundland, 139 p.</p> <p>Brown, T.M., Edinger, E.N., Hooper, R.G., Belliveau, K. 2011. Benthic marine fauna and flora of two nearshore coastal locations in the western and central Canadian Arctic. <i>Arctic</i> 64(3): 281-301.</p> <p>Goldsmit, J., Howland, K.L., and Archambault, P. 2014. Establishing a baseline for early detection of non-indigenous species in ports in the Canadian Arctic. <i>Aquatic Invasions</i> 9: 327-342.</p>

Cmt. #	DFO Cmt. #	Reviewer's Detailed Comment	Reviewer Comment	Reference Section	Baffinland's Response
		<p>Several species of this genus are known having invasive characteristics, are considered on the most successful invaders introduced to the Baltic Sea and are listed among widespread non-indigenous species in marine waters of Europe (Galil et al 2014; Cardeccia et al 2018; Golubkov et al. 2021).</p> <p>Several statements are inconsistent:</p> <ul style="list-style-type: none"> <li>○ "Similar to 2021, benthic sampling in 2022 included targeted collections where Marenzelleria specimens were previously collected. Only two of the four targeted stations had Marenzelleria present, with no records at adjacent stations reinforcing the observation that invasive behaviour is not apparent in Marenzelleria in Milne Port." – this statement is inconsistent with the methods and results which state that no targeted sampling was conducted in 2022.</li> <li>○ "Biogeographic evidence suggests multiple species are indigenous to the Canadian Arctic or may be cryptogenic....Further, documented occurrences of the genus in waters around Baffin Island prior to the commencement of shipping operations confirm this is not a Project-related introduction (if it is to be considered an introduction at all)." – Records of this genus in the Canadian Arctic are scant and there are no reliable documented occurrences in the eastern Arctic. There are only 2 recorded occurrences of this genus in the Eastern Arctic (identified as M. viridis); both were from an older unpublished consultant report and recorded in depths that are hundreds of meters beyond the known depth range of &lt;30m for all taxa in this genus. These records are thus considered to be misidentifications.</li> </ul>			
<b>DFO TECHNICAL COMMENTS ON BAFFINLAND'S 2022 ANNUAL REPORT – FRESHWATER ENVIRONMENT</b>					
3	DFO-3	<p>1. DFO requests clarification on total amount of Arctic Charr removed from Mary Lake (and other reference lakes) annually during sampling events, and if sampling events are individual or combined;</p> <p>"...fish population survey targeted the collection of approximately 100 arctic charr from nearshore lake habitat and 100 arctic charr from littoral/profundal lake habitat.</p> <p>The four mine-exposed study lakes used for the fish population survey were the same as those used to document baseline conditions,</p>	<ul style="list-style-type: none"> <li>• DFO recommends the Proponent explore opportunities to collaborate with Inuit harvesters and other interested parties to align sampling goals to minimize sampling impacts on the Arctic Char population.</li> </ul>	<p>BIM 2023. 2022 NIRB Annual Report – Appendix G.4.1. Fresh Water CREMP</p>	<p>Baffinland agrees that further collaboration with Inuit hunters and other interested parties should be explored.</p> <p>Some additional information on the Project monitoring programs that sample char in freshwater bodies is provided here for reference.</p> <p>1. At each of the study lakes, the CREMP, which is implemented in August, targets 100 arctic charr from littoral/profundal habitat using short duration gill net sets and another 100 (juvenile) arctic charr from shoreline habitat using backpack electrofishing (approximately 200 arctic charr per study lake). The fish are not removed. Rather, fish are collected, held</p>

Cmt. #	DFO Cmt. #	Reviewer's Detailed Comment	Reviewer Comment	Reference Section	Baffinland's Response
		<p>namely Camp, Sheardown NW, Sheardown SE, and Mary lakes..." (Freshwater CREMP pg 27)</p> <p>And</p> <p>"A total of 104 arctic charr were captured from nearshore habitats at both Mary Lake and Reference Lake 3 in August 2022..."</p> <p>"...A total of 99 and 94 arctic charr were sampled from littoral/profundal habitat of Mary Lake and Reference Lake 3, respectively, in August 2022." (Aquatic effects Monitoring Reports Pg 84).</p> <p>2. In the 2022 NIRB Shipping Report; "MHTO did address concerns related to decreased char abundances that have been observed by community members." The Proponent responded; "...Baffinland then sent a more in-depth response via email to the MEWG on July 7th, 2022, comparing methodologies and results of the Baffinland 2021 char studies to the historical DFO char studies conducted in the RSA during the late 1990s. A comparison of these studies indicated that no temporal changes were detected for Arctic Char populations based on samples collected from Tugaat and Qurluktuk Lakes." DFO would like further explanation and clarification on the conclusion that there is no temporal change detected from the sampled lakes, as in the Milne Inlet Fresh Water Fish Health Program 2022, the reported CPUE for Arctic Charr within Tugaat and Qurluktuk lakes both dropped significantly from 2021 (Tugaat: 2021 = 9.33, 2022 = 1.75 Qurluktuk: 2021 = 6.98, 2022 = 1.0).</p> <p>3. The Proponent states "variability in CPUE can be attributed to many things such as weather at the time of study, locations chosen for net deployment, the use of overnight versus daytime sets, and inter-annual climatic factors (e.g., wet years versus dry years)." DFO recommends further measures be taken to ensure the drop in CPUE is attributed to external factors and that the fish population is in fact stable.</p>			<p>temporarily, measured non-lethally (length and weight), and then returned to the waters from which they were collected.</p> <p>2. The Milne Fresh Water Fish Health Program was not designed to directly compare CPUE/abundance over time as the nets were not set randomly. Gill nets with mesh size of 4 to 5" (200 feet long) were set in both years in consideration of recommendations provided by local community members. CPUE achieved at Tugaat Lake ranged from 0 to 17.5 fish in 2021 and 0 to 6.3 in 2022. At Qurluktuk Lake, CPUE ranged from 0 to 2.3 in 2021 and 0 to 1.6 in 2022. The success of fish capture by gill netting (and indeed most fish capture methods) can vary greatly from year to year and can be affected by many factors, such as climactic conditions leading up to the fishing event, weather at the time of fishing, timing of the study, and water levels. Some modifications to the study design (randomization) coupled with careful control or accounting for controlling factors would need to be collected if detection of a potential temporal change in CPUE within the study lakes were identified as a primary objective (see following response).</p> <p>3. The original design of the monitoring was to examine the health of the arctic char within Tugaat Lake and Qurluktuk Lake and was developed with Inuit / community consultation. It was not designed to answer the question of population stability/ population size or structure. If the population size/abundance or stability of these fish communities were to be added to the objectives of the study, the study design would need to be adjusted to appropriately answer this question. Achieving complete randomization and control of factors at affecting CPUE is challenging and would add complexity to the program (see previous response). The program was designed based on Inuit / community input that indicated that fish health was the primary concern and the program was designed and implemented accordingly. Some discussion of the objectives as well as trade-offs associated with program re-design can potentially be facilitated among stakeholders. Such discussion would have to include clear articulation of the purpose of population size estimation, clear definition of how the mine could affect population size, and a clear rationale for why additional data would be necessary. It should be noted that the Project Certificate condition requires Baffinland to study arctic char health through engagement with the MHTO.</p>

**Table A.5: Response to PCa Comments on Baffinland's 2022 Annual Report to the NIRB**

Cmt. #	PCa Cmt. #	Reviewer's Detailed Comment	PCa Recommendations	Reference Section	Baffinland's Response
1	PC-01	<p>This 2022 annual report presents results based on 2022 monitoring reports. We have not had an opportunity to work with the Marine Environment Working Group (MEWG) to discuss the 2022 monitoring reports or to resolve any outstanding issues. As a result, the information provided in this Annual Report does not reflect any recommendations that may be provided through the MEWG review of the document.</p>	<p>Parks Canada encourages BIMC to work with the NIRB, MEWG, and other relevant parties to determine a reporting and review schedule that allows for the inclusion of MEWG feedback to BIMC's monitoring reports and for the resolution of associated issues, prior to the preparation of annual reports.</p>	N/A	<p>The recommendation indicates that the reviewer would prefer that annual monitoring reports be released in draft for comment prior to finalization, and that these final reports (inclusive of feedback) be used to inform the NIRB Annual Report for the same year. Baffinland acknowledges that this suggestion would require consultation with the NIRB to extend the NIRB Annual Report deadline from end of March until the Fall to allow adequate time for member/observer review, comment, and subsequent edits, finalization, and distribution of reports. Such an extension would mean that the NIRB Annual Report would not be reviewed in time for the subsequent shipping and monitoring season. This option was included as one of the three annual report scheduling options proposed in the first and second revision of the draft Terms of Reference (TOR), which MEWG members submitted feedback on. Additionally, this option was discussed as one of three options at the April 19<sup>th</sup>, 2023 combined MEWG/TEWG meetings.</p> <p>The majority of members were in favour of option 2 from the draft TOR, which is where monitoring reports are submitted in final in tandem with the NIRB Annual Report for the same calendar year, and members/observers from the Working Group provide comments on the final reports through the NIRB registry. Feedback received through the registry is to be incorporated into monitoring reports for the following year. Baffinland requested confirmation from MEWG/TEWG members on the April 19<sup>th</sup>, 2023 teleconference to ensure that this proposed schedule was acceptable to the majority of members, recognizing that not all members/observers will be in agreement with a specific reporting schedule. Based on feedback, Baffinland modified the reporting schedule for the 2022 annual reports by appending monitoring reports to the NIRB Annual Report, which were released simultaneously.</p> <p>Baffinland designated a portion of the agenda on the July 12<sup>th</sup> MEWG call for members/observers to address any concerns related to the 2022 monitoring reports and the 2022 NIRB Annual Report. Baffinland acknowledges that this agenda item was not fulfilled due to ongoing discussions unrelated to the annual reporting process, which limited time for these discussions. Baffinland intends to include a discussion on the 2022 NIRB Annual Report and monitoring reports at the next MEWG/TEWG meetings that will be held in Q4 of 2023. Additionally, members and observers provided comments on the 2022 NIRB Annual Report and monitoring reports, which were released by the NIRB on July 11<sup>th</sup>, 2023. Baffinland will submit responses to these comments on August 11<sup>th</sup>, 2023. Baffinland trusts that the majority of concerns and questions related to the 2022 reports will be addressed during this process, which will allow for a more functional MEWG/TEWG discussion because only outstanding questions that were not addressed in writing will need to be discussed.</p>
2	PC-02	<p>The report indicates: "A decreasing trend in the estimated abundance of narwhal in the Eclipse Sound stock can be observed since 2004 (Figure</p>	<p>Parks Canada recommends that the proponent investigate if a significant breakpoint exists and whether it could</p>	<p>2022 Marine Mammal Aerial Survey Program; Section 3.5.6 Abundance</p>	<p>Thank you for your suggestion. This approach will be included in the 2023 Marine Mammal Aerial Survey report, which will incorporate data collected in 2023.</p>

Cmt. #	PCa Cmt. #	Reviewer's Detailed Comment	PCa Recommendations	Reference Section	Baffinland's Response
		<p>36)" but it might be useful to know whether a breakpoint appears in the regression model.</p> <p>Is the decreasing trend still significant when considering only the years 2004, 2013 and 2016? If so, based on the mean and errors for these specific years, the slope is likely to be lower than the slope between 2016 and 2022, and the breakpoint around 2016 could therefore be associated with shipping activities.</p> <p>In any case, the same breakpoint approach could be used in Admiralty Inlet to compare absolute slope values between the two regions and thus inform on the degree of exchange between the two stocks.</p>	<p>be associated with shipping activities. Parks Canada also recommends that the absolute slope values between the two regions are compared to provide information about the degree of exchange between the two stocks.</p>	<p>Comparison with Previous Years, page 85</p>	
3	PC-03	<p>The report states: "For the threshold to be met, response in movement behaviour would need to be observed as a trend in the data across individuals..." in subparagraph 1.3.1, while the criteria in subparagraph 1.3.2 states: "A statistically significant decrease in the proportion of immature narwhal relative to baseline conditions". Could you clearly define what a trend is? Does a non-significant trend trigger a response? In the same paragraph (i.e., 1.3 Adaptive Management Protocol), it would be beneficial to clarify what "degree of certainty" means in the sentence: "The pre- defined actions identified in the TARP describe the responses that Baffinland would implement should the corresponding threshold levels be exceeded and assuming there is some degree of certainty that the measured change is Project-related. An appendix table summarizing the severity score and associated response might be useful.</p>	<p>Parks Canada requests that the proponent clearly define the trends and what triggers a response.</p>	<p>2022 Marine Mammal Aerial Survey Program; Section 1.3 Adaptive Management Protocol, Pages 4 and 5</p>	<p>Baffinland will add this as an agenda item to the next MEWG meeting in 2023 so that all MEWG members are clearly aware of the adaptive management and response triggers in the marine mammal TARP.</p>
4	PC-04	<p>Anthropic pressures might be worth mentioning in the following examples:</p> <p>"...with animals shifting between Eclipse Sound and Admiralty Inlet based on where habitat conditions may be more favourable that season (e.g., ice coverage, prey availability, predation pressure)."</p> <p>"For the above reasons, the potential for climate-driven shifts in species distributions cannot be ignored as a potential driver of the recently observed changes in summer narwhal distribution in Eclipse Sound."</p>	<p>Parks Canada requests that the proponent consider including anthropic pressures in the discussion of shifting species distribution.</p>	<p>2022 Marine Mammal Aerial Survey Program; Executive summary, pages III and IV</p>	<p>Comment acknowledged. Baffinland will consider anthropic pressures in the discussion of shifting species distributions.</p>
5	PC-05	<p>The report indicates that "During Leg 1 of 2019, when bowhead were migrating through the RSA, the calculated abundance of bowhead in the RSA was 176 (15 July) and 1,291 whales (21–22 July) (Golder 2020a)" but, a few lines above it stated that "During eight years of shore-based monitoring conducted for Baffinland from 2013 to 2017 and 2019 to 2021, a total of 21 bowhead were recorded near Bruce Head (Thomas et</p>	<p>Parks Canada requests that the proponent provides additional details regarding the 1291 bowhead whale observations on July 21 and 22, 2019.</p>	<p>2022 Marine Mammal Aerial Survey Program; Section 1.4 Existing Environment, page 8</p>	<p>As stated in the 2019 MMASP report (Golder, 2020), during visual Survey 4 on 21–22 July 2019, a total of 1,377 Km of transects were visually surveyed. The total count of bowhead sightings observed on-effort in the visual survey area was 47 sightings before truncation and 42 after truncation. The overall variation in abundance estimates is based on the encounter rate, cluster</p>

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		<p>al. 2014; Smith et al. 2015, 2016, 2017; Golder 2018c, 2020b, 2021b, 2022a). Similarly, a total of 14 bowhead were recorded along the Northern Shipping Route during three consecutive years of aerial surveys conducted between 2013 and 2015 during the open water period." For the sake of clarity, could you indicate where the 1291 bowhead whales were located in the Regional Study Area (RSA) and provide an explanation for the difference in numbers?</p>			<p>size, and detection function component. The abundance estimate for the visual (observer-based) survey area was 1,279 animals (CV=0.30) for Survey 4 (21-22 July 2019).</p> <p>During Survey 4 (21–22 July 2019), two bowhead whale sightings were recorded in the photographic survey area; one sighting of an individual whale and a second sighting of a pair of animals, resulting in a total count of three animals. The surface estimate was then corrected for availability bias using <math>C\alpha = 4.12</math> (early August correction from Watt et al. 2015b), resulting in an abundance estimate of 12 animals (CV=0.19) for the photographic survey area.</p> <p>The combined (visual and photographic) abundance estimate for bowhead was 1,291 (CV=0.29) for Survey 4 (21-22 July 2019).</p> <p><u>References:</u></p> <p>Golder Associates Ltd. (Golder), 2020. 2019 Marine Mammal Aerial Survey. Golder Report No.1663724-191-R-Rev0. Prepared by Golder Associates Ltd., Victoria, BC for Baffinland Iron Mines Corporation, Oakville, Ontario. 98 p.</p> <p>Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015b. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (<i>Monodon monoceros</i>) in the Canadian High Arctic. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/044. v + 13 p.</p>
6	PC-06	<p>The report indicates that "a total of 1,040 sightings and 2,308 individual narwhals were recorded in Eclipse Sound grid and 328 sightings and 608 individual narwhal were recorded in Admiralty Inlet grid during the Leg 1 surveys." Have these trends towards greater Eclipse Sound abundance at the start of the season also occurred in previous years? Is there a link with the date of sea ice break-up and/or start of the shipping season?</p>	<p>Parks Canada requests more information about/explanation for narwhal abundance in Eclipse Sound at the start of the season.</p>	<p>2022 Marine Mammal Aerial Survey Program; Section 2.5.4 Survey Sightings, page 28</p>	<p>The total number of sightings (n=1,040) and individuals (n=2,308) recorded in Eclipse Sound grid during the Leg 1 surveys was based on seven different surveys (and represents a combined total) and is not the narwhal abundance estimate for the Eclipse Sound stock. Likewise, the total number of sightings (n=328) and individuals (n=608) recorded in Admiralty Inlet grid during the Leg 1 surveys was based on a single survey and is not the narwhal abundance estimate for the Admiralty Inlet stock. Abundance estimates for narwhal are not generated during the Leg 1 surveys.</p> <p>The relative abundance (animals/km) of narwhal in the Regional Study Area (RSA) during Leg 1 surveys was higher in 2022 (0.6464 animals/km) than in 2021 (0.3356 animals/km), 2020 (0.3333 animals/km), and 2019 (0.2952 animals/km).</p> <p>For all survey years combined, the relative abundance calculation for Leg 1 is not considered to be an accurate estimate of narwhal abundance because of uneven aerial coverage effort between surveys. Abundance calculations are considerably impacted if coverage in the survey area is not the same for all surveys. Leg 1 surveys focused on presence/absence and distribution of marine mammals prior to and during initial shipping operations, and relative to existing ice conditions. Complete and equal survey effort coverage of the RSA was not an objective for the Leg 1 surveys. This was often not achieved due to presence of sea ice or due to adverse weather/sighting conditions. Therefore, results from these surveys should be interpreted as a snapshot of the relative abundance of narwhal in the specific area surveyed at the particular time of the survey,</p>

Cmt. #	PCa Cmt. #	Reviewer's Detailed Comment	PCa Recommendations	Reference Section	Baffinland's Response
					and do not represent an estimate of stock abundance. Additionally, during late spring and early summer, narwhals from other stock areas may migrate through the RSA (on their way to their respective summer grounds). At this time, it is not possible to differentiate between narwhal belonging to the Eclipse Sound stock and those from adjacent stock areas that are simply in process of migration. For narwhal remaining in the RSA, they tend to occur in higher concentrations in certain areas (i.e., Koluktoo Bay, Milne Inlet South, Tremblay Sound). As a result, relative abundance estimates will be higher for those surveys targeting high narwhal concentration areas compared to surveys in which all geographic strata in the RSA are flown with equal survey effort (noting that the latter type of survey is not conducted during Leg 1)
7	PC-07	<p>The report indicates that "In the Eclipse Sound grid, narwhal relative abundance in 2022 varied between systematic surveys ranging from 0.096 to 2.813 animals/km (see Table 5). In previous years, narwhal relative abundance ranged between surveys from 0.030 to 0.500 animals/km in 2019 (Golder 2020a), 0.000 to 0.773 animals/km in 2020 (Golder 2021a), and 0.000 to 0.685 animals/km in 2021 (Golder 2022c)." As mentioned in the previous paragraph, migratory narwhals could be included in the 2022 data and "Relative abundance during Leg 1 would be expected to be higher when counts include both narwhal migrating into the RSA to stay for the summer and narwhal migrating through the RSA to other areas for the summer, (e.g., Admiralty Inlet)". If migrating narwhal were included in the 2022 data and not the 2021 or 2020 data, this could explain the observed differences in animals/km between years. If this is the case, the 2022 results should also be used with caution for interpretation.</p>	Parks Canada requests that the proponent clarify whether migrating individuals were included in the 2020 or 2021 data and report the animals/km for each year in a consistent manner, if possible.	2022 Marine Mammal Aerial Survey Program; Section 2.6.1 Narwhal, page 38	<p>As stated in the 2022 Marine Mammal Aerial Survey Program (MMASP) Report (Golder, 2023): "For all survey years combined for the Leg 1 surveys, the relative abundance calculation was not considered to be an accurate estimate of abundance because of uneven aerial coverage effort between surveys. Abundance calculations are considerably impacted if coverage in the survey area is not the same for all surveys. Leg 1 surveys focused on presence/absence and distribution of marine mammals prior to and during initial shipping operations. Complete and equal survey effort coverage of the RSA was not the main goal of Leg 1 surveys. This was often not achieved due to ice or other weather conditions. Therefore, relative abundance results from these surveys should be interpreted as a snapshot of abundance in the specific area surveyed at a particular time and does not represent an estimate of stock abundance. Additionally, in the spring and early summer, narwhal may migrate through the RSA to Admiralty Inlet or other summering areas, and it is not possible to determine which narwhal stay, and which simply migrate through. When narwhal do stay in the RSA, they tend to concentrate in either Koluktoo Bay or Tremblay Sound. As a result, relative abundance numbers will be higher during surveys that focus on surveying locations where narwhal are concentrated rather than flying all areas equally."</p> <p><u>References:</u></p> <p>Golder Associates Ltd. (Golder), 2023. 2022 Marine Mammal Aerial Survey Report. Report #1663724-TM-Rev0-69000. 28 April 2023.</p>
8	PC-08	Formulas used in analyses must be formatted in the report so that the formulas are legible. It is currently impossible to interpret any of the formulas in the report (for example, formulas are appearing with "" instead of the correct letters, numbers, or symbols).	Parks Canada requests that the proponent update the report, ensuring that all analysis formula symbols are formatted correctly.	2022 Marine Mammal Aerial Survey Program; Section 3.4.2.1 Visual Survey, page 51, and throughout the report	Baffinland and consultants have not received any formatting errors when downloading the MMASP report from the NIRB Registry. Baffinland can commit to sharing the MMASP report via Kiteworks with PC and will continue to work with organizations to ensure that reports can be easily interpreted.
9	PC-09	This report indicates that for narwhals, "Over the combined 2014 to 2022 monitoring period, the second highest relative abundance estimate at Bruce Head was observed in 2019, when shipping was highest". This comment recurs frequently in the various reports and implicitly suggests	Parks Canada requests that the proponent avoids making generic statements that could potentially misrepresent the results and that the	2022 Bruce Head Shore-based Monitoring Report, Executive Summary, page ii	Comment acknowledged.

Cmt. #	PCa Cmt. #	Reviewer's Detailed Comment	PCa Recommendations	Reference Section	Baffinland's Response
		that shipping does not affect narwhals and could even be beneficial. However, the effect of high shipping in 2019 could also be observed in 2020 and 2021 when narwhal numbers were lower. The direct and immediate impact of shipping, as well as the potential delayed effects and the long-term impact on narwhal movement and migration routes need to be demonstrated.	proponent provides a more comprehensive interpretation of the abundance data compared with shipping rates over all years of the study.		
10	PC-10	The report mentions "conflicting trends" in response to the presence of ships, but it's also important to note that, despite the different group responses, the presence of ships does seem to affect primary behaviour, especially for groups with immatures (as discussed on page 87).	Parks Canada suggests that the proponent revise the second paragraph on page 130 to discuss the effects vessels have on primary behaviours in different narwhal groups instead of portraying the results as conflicting because of the differences between groups. The paragraph can still highlight that the results should be interpreted with caution due to overall sample size and differences in group responses.	2022 Bruce Head Shore-based Monitoring Report, Section 6.4.1 Primary Behaviour, page 130	The 2022 Bruce Head Report was released as a final report. No updated versions of the report are planned.  The effects vessels have on primary behaviours are clearly provided for each of the various narwhal groups considered in the study, as per the following excerpted text from the discussion section of the 2022 Bruce Head Shore-based Monitoring Report:  <i>Findings based on the three-year UAV dataset provide possible, though conflicting, support that narwhal groups may change the proportion of time that they engage in critical activities when in the immediate presence of vessels. Specifically, group types with immatures (i.e., mother-immature pairs and mixed groups with immatures) and adult groups were shown to decrease the proportion of time that they engage in resting, milling, or social behaviour when within 5 km and 4 km of vessels, respectively. Conversely, mixed groups without immatures were shown to increase the proportion of time that they engage in such behaviours when within 3 km of vessels. While these findings suggest that vessel traffic may have some effect on the ability of narwhal to carry out these critical behaviours, the conflicting trends among group types suggest that the results should be interpreted with caution. Additional monitoring is recommended to increase overall sample size of the corresponding dataset.</i>
11	PC-11	The report mentioned that "Nursing behaviour was recorded during 30 of the surveys, of which five coincided with a vessel being present within 5 km of the focal group". However, the number of nursing (and other) behaviours that were interrupted as the ship approached is not recorded. Would it be possible to adjust or implement an experimental design to investigate this question?	Parks Canada suggests that behaviours interrupted from approaching vessels may be valuable to investigate and the proponent should consider whether and how this could be included in the monitoring program.	2022 Bruce Head Shore-based Monitoring Report, Section 7.0 SUMMARY OF KEY FINDINGS, page 140	The statement is simply indicating that there is no direct correlation between Project shipping levels and narwhal abundance in any given year. This comment does not suggest that shipping does not affect narwhals. As clearly outlined in the report, shipping does result in behavioural effects in narwhal, as has been predicted in the FEIS (Baffinland, 2013). After 8 years of behavioural response studies completed in the RSA looking specifically at this issue, results demonstrate that narwhal responses to shipping are limited to temporary, localized avoidance responses when animals are in close proximity to vessels, with animals returning to their pre-response behaviour shortly following the initial vessel exposure. These types of responses are consistent with low to moderate severity (non-prolonged) behavioural response, which are not expected to result in a significant alteration of natural behavioural patterns by narwhal in the RSA or disruption to their daily routine. By extension, given the type of response and the low frequency of occurrence of shipping interactions under current shipping operations (on average 2 ship transits per day), no long-term impacts on narwhal movements or migration routes are anticipated to occur as a result of current shipping operations. Baffinland requests that Parks

Cmt. #	PCa Cmt. #	Reviewer's Detailed Comment	PCa Recommendations	Reference Section	Baffinland's Response
					<p>Canada avoid making generic statements that misrepresent the analytical results presented in these reports.</p> <p><u>References:</u> Baffinland Iron Mines Corporation (Baffinland), 2013. Final Environmental Impact Statement (FEIS).</p>
12	PC-12	<p>A complex biological response is often complicated to link to a single effect in a multi-stressor environment. Are you going to perform a multivariate analysis and selection model based on AICc, for example, to address the cumulative effect and perhaps rank the different stressors? In addition, why were other variables are not included in the models (e.g., date of sea ice break-up, number of ships, number of harvests)?</p>	<p>Parks Canada suggests that the Proponent consider completing multivariate analyses and using selection models to refine our understanding of biological responses and address cumulative effects.</p>	<p>Proportion of Immature Narwhal (Early warning indicator) in Eclipse Sound and Admiralty Inlet from 2022 Aerial Survey Imagery, Section Introduction, page 3, 5</p>	<p>The purpose of the proportion of immature narwhal analysis is to identify whether differences exist between years, without necessarily identifying the causes for these differences (e.g., date of sea ice break-up, number of ships, number of harvests). The intent of this early warning indicator (EWI) analysis is to provide a simple tool that can be analysed relatively rapidly to inform future monitoring and mitigations. That is why multivariate analyses were not used for this analysis.</p> <p>If a significant difference in the proportion of immature narwhal is found through the EWI analysis, additional studies or analyses are then conducted to better isolate or resolve the cause of this observed difference. These may include multivariate analyses, if appropriate.</p>
13	PC-13	<p>The report states that "Results from the modelling analysis indicated the year effect was statistically significant (P=0.059). The model estimated that proportion of immature narwhal values in 2022 were statistically significantly lower than in 2020 (P=0.083)". What is your p-value threshold for being significant? Is the threshold the same everywhere?</p>	<p>Proportion of Immature Narwhal (Early warning indicator) in Eclipse Sound and Admiralty Inlet from 2022 Aerial Survey Imagery, Section 3.2 Admiralty Inlet, page 11</p>	<p>Parks Canada requests that the p-value threshold for statistical significance be explicitly stated throughout the report.</p>	<p>The p-value is stated in Section 2.3 Data Analysis, page 5 of WSP (2023): "A significance level of alpha = 0.1 was used due to the low sample size."</p> <p><u>References:</u> WSP, 2023. Proportion of immature narwhal (early warning indicator) in Eclipse Sound and Admiralty Inlet from 2022 aerial survey imagery. WSP Technical Memorandum No. 1663724-432-TM-Rev0-59000. 15 p.</p>
14	PC-14	<p>Given that hydrophones are not deployed at the same depth (see Table 1: 275 vs 650 meters) and that there is a lot of variation in CPA, hypotenuse calculations reflecting the actual distance between the vessel and the hydrophone could be very useful. Distance-dependent sound attenuation models could also be very useful for more accurately characterizing vessel noise levels in the environment.</p>	<p>Parks Canada suggests that the proponent include additional detail and in the acoustic monitoring results, such as true distance between the vessel and the hydrophone and distance-dependent sound attenuation models to more accurately characterize vessel noise levels in the environment.</p>	<p>Baffinland 2022 Underwater Acoustic Monitoring. Executive Summary, page 2</p>	<p>When computing vessel source level estimates (not presented in the 2022 Underwater Acoustic Monitoring Report (Austin et al., 2023a) but used for the 2022 Vessel Convoy Analysis Report (Austin et al., 2023b). JASCO does use slant ranges (so called, hypotenuse calculations) and a range-dependent sound propagation model for computing vessel source levels. In future reports, JASCO will more clearly identify the implications of the variations in water depths of the acoustic recorders on the computed results.</p> <p><u>References:</u> Austin, M.E., K.A. Kowarski, and C.C. Wilson. 2023a. Baffinland Iron Mines Corporation – Mary River Project: 2022 Underwater Acoustic Monitoring Program (Open-Water Season). Document 02975, Version 1.0. Technical report by JASCO Applied Sciences for WSP Canada.  Austin, M. 2023. Baffinland 2022 Underwater Acoustic Monitoring: Preliminary analysis of noise from vessel convoys. Version 1.0. Technical report by JASCO Applied Sciences for Baffinland Iron Mines.</p>

Cmt. #	PCa Cmt. #	Reviewer's Detailed Comment	PCa Recommendations	Reference Section	Baffinland's Response
15	PC-15	The report states: "The results demonstrate that while noise from Project vessels is detectable in the underwater soundscape, vessel noise exposure is temporary in nature (detectable in 32 % of the recordings at most) and below sound levels that could cause acoustic injury. Assessed relative to a broadband SPL of 120 dB re 1 µPa (i.e., the current noise disturbance threshold standard used by industry and government for assessing disturbance to marine mammals by continuous type sounds such as vessel noise, and the threshold against which this project was assessed and approved), sound exposure duration averaged less than 1 hour per day". It is unclear how noise from project vessels is only detectable in 32% of the recordings, but sound exposure durations averaged less than 1 hour per day. If project vessels are only detectable in 32% of the recordings, what is causing the sound exposure of an hour or less per day?	Parks Canada requests clarification regarding how the average sound exposure time per day correlates with the percent of detectable vessel recordings.	Baffinland 2022 Underwater Acoustic Monitoring Program (Open-Water Season)	The average sound exposure time per day reflects the amount of time in a day (on average) when vessel noise exceeds the 120 dB re µPa disturbance threshold. 1 hour per day represents approximately 5% of the recording. This is less than the percentage of the recordings in which vessel noise was detectable by the automated detector, as expected, since the automated detector can identify vessel presence at sound levels below 120 dB re 1 µPa. That is, the amount of time that vessel noise is acoustically detectable in the recordings is greater than the amount of time when vessel noise is expected to be high enough to elicit a marine mammal behavioural response.
16	PC-16	The report states: "Bivalve mortalities were observed opportunistically near and within quadrats in both the exposure and reference area in 2022. The cause of the mortalities could not be determined but does not appear to be related to changes in water quality or sediment quality. The apparent widespread nature of the bivalve mortalities, which occurred across multiple species and in both areas, suggest some other factor or factors were affecting marine bivalves. It is possible that the cause was a naturally occurring event involving the release of supercooled high salinity brine from sea ice, flowing to the sea floor". Based on what evidence or references can the proponent conclude that bivalve mortalities were not related to water quality or sediment quality. Does the proponent not consider salinity and water temperature to be part of water quality?	Could the proponent clarify whether there were changes in water quality due to project or project vessels (e.g. from ballast water discharge) and provide references to support conclusions about possible causes?	2022 Final MEEMP, p. 7/1180 of pdf (Chapter 5)	The report should have been worded more specifically to say "The cause of the mortalities did not appear to be related to <b>Project-related</b> changes in water quality or sediment quality". As noted, temperature and salinity are components of water quality. It is not known how long prior to monitoring the mortality took place, however, little or no decomposition of soft tissue had taken place and the specimens appeared quite fresh, however some specimens had blackened siphon ends. Sampling conducted for water quality and sediment quality, as described in more detail in Chapters 2 and 3 of the 2022 MEEMP report (WSP, 2023), found no anomalies that could explain the mortalities. While no conclusion could be reached as to the cause, it was noted that a supercooled brine event resulting in mortalities of benthic bivalves that had blackened siphon ends attributed to anaerobic bacterial decay was observed in Resolute Bay by Kvitek et al. (1998).  <u>References:</u>  Kvitek, R.G, Conlan, K.E., and Iampietro, P.J. 1998. Black pools of death: hypoxic, brine-filled ice gouge depressions become lethal traps for benthic organisms in a shallow Arctic embayment. Marine Biology Progress Series 162: 1-10.  WSP Canada Inc., 2023. 2022 Marine Environmental Effects Monitoring Program (MEEMP) and NIS/AIS Monitoring Program – Final Report. Report # 1663724-430a-R-Rev0-64000. 28 April 2023
17	PC-17	The report states: "Power analysis results, in combination with a taxa accumulation curve generated for this dataset, indicate that the current sample size remains insufficient to reliably detect a project-induced change in community structure or fully characterize the epibenthic community. As such, the current statistical results should be interpreted	If there is insufficient power to reliably detect a project-induced change, why is the proponent interpreting the results so strongly and concluding "no evidence" of change related to project?	2022 Final MEEMP, p. 7/1180 of pdf (Chapter 5)	The 2022 MEEMP Report (WSP, 2023) clearly acknowledged the limitations of the statistical analysis of macroflora and benthic epifaunal communities. As stated in the report:  "Power analysis results, in combination with a taxa accumulation curve generated for this dataset, indicate that the current sample size remains insufficient to reliably detect a Project-

Cmt. #	PCa Cmt. #	Reviewer’s Detailed Comment	PCa Recommendations	Reference Section	Baffinland’s Response
		<p>with caution” and later in the report states “Overall, macrofloral and benthic epifaunal community assemblages were comparable between exposure and reference areas but varied interannually for some indicators, likely driven by regional environmental factors. The report also states that “Monitoring efforts to date revealed no evidence of overarching spatial or temporal trends that might be associated with project-induced effects from construction or operation activities and Milne Port. Monitoring of macroflora and benthic epifauna assemblages is recommended to continue using the same sampling and statistical design”.</p>	<p>This is contradictory and the proponent should clarify – or emphasize the caution in interpretation. Parks Canada suggest the proponent explain the value of this dataset for monitoring project effects when there is little statistical power to detect effects of the project as currently designed. If this is a qualitative assessment, it should be clearly stated, and interpretation of interannual variability driven by regional environmental factors should reference other studies to support these conclusions. Alternatively, the Proponent should consider increasing the sample size to ensure that there is sufficient statistical power to detect project-induced changes.</p>		<p>induced change in community structure or fully characterize the epibenthic community. As such, the current statistical results should be interpreted with caution.</p> <p>The predicted sampling effort that would be required for this program to achieve statistical power to detect a 40% effect size with &gt;0.8 power, as determined by power analysis, would be unattainable within the limited open-water sampling window (August/September). It is therefore recommended to maintain the current sampling methodology and sampling effort (i.e., detection of large-scale trends only), accepting the associated statistical limitations.”</p> <p><u>References:</u></p> <p>WSP Canada Inc., 2023. 2022 Marine Environmental Effects Monitoring Program (MEEMP) and NIS/AIS Monitoring Program – Final Report. Report # 1663724-430a-R-Rev0-64000. 28 April 2023</p>
18	PC-18	<p>Interpretation of trends through time in water quality parameters (e.g., iron or copper) are not supported by statistical analyses but are qualitative and only based on a few stations (e.g., Figures 2-3 to 2-5; MP-05 and MP-06 only), and graphs do not present data prior to 2017 even though tables contain data from 2016. Statistical analyses would help support conclusions and remove some of the subjectivity of conclusions that there are no changes through time.</p> <p>The report also states that “all measurements downstream from the primary site discharges MP-05 and MP-06 in 2022 were within range reported from previous years” (p.68, Appendix 2E-Table 1). However, being within the same range does not indicate any change through time in mean concentrations. Again, a statistical analysis to support conclusions would be required.</p>	<p>For select parameters (e.g., iron), the Proponent provides statistical analysis of changes in iron concentration between years. Alternatively, a Canadian Council of Ministers of the Environment (CCME) Water Quality Index (WQI) could be calculated, and this would perhaps better represent frequency and magnitude of exceedances, through looking at cumulative effects or changes in water quality (all parameters integrated) through time and spatially, including salinity and water temperature.</p> <p>It would also be useful to indicate in the water quality tables where the exceedances occurred, similar to how the sediment exceedances are reported in Appendix 3D.</p>	2022 Final MEEMP, Chapter 2	<p>The water quality assessment as stated in the report objectives is focussed on the evaluation of water quality in the receiving environment downstream from site discharge points MP-05 and MP-06 (4 stations per discharge point sampled 5 times). Therefore, both spatial and temporal variability are captured downstream of each discharge point by the sampling program. Summary statistics were calculated and data screened against applicable water quality guidelines to identify parameters of potential concern. These parameters of potential concern were then evaluated further (e.g., through the interpretation of graphs). The 2016 data were not included in the graphs because of limitations due to elevated detection limits prior to 2017.</p> <p>For the 2023 MEEMP Report, consideration will be given to the presentation of exceedances in tabular format as suggested by the reviewer. Given that 7 years of data are now available that are not affected by elevated detection limits, consideration will also be given to the application of statistical analysis in reporting to address the objectives of the water quality monitoring program.</p>



Table A.6: Response to CIRNAC Comments on Baffinland's 2022 Annual Report to the NIRB

Cmt. #	CIRNAC Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendation	Reference Section	Baffinland's Response
<b>DUST MANAGEMENT AND MONITORING</b>					
1	CIRNAC #1	<p>In reviewing the Mary River 2021 Annual Report, CIRNAC recommended that Baffinland considers including the following measures to increase the quality of monitoring activities:</p> <p>a) Testing the chemical composition of soil base sites for bioavailable metal loadings from the dust, resulting from contact with surface water / soil moisture (for example, acidity, leachable metals, sulphate, nitrate).</p> <p>This measure would address ongoing concerns regarding the generation of dust by Project components and the potential effects of dustfall on land-based ecology and aquatic receiving environments, which are reiterated in Dust Audit Committee (2023).</p> <p>CIRNAC recognizes that seasonal dustfall rates are provided in the 2022 TEAMR, and that sampling of the terrestrial biota was undertaken to assess metals uptake in plants/lichen from dustfall, with ongoing bulk chemistry soil sampling to assess dustfall impacts across the site (EDI 2023).</p> <p>While bulk chemistry (including metals) soil sampling is a good measure of the spatial extent of dustfall related to the Project Development Area (PDA), it is not an indicator of contaminant mobility within the receiving environment (i.e., land-based and aquatic environments).</p> <p>To characterize contaminant mobility and potential impacts on aquatic environments, CIRNAC suggests pairing bulk metal soil sampling with leachability sampling to better understand the soluble constituents in the dustfall. Characterizing the leachability would help Baffinland understand the indirect transport pathways of dissolved soluble constituents to aquatic receptors, as dissolved soluble constituents are generally more bioavailable to aquatic receptors.</p> <p>In order to visualize and evaluate the sources and extent of metals contamination within the PDA, Baffinland should consider developing a dustfall impact Conceptual Site Model (CSM). The CSM should be a living document that is used to continually evaluate the sources of contamination, direct and indirect dustfall transport pathways and identify where impacts to aquatic receptors may be occurring throughout the PDA.</p>	<p>CIRNAC recommends that Baffinland considers including the following measures to increase the quality of monitoring activities:</p> <p>a. Develop a dustfall impact CSM. The CSM should be a living document that is used to summarize and evaluate the sources and extent of contamination and transportation pathways, while considering meteorological variables, and where impacts to receptors may be occurring within the PDA.</p> <p>b. Clearly indicate how dustfall rates correlate with direct or indirect contaminant loading into recipient aquatic environments.</p> <p>c. Undertake leachability and geochemical testing on soil and sediment samples to assess the mobility and uptake of metals, from dustfall, in the environment.</p>	<ul style="list-style-type: none"> <li>• Project Certificate No. 005 (Amendment 04) Terms and Conditions #10, 20, 21</li> <li>• CIRNAC Comments to NIRB Re: Comment Request for Baffinland Iron Mines Corporation's 2021 Annual Report for the Mary River Project (June 15, 2022)</li> <li>• Baffinland Iron Mines Corporation (Baffinland) 2022 Annual Report to the Nunavut Impact Review Board (NIRB) (April 30, 2023):             <ul style="list-style-type: none"> <li>○ Section 4.6.2 Air Quality</li> <li>○ Section 4.6.5 Groundwater &amp; Surface Water</li> <li>○ Section 4.6.6 Vegetation</li> </ul> </li> <li>• EDI Environmental Dynamics Inc. (EDI) 2023. Mary River Project Terrestrial Environment 2022 Annual Monitoring Report (TEAMR) (April 2023)</li> <li>• Nunami Stantec Limited and Independent Dust Audit Committee Members (Dust Audit Committee). 2023. Baffinland Dust Audit Final Recommendations Report. (February 8, 2023)</li> </ul>	<p>a. It's not clear how a CSM and/or leachability study will advance dustfall monitoring at the Project above/beyond existing Programs/Commitments listed in the TEMMP.</p> <p>b. Baffinland will complete a quantitative analysis between dustfall rates and the lake sedimentation monitoring program at the Mine Site and provide this analysis in the 2023 Annual Report for Operations. Specifically, annual dustfall data from DF-M-02 (the closest dustfall monitoring station to Sheardown Lake NW) will be correlated with sedimentation rates. Additional correlations will be made between DF-M-01 and DF-M-03 (additional mine site locations). An annual spatial autocorrelation (e.g., Moran's I) may be the most appropriate test followed by an inter-year comparison using descriptive statistics.</p> <p>c. Given responses a and b (above), undertaking leachability and geochemical testing is not presently warranted.</p> <ul style="list-style-type: none"> <li>○ Baffinland already has a program that pairs soil samples with continuous particulate monitoring stations (i.e., passive dustfall collectors) at variable distances along the Tote Road. The data has been consistent, reliable and robust (see part 4 of this answer). To date, soil metals different from baseline conditions have been at or below laboratory detection levels. A study for leachability might come when we repeatedly detect measurable concentrations of metals in the soil above baseline conditions. Given the existing programs and results, Baffinland is unclear why CIRNAC is requesting the addition of a program that already exists.</li> <li>○ Baffinland already monitors and investigates potential trends in increased dustfall generation with soil contamination in the various mine site areas. A long-term vegetation and soil base metals monitoring program was initiated in 2012, as described in the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) (Baffinland, 2016). The objectives of the vegetation and soil base metals monitoring program are to monitor metal concentrations in vegetation and soil, particularly caribou forage (i.e., lichen), and verify that metal concentrations are within the acceptable range for established soil quality guidelines and relevant vegetation indicator values.</li> <li>○ The most recent soil-metal concentration data, collected in 2022 at the Project, predominantly indicated no significant change, or concentrations were significantly lower relative to baseline values. Concentrations were below or within an acceptable range for soil-metal concentrations. Further, it</li> </ul>

Cmt. #	CIRNAC Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendation	Reference Section	Baffinland's Response
		<p>The CSM also would benefit from considering meteorological variables, such as air temperature, precipitation, and prevailing wind direction.</p> <p>Higher air temperatures could lead to increased daytime heating, enhancing convection and the uplift of dust, which may explain observations of enhanced dustfall at the mine site in 2022 (e.g., DF-M-02 and DF-M-03, Figure 4.10 of the 2022 Annual Report). This effect could be amplified if precipitation inputs are reduced, which was documented in July 2022 (i.e., Figure 4.8 in the 2022 Annual Report), minimizing the scavenging of dust particles by rain droplets.</p>			<p>was noted that there was a significant negative relationship between metal concentrations in dustfall and metal concentrations in soil for all CoPCs except cadmium; for all CoPCs, this appeared to be mediated by a significant positive relationship with soil pH. No unifying trend has been drawn from the analysis (EDI, 2023).</p> <p><u>References:</u></p> <p>Baffinland Iron Mines Corporation (Baffinland), 2016. Terrestrial environment mitigation and monitoring plan, BAF-PH-830-P16-0027, Rev. 1. 128 pp.</p> <p>EDI Environmental Dynamics Inc (EDI), 2023. Mary River Project: 2022 Terrestrial Environment Annual Monitoring Report. Prepared for Baffinland Iron Mines Corporation, Oakville, Ontario, Canada. 426 pp.</p>
2	CIRNAC #2	<p>The Air Quality and Noise Abatement Management Plan (AQNAMP) was updated in 2021 to include Dust Stop® and DusTreat®. Dust Stop® has since been rebranded as DUST/BLOKR®.</p> <p>During the review of the 2021 Annual Report, CIRNAC recommended updates to the AQNAMP to include any procedures or application protocols specifically for DusTreat® on the stockpiles, which were not included in the 2021 AQNAMP update. Additionally, CIRNAC recommended that any reference to Dust Stop® in the AQNAMP be updated to the product used, DUST/BLOKR®.</p> <p>The 2022 Annual Report states that the AQNAMP is currently undergoing additional revisions and will be submitted to NIRB following a public review.</p>	<p>CIRNAC recommends that Baffinland ensure that the AQNAMP update includes procedures and protocols surrounding the application of DusTreat® on stockpiles, as well as the use of the current product name DUST/BLOKR®.</p> <p>CIRNAC also recommends that the updated AQNAMP be included in the 2023 Annual Report.</p>	<ul style="list-style-type: none"> <li>• Project Certificate No. 005 (Amendment 03) Term and Condition #10</li> <li>• CIRNAC Comments to NIRB Re: Comment Request for Baffinland Iron Mines Corporation's 2021 Annual Report for the Mary River Project (June 15, 2022)</li> <li>• Baffinland 2021 Annual Report to the NIRB (March 31, 2022)</li> <li>• Baffinland Air Quality and Noise Abatement Management Plan (AQNAMP) Rev 8 (April 31, 2021)</li> <li>• Baffinland 2022 Annual Report to the NIRB (April 30, 2023): <ul style="list-style-type: none"> <li>○ Section 4.6.2 Air Quality</li> <li>○ Section 6 Management Plan Updates</li> </ul> </li> </ul>	<p>Procedures and protocols regarding the application of DusTreat® on ore stockpiles at Milne Port are addressed in a Standard Operating Procedure (SOP).</p> <p>Baffinland will ensure that the AQNAMP update reflects that the use of the application of DusTreat® to stockpiles at Milne Port was fully implemented; following the pilot project, which demonstrated DusTreat® was effective in mitigating wind-blown dust generation from the ore stockpiles. In addition, administrative updates are being completed to ensure the current product name DUST/BLOKR® is referenced where applicable in the AQNAMP update.</p> <p>Baffinland will submit the updated AQNAMP, as requested, with the 2023 QIA &amp; NWB Annual Report for Operations.</p>
<b>WASTE ROCK FACILITY – IDENTIFICATION AND MANAGEMENT OF ACID ROCK DRAINAGE / METAL LEACHING WASTE ROCK MATERIALS AND PERMAFROST</b>					
3	CIRNAC #3	<p>CIRNAC's issues #1 and #3 raised in their 2021 review of the Annual Report remains relevant for the current 2022 review:</p> <p>As per Section 5.3.1 and Table 5.8 of the 2022 QIA and NWB Annual Report, the proportion of potential acid-generating (PAG) waste for the</p>	<p>CIRNAC recommends that Baffinland:</p> <p>a. Provide an updated LOM estimation of PAG tonnages</p>	<ul style="list-style-type: none"> <li>• Project Certificate No. 005 (Amendment 04) Terms and Conditions #16, 17, 23, 24, 46</li> </ul>	<p>a. CIRNAC notes that the proportion of PAG waste mined in 2022 was well over what was anticipated for the life of mine, and indicates this warrants a comment on LOM tonnage estimates of PAG waste rock. However, annual variability is and should be expected when comparing against LOM averages, and a relatively higher percentage of PAG mined in 2022 does not indicate concern with LOM</p>

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		<p>year (23.5%) remains well over what was anticipated for the life of mine (LOM), warranting a comment on updated LOM tonnage estimates of PAG waste rock, and confirmation that the WRF design and mitigation measures for operation and mine closure are still appropriate.</p> <p>Additionally, a review of the drill blast test work data (Appendix E.6) suggests approximately 17.5% of samples (924 samples) have an x-ray fluorescence scan (XRF-S) value between 0.05% and 0.2%. If carbonate minerals are present, they are likely to be subject to significant iron alteration and thus have lower-than-expected effective neutralization potential than calcite/dolomite (noting silicate nanoparticle reacts too slowly to be effective). This renders these samples as, at least, 'Uncertain', or more conservatively, PAG, in terms of acid rock drainage (ARD) classification.</p> <p>This suggests all previous requests by CIRNAC, as listed below, remain relevant in terms of the 2020 Baffinland commitment to 'Further evaluation of the geochemical monitoring dataset and screening criteria' (Baffinland Response to Comments Received for Baffinland's Production Increase Proposal Extension 2020 Annual Monitoring Report, 2021), which will be completed during the next update to the Phase 1 Waste Rock Management Plan.</p> <p>There have been no further updates to the Waste Rock Facility (WRF) instrumentation after 2019 despite CIRNAC's recommendation for Baffinland to use additional instrumentation and monitoring, and update the thermal analysis, including heat and oxygen balances across the WRF. CIRNAC notes that the expanded footprint and/or volume of the WRF was provided back at that time, but there are no plans noted for additional thermal instrumentation.</p> <p>More-than-expected PAG materials are still reporting to the WRF, and Baffinland has now reported dysfunctional instrumentation and any assessment of performance by an external consultant is still forthcoming (2022 QIA and NWB Annual Report). Additionally, Baffinland still continues to limit its performance monitoring commentary in both Section</p> <p>9.6.3 (2022 QIA and NWB Annual Report) and Section 4.6.5 (2022 NIRB Annual Report) to pH values and discharge compliance. As such, the comments for additional instrumentation, monitoring, and updates seem</p>	<p>and confirmation that the WRF design and contingencies for closure are still appropriate.</p> <p>b. Provide the external consultants evaluation of the WRF performance. This report should include thermal analysis, including heat and oxygen balances across the WRF and an evaluation of temporal trends in key ARD markers in surface and groundwater.</p> <p>c. Adhere to the 2020 Baffinland-NIRB response commitment to 'Further evaluation of the geochemical monitoring dataset and the Phase 1 Waste Rock Management Plan.'</p> <p>As part of that request, the following should be considered:</p> <ul style="list-style-type: none"> <li>o Review the 0.2% total sulphur threshold as an analogue for an neutralization potential ration (NPR) of 2, based on further geochemical test work and data review, to consider the implications of an absence of calcium or magnesium carbonate mineral content and the associated neutralization potential in the waste rock.</li> <li>o Perform a sensitivity analysis around the effect of uncertainty in the 0.2%</li> </ul>	<ul style="list-style-type: none"> <li>• CIRNAC Comments to NIRB Re: Comment Request for Baffinland Iron Mines Corporation's 2021 Annual Report for the Mary River Project (June 15, 2022)</li> <li>• Baffinland 2022 Annual Report to NIRB. <ul style="list-style-type: none"> <li>o Section 4.6.4 Hydrogeology and Hydrogeology</li> <li>o Section 4.6.5 Groundwater &amp; Surface Water</li> <li>o Section 4.6.7 Freshwater Environment</li> </ul> </li> <li>• Baffinland 2022 Qikiqtani Inuit Association (QIA) and Nunavut Water Board (NWB) Annual Report for Operations (March 31, 2023)</li> <li>• Baffinland 2022 QIA and NWB Annual Report for Operations: <ul style="list-style-type: none"> <li>o Appendix E.6. Waste Rock Geochemistry Analytical Sampling Results. (March 2023).</li> </ul> </li> <li>• Baffinland Response to Comments Received for Baffinland's Production Increase Proposal Extension 2020 Annual Monitoring Report (August 2021).</li> </ul>	<p>estimates. Noteworthy, Baffinland does recognize the value in reconciling waste mined vs modelled over a multi-year period and has already planned to complete this exercise. Baffinland will prepare a memo on waste reconciliation for material mined between 2014 and 2022, and will provide this to regulators no later than June 30<sup>th</sup> 2024.</p> <p>b. Baffinland is currently working with a third party consultant to update its Phase 1 Waste Rock Management Plan and this update will include reporting and analysis of collected data to evaluate the WRF performance. This update will be completed by no later than December 31, 2023.</p> <p>c. Baffinland will provide a full update to the Phase 1 Waste Rock Management Plan by no later than December 31, 2023, and this update will address the following recommendations:</p> <ul style="list-style-type: none"> <li>o <i>Review of the 0.2% total sulphur threshold as an analogue for a Neutralization Potential Ratio (NPR) of 2, and to consider the implications of an absence of calcium or magnesium carbonate mineral content and the associated Neutralization Potential (NP) in the waste rock</i></li> <li>o <i>Perform a sensitivity analysis around the effect of uncertainty in the 0.2% total sulphur threshold</i></li> </ul> <p>d. All point sources with potential ARD are monitored through the site SNP and/or CREMP monitoring programs. As part of those monitoring programs, any anomalous data or data outside of pre-established thresholds triggers an investigation into the cause (Trigger Action Response Plan or TARP). This includes parameters associated with ARD.</p> <p>e. As no TARP has been triggered with regard to these facilities or these parameters, Baffinland will not be looking specifically into temporal or spatial trends. This request is essentially arbitrarily changing Baffinland's Water Licence and associated Management Plans without public review. Baffinland would be happy to revisit this idea during the Water Licence renewal process.</p>

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		<p>to be more and more critical to identifying and managing project activities.</p> <p>Key markers of acid rock drainage include many parameters, including: pH, acidity, sulphate, aluminum, iron, manganese, and other dissolved metals and metalloids of environmental concern, such as cadmium, chromium, copper, lead, mercury, nickel, lead, selenium and zinc.</p> <p>Both surface water and groundwater monitoring locations in the immediate vicinity of, not just the WRF, but all potential ARD point sources for the project (e.g., open pit, quarries and ore stockpiling and haulage routes) should have collection of this dataset in the associated watershed.</p> <p>Furthermore, all temporal trends above laboratory reporting limits should be presented to identify ARD issues and/or validate the performance of the WRF and other ARD point sources. This is further supported by Table E.6.6 of the 2022 QIA and NWB Annual Report where several surface water samples around the WRF have reported total sulphur in water (which is most likely present as sulphate) in the hundreds of mg/L. This alone suggests sulphide oxidation is occurring in the WRF waste rock profile and thus a more comprehensive surface water and groundwater monitoring and performance monitoring data evaluation process is warranted.</p>	<p>total sulphur threshold and expected tonnages of PAG and NAG rock and implications in the design and operation of the WRF.</p> <p>d. Comment on all surface and groundwater monitoring data evaluation associated with all potential ARD point sources for the project (e.g., open pit, quarries and ore stockpiling and haulage routes) in relation to the degree to which they may be exerting an adverse influence as a result of ARD.</p> <p>Collect, evaluate, and provide a discussion on temporal and spatial trends for dissolved fractions above reporting limit for the following key markers of ARD, including: pH, acidity, sulphate, aluminum, iron, manganese and other dissolved metals and metalloids of environmental concern, such as cadmium, chromium, copper, lead, mercury, nickel, lead, selenium and zinc.</p>		
<b>GROUNDWATER MONITORING AND MANAGEMENT PLAN</b>					
4	<b>CIRNAC #4</b>	<p>Baffinland continues to implement the Groundwater Monitoring and Management Plan to monitor, prevent and/or mitigate the potential effects of the Project on groundwater within the Project area (Knight Piesold 2023a). In reviewing the 2021 Annual Report for the Mary River Project, CIRNAC recommended that the program be expanded to include the WRF in 2022.</p>	<p>CIRNAC recommends that Baffinland:</p> <p>a. Implement the recommendations described in the Knight Piesold (2023b).</p> <p>b. Investigate groundwater migration between the ROM</p>	<ul style="list-style-type: none"> <li>Project Certificate No. 005 (Amendment 04) Term and Condition 23</li> <li>CIRNAC Comments to NIRB Re: Comment Request for Baffinland Iron Mines Corporation's 2021</li> </ul>	<p>a. Baffinland plans to continue to retain consultants to execute the groundwater monitoring program in 2023, which will be implemented based on the assessment and recommendations from the 2022 Groundwater Monitoring Report.</p> <p>b. The future SDLT-1 sedimentation pond (2024) will contain contact water via surface runoff and subsurface seepage. Runoff from the ROM temporary ore storage area is treated in the KM106 sedimentation pond. It is not anticipated</p>

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		<p>CIRNAC notes that two shallow test pits were advanced in the 2022 program in the WRF area. CIRNAC is of the opinion that this is a small sample size given the geographic extent of the WRF. The two test pits are not representative of the WRF area; therefore, the data collected from the two test pits is insufficient to adequately assess the extent and direction groundwater transport in the watershed. Knight Piesold (2023a) reported that groundwater levels measured in 2022 indicated a groundwater flow direction towards Sheardown Lake, and leachate was identified in all test pits excavated through the waste within the Landfill Facility.</p> <p>The Knight Piesold (2023a) report is consistent with the Minnow Environmental (2023) CREMP results, indicating an increasing trend in metal accumulation documented in Sheardown Lakes, which lists groundwater as a potential source.</p> <p>In the Knight Piesold (2023b) assessment of the Groundwater Monitoring Program, a risk-based screening criteria was used to assist with determining threshold for implementing groundwater monitoring at 15 facilities within the Mine Site. The risk-based screening criteria indicates that any facility with an overall score greater than 12 should be classified as high-risk. Low risk facilities scored between 5 and 7. Medium-risk facilities scored between 8 and 12. The maximum score for the rating criteria is 18.</p> <p>The risk-based screening indicated in Table 3.1 that the Crusher Pad Facility (score of 12), WRF (score of 8), and Run of Mine (ROM) Ore Storage Area at KM 106 (score of 9) were considered medium, as they have water collection systems; however, CIRNAC notes that these facilities are not lined with an impermeable barrier. In the absence of an impermeable barrier, shallow groundwater in the active zone can bypass the trenches and potentially reach the aquatic receiving environment.</p> <p>Furthermore, in the absence of groundwater data, the mine features were given a score of 1.</p> <p>If the mine feature lacks data to account for the uncertainty and low confidence in the direction, extent, and magnitude of groundwater transport, and potential metal leaching into groundwater, CIRNAC notes that a more conservative score (higher score) could be warranted.</p>	<p>Temporary Ore storage / Crusher Facility and the receiving waters of Sheardown Lake.</p> <p>c. Expand the groundwater monitoring program to include the additional testing in the WRF area and other potentially significant sources of groundwater contamination at the mine in 2023 and future years, to gain a better understanding of the groundwater levels, stratigraphy characterization, permeability, groundwater quality, and groundwater flow direction.</p> <p>d. Undertake additional investigations to determine if shallow groundwater is migrating from the core mining areas.</p>	<p>Annual Report for the Mary River Project (June 15, 2022)</p> <ul style="list-style-type: none"> <li>• Baffinland. 2022 Annual Report to NIRB (April 30, 2023): <ul style="list-style-type: none"> <li>○ Section 4.6.5 Groundwater &amp; Surface Water</li> </ul> </li> <li>• Knight Piesold Consulting (Knight Piesold). 2023a. 2022 Groundwater Monitoring Program Report (March 2023)</li> <li>• Knight Piesold. 2023b. 2022 Groundwater Monitoring Program Assessment (March 2023)</li> <li>• Minnow Environmental Inc (Minnow). 2023. Mary River Project 2022 Core Receiving Environmental Monitoring Program (CREMP) Report (March 2023)</li> </ul>	<p>that groundwater impacts are present downgradient of this area. The quality of effluent reporting to the ROM stockpile pond is</p> <p>c. These other facilities were not rated high risk according to Baffinland's risk assessment methodology. A lined seepage collection pond is present at the WRF and is subsequently treated at the WRF water treatment pond. Additionally, no groundwater was observed by Tetra Tech in the two test pits advanced (2021 Groundwater Monitoring Report). Baffinland proposes to address CIRNAC's concern regarding the potential for seepage to bypass the trenches by conducting a dye test within the ditch, and excavating test pits outside the ditch to determine if dye-containing seepage is present in meaningful concentrations.</p> <p>d. Baffinland will implement additional groundwater investigations of high-risk facilities in accordance with its risk assessment methodology.</p> <p>The consultant reports that this is an error in the report. Rankings 8 to 13 (not 8 to 12) are ranked medium, consistent with the table, not the report text. Thus, investigation of the explosives magazine area is not warranted, in the absence of a known or suspected spill.</p>

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		The Explosives Magazine Area had a total score of 13 but is classified as medium risk. CIRNAC notes that this classification under-rates the area, as per their stated groundwater risk-based screening score.			
<b>BORROW PIT / QUARRY / SOURCE MANAGEMENT</b>					
5	CIRNAC #5	<p>There are no non-compliance issues in relation to the operation of the borrow and quarry pit sites. In addition, CIRNAC agrees that the Potential Acid Generating (PAG) / Non-Acid Generating (NAG) classifications of the blast hole samples appear consistent with the current quarry management plans; however, CIRNAC maintains that there is a significant benefit to the addition of markers of Acid Rock Drainage/Metal Leaching (ARD/ML) beyond pH (for example, sulphate) to the set of measured parameters and data evaluation in quarry water license monitoring. Expansion of markers could aid in the identification of any emerging water quality issue in the watershed that may require mitigation during operations and prior to closure and rehabilitation. Test work to confirm that disturbed quarry rock is NAG alone will not enable the identification of any emerging water quality issue.</p> <p>Additionally, Baffinland should present temporal and spatial trends for dissolved fractions above the reporting limit in future annual reports, in addition to comparing the monitoring results to Final Environmental Impact Statement (FEIS) Addendum predictions and or compliance criteria. In that manner, spatial and temporal trends can be best used to assess performance and mitigation requirements.</p> <p>This will assist, not just in the identification of ARD/ML problematic materials that may be inappropriate for construction purposes, but also the requirements for the eventual remediation/rehabilitation of the quarry areas.</p>	<p>CIRNAC recommends that in future annual reports Baffinland:</p> <ol style="list-style-type: none"> <li>Evaluate all surface and groundwater monitoring data associated with quarry operations to discuss the degree to which they may be exerting an adverse influence as a result of ARD.</li> <li>Collect, evaluate, and provide a discussion on temporal and spatial trends for dissolved fractions of both surface and groundwater for the following key markers of ARD, including pH, acidity, sulphate, aluminum, iron, manganese, and other dissolved metals and metalloids of environmental concern, such as cadmium, chromium, copper, lead, mercury, nickel, lead, selenium, and zinc.</li> <li>Expand the comparison of monitoring results to show and discuss temporal and spatial trends for dissolved fractions above any reporting limits.</li> </ol>	<ul style="list-style-type: none"> <li>Project Certificate No. 005 (Amendment 04) Terms and Conditions 25, 26, 28, 30, 41, 42, 43, 44, 46 and 60</li> <li>Baffinland 2022 Annual Report to NIRB:             <ul style="list-style-type: none"> <li>Section 4.6.5 Groundwater &amp; Surface Water</li> <li>Section 4.6.7 Freshwater Environment</li> <li>Section 4.6.8 Terrestrial Environment</li> </ul> </li> <li>CIRNAC Comments to NIRB Re: Comment Request for Baffinland Iron Mines Corporation's 2021 Annual Report for the Mary River Project (June 15, 2022)</li> <li>Baffinland 2022 QIA and NWB Annual Report for Operations:             <ul style="list-style-type: none"> <li>Section 9.5 Summary of Geochemical Analysis for Operated Quarries</li> <li>Appendix E.7 Quarry Geochemistry Analytical Sampling Results (Table E.7.1 to Table E.7.3)</li> </ul> </li> </ul>	<ol style="list-style-type: none"> <li>There is no ARD occurring based on current monitoring.</li> <li>If all current surface and groundwater monitoring associated with quarry operations indicates no ARD, then no additional discussion of temporal and spatial trends for dissolved fractions is necessary. It is suggested that this would more appropriately be an analysis that is triggered by evidence of ARD in association with quarry operations.</li> <li>as above.</li> </ol>
<b>AQUATIC EFFECTS MONITORING PLAN AND DUSTFALL MONITORING</b>					
6	CIRNAC #6	CIRNAC anticipates that dustfall monitoring results reported in the 2022 TEAMR would support validating the effectiveness of Baffinland's approved Aquatics Effects Monitoring Plan (AEMP).	CIRNAC recommends that Baffinland consider adapting TEAMR dustfall monitoring results	<ul style="list-style-type: none"> <li>Project Certificate 005 (Amendment 04) Term and Condition 21</li> </ul>	Acknowledged. The results of Baffinland's dustfall monitoring program will be considered in the interpretation of data for the CREMP and Lake Sedimentation programs in the future. Specifically, changes in environmental conditions determined

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		Incorporating dustfall results from the 2022 TEAMR into the reporting for the Core Receiving Environment Monitoring Program (CREMP) and Lake Sedimentation Monitoring Program (Appendices G.4.1 and G.4.2) would support validating the effectiveness of the respective monitoring activities, taking an adaptive management approach to identify the need for added protection measures, adaptations to the monitoring programs, and updates to the AEMP.	or any reported emerging dustfall trend into the reporting for the CREMP and Lake Sedimentation Monitoring Program, to facilitate adaptive management of these activities, and to identify added measures to mitigate for dustfall from operations.	<ul style="list-style-type: none"> <li>• Baffinland. 2022 Annual Report to NIRB:               <ul style="list-style-type: none"> <li>○ Section 4.6.4 Hydrology and Hydrogeology</li> <li>○ Section 4.6.5 Groundwater &amp; Surface Water</li> <li>○ Appendix G.4 Freshwater Environment Monitoring Reports</li> </ul> </li> <li>• CIRNAC Comments to NIRB Re: Comment Request for Baffinland Iron Mines Corporation's 2021 Annual Report for the Mary River Project (June 15, 2022)</li> <li>• EDI Environmental Dynamics Inc. (EDI) 2023. 2022 TEAMR</li> <li>• Minnow. 2023. Mary River Project 2022 CREMP (March 2023)</li> <li>• Baffinland. 2022. Aquatic Effects Monitoring Plan (Rev 2) (March 31, 2022)</li> </ul>	from the CREMP and/or Lake Sedimentation programs will be evaluated considering information from the dustfall monitoring program to assess for potential source-related linkages.
<b>PERFORMANCE OF NEW MS-11 SURFACE WATER MANAGEMENT POND AT KM105</b>					
7	<b>CIRNAC #7</b>	<p>MS-11 surface water management pond at KM 105 (KM105 pond) is a part of the first phase of the implementation of the Mary River Project - Mine Site Water Management Plan (Knight Piesold 2021) to address erosion and sedimentation at the Mine Site. KM105 pond collects surface water runoff from the main mine Deposit No. 1 that was operational in 2022.</p> <p>MS-11/KM105 pond represents a monitoring station under Schedule I of the NWB Type "A" Water Licence and Metal and Diamond Mining Effluent Regulations (MDMER). Total suspended sediment (TSS) settling was expected to be met after three days of retention, according to the pond design; however, exceedances of TSS were detected during two events in June as a result of freshet conditions, prompting a warning letter from ECCC. As per Term and Condition 24, Baffinland shall monitor, as</p>	<p>CIRNAC recommends that Baffinland:</p> <ol style="list-style-type: none"> <li>a. Verify the effectiveness of the thermal covering, as per Term and Condition 28. The design involves a protective thermal covering; however, no reference to any thermal analysis of the containment embankments was included.</li> <li>b. Confirm that the TSS removal will be in place by freshet of 2023 and provide the results of</li> </ol>	<ul style="list-style-type: none"> <li>• Project Certificate 005 (Amendment 04) Term and Condition 16, 17, 22, 24, 25, 28 and 29</li> <li>• Baffinland. 2022 Annual Report to NIRB:               <ul style="list-style-type: none"> <li>○ Section 3 Operations Overview</li> <li>○ Section 4.3 Summary of 2022 Compliance with Terms and Conditions</li> <li>○ Section 4.5.1.3 ECCC Inspections</li> </ul> </li> </ul>	<ol style="list-style-type: none"> <li>a. A 3rd party review by TetraTech Engineering of the effectiveness of the thermal covering will be provided during an upcoming DSR (dam safety review).</li> <li>b. Interim measures for field level water treatment and monitoring were implemented for TSS removal due to delays in construction of the automated water treatment system caused by supply chain issues and further seepage remediation efforts at the 105 Km Sedimentation Pond. The automated water treatment system will be in place and operational by Freshet 2024.</li> <li>c. The engineering assessment of the 105km Sedimentation Pond seepage and remedial measures including 3rd party, Knight Piesold, IFC design and construction review report was provided within the 105 Km Sedimentation Pond CSR. Tetra Tech is now taking on engineering support for this facility.</li> </ol>

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		<p>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.</p> <p>In response to the ECCC letter, a third-party design consultant, Knight Piesold, was contacted to evaluate remediation measures to address the containment failure of MS-11/KM105 pond. Their analysis of data provided from site investigations and observations indicates the seepage likely originated immediately upstream of the northwest embankment geomembrane tie-in trench, at the area where the trench transitions from the upstream embankment to the abutment slope (Knight Piesold 2022).</p> <p>A seepage remediation plan was developed and implemented in consultation with the third-party design engineer (Knight Piesold), which included the use of a bentonite mixture to fill voids. The remediation work was completed in October 2022.</p> <p>The design included a protective thermal covering placed over the liner to add additional thermal protection for the underlying ice rich soils. This design feature is relevant to Term and Condition 28, which specifies that the Proponent shall monitor the effects on permafrost along the railway and all other Project affected areas and must implement effective preventive measures to ensure that the integrity of the permafrost is maintained. CIRNAC notes that no formal thermal analysis of the embankment was provided to verify the thermal protection was performing as intended.</p> <p>Water treatment for TSS removal is planned to be implemented at the MS-11/KM105 Pond prior to freshet 2023, to meet the conditions of the MDMER and Type “A” Water Licence Discharge Criteria. Term and Condition 24 relates to water treatment for TSS removal.</p> <p>Additionally, the MS-11/KM105 pond containment embankments have a Canadian Dam Association dam hazard classification of “high hazard potential” structures, which refer the presence of a downstream population at risk, where the failure of the facility would result in the potential loss of life due to the downstream presence of workers. The failure of this facility represents the largest disturbance and its all-time proper functioning is important, as uncontrolled water release and unintended ponding of water elsewhere may have continuous</p>	<p>MS-11/KM105 pond monitoring in the 2023 Annual Report as per Term and Condition 24 and 25.</p> <p>c. Provide details of the finding of containment failure and remedial measures, including as-built details, as per Term and Condition No. 29 (Landforms, Geology and Geomorphology – Design Plans). This should include evidence that the Engineer of Record of the MS-11/KM105 pond revisit the design to ensure it meets the design intent of containing of the surface runoff, and specifying the party assigned with responsibility of the facility post seepage remedial works.</p>	<ul style="list-style-type: none"> <li>• Baffinland. 2022. Annual Geotechnical Inspections – 2022 Report 1 and 2022 Report 2. (August 21, 2022 and November 1, 2022)</li> <li>• NWB. 2013. NWB Type “A” Water Licence No. 2AM-MRY1325</li> <li>• NWB. 2015. NWB Type “A” Water Licence No. 2AM-MRY1325, Amendment No. 1</li> <li>• Baffinland. 2021. Surface Water and Ecosystem Management Plan (Rev 7) (March 31, 2021)</li> <li>• Baffinland 2022 QIA and NWB Annual Report for Operations:             <ul style="list-style-type: none"> <li>○ 7.3.6 Mine Site KM105 Surface Water Management Pond</li> <li>○ Appendix C.1.2 Construction Summary Report - KM 105 Sedimentation Pond (January 2023)</li> <li>○ Appendix C.1.2. Knight Piesold (2022). KM Sedimentation Pond Northwest Embankment Remediation – Site Visit Summary</li> </ul> </li> <li>• Knight Piesold. 2021. Mary River Project – Mine Site Water Management Plan. June 30. Ref: NB102-181/63/2, Rev 2.</li> </ul>	

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		aggravating effects on disturbing the thermal regime and promoting the landmass wasting process.			
<b>CLIMATIC AND SEISMICITY DESIGN OF INFRASTRUCTURE</b>					
8	CIRNAC #8	<p>The National Building Code of Canada (NBCC) has updated their guidelines, published in 2020. These guidelines have updated climatic and seismic design parameters, which are relevant to Baffinland infrastructure. Most of the project infrastructure was designed to NBCC 2015 or earlier standards.</p> <p>To aid in prevention of potential ecosystemic impact, the design validity of all infrastructure should be reviewed in consideration of updated climatic and seismic design parameters. The stability of Baffinland's infrastructure may be significantly impacted as a result of evolving climate change scenarios.</p> <p>CIRNAC notes the updated guidelines are relevant to the following Terms and Conditions:</p> <ul style="list-style-type: none"> <li>• Term and Condition 25 which states that Baffinland "undertake geotechnical investigations to identify sensitive landforms, modify engineering design for Project infrastructure, develop and implement preventive and/or mitigation and monitoring measures to minimize the impacts of the Project's activities and infrastructure on sensitive landforms.</li> <li>• Term and Condition 28 which states that Baffinland "shall monitor the effects of the Project on permafrost along the railway and all other Project affected areas and must implement effective preventive measures to ensure that the integrity of the permafrost is maintained."</li> </ul>	CIRNAC recommends that Baffinland examine these changes and the Engineer of Record validate the design of these structures to the most recent building codes.	<ul style="list-style-type: none"> <li>• Project Certificate 005 (Amendment 04) Term and Condition 25, 28</li> <li>• Baffinland. 2022 Annual Report to NIRB:             <ul style="list-style-type: none"> <li>○ Section 1.3 Existing Project Overview</li> <li>○ Section 3 Operations Overview</li> </ul> </li> <li>• Canadian Commission on Building and Fire Codes. 2022 National Building Code of Canada: 2020. Volume 1. (15th Edition):             <ul style="list-style-type: none"> <li>○ Appendix C Climatic and Seismic Information</li> </ul> </li> </ul>	Baffinland appreciates the information provided on updates to the NBCC and will review the updates to climactic and seismic design parameters.
<b>SURFACE WATER MANAGEMENT PONDS</b>					
9	CIRNAC #9	<p>Several discharge events were reported in 2022. Three of the discharge events occurred from the Milne Port surface water management pond (MP-05), the Mine Site Crusher Facility Pond (MS-06) and the Mine Site KM105 surface water management pond (MS-11).</p> <p>All discharge events appear to be associated with snow melt in June, causing sediment-laden water to enter the surface water management ponds. In some cases, the discharge events triggered the need to initiate a controlled discharge to lower the effluent level in the pond. The repeated need to discharge from containment facilities using the</p>	CIRNAC recommends that Baffinland: <ol style="list-style-type: none"> <li>Evaluates the adequacy of the storage capacities for the surface water management ponds, based on current site activity and topography, future planned activities, and post-closure, and provide a path</li> </ol>	<ul style="list-style-type: none"> <li>• Project Certificate 005 (Amendment 04) Term and Condition 17 and 24</li> <li>• Baffinland. 2022 Annual Report to NIRB:             <ul style="list-style-type: none"> <li>○ Table 4.3 List of Reported Spills and Unauthorized Discharges – 2022</li> </ul> </li> </ul>	<ol style="list-style-type: none"> <li>Baffinland will ensure that current and future storage capacities of surface water management ponds are aligned with best practices and will present the findings of the suggested evaluation in the 2023 Annual Reports</li> <li>Yearly discharge trend analysis will be presented in support of a.</li> <li>Baffinland will continue to conduct reviews of Standard Operating Procedures (SOPs) and management plans, on a regular basis, to ensure procedures and plans remain up-to-date and reflective of current operations. Baffinland will also continue to provide ongoing training and education to site personnel to ensure</li> </ol>

Cmt. #	CIRNAC Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendation	Reference Section	Baffinland's Response
		<p>emergency response plan indicates an insufficient factor of safety in the containment facility capacity. The storage capacities should be increased to allow for more storage at freshet given the high frequency of discharge reported events in 2022.</p> <p>The 2022 QIA-NWB Annual Report Table 5.4 indicates that 2,555.4 m3 of water was discharged between the June 8 and July 13, 2022 from MP-05 following the collection of a discharge sample with TSS above the discharge criteria outlined in the NWB Type "A" Water License. There was no indication that the discharge from MP-05 was initiated as per the MDMER Emergency Response Plan.</p> <p>CIRNAC seeks clarification from Baffinland for the active discharge event following the collection of a discharge sample above the TSS criteria, which does not seem to be consistent with the MDMER Emergency Response Plan.</p>	<p>forward on addressing these discharges.</p> <p>b. Provide a yearly discharge trend analysis to support an evaluation of the adequacy of storage capacities for the surface water management ponds.</p> <p>c. Reviews their procedures and provide staff and contractor training on the MDMER and NWB Type "A" Water Licence discharge criteria.</p>	<p>o Section 4.6.4 Hydrology and Hydrogeology</p> <ul style="list-style-type: none"> <li>• Baffinland 2022 QIA and NWB Annual Report for Operations</li> <li>• Baffinland. 2020. Metal and Diamond Mining Effluent Regulations (MDMER) Emergency Response Plan. (December 16, 2020) Rev 3</li> </ul>	<p>an understanding of applicable effluent discharge criteria, and response procedures; including reviewing relevant scenarios and incorporating new lessons learned into annual MDMER drills and exercises.</p>
<b>SURFACE WATER – ELEVATED NITRATE IN MARY RIVER TRIBUTARY</b>					
10	CIRNAC #10	<p>As part of the Mary River surface water monitoring program, an increase in nitrate was observed in samples collected from the Mary River Tributary (F0-01) during the operation period between 2015 to 2022 (Minnow 2023). Ammonium nitrate is one of the ingredients used in the manufacturing of explosives.</p> <p>Upstream of F0-01 is the Waste Rock Facility (WRF) Treatment Plant (MS-08) and the Explosives Magazine Area.</p> <p>The highest nitrate concentration (2.64 mg/L) in samples collected from F0-01 was observed in the 2022 summer sample. The elevated concentration of nitrate appears to be associated with effluent discharging from the WRF Treatment Plant (MS-08), which was discharging effluent with nitrate concentrations in samples of 13.5 mg/L and 15.8 mg/L in August 2022. Minnow (2023) states that since "no changes in concentrations of AEMP benchmark parameters occurred relative to background...no management response is required for Mary River."</p> <p>CIRNAC notes that no discussion was provided on the increasing trend or elevated concentration of nitrate in the Mary River Tributary. The Mary River tributary summer sample collected from F0-01, with a concentration of 2.64 mg/L, is more than double the previously observed sample maximum and is approaching the AEMP benchmark of 3 mg/L. Baffinland's environmental management process have relied on the</p>	<p>CIRNAC recommends that Baffinland:</p> <p>a. Conduct additional monitoring and source contaminant characterization along the Mary River Tributary.</p> <p>b. Implement groundwater monitoring at the areas identified as high-risk, including the Explosives Magazine Area.</p> <p>c. Update any management plans (e.g., Aquatic Effects Monitoring Plan, Phase 1 Waste Rock Management Plan, Surface Water and Aquatic Ecosystems Management Plan), to mitigate any potential impacts, if elevated concentrations of nitrogen are found, particularly with</p>	<ul style="list-style-type: none"> <li>• Project Certificate 005 (Amendment 04) Term and Condition 17 and 20</li> <li>• Baffinland. 2022 Annual Report to NIRB (April 30, 2023): <ul style="list-style-type: none"> <li>o Section 4.6.5 Groundwater &amp; Surface Water</li> </ul> </li> <li>• Knight Piesold. 2023a. 2022 Groundwater Monitoring Program Report (March 2023)</li> <li>• Knight Piesold. 2023b. 2022 Groundwater Monitoring Program Assessment (March 2023)</li> <li>• Minnow. 2023. Mary River Project 2022 CREMP (March 2023)</li> </ul>	<p>a. The water quality monitoring program has effectively identified the source of nitrogen compounds and additional spatial coverage is not necessary for understanding source. Statistical trend analysis is warranted for an apparent mine-related influence below AEMP benchmarks and will be completed. Effort will be better expended on source mitigation measures rather than additional sampling of Mary River tributary.</p> <p>b. Additional groundwater monitoring will be conducted at the landfill facility and HWB area in 2023. It is not anticipated that groundwater impacts are present within the explosive's magazine area. A contained building is present that complies with all regulatory requirements and no spills have been reported. As noted above, this facility is considered medium (not high) risk, and thus not subject to groundwater monitoring. This would change if a spill occurred.</p> <p>c. If a mine-related trend is identified, Baffinland will consider updating relevant management plans; if applicable, based on the outcome of its review of nitrate monitoring data in 2023.</p>

Cmt. #	CIRNAC Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendation	Reference Section	Baffinland's Response
		<p>principles of adaptive management, which requires that trends in changes of key variables be addressed in a timely manner.</p> <p>The Explosives Magazine Area is upstream of the Mary River Tributary (F0-01) and is rated as a high-risk facility in accordance with the groundwater risk-based screening criteria developed by Knight Piesold (2023b). The screening criteria were implemented to determine the need for groundwater monitoring at the Mine Site facilities. The facility was rated as having high contaminant mobility and a high hydraulic gradient; however, the facility was not recommended for groundwater monitoring because containment is present. CIRNAC also notes</p> <p>that the Explosives Magazine Area has source material that includes nitrogen-containing material (i.e., nitrate, nitrite, ammonia) and is within 50 meters of a receptor. Implementing groundwater monitoring at this facility would support source contaminant characterization of the Mary River Tributary.</p> <p>Additionally, as per Term and Condition 20, 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 and transportation and use of explosives do not negatively impact the Project and surrounding areas.</p>	<p>respect to discharge from the WRF Treatment Plant.</p>		
<b>REMOVAL OF DUSTFALL MONITORING STATIONS AND MONITORING OF CHANGES TO SOIL AND AQUATIC RECEIVING ENVIRONMENTS</b>					
11	CIRNAC #11	<p>Baffinland plans to remove dustfall monitoring at 10 locations, due to the 2022 TEAMR showing no statistically significant difference between the regular and short monitors (EDI 2023). In 2022 TEAMR Section 8.3.4:</p> <p>"No statistically significant difference was found in the dustfall measured at the standardized height of 2.0 m and the QIA-requested monitoring stations closer to the ground (0.5 m).</p> <p>To meet the assumptions of normality, one sample was dropped from the analysis (DF-M-01: short dustfall collector = 2.96 mg/dm<sup>2</sup>-day, tall dustfall collector = 0.57 mg/dm<sup>2</sup>-day; sample collected on November 18, 2022)."</p> <p>Baffinland mentions only 6 short monitors at the mine; therefore, the rationale for discontinuing dustfall monitoring at 10 locations is unclear.</p> <p>CIRNAC notes that non-parametric tests (e.g., Wilcoxon test) could be applied to the entire dataset, rather than removing data points, if the</p>	<p>CIRNAC requests that Baffinland provide the following:</p> <ol style="list-style-type: none"> <li>Data to support the decision to remove 10 dustfall monitors.</li> <li>Locations of the 10 dustfall monitors planned to be removed from the program and justification for those chosen locations.</li> <li>Documentation to show dustfall is not accumulating metals at concentrations that approach or exceed the</li> </ol>	<ul style="list-style-type: none"> <li>Project Certificate 005 (Amendment 04) Term and Condition 21</li> <li>Baffinland. 2022 Annual Report to NIRB (April 30, 2023):             <ul style="list-style-type: none"> <li>Section 4.6.5 Groundwater &amp; Surface Water</li> </ul> </li> <li>EDI Environmental Dynamics Inc. (EDI) 2023. 2022 TEAMR (March 2023)</li> <li>Minnow. 2023. Mary River Project 2022 CREMP (March 2023)</li> </ul>	<ol style="list-style-type: none"> <li>CIRNAC's question/concern regarding the removal of "10 dustfall monitors" is unsubstantiated and appears to be unrelated to the 2022 TEAMR. Baffinland welcomes alternate dialogue to clarify this assertion.             <ul style="list-style-type: none"> <li>Four (4) dustfall monitors were installed along the proposed Phase 2 railway route to collect baseline dustfall data. All four dustfall monitors were discontinued when the Phase 2 project application was rejected.</li> <li>Six (6) non-conventional 0.5 m dustfall monitors were installed in tandem with six (6) standard-sized 2.0 m dustfall monitors as part of a comparative trial. All of these dustfall monitors (0.5 m and 2.0 m) presently remain in place and operational. A forthcoming memo, anticipated in fall 2023 will summarize outcomes of this dustfall monitoring trial and recommendations. The memo will be shared with all applicable stakeholder and regulatory groups.</li> </ul> </li> <li>Not applicable; refer to Part a response (above).</li> </ol>

Cmt. #	CIRNAC Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendation	Reference Section	Baffinland's Response
		<p>dataset does not follow a normal distribution. The statistical result may not impact the overall relationship between short and tall dust monitors; however, the result would be more inclusive and conservative.</p> <p>Baffinland mentions dustfall exceeds the FEIS predictions at select locations, but states that dustfall is within a range observed in previous years. Baffinland states that dust does not have a measurable impact on environmental media (freshwater quality, soil quality, vegetation, etc.); however, Figure C.11 of the 2022 CREMP Report suggests that dustfall may be contributing to metal accumulation in Camp and Sheardown Lakes:</p> <p>"Concentrations of aluminum and molybdenum were detectable in dustfall captured at the passive dustfall collector located nearest to the Sheardown lake basins (Station DF-M02) that is monitored under the Mary River Project dustfall monitoring program (EDI 2023), suggesting dustfall may have also contributed to elevated aqueous concentrations of these parameters in the Sheardown basins."</p> <p>The Dust Audit Committee (2023) cites that the effects dustfall and associated metals contamination has been frequently identified as a concern for land users and the impacted communities, particularly in relation to its effects on harvesting, wildlife, and water. The Dust Audit Committee provided a list of dust reduction measures that could aid in the prevention of dust deposition near the site.</p>	<p>Canadian Council of Ministers of the Environment (CCME) soil quality guidelines (agricultural), to support the closure criteria specified in the Baffinland Interim Closure and Reclamation Plan regarding the removal of chemical contaminant sources from the site.</p> <p>d. Documentation to show that the dust-impacted soil is not leaching metals to receiving water environments.</p> <p>CIRNAC recommends that Baffinland implement dust reduction measures identified by the Dust Audit Committee to cover loads to minimize fugitive dust while hauling, enclose the Crusher Facility and continue dust suppression. Covering loads will reduce impacts of dustfall to environmental media (freshwater quality, soil quality, vegetation, etc.).</p>	<ul style="list-style-type: none"> <li>• Dust Audit Committee. 2023. Baffinland Dust Audit Final Recommendations Report. (February 8, 2023)</li> <li>• Baffinland. 2018. Interim Closure and Reclamation Plan BAF- PH1-830-P16-0012. Revised Draft – Rev 5. (October 30, 2018).</li> </ul>	<p>c. Refer to Response #1 (CIRNAC #1)</p> <ul style="list-style-type: none"> <li>○ Baffinland already monitors and investigates potential trends in increased dustfall generation with soil contamination in the various mine site areas. A long-term vegetation and soil base metals monitoring program was initiated in 2012, as described in the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) (Baffinland, 2016). The objectives of the vegetation and soil base metals monitoring program are to monitor metal concentrations in vegetation and soil, particularly caribou forage (i.e., lichen), and verify that metal concentrations are within the acceptable range for established soil quality guidelines and relevant vegetation indicator values.</li> <li>○ The most recent soil-metal concentration data, collected in 2022 at the Project, predominantly indicated no significant change, or concentrations were significantly lower relative to baseline values. Concentrations were below or within an acceptable range for soil-metal concentrations. Further, it was noted that there was a significant negative relationship between metal concentrations in dustfall and metal concentrations in soil for all CoPCs except cadmium; for all CoPCs, this appeared to be mediated by a significant positive relationship with soil pH. No unifying trend has been drawn from the analysis (EDI, 2023).</li> </ul> <p>d. Undertaking leachability and geochemical testing is not presently warranted given that soil sampling data collected in 2022 predominantly indicated concentrations were below or within an acceptable range for soil-metal concentrations. The TEMMP/Trigger-Action Response Plan would guide future adaptive management response "If monitoring indicates increasing concentrations of metals over time".</p> <p><u>References:</u></p> <p>Baffinland Iron Mines Corporation (Baffinland), 2023. Terrestrial Environment Mitigation and Monitoring Plan. Ref. No. BAF-PH1-830-P16-0027, DRAFT. May 15, 2023.</p> <p>EDI Environmental Dynamics Inc. (EDI). 2023. Mary River Project: 2022 Terrestrial Environment Annual Monitoring Report. Prepared for Baffinland Iron Mines Corporation, Oakville, Ontario, Canada. 426 pp.</p>

Table A.7: Response to HC Comments on Baffinland's 2022 Annual Report to the NIRB

Cmt. #	HC Cmt. #	Reviewer's Detailed Comment	HC Recommendations	Reference Section	Baffinland's Response
<b>NON-THRESHOLD AIR CONTAMINANTS</b>					
1	HC-01	<p>HC encourages the use of Canadian Ambient Air Quality Standards (CAAQS) in effect at the time of monitoring, and ongoing efforts to limit emissions of non-threshold air quality contaminants to the extent possible.</p> <p>In Table 4.8 it is stated that, "2022 air quality monitoring for SO<sub>2</sub> and NO<sub>2</sub> were within Nunavut Ambient Air Quality Standards (AAQS) and FEIS predictions. TSP (and PM<sub>2.5</sub>) results were at times above the AAQS, however these exceedances are not due to combustion." HC notes that nitrogen dioxide (NO<sub>2</sub>) and PM<sub>2.5</sub> (particulate matter &lt;2.5 µm in diameter) are non-threshold air contaminants, meaning that associations with different health outcomes have been demonstrated throughout the range of concentrations. Therefore, any increase in exposure will result in an increased health risk.</p> <p>HC recommends using the relevant CAAQS value in effect at the time of monitoring for future reporting purposes. The applicable air quality standards, such as the CAAQS, should not be considered as "pollute up-to" levels and the Proponent is encouraged to strive for continuous improvement.</p>	<ol style="list-style-type: none"> <li>1. HC recommends using the most stringent federal, provincial, or territorial air quality standards applicable to the given area. In many cases, although they are not based on health effects alone, the CAAQS will be the most stringent levels for key air pollutants, especially for longer-term projects with emissions after 2025.</li> <li>2. HC supports implementing all economically and technologically feasible mitigation measures to limit emissions of non-threshold air contaminants to the extent possible.</li> </ol>	<p>2022 Annual Monitoring Report, Section 4.2.6 – Air Quality (PC Terms and Conditions 7 through 12; PDF pg. 129-144)</p> <p>Table 4.8: Air Quality Impact Evaluation (PDF pg. 129-130)</p> <p>Appendix G.2.1: 2022 Air Quality, Dustfall, and Meteorology Report, Table 1.1 (PDF pg. 15)</p>	<p>The following was added to paragraph 2, page 1-3 (Attachment 2, 2022 Annual Air Quality, Dustfall and Meteorology Report):</p> <p>"CAAQS should not be considered "pollute up-to" levels because they are non threshold air contaminants, meaning that associations with different health outcomes have been demonstrated throughout a range of concentrations. Therefore, any increase in exposure will result in an increased health risk."</p>
<b>INAPPROPRIATE GUIDELINE USED TO ASSESS MERCURY LEVELS IN FISH TISSUES</b>					
2	HC-02	<p>HC recommends that mercury in country foods, and specifically fish tissues, be assessed using the provisional tolerable daily index (pTDI) values and consumption patterns.</p> <p>As described in HC-FC-03 from HC's Final Written Submission for the Phase 2 Development Proposal, elevated concentrations of methylmercury (MeHg) and inorganic mercury were present under baseline conditions for some country foods. As such, HC encourages the Proponent to assess mercury monitoring data using an approach that is protective of human health.</p> <p>In Section 4.6.10 of the Annual Monitoring Report and Appendix 6.4.3, all fish tissues sampled for mercury concentrations were compared to a guideline of 0.5 mg/kg wet weight. This guideline value is applicable to commercial foods only. For species consumed by local communities, HC recommends using the pTDI value of 0.47 µg of MeHg per kg body weight per day (kg-bw/day) for adults and 0.2 µg MeHg per kg-bw/day for</p>	<p>HC recommends that the pTDI values and local consumption patterns be used to assess potential human health risks of mercury in country foods, and specifically, fish tissues, in future project reporting.</p>	<p>2022 Annual Monitoring Report, Section 4.6.10 Marine Environment (PC Terms and Conditions 76 through 98) (PDF pg. 331, 353, 355, 463, 464)</p> <p>2022 Annual Monitoring Report, Appendix 6.4.3 – Milne Inlet Freshwater Fish Health Program (PDF pg. 5)</p> <p>HC Final Written Submission, Final Comment HC-FC-03, Phase 2</p>	<p>PTDI values will also be used in future interpretation of fish tissue data quality data relative to human health. Standard Health Canada guidance (as cited) will be applied, subject to standard assumptions of consumption rates and body weight.</p>

Cmt. #	HC Cmt. #	Reviewer's Detailed Comment	HC Recommendations	Reference Section	Baffinland's Response
		<p>women of childbearing age and young children up to 12 years of age (Health Canada, 2007) to assess potential risks to local consumers based on consumption patterns informed by community consultation.</p> <p>Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption.</p>		<p>Development Proposal.            NIRB PRI: 326953</p>	
<b>NOISE COMPLAINT RESOLUTION PROCESS AND ADDITIONAL MITIGATION MEASURES TO BE PROTECTIVE OF OFF-DUTY WORKERS AND COMMUNITY MEMBERS</b>					
3	HC-03	<p>HC encourages mitigating noise to levels that are protective of off-duty workers.</p> <p>In fulfillment of Term and Condition 14, the Proponent completed noise and vibration monitoring at accommodation facilities on the mine site and at Milne Inlet Port. Based on data presented in Appendix G.2.3, average indoor noise levels in accommodation facilities located at the mine site and Milne Port were 39.1 to 50.9 A- weighted decibels (dBA) during the 2022 surveys. The Annual Monitoring Report (PDF pg. 150) indicates an increasing trend in noise levels over time at the accommodations, with an average measured noise level of 46.78 dBA in 2022 compared to 28 dBA in 2017. According to the Proponent, this trend may be due to additional construction activities at the mine site since 2017.</p> <p>Adverse impacts on sleep may begin when average sound levels inside sleeping quarters exceed 30 dBA for continuous noise sources, or 45 dBA (max) for discrete noise events (WHO, 1999). In addition, when evaluating impulsive noise sources, 60 dBA (LAmax) should not be exceeded more than 10-15 times per night to be protective of sleep disturbance (Health Canada, 2017). The available noise monitoring data suggest that current noise levels could have health impacts on human receptors, including off-duty workers. As such, continued noise monitoring as part of the Project Certificate terms and conditions is warranted, and HC suggests that the noise complaint resolution mechanism remains in place. HC also recommends that noise be mitigated to the extent possible, particularly impulsive noise during sleeping hours, to protect against sleep disturbance.</p> <p><i>World Health Organization (WHO). 1999. Guidelines for community noise. Geneva: World Health Organization.</i></p> <ul style="list-style-type: none"> <li>Health Canada. 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise.</li> </ul>	<ol style="list-style-type: none"> <li>HC encourages maintaining an active complaint resolution mechanism and implementing additional noise monitoring and/or mitigation if noise levels exceed their approved limit or in the event of public or worker complaints.</li> <li>HC supports ongoing monitoring and the implementation of additional mitigations under the Proponent's Air Quality and Noise Abatement Management Plan to limit noise and noise-related health impacts for off-duty workers and community members to the extent possible.</li> </ol>	<p>2022 Annual Monitoring Report, Section 4.6.3 - Noise and Vibration (PC Terms and Conditions 13 through 15)</p> <p>2022 Annual Monitoring Report, Appendix G.2.3 - 2022 Noise and Vibration Surveys – Accommodation Facilities</p>	<p>Baffinland has retained a third-party hygienist to monitor noise for the past several years. In 2023, the monitoring is scheduled to be conducted in August and November. As a broader sample pool of data is collected over time, better identification of actual noise issues in the rooms and accommodations, where there is the most impact, can be achieved to inform the development of engineering controls to continue to reduce and/or mitigate identified noise levels if warranted.</p>

Cmt. #	HC Cmt. #	Reviewer's Detailed Comment	HC Recommendations	Reference Section	Baffinland's Response
<b>MONITORING OF METALS IN SOIL AND VEGETATION</b>					
4	HC-04	<p>HC supports continued monitoring of metals in soils and other environmental media and assessment of any Project-related trends.</p> <ul style="list-style-type: none"> <li>Appendix G.5.1 of the 2022 Annual Monitoring Report presents monitoring results for metals in soil (Tables 9-3 to 9-15 and Figures 9-1 to 9-14) and lichen (Tables 9-16 to 9-28 and Figures -9-15 to 9-34). While it is reported that no statistically significant increasing trends were found compared to pre-mining levels for metals in soil, monitoring results show increased concentrations (relative to pre-mining baseline) of lead (including exceedances of lichen lead concentration thresholds), arsenic, copper, selenium, and cadmium in lichen. HC also notes that the QIA raised concerns about increasing trends in reported metal concentrations in soil and lichen in their Written Submission and Technical Comments on the 2023 Sustaining Operations Proposal (QIA, 2023). HC recommends ongoing monitoring and implementation of additional mitigation measures should results continue to indicate increasing concentrations of metals in soil and/or vegetation over time.</li> </ul>	<ol style="list-style-type: none"> <li>HC supports continued monitoring of metals in soil and other relevant environmental media (e.g., vegetation) during all project phases as part of the Project Certificate Terms and Conditions.</li> <li>If monitoring indicates increasing concentrations of metals over time in the environmental media, HC encourages implementation of additional monitoring, mitigations, or adaptive management measures developed in consultation with the Terrestrial Environment Working Group.</li> </ol>	<p>2022 Annual Monitoring Report, Appendix G.5.1 – Terrestrial Environment Reports, Sections 9.1.2 and 9.2.</p> <p>Qikiqtani Inuit Association (QIA). 2023. Written Submission and Technical Comments of the Qikiqtani Inuit Association to the Nunavut Impact Review Board regarding the Baffinland Iron Mines Corporation 2023 Sustaining Operations Proposal. June 26, 2023.</p>	<ol style="list-style-type: none"> <li>Baffinland is committed to ongoing monitoring of dustfall and potential effects on the receiving environment (i.e., vegetation abundance, soil/lichen-metals).</li> <li>The most recent soil-metal concentration data, collected in 2022 at the Project, predominantly indicated no significant change, or concentrations were significantly lower relative to baseline values. Concentrations were below or within an acceptable range for soil-metal concentrations. Further, it was noted that there was a significant negative relationship between metal concentrations in dustfall and metal concentrations in soil for all constituents of potential concern (CoPCs) except cadmium. For all CoPCs, this appeared to be mediated by a significant positive relationship with soil pH. No unifying trend has been drawn from the analysis (EDI, 2023).</li> </ol> <p>Consistent with Health Canada's request, the TEMMP/Trigger-Action Response Plan to guide the adaptive management response "If monitoring indicates increasing concentrations of metals over time".</p> <p><u>References:</u></p> <p>Baffinland Iron Mines Corporation (Baffinland), 2023. Terrestrial Environment Mitigation and Monitoring Plan. Ref. No. BAF-PH1-830-P16-0027, DRAFT. May 15, 2023.</p> <p>EDI Environmental Dynamics Inc. (EDI), 2023. Mary River Project: 2022 Terrestrial Environment Annual Monitoring Report. Prepared for Baffinland Iron Mines Corporation, Oakville, Ontario, Canada. 426 pp.</p>

Table A.8: Response to TC Comments on Baffinland’s 2022 Annual Report to the NIRB

Cmt. #	TC Cmt. #	Reviewer’s Detailed Comment	TC Recommendations	Reference Section	Baffinland’s Response
<b>MARINE SAFETY AND SECURITY</b>					
1	N/A	<ul style="list-style-type: none"> <li>• TC MSS inspected 7 vessels at the Milne Port in 2022, including ballast water compliance inspections; no deficiencies were noted.</li> <li>• TC MSS inspected the Milne Port Oil Handling Facility in 2022 and confirm it is in compliance with regulatory requirements as per part 8 of the Canada Shipping Act, 2001 (CSA 2001).</li> <li>• TC MSS inspected the Baffinland/Milne Inlet Marine Facility in 2022 and confirm it is in compliance with the Marine Transport Security Regulations.</li> <li>• TC would like to clarify that we do not approve Oil Pollution Emergency Plans (OPEP)/Oil Pollution Prevention Plans (OPPP). Rather, we review them for regulatory compliance and therefore request that this correction be made in future reporting.</li> <li>• TC would like to provide the following information for consideration:               <ul style="list-style-type: none"> <li>○ In fall 2022, Transport Canada published its Voluntary Guidance for Relevant Authorities on In-Water Cleaning of Vessels (canada.ca), which includes a biofouling management plan and biofouling record book templates that have been well regarded internationally. The guidance provides clarity to stakeholders (competent authorities, vessel owners and operators, and in-water clean-up service providers) on recommended best practices that can be used to manage the biosecurity and water quality risks associated with cleaning vessels underwater.</li> <li>○ Recently the International Maritime Organization’s (IMO) Marine Environment Protection Committee (MEPC) adopted the revised “Guidelines for the Control and Management of Ship’s Biofouling to Minimize the Transfer of Invasive Aquatic Species” (Marine Environment Protection Committee (MEPC 80), 3-7 July 2023 – preview (imo.org)). These guidelines provide recommendations on in-water inspections with a focus on the quantitative assessment of biofouling using a biofouling rating number, as well as on observations of the anti-fouling system condition, which will assist vessel owners and operators in minimizing the transfer of potentially harmful aquatic species, following globally agreed guidance.</li> </ul> </li> </ul>	N/A	N/A	<p>Baffinland will ensure that future reporting clarifies that Transport Canada (TC) reviews Oil Pollution Emergency Plans (OPEP)/Oil Pollution Prevention Plans (OPPP). Thank you highlighting this correction.</p> <p>Baffinland acknowledges TC’s Voluntary Guidance for Relevant Authorities on In-Water Cleaning of Vessels as well as the International Maritime Organization’s (IMO) Marine Environment Protection Committee (MEPC) revised “Guidelines for the Control and Management of Ship’s Biofouling to Minimize the Transfer of Invasive Aquatic Species” <b>and will bring these to the attention of contracted vessels through Baffinland’s Standing Instructions for Vessel Masters (SITM).</b></p>

Cmt. #	TC Cmt. #	Reviewer's Detailed Comment	TC Recommendations	Reference Section	Baffinland's Response
<b>NAVIGATION PROTECTION</b>					
2	N/A	<ul style="list-style-type: none"> <li>TC confirms that Baffinland is compliant with all conditions within its regulatory approvals under the Navigable Waters Protection Act for the Mary River Project. TC did not conduct a physical inspection of these works in 2022.</li> </ul>	N/A	N/A	Baffinland appreciates Transport Canada providing an update to the Nunavut Impact Review Board (NIRB) that the Mary River Project had no compliance issues related to regulatory approvals under the Navigable Waters Protection Act in 2022.
<b>TRANSPORTATION OF DANGEROUS GOODS</b>					
3	N/A	<ul style="list-style-type: none"> <li>There were no TDG inspections conducted in person nor remotely by any TC TDG inspectors at the Mary River mine site in 2022.</li> <li>There were no complaints or enforcement activities related to TDG in 2022.</li> </ul>	N/A	N/A	Baffinland appreciates Transport Canada providing an update to the Nunavut Impact Review Board (NIRB) that there were no complaints or enforcement activities related to Transportation of Dangerous Goods in 2022.

## **Attachment 2**

2022 Annual Air Quality, Dustfall and Meteorology Report

# Baffinland Iron Mines

2022 Annual Air Quality, Dustfall and Meteorology Report

Prepared for:

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April 21, 2023

Project No.: 121416773



## Limitations and Sign-off

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## Executive Summary

This annual report presents a summary of the ambient air quality, dustfall, and meteorology data collected during 2022 for the Mary River Project (the Project) by Baffinland Iron Mines Corporation. For context, the ambient air quality data are compared with regulatory standards and objectives for ambient air quality from the Government of Nunavut and the Government of Northwest Territories. The 2022 dustfall monitoring data are compared with the two meteorology variables that have the strongest influence on the generation of fugitive dust and dustfall: wind speed and precipitation in the form of rain. The Project's 2022 meteorology data are compared with 2022 data from the nearest climate monitoring station operated by Environment and Climate Change Canada (Pond Inlet) and with the latest available 30-year Climate Normal (1981-2010) for Pond Inlet.

Ambient air quality data were collected at two Baffinland sites referred to as the Mine Site Complex (MSC) and Port Site Complex (PSC). The data were collected for NO<sub>2</sub> and SO<sub>2</sub> using Teledyne NO<sub>x</sub> and SO<sub>2</sub> analyzers maintained and calibrated monthly and verified with onboard Permeation (perm) tube technology. Data acquisition was done using “Envidas” data acquisition software with on-site computer systems located in the respective ambient air quality monitoring stations. The Baffinland Iron Mines Environmental Technicians submitted monthly air quality monitoring data reports (i.e., data and calibration reports) to Nunami Stantec for review to verify data quality and for identification of potential equipment issues/deficiencies.

The NO<sub>2</sub> and SO<sub>2</sub> monitoring data were compared to historical data provided by RWDI annual summary reports. The 2022 data collected at MSC and PSC were consistent with the historical RWDI data trends, with the highest SO<sub>2</sub> and NO<sub>2</sub> concentrations occurring during the winter months and falling sharply during the summer periods. Recent air dispersion modelling completed for the Project indicated that the mixing heights during winter are lower during summer and this atmospheric condition could result in higher measured SO<sub>2</sub> and NO<sub>2</sub> concentrations during winter. The presence of an elevated inversion can trap contaminants discharged into the atmosphere in the layer between the surface and the base of the inversion layer; this can increase ground-level ambient concentrations relative to the absence of an inversion layer (Nunami Stantec 2023).

Beta attenuation monitors (BAMs) were installed in early December 2021 at the PSC and MSC stations to measure total suspended particulates (TSP) and respirable particulates 2.5 µm in diameter and less (PM<sub>2.5</sub>). After testing and calibration, the monitors officially began collecting data in April 2022. The measured TSP and PM<sub>2.5</sub> concentrations were elevated in May and June and were lower during July and August. The measured TSP and PM<sub>2.5</sub> concentrations increased again from September through October before falling back to lower levels in November and remaining low through December 2022. At the MSC, the measured TSP concentrations were greater than the “project standard TSP 24-hour concentration” (120 µg/m<sup>3</sup>) for 82 events comprising 32.8% of the available period of record; the measured PM<sub>2.5</sub> concentrations at MSC for the available period of record (4.08 µg/m<sup>3</sup>), were less than the project annual standard (10 µg/m<sup>3</sup>). Also important to note is that the PSC and MSC are both within the PDA, and therefore not in locations to determine compliance with the project standards. The comparison of these MSC TSP monitoring results (inside the PDA boundary) to the project standards is being done to guide

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management actions for the protection of ambient air quality. As such, additional controls should be considered for implementation to limit the amount of fugitive dust that escapes during ore crushing, and transportation activities at the mine site should be investigated and implemented where possible. At the PSC, there were 11 out of the 246 measured 24-hour TSP averages that were greater than the project standard ( $120 \mu\text{g}/\text{m}^3$ ) comprising 4% of the total readings in 2022. During the same time the average measured  $\text{PM}_{2.5}$  concentration at the PSC ambient air quality monitoring station for the available period of record ( $2.27 \mu\text{g}/\text{m}^3$ ) was less than the project annual standard ( $10 \mu\text{g}/\text{m}^3$ ).

Meteorological data were gathered at three sites (Mary River, Milne Port and Steensby meteorology stations). Gathered data included air temperature, relative humidity, rainfall precipitation, wind speed and direction, and solar radiation. Data were compared to previous years for both previous reports from EDI and Knight Piesold, as well as the 30-year Climate Normal as provided by Environment and Climate Change Canada for the Pond Inlet Airport climate station.

The air temperature trends in 2022 compare well with the trend of the Climate Normal, with slightly warmer periods between December and January, as well as early spring (March and April). Additionally, the summer season was slightly warmer (with the peak air temperatures in July). This trend is also represented in the Pond Inlet Airport trend for 2022. The lowest average air temperature occurs in February with the warmest period occurring during July. The 2022 maximum air temperatures for Mary River and Milne Port were higher than in 2021. For Milne Port, the 2022 maximum air temperature was consistent with the 2020 value. For Mary River, the 2022 maximum air temperature was consistent with the 2019 value. The 2022 minimum air temperatures were slightly cooler at Mary River, and slightly warmer at Milne Port, but were within range of the previous two years (2020 and 2021).

Relative humidity trends are indicative of a coastal area, with consistently high (typically greater than 60%) relative humidity through most of 2022. When compared with 2021 data, most sites had a more pronounced dip in relative humidity at the peak of summer, with Mary River having the lowest humidity in July with 53%.

Precipitation at the meteorological stations indicated rain mostly fell between June and October in 2022. This trend is consistent with the Climate Normal data. During 2022, rain could not be quantified at the Steensby meteorological station due to a damaged funnel for the tipping bucket rain gauge sensor. Both Mary River and Milne Port locations experienced more rainfall in the fall than in 2021 with lower summer rain. Making comparisons with rain data collected during 2021 is difficult because the tipping bucket rain gauges at the three meteorology stations was obstructed between January and August 2021.

Average wind speeds measured at Steensby were incomplete due to rime ice buildup on the sensor. Mary River and Milne Port had higher average wind speeds in 2022 when compared to the Climate Normal; however, were consistent with 2021. Wind direction information at the three sites were consistent with previous years.

Solar radiation observations recorded at the three stations were consistent, with the largest observed radiative fluxes occurring between May and July for Mary River, Milne Port, and Steensby. When compared to 2021 data, the maximum solar radiation was slightly higher.

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Overall, the meteorology data collected during 2022 is consistent with the historical data. There are some data that depart slightly from the historical trends, but those departures are within the natural variation that would be expected over a multi-year monitoring program.

Tote Road North Crossing and Tote Road South Crossing dustfall stations showed peaks during May and June 2022 (Figure 8-4 in EDI 2023) which coincided with dry conditions (between 2 and 6 days of rain per month, Figures 4-2 and 4-4 in EDI 2023). Dustfall was low at the Tote Road North Crossing and the Tote Road South Crossing dustfall stations during September 2022 which coincided with unusually wet conditions (13 to 15 days with rain). There was no correlation between the 2022 peak monthly dustfall values for the Tote Road North Crossing and the Tote Road South Crossing monitoring stations and higher than average monthly wind speeds recorded at the nearest meteorology station.

Elevated dustfall values recorded at all of the Mine Site and Milne Port monitoring stations during May 2022 coincided with dry conditions recorded at the Mine Site and Milne Port meteorology stations (2 days during May 2022 with measurable precipitation). Low dustfall values coincided with unusually wet conditions during September 2022. There was no correlation between monthly average wind speeds and dustfall values at the Mine Site and Milne Port monitoring locations during 2022. For the stations sampled year round, the 2022 measured annual dustfall levels were greater than the 50 g/m<sup>2</sup>/year management action trigger level for monitoring stations at the Mine Site, Milne Port, Tote Road North Crossing and Tote Road South Crossing (Figure 8-7 in EDI 2023).

A variety of programs are underway to reduce dust emissions. Baffinland has more than 30 commitments related to dust that now form part of the Project Certificate. In 2021, Baffinland commissioned a third-party Dust Audit, which includes the establishment of an independent Dust Audit Committee comprised of representatives from the five North Baffin communities. As part of this work, the Audit Committee undertook an on-site investigation in October 2021, and additional engagement activities were conducted during 2022. An interim Dust Audit report was issued to the Baffinland Iron Mines community liaison officers and the communities in September 2022. The results of the audit have been captured in a Final Recommendations Report that was submitted to NIRB on February 16, 2023 (NIRB Registry No. 342950).

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## Abbreviations

AQNAMP .....	Air Quality and Noise Abatement Management Plan
Baffinland .....	Baffinland Iron Mines Corporation
BAM.....	Beta Attenuation Monitor
CAAQS.....	Canadian Ambient Air Quality Standards
CAC.....	Common Air Contaminants
CCME.....	Canadian Council of Ministers of the Environment
CO .....	Carbon Monoxide
e.g. ....	example
ECCC .....	Environment and Climate Change Canada
EDI .....	Environmental Dynamics Inc.
GIS .....	Geographic Information System
GN .....	Government of Nunavut
GPS.....	Global Positioning System
MPO .....	Manufactured, Processed or Otherwise used
MSC .....	Mine Site Complex
NAAQS.....	Nunavut Ambient Air Quality Standards
NIRB.....	Nunavut Impact Review Board
NO <sub>2</sub> .....	Nitrogen dioxide
NO <sub>x</sub> .....	Nitrogen oxides
NWTAAQS .....	Northwest Territories Ambient Air Quality Standards
PDA .....	Project Development Area
PM .....	Particulate matter
PM <sub>2.5</sub> .....	Particulate matter with an aerodynamic diameter of less than 2.5 micrometers
PMT .....	photo multiplier tube
PPB .....	parts per billion
Project .....	Mary River Project
PSC.....	Port Site Complex
SO <sub>2</sub> .....	Sulphur dioxide

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Abbreviations

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SOP .....	Standard operating procedure
SWE .....	snow-water-equivalent
TBRG .....	Tipping bucket rain gauge
TEAMR .....	Terrestrial Environment Annual Monitoring Report
TEMMP .....	Terrestrial Environment Mitigation and Monitoring Plan
TSP .....	Total Suspended Particulates

# 1 Introduction

Nunami Stantec Limited was retained by Baffinland Iron Mines Corporation (Baffinland) to compile an annual report for the air quality, dustfall and meteorology monitoring programs at the Mary River Mine Project (the Project). These monitoring programs include:

- Continuous ambient air quality monitoring for SO<sub>2</sub>, NO<sub>x</sub> and NO<sub>2</sub> at Port Site Complex (PSC) and the Mine Site Complex (MSC) accommodations buildings;
- Continuous ambient air quality monitoring for total suspended particulates (TSP) and respirable particulates 2.5 µm in diameter and less (PM<sub>2.5</sub>) at the PSC and MSC (see Section 2 for more details);
- Passive dustfall monitoring at Milne Port, the Mine Site, and along the Tote Road; and
- Automated meteorology stations at Milne Port, Mine Site and Steensby Port.

The background and ambient air quality (including dustfall) objectives are summarized below. Section 2 contains a more detailed description of the ambient air quality monitoring program and results. Section 3 contains a detailed description of the meteorology monitoring program and results. Section 4 contains a detailed description of the dustfall monitoring and results. Section 5 presents an overall summary. Chapter 6 contains the references.

## 1.1 Background and Objectives

Continuous monitoring of gaseous SO<sub>2</sub> and NO<sub>2</sub> is undertaken at the MSC and PSC, in accordance with Project Certificate Conditions #7 and #8. No air quality monitoring is undertaken at Steensby Port as that component of the Project has not yet been constructed. Continuous ambient air quality monitoring for SO<sub>2</sub> and NO<sub>2</sub> would normally be done at the Project Development Area (PDA) boundary; however, because there are no power sources available along the PDA boundary, the SO<sub>2</sub> and NO<sub>2</sub> monitors are in an active area of the facility (e.g., at the accommodation and office facilities). The results from the monitoring of gaseous SO<sub>2</sub> and NO<sub>2</sub> are compared to ambient air quality standards and objectives for Nunavut as shown in Table 1.1.

Ambient air quality standards and objectives are non-statutory limits (i.e., not legally binding) used to assess ambient air quality and guide air management decisions. Ambient air is defined as the outdoor air, in this case outside (beyond) a PDA boundary. The PDA boundary is often referenced in industry as a property fenceline where public access is restricted. The PDA boundary is not a physical fenceline; rather it is industry terminology for the boundaries at the edge of the Project areas for the Mine Site and Port Site.

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The air quality inside of the PDA boundary is considered from an occupational workplace perspective and is assessed using different standards. In Nunavut, workplace air quality is protected by the Schedule O Contamination Limits provided in the Nunavut Occupational Health and Safety Regulations (NU Reg 003-2016, <http://canlii.ca/t/52qsb>). The exception to this situation is the comparison of the SO<sub>2</sub> and NO<sub>2</sub> monitoring data at the PSC and MSC that are being compared to the Nunavut Ambient Air Quality Standards (NAAQS).

The Government of Nunavut (GN) has established the NAAQS for several common air contaminants (CACs): total suspended particulate matter (TSP), particulate matter with an aerodynamic diameter of <2.5 µm (PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>) (GN 2011). The NAAQS did not include an annual standard for PM<sub>2.5</sub>, therefore the Northwest Territories Ambient Air Quality Standard (NWTAAQS) was adopted for comparison purposes in this study. Table 1.1 presents the air quality guidelines and objectives adopted by the Project for the CACs.

**Table 1.1 Standards and Objectives for Ambient Air Quality**

Common Air Contaminant	Averaging Time	Units	NAAQS <sup>1</sup>	NWTAAQS <sup>2</sup>	2020 CAAQS <sup>3</sup>	Project Standard <sup>5</sup>
SO <sub>2</sub>	1 hr	µg/m <sup>3</sup>	450 (172 ppb)	-	183 <sup>5</sup>	450
	24 hr	µg/m <sup>3</sup>	150 (57 ppb)	-		150
	Annual	µg/m <sup>3</sup>	30 (11 ppb)	-	13.1 <sup>4</sup>	30
NO <sub>2</sub>	1 hr	µg/m <sup>3</sup>	400 (213 ppb)	-	113 <sup>4</sup>	400
	24 hr	µg/m <sup>3</sup>	200 (106 ppb)	-		200
	Annual	µg/m <sup>3</sup>	60 (32 ppb)	-	32.0 <sup>4</sup>	60
TSP	24 hr	µg/m <sup>3</sup>	120	-	-	120
	Annual	µg/m <sup>3</sup>	60	-	-	60
PM <sub>2.5</sub>	24 hr	µg/m <sup>3</sup>	30	-	27	30
	Annual	µg/m <sup>3</sup>	-	10	8.8	10

**NOTES:**

<sup>1</sup> GN (2011).

<sup>2</sup> GNWT (2014).

<sup>3</sup> 2020 Canadian Ambient Air Quality Standards (2020 CAAQS); CCME (2014). Provided for context, not intended for use at facility PDA boundary for compliance.

<sup>4</sup> CAAQS for these variables are provided in parts per billion (ppb); these have been converted to µg/m<sup>3</sup> by the equation: Concentration (µg/m<sup>3</sup>) = 0.0409 x Concentration (ppb) x molecular weight (Boguski 2006).

<sup>5</sup> Project Standards are from Nunavut Standards where available, or otherwise the most stringent available from a Territorial Government.

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The Canadian Ambient Air Quality Standards (CAAQS) were established as objectives under sections 54 and 55 of the *Canadian Environmental Protection Act*, 1999 on May 25, 2013. The 2020 CAAQS are not facility-level regulatory standards that are to be enforced at a PDA boundary. The 2020 CAAQS are summarized in Table 1.1 for comparison purposes, although the adopted Project Standard for each CAC is based on the Nunavut standards or a provincial or Health Canada surrogate.

The CAAQS were developed by the Canadian Council for the Ministers of the Environment (CCME) to manage air emissions and ambient air quality concentrations in a regional airshed; CAAQS are not intended to determine compliance at the PDA boundary for an industrial facility. CAAQS should not be considered “pollute up-to” levels because they are non threshold air contaminants, meaning that associations with different health outcomes have been demonstrated throughout a range of concentrations. Therefore, any increase in exposure will result in an increased health risk. CAAQS are best suited as a tool to manage air emissions in regional airsheds that have multiple industrial sources with the objective of driving continuous improvement of air quality in Canada. Regional airsheds typically have sensitive receptors (i.e., vulnerable populations such as infants, the elderly, and those with respiratory ailments), major industrial air emissions, and opportunities for achievable emission reductions. These airsheds often have multi-pollutant management needs. Regional airsheds differ based on the unique characteristics of local geography, meteorological conditions, and composition of human activity, including industrial activity.

Baffinland has committed to advancing an ambient air quality monitoring framework for the current operations (4.2 million tonnes per year of production) in consultation with the GN and Environment and Climate Change Canada (ECCC). Section 2 describes the additional continuous monitoring equipment for measuring the TSP and PM<sub>2.5</sub> concentrations at the MSC and PSC. The new monitoring equipment was installed and calibrated/verified in December 2021. TSP and PM<sub>2.5</sub> official data collection began in April 2022 following several months of calibrating and data review. The potential applicability of the 2020 CAAQS to the Project was considered as part of the monitoring framework and Baffinland determined that the 2020 CAAQS would be used for comparison purposes only in agreement with the CCME objective to “keep clean areas clean” with respect to ambient air quality.

Passive sampling of dustfall is undertaken at a total of fifty-three (53) sampling sites at Milne Port, the Mine Site, and along the Tote Road (North and South crossings). This program forms part of the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) because of its linkage to monitoring of metals concentrations in soil and vegetation and monitoring of vegetation abundance and diversity programs also presented in the TEMMP. The location and methodology used for the dustfall monitoring stations is summarized in the 2022 Terrestrial Environment Annual Monitoring Report (TEAMR, EDI 2023).

## 1.2 Monitoring Locations

Table 1.2 and Figure 1.1 to Figure 1.3 summarize the locations for the two (2) ambient air quality monitoring stations and the four (4) automated meteorology monitoring stations.

**Table 1.2 Summary of Baffinland Ambient Air Quality and Meteorology Stations and the Pond Inlet Airport Climate Station**

<b>Station</b>	<b>Location</b>	<b>Data Period</b>	<b>Distance to PDA (km)</b>	<b>Easting (m, UTM Zone 17 W)</b>	<b>Northing (m, UTM Zone 17 W)</b>
Port Site Complex (PSC) Ambient Air Quality Monitoring Station	Port Site	year-round	Within PDA	503,967	7,976,009
Mine Site Complex (MSC) Ambient Air Quality Monitoring Station	Mine Site	year-round	Within PDA	561,378	7,913,445
Mary River Meteorology Station <sup>a</sup>	Mine Site	year-round	Within PDA	558,095	7,914,347
Milne Port Meteorology Station <sup>a</sup>	Port Site	year-round	1.6	505,829	7,975,277
Steensby Meteorology Station <sup>a</sup>	Mine Site	year-round	Within PDA	593,118	7,798,634
Pond Inlet Airport Climate Station <sup>b</sup>	Pond Inlet Airport	year-round	130 from the Port Site Complex	401,435	8,068,271

**NOTES:**

<sup>a</sup> Based-on information from Baffinland

<sup>b</sup> Based on Environment and Climate Change Canada (ECCC 2021) and on UTM Zone 18

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**Figure 1.1 Mine Site Air Quality and Meteorology Stations**

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**Figure 1.2 Milne Port Air Quality and Meteorology Stations**

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**Figure 1.3 Steensby Port Meteorology Station**

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## **1.2.1 Mary River Mine Site**

There is one (1) automated meteorology station at the Mine Site located near the Weatherhaven structure. Photo 1.1 shows the Mary River meteorology station.

Photo 1.2 shows the continuous gas analyzers at the MSC. The ENVIDAS computer that controls the data collection is the grey device at the bottom of the rack. The device below the computer display is the Teledyne dilution calibrator. Photo 1.3 and Photo 1.4 show the continuous ambient air quality monitors for TSP and PM<sub>2.5</sub>. Photo 1.5 shows the location of the Mine Site ambient air quality monitoring station in relation to nearby buildings. Photo 1.6 shows a dustfall station near the Mine Site.



**Photo 1.1 The Mary River Meteorology Station looking towards the north.**



**Photo 1.2** The rack-mounted Teledyne T100 (SO<sub>2</sub>) and T200 (NO<sub>x</sub>-NO<sub>2</sub>) continuous gas analyzers at the MSC.



**Photo 1.3 The PM<sub>2.5</sub> BAM analyzer at the MSC.**

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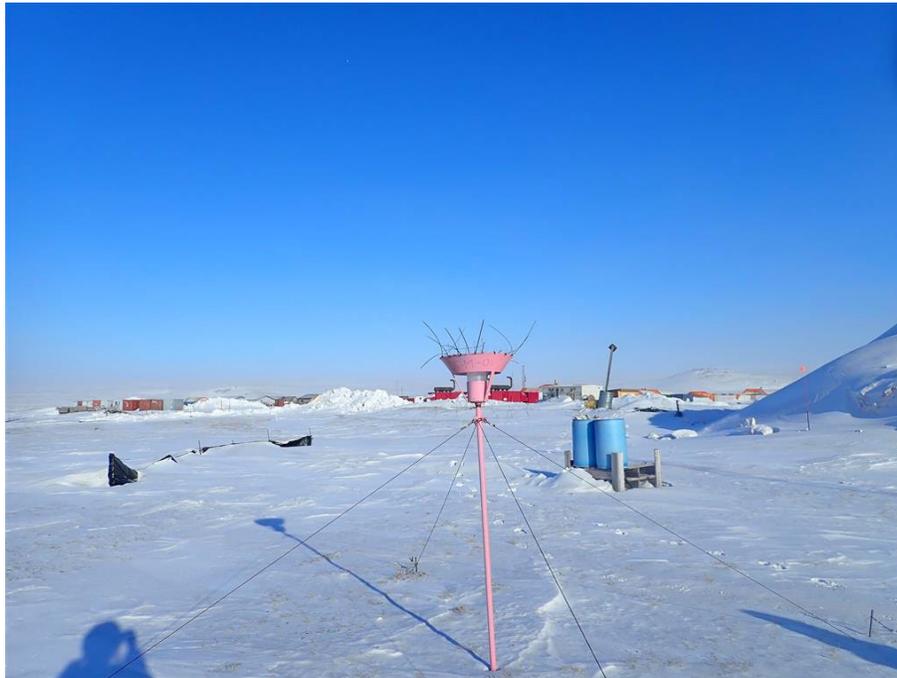
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**Photo 1.4** The TSP and PM<sub>2.5</sub> roof mount outlets and cutter heads.



**Photo 1.5** Plan view showing the location of the ambient air quality (AQ) monitoring station for SO<sub>2</sub> and NO<sub>2</sub> at the MSC (identified as MS or Mine Site in this photo).



**Photo 1.6** Dustfall station DF-M-01 (March 20, 2021) near the Mine Site is located approximately 250 m south of the airstrip and 250 m east of Camp Lake.

## **1.2.2 Milne Port**

Photo 1.7 shows the Milne Port Meteorology Station located approximately 1.6 km east of the Milne Port infrastructure. Photo 1.8 shows the continuous gas analyzers at the PSC and the BAM 1020 continuous analyzer for TSP. The ENVIDAS computer that controls the data collection is the grey device at the bottom of the rack. The device below the computer display is the Teledyne dilution calibrator. Photo 1.9 shows the location of the PSC ambient air quality monitoring station in relation to nearby buildings. Photo 1.10 shows dustfall monitoring station DF-P-04 near Milne Port.



**Photo 1.7 Milne Port Meteorology Station (September 9, 2021).**



**Photo 1.8** The rack-mounted Teledyne T100 (SO<sub>2</sub>) and T200 (NO<sub>x</sub>-NO<sub>2</sub>) continuous gas analyzers at the PSC. The BAM 1020 analyzer for TSP is at the top of the rack.



**Photo 1.9** The plan view showing the location of the ambient air quality (AQ) monitoring station for SO<sub>2</sub> and NO<sub>2</sub> at the PSC (identified as Milne Port or MP in this photo).



**Photo 1.10** Dustfall station DF-P-04 (February 17, 2021) near Milne Port is located approximately 300 m south of Quarry Q1 and 300 m east of the Tote Road.

### **1.2.3 Steensby**

The Steensby automated meteorology station shown in Photo 1.11 is located approximately 120 km southeast from the Mary River Mine Site. As the Mary River mine site increases production, a railway is to be constructed to the southeast to transport ore to a port at Steensby Inlet which would operate year-round to ship ore to market.



**Photo 1.11 The Steensby Port Meteorology Station looking towards the west.**

## 2 Ambient Air Quality Monitoring

### 2.1 Methods

#### 2.1.1 Continuous Monitoring for Nitrogen Oxides, Nitrogen Dioxide and Sulphur Dioxide at Mary River and Milne Port

The Teledyne API Model T200 NO<sub>x</sub> analyzer shown below uses a photo multiplier tube (PMT) to detect the amount of chemiluminescence created in the Reaction Cell. Photons from the reaction are filtered by an optical high-pass filter which enter the PMT and strike a negatively charged photo cathode causing it to emit electrons. A high voltage potential across these focusing electrodes directs the electrons toward the array of high voltage dynodes. The dynodes in the T200 are designed so that each stage multiplies the number of emitted electrons by emitting multiple, new electrons. This activity increases the number of electrons emitted which are collected by the anode to create a useable current signal. The Signal is then interpreted across the PMT board and translated to numerical data through the motherboard to be displayed on the unit's display panel and transmitted to collection software. (Operation Manual Model T200 NO/NO<sub>2</sub>/NO<sub>x</sub> Analyzer, Teledyne API 2018a)



The Teledyne API Model T100 UV Fluorescence SO<sub>2</sub> Analyzer shown here determines the concentration of SO<sub>2</sub> in the ambient air by drawing in a continuous sample through the instrument. The sample gas is exposed to ultraviolet light which causes the SO<sub>2</sub> molecules to change to an excited state (SO<sub>2</sub>\*). As the molecules decay into SO<sub>2</sub> they emit a photon.

The reaction enters a PMT which increases the number of electrons emitted (as in the T200). The Signal is then interpreted across the PMT board and translated to numerical data through the motherboard to be displayed on the units display panel and transmitted to collection software. (Operation Manual Model T100 UV Fluorescence Analyzer, Teledyne API 2018b)

The NO<sub>x</sub> and SO<sub>2</sub> analyzers are calibrated and maintained in accordance with the manufacturer-recommended calibration methods and the US EPA calibration standards in compliance with 2020 Canadian Ambient Air Quality Standards and CCME (2014).

#### 2.1.2 Continuous Monitoring for Particulate Matter at Mary River and Milne Port

A commitment for the Production Increase Proposal Extension was made to ECCC to add continuous monitoring equipment for particulate matter at the Mine Site and Milne Port where a suitable and reliable power source is available.

The commitment was to implement one (1) continuous and/or discrete particulate monitoring station for TSP and PM<sub>2.5</sub> at the Port site, and another at the Mine site. To achieve this, a desktop review and site visit were completed in 2020 to inform placement of these monitoring stations. The intention was to

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deploy these monitoring stations in 2020, subject to logistical constraints and external factors. However, the site visit by Nunami Stantec Limited to install the equipment was delayed until October 2021, due to COVID-19. After selection of continuous monitors, the interior installation and setup at each site was conducted in October 2021. BIM completed monitor inlet installations through each roof (MSC and PSC ambient air stations) in January 2022. Each of the monitors were initiated and calibrated in February-March 2022 and officially brought online in April 2022.

The BAM 1020 air quality monitoring instrument collects and analyzes atmospheric dust (TSP or respirable particulate matter,  $PM_{2.5}$ , with an aerodynamic diameter of less than 2.5 micrometers) concentrations in ambient air. The BAM 1020 has been widely used over the last 18 years by ECCC at their nation-wide National Air Pollution Surveillance (NAPS) monitoring stations.

The BAM 1020 measures dust particle mass through the principle of beta ray attenuation across the sampling medium (filter tape). A small C-14 (Carbon 14) element emits a constant source of high-energy electrons known as beta rays. The BAM 1020 first conducts a beta ray count across the clean filter tape, records the value internally, and then proceeds to draw ambient air through the filter tape. Dust particles are collected on the filter tape at the primary record location and scintillation counts are conducted to measure the beta attenuation and calculate the PM concentration in micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ). Particle size differentiation is carried out utilizing a splitter head (size selective inlet or “SSI”) mounted on the end of the sample inlet tube/pipe. The SSI creates a calculated flow change which cause heavier particles to drop out of the flow path, delivering only the pre-determined particle size to the BAM analyzer. Photo 2.1 shows the BAM 1020 continuous ambient air quality monitor at the PSC.



**Photo 2.1** BAM 1020 for Continuous TSP Monitoring at the PSC – Stantec.

The TSP and PM<sub>2.5</sub> concentration data are downloaded and tabulated for data storage and analysis using COMET2, the BAM interface software. The measured TSP and PM<sub>2.5</sub> concentrations are compared to the Nunavut Ambient Air Quality Standards (NAAQS), and the Canadian Ambient Air Quality Standards (CAAQS). Any exceedances noted during the previous monitoring period are flagged and recorded during the analysis. During the monthly flow checks the flow data are reviewed as part of the data validation. In addition to the monthly flow verifications, an exceedance report is generated weekly through the Envidas Ultimate software and the exceedance data are checked against the hourly data for consistency. The hourly concentrations for each monitor (TSP or PM<sub>2.5</sub>) from Envidas Ultimate software are also verified by comparing with the data trends from each monitor for data correlations and anomalies.

During October 2021, internal system setup and install and the zero and span checks were conducted on the four (4) new BAM 1020 instruments. Calibration and verification were conducted in accordance with the manufacturer's specifications. In addition, training was provided in October for the on-site staff, and a standard operating procedure (SOP) for calibration and maintenance was developed for the new BAM 1020 instruments. BAM installations through each roof of the PSC and MSC, as well as final verification of zero air were completed in November/Early December 2021. The new BAM 1020 instruments were subsequently put into operation to collect preliminary data and to be calibrated during January to March 2022 prior to going into full operation in April 2022.

## **2.2 SO<sub>2</sub> and NO<sub>2</sub> Results and Discussion**

Ambient air quality monitoring results for 2022 for SO<sub>2</sub> and NO<sub>2</sub> are presented below separately for the MSC and PSC monitoring locations.

### **2.2.1 MSC Ambient Air Quality Monitoring Station**

#### **2.2.1.1 Sulphur Dioxide**

The SO<sub>2</sub> data at the MSC ambient air quality monitoring station had 87.15% valid data for 2022 with a low of 10.08% for January due to an internal Pump failure (Table 2.1). A new pump was installed in January 2022 bringing the monitor back on-line.

The SO<sub>2</sub> concentrations remained very low throughout 2022 and did not exceed the hourly (172 ppb), 24-hour (57 ppb) or annual (11 ppb) NAAQS (GN 2011) during the period of active operation. The maximum hourly recorded concentration was 2% of the NAAQS 1-hour standard and 1% of the NAAQS 24-hour standard. It was not possible to calculate the annual average concentrations due to the Internal Pump failure that resulted in loss of data. The maximum 1-Hour SO<sub>2</sub> concentrations was 2% of the 1-Hour CAAQS<sup>1</sup>. Negative values observed in the data set reflect background noise in the system when the ambient air SO<sub>2</sub> levels fall below detectable limits. The system calibrations were maintained and fell within the operational limits of the analyser.

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<sup>1</sup> Mary River data based on 98th percentile of data values; derived from 7845 and 8665 valid data points for SO<sub>2</sub> and NO<sub>2</sub>, respectively

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**Table 2.1 Hourly Summary of SO<sub>2</sub> Concentrations for MSC Ambient Air Quality Monitoring Station  
(measured in parts per billion, ppb)**

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean	-1.06	-1.14	-1.34	-1.53	-1.34	-1.15	-0.44	-0.14	0.06	0.03	0.96	0.51	-0.51
Median	-1.44	-1.31	-1.46	-1.59	-1.35	-1.13	-0.35	-0.16	0.05	0.01	0.68	0.43	-0.36
Mode	-1.49	-1.64	-1.57	-1.66	-1.61	-1.14	-0.31	-0.23	-0.01	0.23	0.58	0.17	-1.43
Range	3.28	5.05	8.98	2.04	2.15	3.87	8.20	1.31	1.85	8.24	10.70	6.83	14.19
Minimum	-2.03	-2.36	-2.38	-2.11	-2.06	-3.79	-3.57	-0.75	-0.76	-1.33	-0.31	-0.51	-3.79
Maximum	1.26	2.68	6.60	-0.06	0.09	0.07	4.63	0.56	1.09	6.91	10.39	6.32	10.39
Count	75.00	638.00	688.00	689.00	713.00	691.00	678.00	710.00	690.00	712.00	643.00	707.00	7634.00
% Valid	10.08%	94.94%	92.47%	95.69%	95.83%	95.97%	91.13%	95.43%	95.83%	95.70%	89.31%	95.03%	87.15%

**NOTES:**

N/A - not available. September to December Monthly and Annual data is invalid – below the &gt;75% Valid data criteria.

Negative values reflect normal noise in the analyzer and are considered valid “zero” data

Nunavut Air Quality Standards: 1 hr 172 ppb, 24 hr 57 ppb, Annual 11 ppb.

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The SO<sub>2</sub> concentrations were highest in the winter (November, December) and lowest in the spring/summer months (Figure 2.1); consistent with historical trends (RWDI 2015, 2017, 2018, Nunami Stantec, 2021). The likely cause of the highest concentrations in winter may be the SO<sub>2</sub> emissions from diesel mine trucks operating in and near the MSC ambient air quality monitoring station. Signs are posted near the MSC ambient air quality monitoring station to request that operators refrain from idling their diesel trucks.

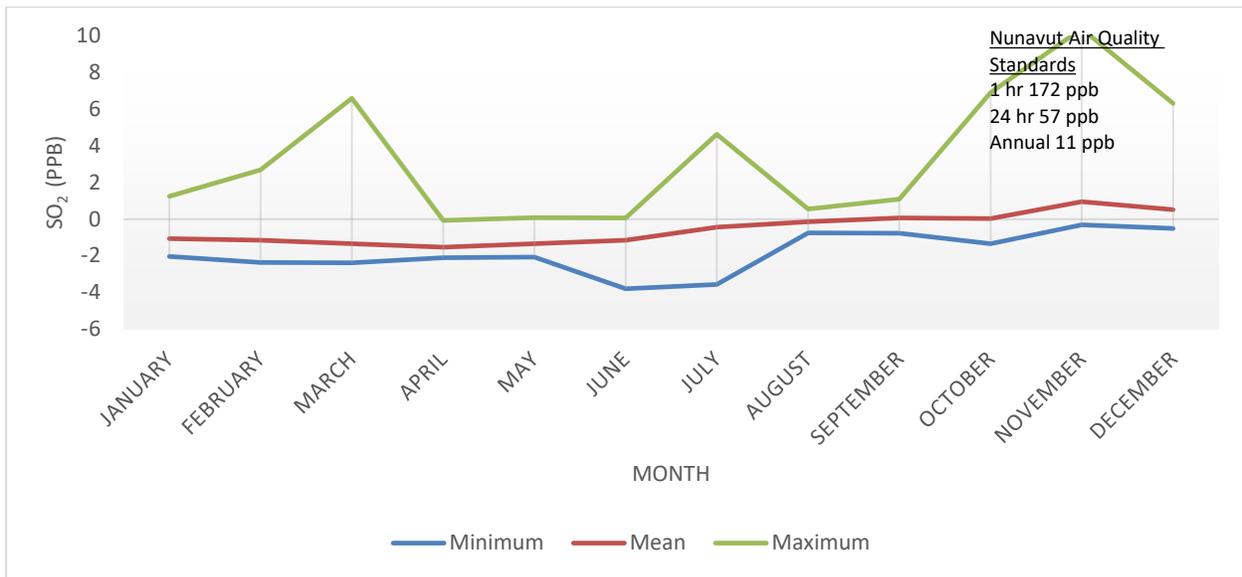


Figure 2.1 MSC Hourly SO<sub>2</sub> Concentration (ppb) Summaries by Month

### **2.2.1.2 Nitrogen Dioxide**

The NO<sub>2</sub> data at the Mary River MSC ambient air quality monitoring station had 94.4% valid data for 2022 with a low of 91.13% for January and July due to equipment maintenance and calibration (Table 2.2). The NO<sub>2</sub> concentrations did not exceed the hourly (213 ppb), 24-hour (106 ppb) or annual (32 ppb) NAAQS (GN 2011) with maximum concentrations of 122 ppb (Figure 2.2), 34 ppb and 15.8 ppb, respectively. The highest average hourly maximum occurred on December 29, 2022 (122.0 ppb). The NO<sub>2</sub> concentrations exceeded the 1-hour CAAQS<sup>2</sup> in 2.6% of the hourly averaged data (216 occurrences) with recorded levels ranging from 60.02 to 122.0 ppb. The CAAQS are being used for comparison purposes only in agreement with the CCME objective to “keep clean areas clean” and the most relevant NO<sub>2</sub> standard for comparison is the NAAQS. The annual CAAQS mean NO<sub>2</sub> concentration was 15.8 ppb which is 49% of the annual CAAQS arithmetic mean (32 ppb). The maximum recorded values may be attributed to vehicles or other diesel combustion equipment occasionally operating at locations near the MSC ambient air quality monitoring station.

Minimum values present in the data reflect the level of zero air noise in the analyzer and remained consistent between calibrations.

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<sup>2</sup> Milne Port data based on 98th percentile of data values derived from 8170 valid data points each for SO<sub>2</sub> and NO<sub>2</sub><sup>2</sup>

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**Table 2.2 Hourly Summary NO<sub>2</sub> Concentrations for MSC Ambient Air Quality Monitoring Station (ppb)**

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean	35.42	34.60	21.95	9.84	7.39	4.71	4.95	4.55	4.67	10.15	31.39	22.77	15.83
Median	35.57	32.69	18.30	6.92	5.31	3.52	3.69	3.12	2.96	7.26	33.15	19.50	7.92
Mode	42.26	2.86	10.97	4.83	5.60	8.03	11.68	1.62	0.64	2.70	7.56		3.34
Range	120.73	115.78	88.29	109.30	40.89	26.20	18.92	23.22	25.57	83.81	105.31	122.50	122.50
Minimum	0.73	0.79	0.44	0.73	0.08	0.00	0.33	-0.15	-0.17	-0.03	0.66	-0.50	-0.50
Maximum	121.46	116.57	88.73	110.03	40.97	26.20	19.25	23.07	25.40	83.78	105.96	122.00	122.00
Count	678.00	642.00	687.00	690.00	713.00	691.00	678.00	710.00	690.00	712.00	675.00	707.00	8273.00
98 <sup>th</sup> percentile	78.0	84.3	59.5	38.4	27.6	15.8	16.0	18.2	18.9	36.3	63.0	62.7	63.4
% Valid	91.13%	95.54%	92.34%	95.83%	95.83%	95.97%	91.13%	95.43%	95.83%	95.70%	93.75%	95.03%	94.44%

**NOTES:**

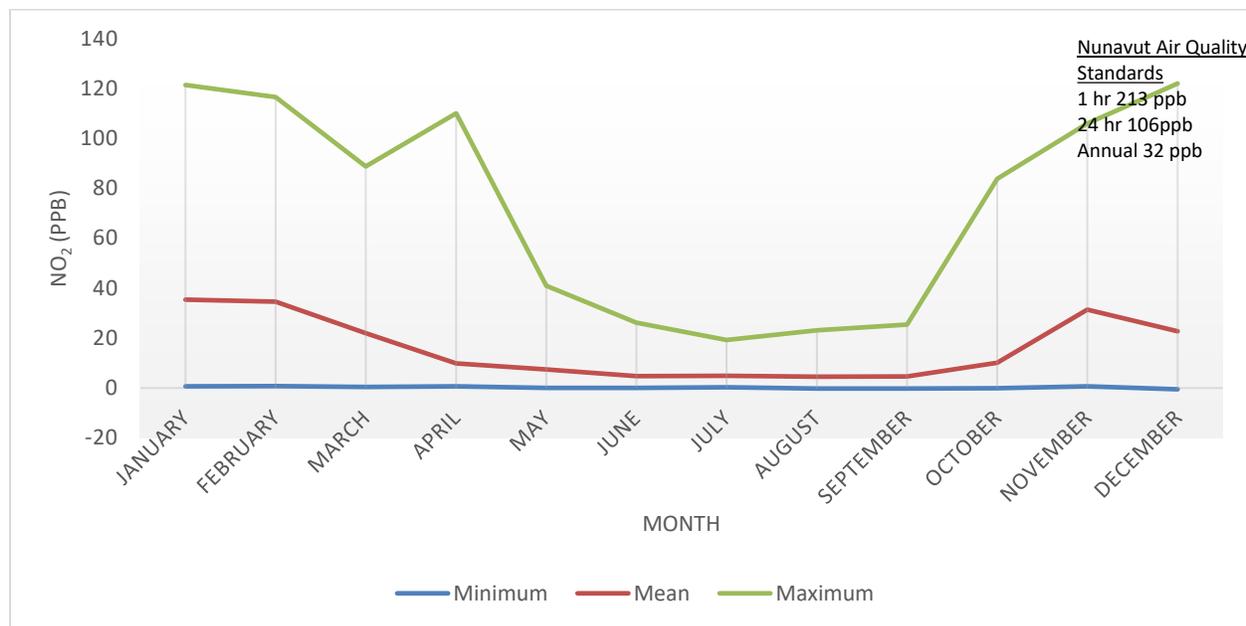
In the column for the annual values the lowest minimum and highest maximum monthly values are shown.

Nunavut Air Quality Standards: 1 hr 213 ppb, 24 hr 106ppb, Annual 32 ppb

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The NO<sub>2</sub> concentrations were highest in the winter and lowest in the summer months (Figure 2.2) consistent with historical trends (RWDI 2015, 2018; Nunami Stantec 2021). The likely cause of the highest concentrations in winter may be the NO<sub>2</sub> emissions from diesel mine trucks operating in and near the MSC ambient air quality monitoring station. Signs are posted near the MSC ambient air quality monitoring station to request that operators refrain from idling their diesel trucks.



**Figure 2.2 MSC Hourly NO<sub>2</sub> Concentrations (ppb) by Month**

## 2.2.2 PSC Ambient Air Quality Monitoring Station

### 2.2.2.1 Sulphur Dioxide

The SO<sub>2</sub> data at the PSC ambient air quality monitoring station had 74.7% valid data for 2022 with a low of 0.81% for March. The low valid data collection result (for January 2022) was due to an internal pump failure in 2021 which was replaced in January 2022. February and March data were excluded from the data set due to large negative values indicating calibration drift outside of specification (Table 2.3). After the final March calibration, the system stabilized, and consistent data were collected.

The SO<sub>2</sub> concentrations remained very low (0-10.1 ppb) throughout 2022 and did not exceed the hourly (172 ppb), 24-hour (57 ppb) or annual (11 ppb) NAAQS (GN 2011). The maximum hourly recorded concentration was 4% of the NAAQS 1-hour standard, 2% of the NAAQS for 24-hours and 1% of the NAAQS annual standard. Negative values reflect the level of zero air noise in the analyzer and remained consistent between calibrations once the internal pump was replaced and the system stabilized. The SO<sub>2</sub> concentrations were highest in the winter and lowest in the summer months (Figure 2.3).

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**Table 2.3 Hourly Summary SO<sub>2</sub> Concentrations for PSC Ambient Air Quality Monitoring Station (ppb)**

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean	0.90	1.45	0.72	-0.37	-0.34	-0.25	-0.22	-0.02	0.04	-0.02	1.11	0.23	0.11
Median	0.80	0.90	0.55	-0.40	-0.40	-0.20	-0.20	-0.10	0.00	-0.10	0.20	0.10	-0.10
Mode	0.80	0.70	0.30	-0.50	-0.40	-0.20	-0.30	0.00	-0.10	-0.10	0.00	0.10	-0.10
Range	3.90	8.10	1.10	2.40	2.30	1.70	1.60	2.50	2.50	2.30	123.90	2.90	8.60
Minimum	-0.20	-0.80	0.30	-1.20	-1.30	-1.00	-1.00	-1.00	-1.00	-0.90	-0.80	-0.70	-1.30
Maximum	3.70	7.30	1.40	1.20	1.00	0.70	0.60	1.50	1.50	1.40	7.30	2.20	7.30
Count	93.00	591.00	6.00	264.00	710.00	691.00	707.00	711.00	690.00	710.00	668.00	707.00	6544.00
% Valid	12.50%	87.95%	0.81%	36.67%	95.43%	95.97%	95.03%	95.56%	95.83%	95.43%	92.78%	95.03%	74.70%

NOTE:

Nunavut Air Quality Standards: 1 hr 172 ppb, 24 hr 57 ppb, Annual 11 ppb.

The SO<sub>2</sub> concentrations were highest in the winter and lowest in the summer months (Figure 2.3) consistent with historical trends (RWDI 2015, 2018; Nunami Stantec 2021). The likely cause of the highest concentrations in winter may be the SO<sub>2</sub> emissions from diesel mine trucks operating in and near the MSC ambient air quality monitoring station. Signs should be posted near the PSC ambient air quality monitoring station to request that operators refrain from idling their diesel trucks.



Figure 2.3 PSC Hourly SO<sub>2</sub> Concentrations (ppb) by Month

### 2.2.2.2 Nitrogen Dioxide

The NO<sub>2</sub> data at the Milne Port PSC had 99.97% valid data for 2022 with a low of 93.61% for December due to intermittent power failures Dec. 11-13 (Table 2.4). The NO<sub>2</sub> concentrations were less than the hourly (213 ppb), 24-hour (106 ppb) or annual (32 ppb) NAAQS (GN 2011) with concentrations of 131.35 ppb, 58.2 ppb and 12.2 ppb, respectively (Figure 2.4). The NO<sub>2</sub> concentrations were greater than the 1-hour CAAQS<sup>3</sup> in <2% of the hourly averaged data (159 occurrences) ranging from 60.2 to 131.4 ppb; with the highest average hourly maximum occurring on February 22, 2022 (131.4 ppb). The CAAQS are being used for comparison purposes only in agreement with the CCME objective to “keep clean areas clean” and the most relevant NO<sub>2</sub> standard for comparison is the NAAQS. The annual CAAQS mean NO<sub>2</sub> concentration was 12.2 ppb which is 37% of the annual CAAQS arithmetic mean (32 ppb). The maximum recorded values may be attributed to vehicles or other diesel combustion equipment occasionally operating at locations near the ambient air quality monitoring stations.

Negative values present in the data reflect the level of zero air noise in the analyzer when the ambient gas concentrations are below the analyzer detection limits.

<sup>3</sup> Milne Port data based on 98th percentile of data values derived from 8170 valid data points each for SO<sub>2</sub> and NO<sub>2</sub><sup>3</sup>

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**Table 2.4 Hourly Summary of NO<sub>2</sub> Concentrations for PSC Ambient Air Quality Monitoring Station (ppb)**

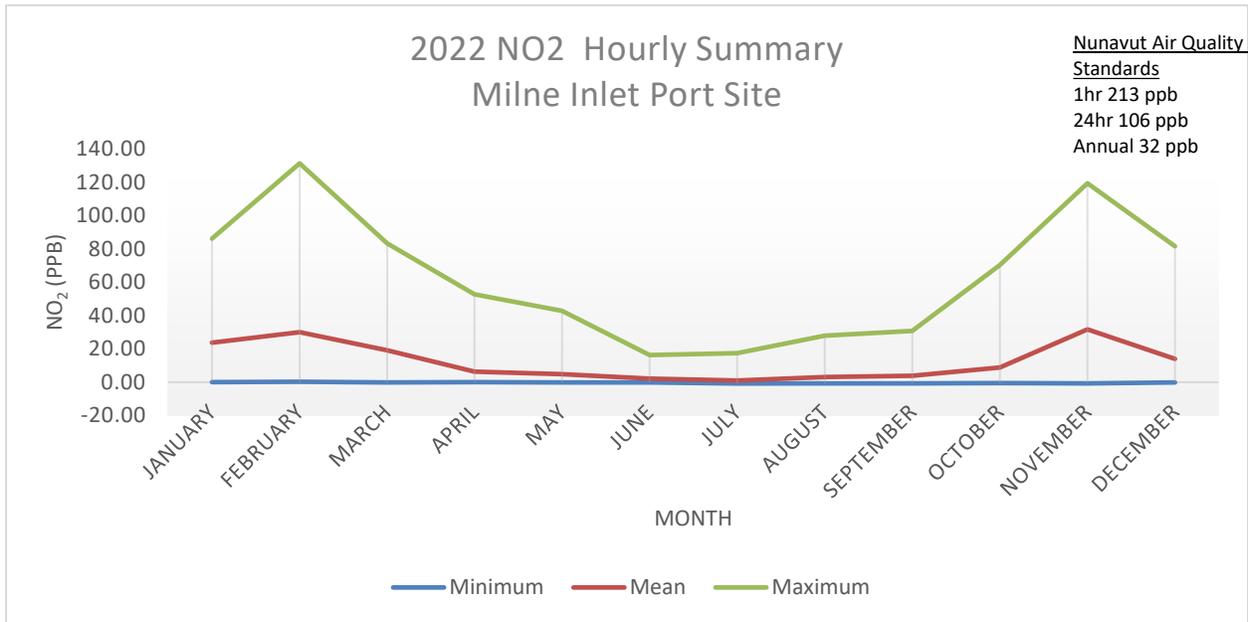
	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean	23.69	30.05	19.14	6.43	4.73	2.16	1.00	3.16	3.83	8.75	29.52	13.89	12.01
Median	0.70	0.80	0.70	0.34	0.25	0.10	0.11	0.18	0.20	0.40	1.37	0.65	5.70
Mode	22.91	30.39	14.58	2.97	1.88	1.21	-0.17	1.10	1.50	5.14	2.20	5.43	0.00
Range	3.82	35.53	0.09	0.24	0.12	0.24	-0.47	1.44	0.41	0.14	2.20	0.07	131.28
Minimum	0.13	0.26	-0.21	-0.01	-0.22	-0.13	-0.80	-0.69	-0.71	-0.57	-0.71	-0.16	0.00
Maximum	86.11	131.35	83.29	52.76	42.82	16.29	17.49	27.84	30.80	70.28	119.35	81.59	131.35
98 <sup>th</sup> Percentile	61.4	71.9	66.9	35.4	26.2	9.5	11.9	17.6	18.3	41.1	72.5	61.8	59.6
Count	707.00	638.00	711.00	686.00	710.00	691.00	706.00	711.00	690.00	712.00	674.00	708.00	8757.00
% Valid	95.03%	94.94%	95.56%	95.28%	95.43%	95.97%	94.89%	95.56%	95.83%	95.70%	93.61%	95.16%	99.97%

**NOTES:**

In the column for the annual values the lowest minimum and highest maximum monthly values are shown.

Nunavut Air Quality Standards: 1 hr 213 ppb, 24 hr 106ppb, Annual 32 ppb

The NO<sub>2</sub> concentrations were highest in the winter and lowest in the summer months (Figure 2.4), consistent with historical trends (RWDI 2015, 2017, 2018, Nunami Stantec, 2021, 2022). The likely cause of the highest concentrations in winter may be the NO<sub>2</sub> emissions from diesel mine trucks occasionally operating at locations near the PSC ambient air quality monitoring station. Signs should be posted near the PSC ambient air quality monitoring station to request that operators refrain from idling their diesel trucks.



**Figure 2.4 PSC Hourly NO<sub>2</sub> Concentrations (ppb) by Month**

**2.2.3 Quality Assurance and Quality Control**

From August 20-26, 2021, a site visit by Nunami Stantec Limited was conducted. The scope of work for the site visit included trouble shooting and calibrating the NO<sub>x</sub>/SO<sub>2</sub> analyzers, including monitor annual maintenance, chamber extraction and cleaning, as well as filter and component replacements. Permeation tubes for the SO<sub>2</sub> meters were replaced in early 2022 when the new internal pumps were installed. After pump and perm tube replacement, the meters were calibrated and brought back online to resume data collection.

A training session was conducted in 2021 and 2022 with the on-site technicians, which included weekly and monthly equipment maintenance best practices and a review of the manufacturer-recommended component replacement intervals.

Table 2.5 summarizes the maintenance and calibration activities that were completed for the gas analyzers during November 2022.

**Table 2.5 November 2022 Gas Analyzer Calibration and Maintenance Summary**

Continuous Ambient Air Quality Monitoring Station	Calibration and Maintenance Completed	Maintenance not Completed and Requiring Additional Work
<p><b>MSC</b>                      Teledyne T100 analyzer for SO<sub>2</sub>                      Teledyne T200 analyzer for NO/NO<sub>2</sub>/NO<sub>x</sub></p>	<ul style="list-style-type: none"> <li>• Rebuilt reaction chamber for T100 and T200</li> <li>• Replaced internal filters for T100 and T200</li> <li>• Replaced sintered filters and flow orifices for T100 and T200</li> <li>• Conducted pre-burn calibration on T100, T200</li> <li>• Conducted follow-up calibration check after 5-7 day “burn in”</li> </ul>	<ul style="list-style-type: none"> <li>• If vacuum reaches 10 inches of mercury_ then rebuild pump for T200</li> </ul>
<p><b>PSC</b>                      Teledyne T100 analyzer for SO<sub>2</sub>                      Teledyne T200 analyzer for NO/NO<sub>2</sub>/NO<sub>x</sub></p>	<ul style="list-style-type: none"> <li>• Rebuilt reaction chamber for T100 and T200</li> <li>• Replaced internal filters for T100 and T200.</li> <li>• Replaced Sintered Filters and flow orifices for T100 and T200.</li> <li>• Conducted pre-burn calibration on T100, T200.</li> <li>• Conducted follow-up calibration check after 5-7 day “burn-in”</li> <li>• Installed back-up Perm-Tube in T200</li> </ul>	<ul style="list-style-type: none"> <li>• If vacuum reaches 10 inches of mercury_ then rebuild pump for T100.</li> </ul>

**2.2.3.1 Permeation (Span) and Zero Daily Quality Assurance**

Perm tubes coupled with zero span daily checks are used to assess if a gas analyzer has a failure during the previous 23-hour cycle. If the daily level changes significantly over the observed daily trend (sudden spikes or dips), then technicians conduct an on-site calibration check of the analyzer in question to ensure that the unit is operating within the calibration validation limits (<15% of previous months calibration values, <6% analyzer operational limits). Once the checks are completed, the analyzer data are validated, and ongoing perm/zero checks are monitored for changes.

**2.2.3.2 Sulphur Dioxide**

**2.2.3.3 MSC**

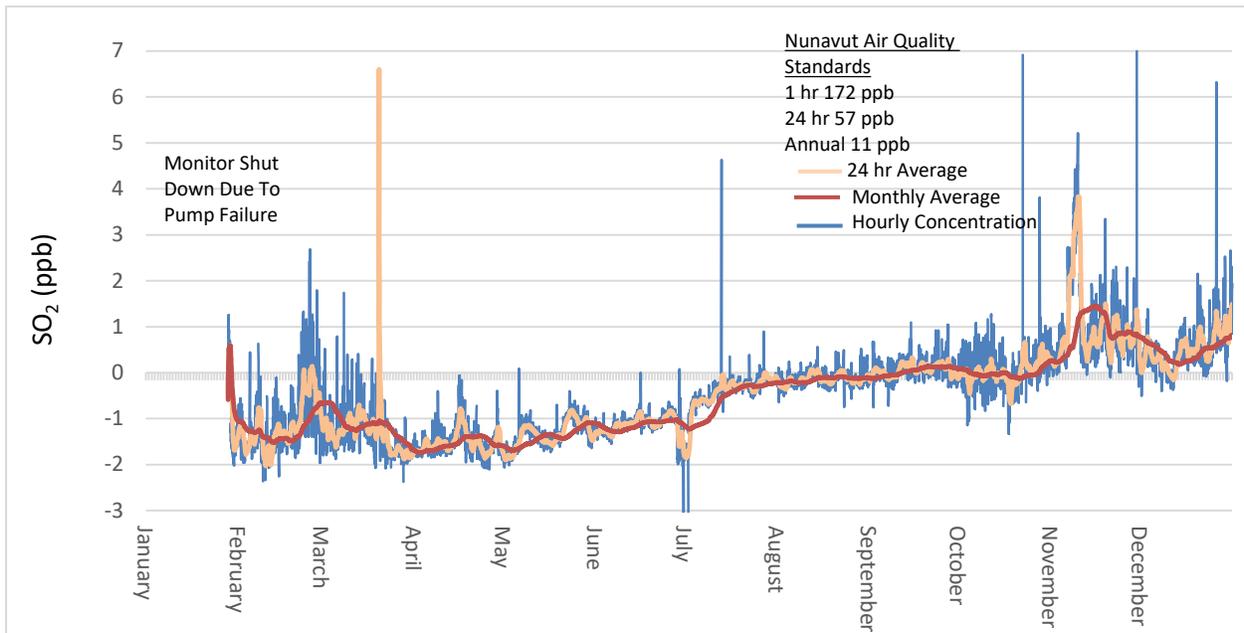
The SO<sub>2</sub> concentrations remained very low throughout 2022 and did not exceed the hourly (172 ppb), 24-hour (57 ppb) or annual (11 ppb) NAAQS (GN 2011) during the period of active operation (Figure 2.5). Negative values present in the data, between February and August, indicate background noise in the system typical for ambient levels with zero detectable concentrations. The excessive noise observed in March and April was due to the new pump installation and required re-calibrations (Figure 2.5).

Zero and span data were showed a consistent equipment response (Figure 2.6). Data were verified monthly during calibration cycles. The Monitor was shut down in January due to an internal pump failure, which is reflected in the loss of data and trends for January 2022 (Figure 2.5).

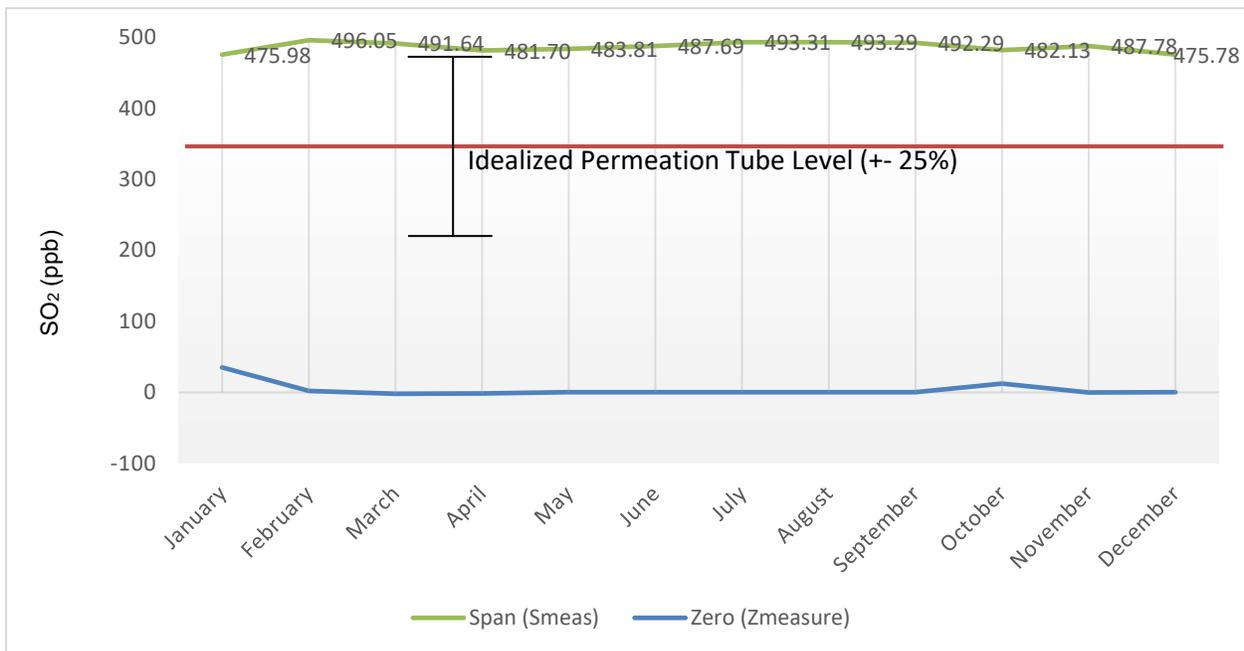
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**Figure 2.5 MSC Hourly SO<sub>2</sub> Concentrations with 24-hour and Monthly Average Trends**



**Figure 2.6 MSC Hourly SO<sub>2</sub> Annual Permeation Tube Span and Zero Data**

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### 2.2.3.4 PSC

The SO<sub>2</sub> concentrations remained very low throughout 2022 and did not exceed the hourly (172 ppb), 24-hour (57 ppb) or annual (11 ppb) NAAQS (GN 2011) during the period of active operation (Figure 2.7). Negative values present in the data, mostly during the summer months, indicate background noise in the system typical for ambient levels with zero detectable concentrations. The excessive noise observed in February and March was due to the new pump installation and was corrected after re-calibrations (Figure 2.7).

Zero and Span data was good with consistent equipment response (Figure 2.6). Data was verified monthly during calibration cycles. The monitor was shut down in January due to an internal pump failure, which is reflected in the loss of data and trends for January 2022 (Figure 2.5).

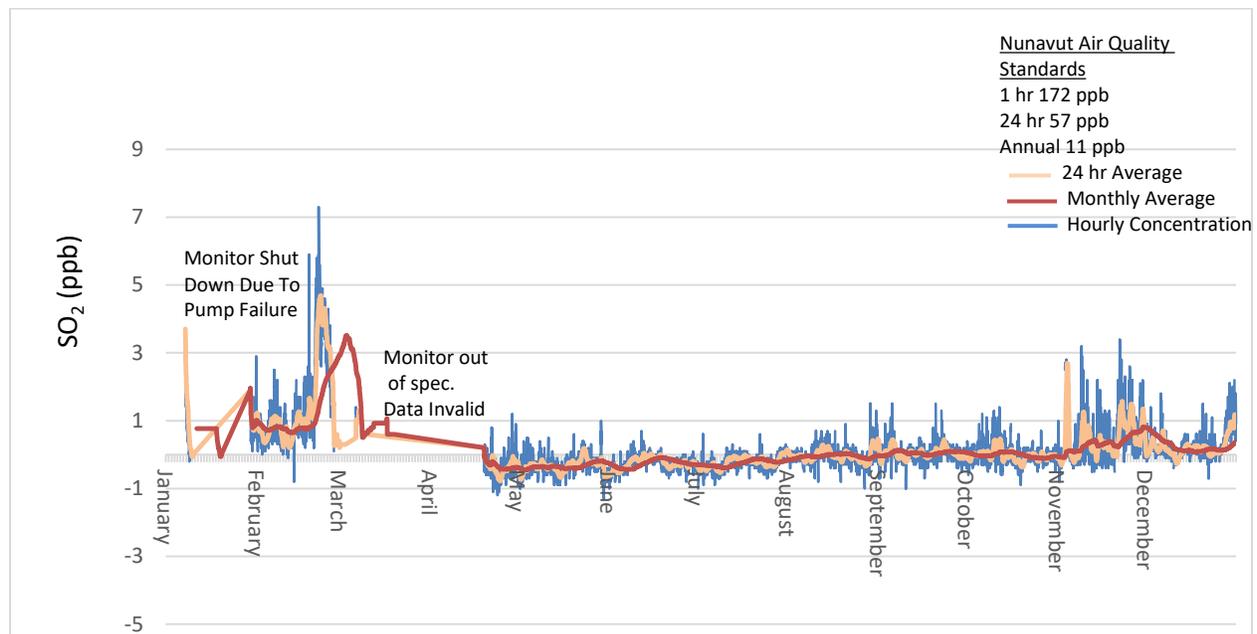
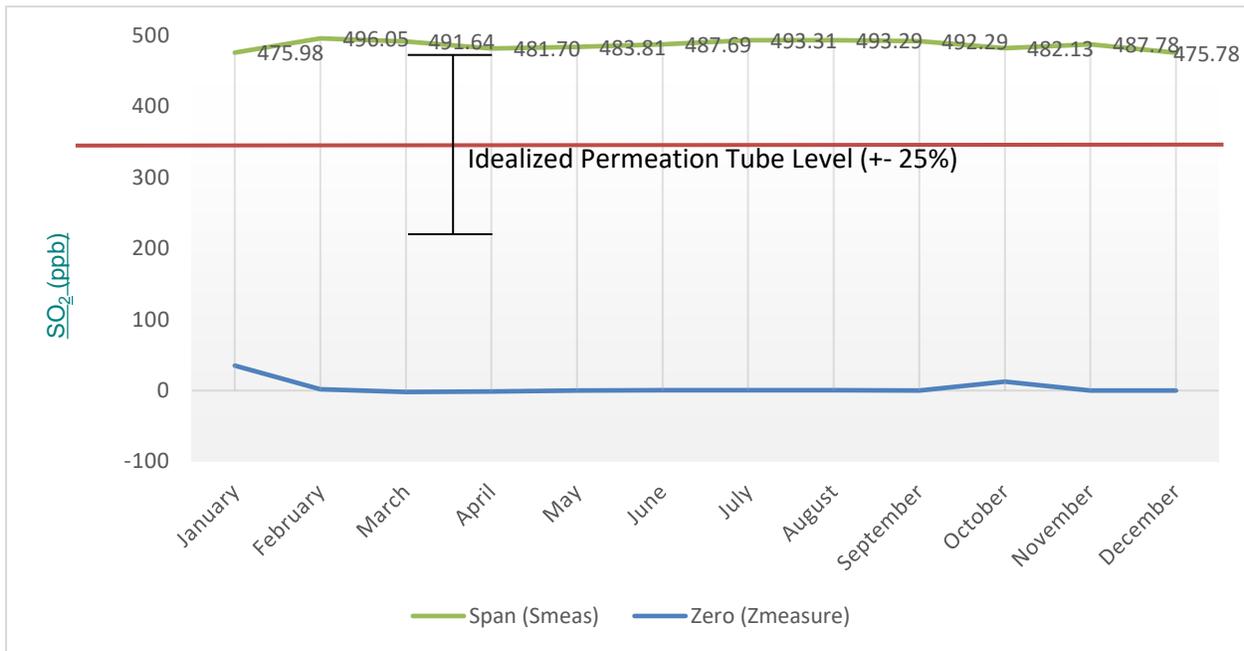


Figure 2.7 PSC Hourly SO<sub>2</sub> Concentrations with 24-hour and Monthly Average Trends

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**Figure 2.8 PSC SO<sub>2</sub> Permeation Tube Data Span/Zero**

**2.2.3.5 Nitrogen Dioxide**

**2.2.3.6 MSC**

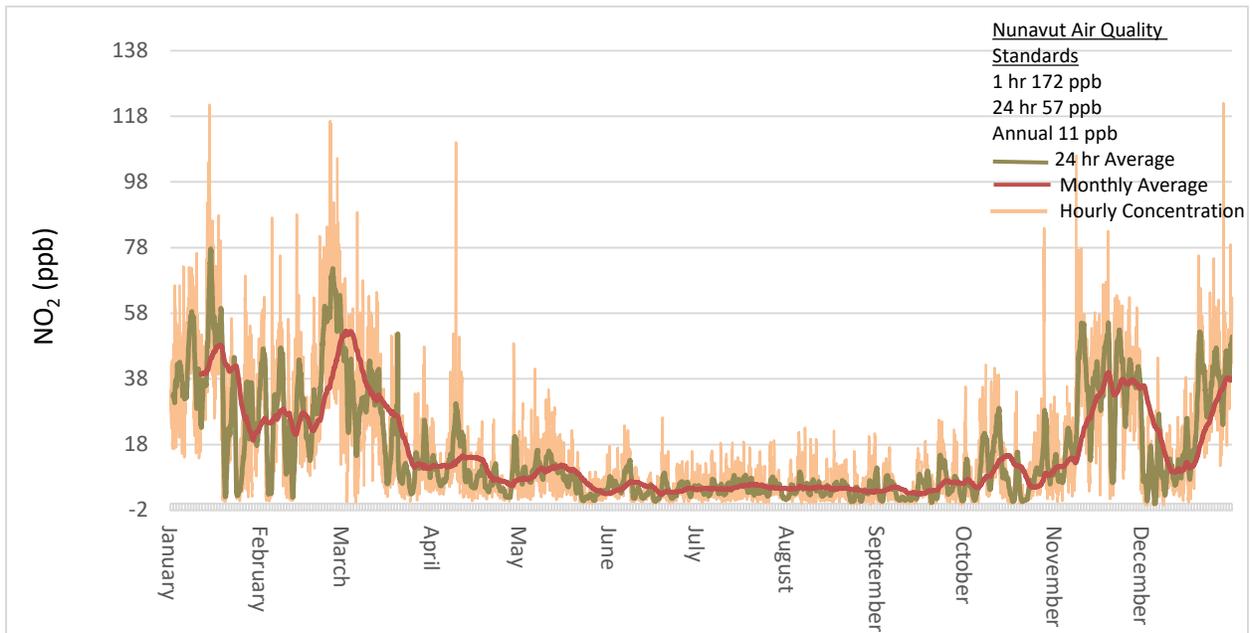
The NO<sub>2</sub> concentrations trend higher during the winter months and fall during the summer months (Figure 2.9), which is consistent with historical trends (RWDI 2016, 2018; Nunami Stantec 2021, 2022). The monitor up-time was excellent, recording 8,273 valid points out of a possible 8,760.

The perm span values remained consistent, through 2022, indicating good meter response during the daily checks. The monthly calibration cycles and daily perm span diagnostics confirm accurate diagnostic checks and verify data validity (Figure 2.10).

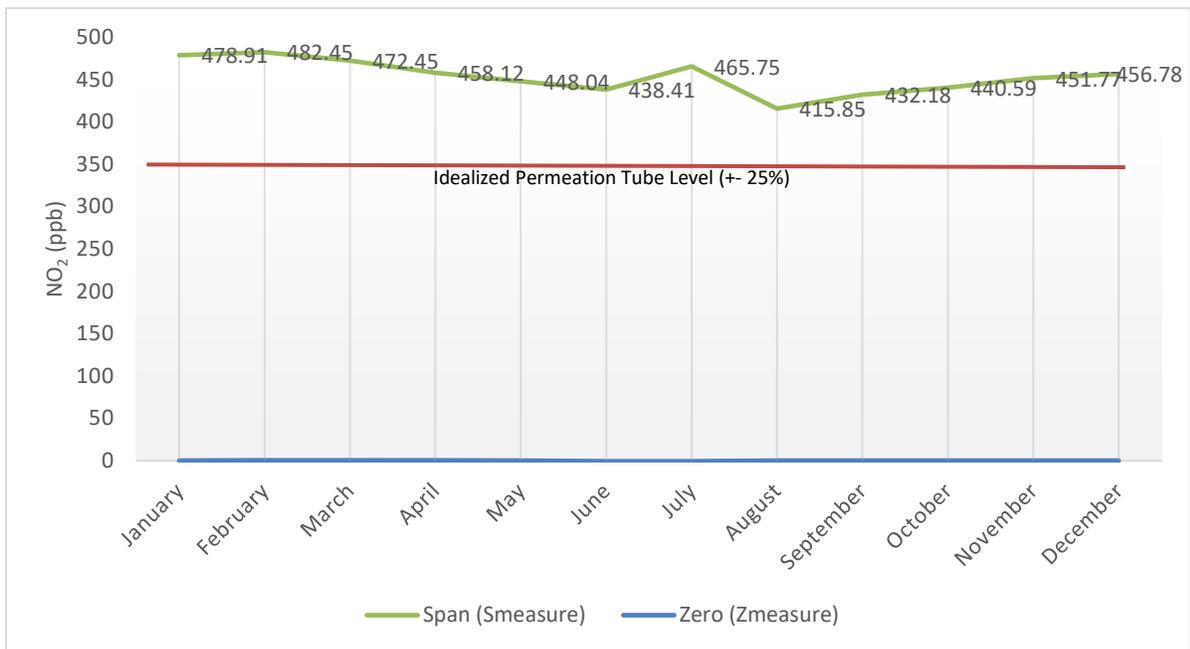
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**Figure 2.9 MSC Hourly NO<sub>2</sub> Concentrations with 24-hour and Monthly Average Trends**

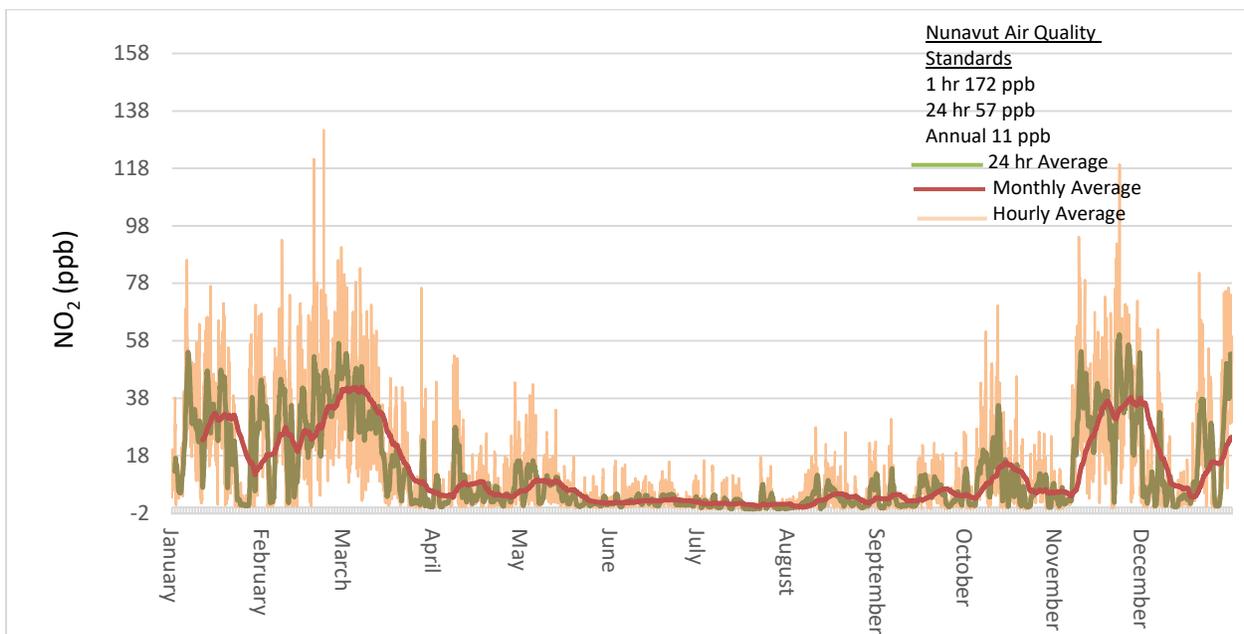


**Figure 2.10 MSC NO<sub>2</sub> Annual Permeation Tube Data Span/Zero**

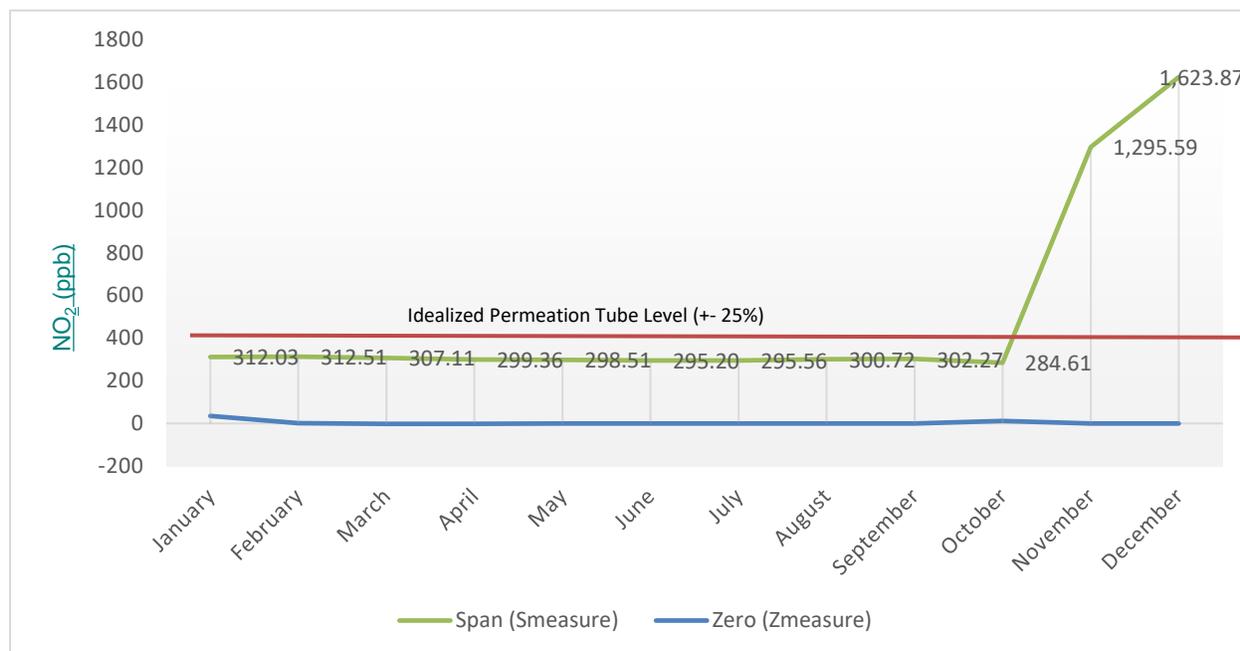
**2.2.3.7 PSC**

The NO<sub>2</sub> concentrations were highest in the winter and lowest in the summer months (Figure 2.11), consistent with historical trends (RWDI 2015, 2017, 2018, Nunami Stantec, 2021). The monitor up-time was excellent, recording 8,757 points resulting in a 99% rate for data capture.

The NO<sub>2</sub> span values remained consistent over 2022 with no noted spikes or data anomalies from permeation gas latency or extinction in the system. Due to the low permeation values; the perm tube was replaced in November, 2022. The new perm tube range is very high and may be set for a 1,000 ppb range system. (Figure 2.12). Since the monitor range is set at 500 ppb instead of 1000; a new permeation tube with a 400 ppb range should be ordered and installed to reflect 80% of the range of the monitor.



**Figure 2.11 PSC Hourly NO<sub>2</sub> Concentrations with 24 hour and Monthly Average Trends**



**Figure 2.12 PSC NO<sub>2</sub> Annual Permeation Tube Data Span/Zero (red horizontal line indicates the average new manufactured perm tube level ± 25%)**

## 2.3 TSP and PM<sub>2.5</sub> Results and Discussion

Particulate matter monitoring results for 2022 (TSP and PM<sub>2.5</sub>) are presented below separately for the MSC and PSC monitoring locations, following a discussion of quality assurance and quality control.

### 2.3.1 Quality Assurance and Quality Control

From November 2 to 12, 2022, a site visit by Nunami Stantec Limited was conducted. The scope of work for the site visit included trouble shooting and calibrating the PM<sub>2.5</sub> and TSP analyzers, including meter annual maintenance, head (inlet) removal and cleaning, as well as filter and component replacements.

A training session was conducted with the on-site technicians, which included weekly and monthly equipment maintenance best practices and a review of the manufacturer-recommended component replacement intervals (Met-One 2020).

Table 2.6 summarizes the maintenance and calibration activities that were completed for the BAM units during November 2022.

**Table 2.6 November 2022 Beta Attenuation Monitor Calibration and Maintenance Summary**

Continuous Ambient Air Quality Monitoring Station	Calibration and Maintenance Completed	Maintenance not Completed and Requiring Additional Work
<b>MSC</b> BAM – PM <sub>2.5</sub> BAM – TSP	<ul style="list-style-type: none"> <li>• Replaced internal filters for PM<sub>2.5</sub> and TSP</li> <li>• Checked and verified flow path</li> <li>• Checked and verified internal sensors (RH, Temp, Pressure)</li> <li>• Conducted Calibrations and Training on PM<sub>2.5</sub> and TSP</li> <li>• Removed and cleaned PM<sub>2.5</sub> Head and inlet tube</li> </ul>	
<b>PSC</b> BAM – PM <sub>2.5</sub> BAM – TSP	<ul style="list-style-type: none"> <li>• Replaced internal filters for PM<sub>2.5</sub> and TSP</li> <li>• Checked and verified flow path</li> <li>• Checked and verified internal sensors (RH, Temp, Pressure)</li> <li>• Conducted Calibrations and Training on PM<sub>2.5</sub> and TSP</li> <li>• Removed and cleaned PM<sub>2.5</sub> Head and inlet tube</li> <li>• PM<sub>2.5</sub> flow failure – replaced Flow controller with backup from MSC</li> </ul>	<ul style="list-style-type: none"> <li>• Replace flow controller with new unit once it arrives on-site</li> </ul>

## 2.3.2 Total Suspended Particulates (TSP)

### 2.3.2.1 MSC

The BAM TSP data at the MSC ambient air quality monitoring station had 63.14% valid data for 2022. Data were not available during January to April due to delayed monitor set-up and configuration in the ambient air quality monitoring station (Table 2.7). The BAM monitor began active recording TSP data on April 26, 2022. The hourly TSP concentrations ranged from 0 to 1,900 µg/m<sup>3</sup> (Figure 2.13). The TSP monitor successfully recorded 250 days of data in 2022. Eighty-two events (32.8%) exceeded the project standard TSP 24-hour concentration (120 µg/m<sup>3</sup>). May and June had the highest number of occurrences (46) with 24-hour average TSP concentrations ranging from 127 µg/m<sup>3</sup> to 600 µg/m<sup>3</sup>. The remaining events were distributed between July to October 2022 ranging from 124 µg/m<sup>3</sup> to 411 µg/m<sup>3</sup>. The project standards for ambient air quality are applicable to areas along the PDA boundary and outwards. The BAM TSP monitor at the MSC is located inside the PDA boundary and is therefore not in a location to determine compliance with the project standards. The comparison of these MSC TSP monitoring results (inside the PDA boundary) to the project standards is being done to guide management actions for the protection of ambient air quality. The ambient air quality within the PDA boundary is managed using occupational (workplace) air quality standards that are different than the Nunavut Ambient Air Quality Standards that were the basis for developing the project standards.

The highest levels were hourly spikes and may be associated with wind causing the inlet tubes to vibrate on the roof top inlets or direct operation and maintenance interactions with the analyzer (Figure 2.13). The TSP concentrations were highest in the spring after initial monitor setup and may be associated with initial instrument commissioning and the associated particulate disturbances while working with the monitor and inlet tubes. Exceedances observed throughout the year may be associated with activities

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near the ambient air quality monitoring station, crusher activity, a prolonged dry period or wind events. The TSP concentrations were lower in July and August and rose again in September before falling sharply in November and remaining low through December (Figure 2.14).

The measured TSP concentrations exceeded the project standard annual average concentration ( $60 \mu\text{g}/\text{m}^3$ ) for the available period of record, in which the average TSP concentration was  $116.91 \mu\text{g}/\text{m}^3$ . The project standards for ambient air quality are applicable to areas along the PDA boundary and outwards. The BAM TSP monitor at the MSC is located inside the PDA boundary and is therefore not in a location to determine compliance with the project standards. Controls should be implemented to limit the amount of dust that escapes during the ore crushing and transportation activities at the mine site.

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**Table 2.7 Hourly Summary TSP Concentrations for MSC Ambient Air Quality Monitoring Station ( $\mu\text{g}/\text{m}^3$ )**

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean				149.37	299.06	157.74	49.59	95.63	124.07	160.91	30.61	22.77	116.91
Median				72.60	213.80	71.90	9.65	37.80	45.90	74.25	30.79	19.50	38.08
Mode				133.30	286.80	6.40	6.50	6.00	16.10	8.60	4.80	N/A	6.60
Range				970.00	1893.20	1399.10	1187.20	1383.10	1478.00	1594.50	465.30	122.50	1896.50
Minimum				1.00	1.50	0.50	1.00	-1.80	1.00	1.30	1.00	-0.50	-1.80
Maximum				971.00	1894.70	1399.60	1188.20	1381.30	1479.00	1595.80	466.30	122.00	1894.70
Count				80.00	733.00	625.00	726.00	741.00	646.00	574.00	699.00	707.00	5531.00
% Valid	0.00%	0.00%	0.00%	11.11%	98.52%	86.81%	97.58%	99.60%	89.72%	77.15%	97.08%	95.03%	63.14%

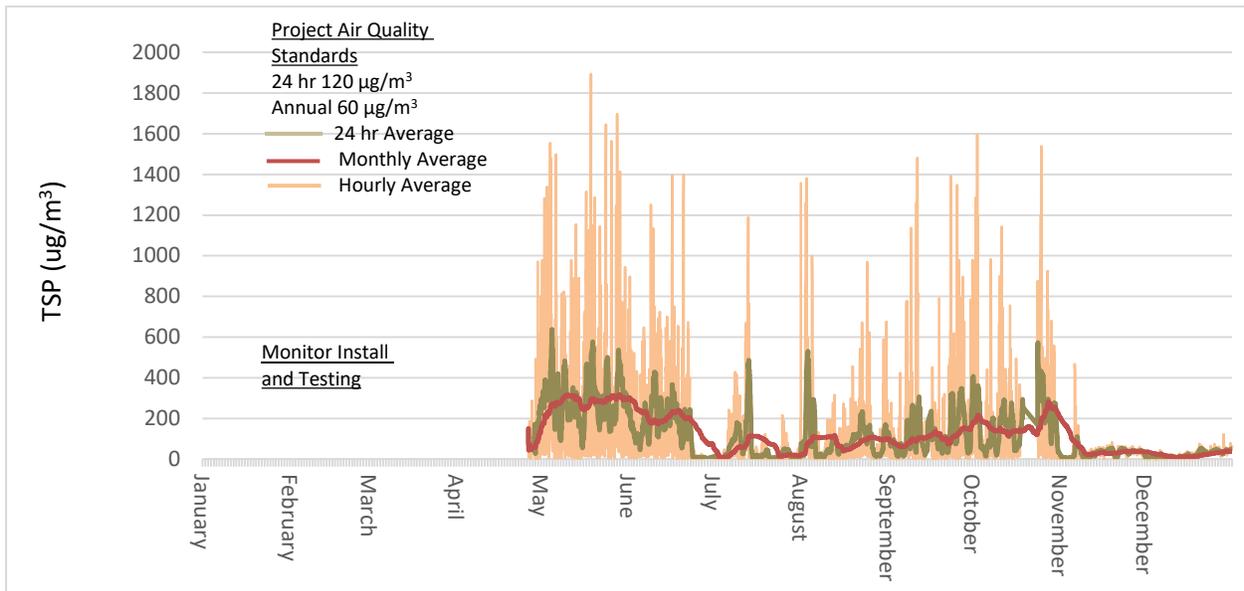
**NOTE:**

In the column for the annual values the lowest minimum and highest maximum monthly values are shown.

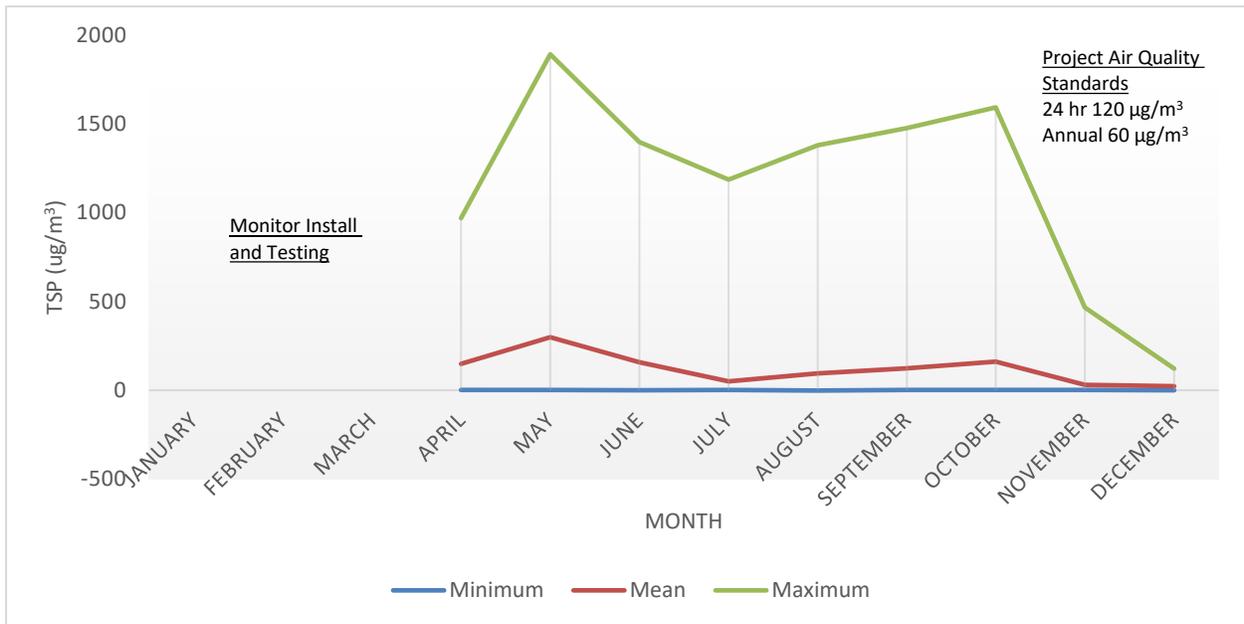
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**Figure 2.13 MSC Hourly TSP Concentrations with 24 hour and Monthly Average Trends**



**Figure 2.14 MSC TSP Concentrations ( $\mu\text{g}/\text{m}^3$ ) by Month**

### **2.3.2.2 PSC**

The BAM TSP data at the PSC ambient air quality monitoring station had 67.53% valid data for 2022. Data was not available from January to April due to monitor set-up and configuration in the ambient air quality monitoring station (Table 2.8). For the available period of record, the hourly TSP concentration ranged from 0 to 1,500  $\mu\text{g}/\text{m}^3$  (Figure 2.15). Eleven 24-hour average concentrations exceeded the 24-hour project standard (120  $\mu\text{g}/\text{m}^3$ ) with averages ranging from 130 to 309  $\mu\text{g}/\text{m}^3$ . Seven of the exceedance events occurred between May 3 and 13, and two of events occurred in October (October 1 and 12, 2022). The dominant winds during the May 3 and 13 exceedance events were from the southerly direction, therefore it was likely caused by fugitive dust liberated from snow melt on the roof and areas adjacent to the monitor inlets and from light vehicle and heavy equipment traffic on the site roads. The dominant winds during the October 1 and 12 exceedance events were from the southerly direction, therefore it was likely caused by fugitive dust from light vehicles and heavy equipment traffic on the site roads. The data also indicates one exceedance in July (130.3  $\mu\text{g}/\text{m}^3$ ) and one in September (280.96  $\mu\text{g}/\text{m}^3$ ). The TSP concentrations did not exceed the annual project standard concentration (60  $\mu\text{g}/\text{m}^3$ ) for the available period of record (27.64  $\mu\text{g}/\text{m}^3$ ).

The TSP concentrations were highest in the summer months, falling sharply in November and remaining low through December (Figure 2.16). The observed higher dust levels in the summer may be due to prolonged dry periods when there is no snow cover to prevent the generation of airborne dust. Dust concentrations fall off once a snowpack has accumulated over the tundra and on the roadbeds which mitigates traffic and wind borne dust effects.

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**Table 2.8 Hourly Summary TSP Concentrations for PSC Ambient Air Quality Monitoring Station ( $\mu\text{g}/\text{m}^3$ )**

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean				26.78	77.66	8.08	32.18	30.27	26.47	27.50	11.79	8.01	27.64
Median				10.00	12.15	5.30	12.35	10.45	4.70	6.85	7.00	5.80	7.40
Mode				3.20	5.40	4.70	6.50	5.90	1.80	3.40	6.70	5.20	4.50
Range				346.10	1563.70	100.50	842.30	1160.90	1602.20	714.10	177.80	89.40	1602.30
Minimum				-0.40	-0.80	-3.00	-1.50	-1.90	-2.90	-2.50	-1.80	-1.70	-3.00
Maximum				345.70	1562.90	97.50	840.80	1159.00	1599.30	711.60	176.00	87.70	1562.90
Count				307.00	734.00	621.00	740.00	738.00	708.00	742.00	661.00	665.00	5916.00
% Valid	0.00%	0.00%	0.00%	42.64%	98.66%	86.25%	99.46%	99.19%	98.33%	99.73%	91.81%	89.38%	67.53%

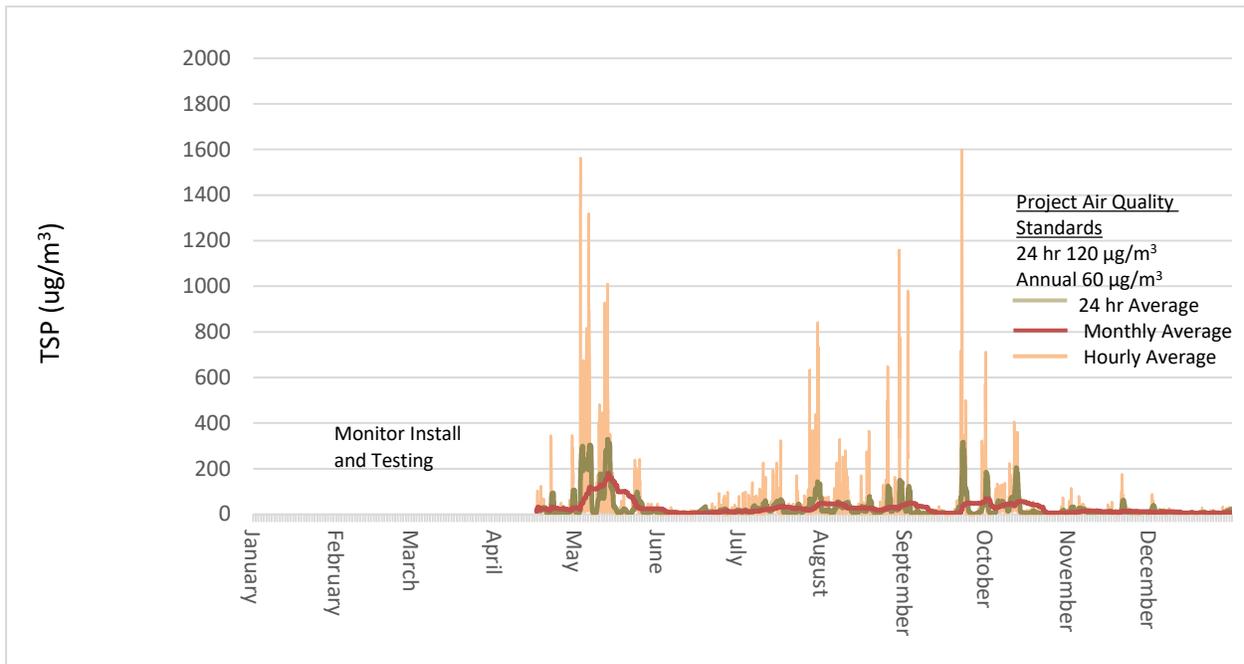
**NOTE:**

In the column for the annual values the lowest minimum and highest maximum monthly values are shown.

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**Figure 2.15 MSC Hourly TSP Concentrations with 24 hour and Monthly Average Trends**



**Figure 2.16 PSC TSP Concentrations ( $\mu\text{g}/\text{m}^3$ ) by Month**

### **2.3.3 Respirable Particulates 2.5 µm in Diameter and Less (PM<sub>2.5</sub>)**

#### **2.3.3.1 MSC**

The BAM PM<sub>2.5</sub> data at the MSC ambient air quality monitoring station had 55.5% valid data for 2022 with 4,860 recorded hours. Data were not available during January to April due to monitor set-up and configuration in the ambient air quality monitoring station (Table 2.9). The BAM PM<sub>2.5</sub> monitor began active recording data on April 26, 2022. The hourly PM<sub>2.5</sub> concentrations ranged from 0 to 113 µg/m<sup>3</sup> (Figure 2.17). The monitor was shut down in May due to a flow error and was repaired, calibrated, and brought back online May 30, 2022. The monitor successfully recorded data for 218 days during 2022. During the recording period not all the days, noted above, contained a full 24 hours of uninterrupted data. A wind event in October caused excess material to bridge the PM<sub>2.5</sub> sampling head, resulting in invalid data. Due to the wind event, more frequent cleaning and maintenance of the inlet tube and sampler inlet has been implemented. During 2022 there were no exceedances recorded for the measured 24-hour PM<sub>2.5</sub> concentrations for the project standard (30 µg/m<sup>3</sup>).

The measured PM<sub>2.5</sub> concentrations were highest in the spring and were lower in July and August. The measured PM<sub>2.5</sub> concentrations rose again in September before falling in November and remaining low through December (Figure 2.18). The measured PM<sub>2.5</sub> concentrations, for the available period or record (4.08 µg/m<sup>3</sup>), did not exceed the project standard annual average concentration (10 µg/m<sup>3</sup>).

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**Table 2.9 Hourly Summary PM<sub>2.5</sub> Concentrations for PSC Ambient Air Quality Monitoring Station (µg/m<sup>3</sup>)**

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean				13.79	8.94	6.58	3.26	1.41	1.94	9.19	4.51	0.99	4.08
Median				12.80	5.60	4.70	2.30	0.90	0.90	4.90	3.00	0.54	1.90
Mode					4.50	4.00	0.70	-0.30	1.40	4.90	1.30	2.20	0.50
Range				21.60	67.80	74.40	55.70	27.80	61.10	66.90	117.60	30.20	120.10
Minimum				6.00	-5.50	-4.40	-5.40	-5.20	-6.30	-5.00	-3.80	-2.50	-6.30
Maximum				27.60	62.30	70.00	50.30	22.60	54.80	61.90	113.80	27.70	113.80
Count				14.00	119.00	719.00	647.00	738.00	709.00	688.00	509.00	717.00	4860.00
% Valid	0.00%	0.00%	0.00%	1.94%	15.99%	99.86%	86.96%	99.19%	98.47%	92.47%	70.69%	96.37%	55.48%

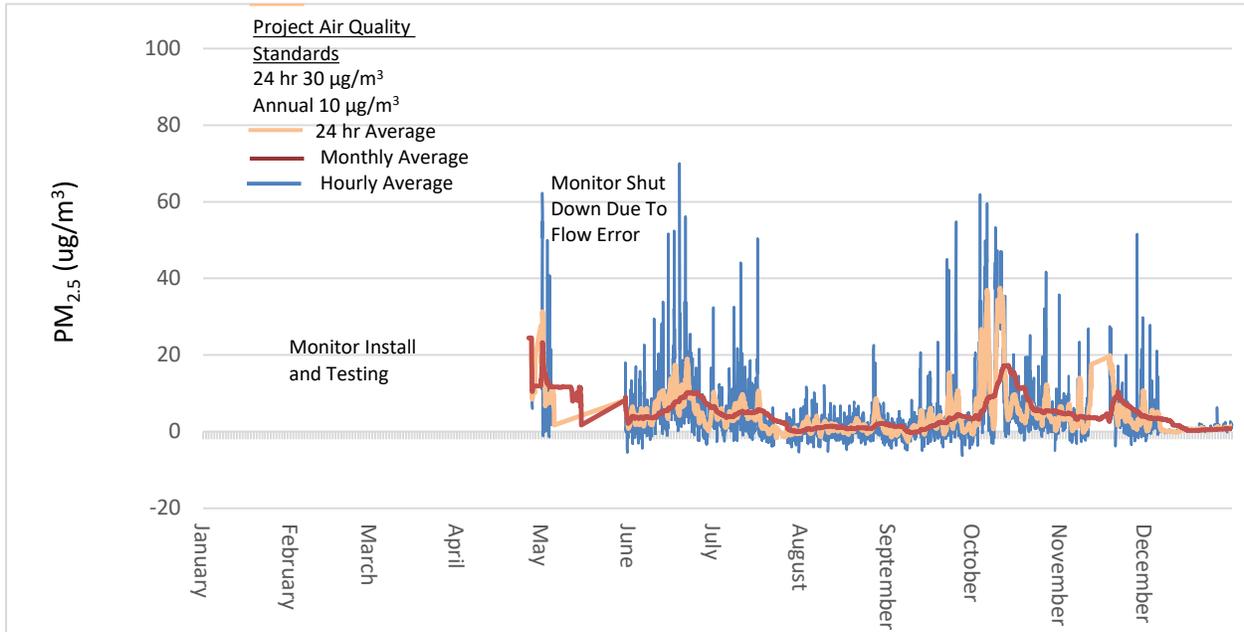
**NOTE:**

In the column for the annual values the lowest minimum and highest maximum monthly values are shown.

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**Figure 2.17 MSC Hourly PM<sub>2.5</sub> Concentrations with 24 hour and Monthly Average Trends**



**Figure 2.18 MSC PM<sub>2.5</sub> Concentrations (µg/m<sup>3</sup>) by Month**

### **2.3.3.2 PSC**

The BAM PM<sub>2.5</sub> data at the PSC ambient air quality monitoring station had 69.11% valid data for 2022 with 6,054 recorded hours. Data were not available during January to April due to monitor set-up and configuration in the ambient air quality monitoring station (Table 2.10). The BAM monitor began active recording of data on April 16, 2022. The hourly PM<sub>2.5</sub> concentrations ranged from 0 to 117.3 ug/m<sup>3</sup> (Figure 2.19). The BAM monitor successfully recorded 256 days of data in 2022. During the 2022 operational period one 24-hour average exceedance was observed on September 22, 2022 (24.20 ug/m<sup>3</sup>). The PM<sub>2.5</sub> exceedance coincides with the TSP exceedance on the same day.

The PM<sub>2.5</sub> concentrations were highest in the spring, then fell and remained relatively low through the remainder of the year, although there were some hourly spikes throughout the year for the 24-hour average (Figure 2.20). The average PM<sub>2.5</sub> concentration, for the available period of record (2.27 µg/m<sup>3</sup>), did not exceed the project standard (10 µg/m<sup>3</sup>).

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**Table 2.10 Hourly Summary PM<sub>2.5</sub> Concentrations for PSC Ambient Air Quality Monitoring Station (µg/m<sup>3</sup>)**

	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean				4.19	4.80	0.05	1.07	1.71	2.58	2.37	2.15	2.49	2.27
Median				3.70	2.50	0.00	0.90	1.40	1.60	1.50	2.10	2.10	1.60
Mode				3.20	2.30	0.10	0.00	1.60	1.00	0.80	2.40	1.80	0.80
Range				21.40	79.70	10.70	25.80	68.40	121.70	52.80	15.10	20.70	122.50
Minimum				-1.00	-3.40	-5.20	-4.50	-4.30	-4.40	-3.10	-3.20	-2.80	-5.20
Maximum				20.40	76.30	5.50	21.30	64.10	117.30	49.70	11.90	17.90	117.30
Count				343.00	736.00	717.00	741.00	737.00	715.00	742.00	687.00	636.00	6054.00
% Valid	0.00%	0.00%	0.00%	47.64%	98.92%	99.58%	99.60%	99.06%	99.31%	99.73%	95.42%	85.48%	69.11%

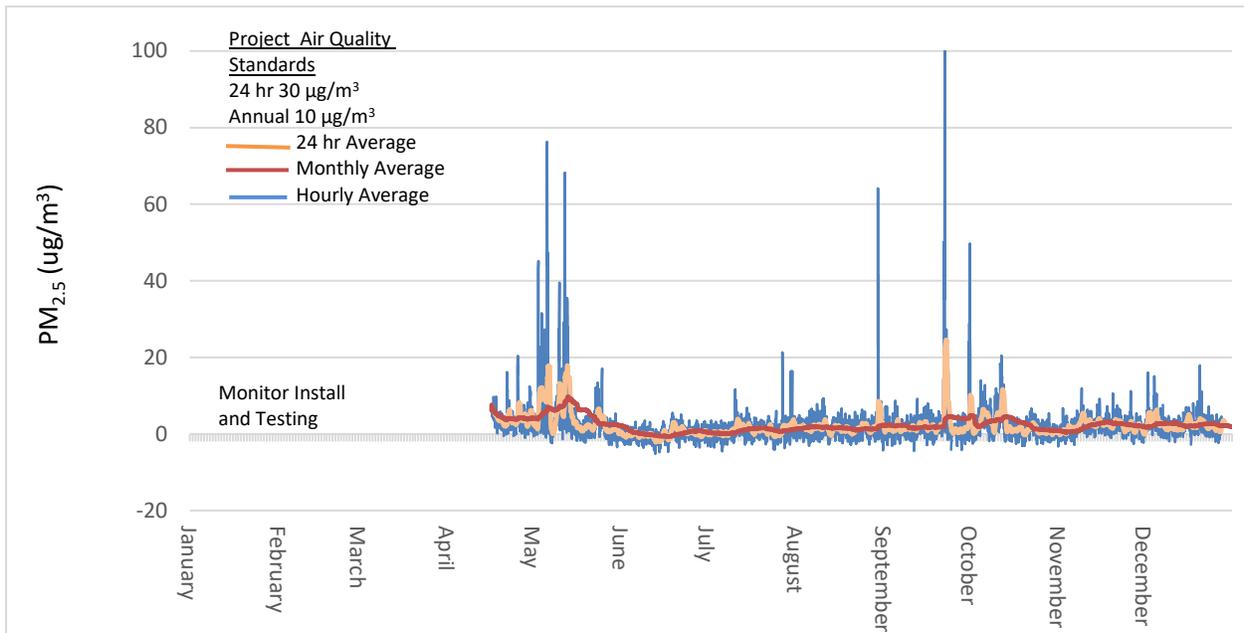
**NOTE:**

In the column for the annual values the lowest minimum and highest maximum monthly values are shown.

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**Figure 2.19 PSC Hourly PM<sub>2.5</sub> Concentrations with 24 hour and Monthly Average Trends**



**Figure 2.20 PSC PM<sub>2.5</sub> Concentrations (µg/m<sup>3</sup>) by Month**

# 3 Meteorology

The Mary River, Milne Port, and Steensby meteorology stations are equipped to collect a suite of measurements, which are summarized in Table 3.1. Additionally, the measurements provided at the Pond Inlet Airport Climate Station are also summarized. In general, each station provides measurements of ambient temperature, relative humidity, rain precipitation, and wind speed/direction.

The meteorology stations at Mary River, Milne Port, and Steensby also record measurements of solar radiation. Although the climate station at the Pond Inlet Airport does not collect solar radiation data, the three (3) meteorology stations at the Project can be compared to each other. The data collected from the meteorological stations are used to establish an ongoing climatic record in key project areas.

**Table 3.1 Summary of Data Collected at Each Baffinland Meteorology Station and the Pond Inlet Airport Climate Station in 2022**

Station	Temperature	Relative Humidity	Rainfall Precipitation	Solar Radiation	Wind Speed/Wind Direction
Mary River Meteorology Station	✓	✓	✓	✓	✓
Milne Port Meteorology Station	✓	✓	✓	✓	✓
Steensby Meteorology Station	✓	✓	✓	✓	✓
Pond Inlet Airport Climate Station	✓	✓	✓		✓

## 3.1 Methods

The three meteorology stations at the Project are each equipped with a datalogger and several sensors, which are consistent across the three sites as indicated in Table 3.1. Until 2020, Campbell Scientific Canada provided annual meteorology station maintenance services. These services are now provided by Nunami Stantec. A summary of the probes currently installed at each site is provided in Table 3.2.

Each meteorology station is equipped with an enclosure that stores the datalogger, charger, and communications hardware. The enclosure is sealed after maintenance and contains a desiccant to prevent the buildup of moisture. The datalogger receives input from the sensors, which are stored and synched with offsite data storage via Iridium satellite communications (Campbell Scientific Canada 2015).

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**Table 3.2 Summary of Data Collection Equipment at Each Baffinland Meteorology Station**

Station	Sensors	Datalogger	Communications
Mary River Meteorology Station	HC2-S3-XT Rotronics Temp and Relative Humidity Probe	CR 1000-55	9522B Iridium Satellite Modem
	05103 RM Young Wind Monitor		COM9522B Satellite Modem Interface
	SP Lite2 Kipp & Zonen Solar Radiation Sensor		SC932A CS I/O Interface
	SBS 500 Tipping Bucket Rain Gauge		
Milne Port Meteorology Station	HC2-S3-XT Rotronics Temp and Relative Humidity Probe	CR 1000-55	9522B Iridium Satellite Modem
	05108 RM Young Wind Monitor		COM9522B Satellite Modem Interface
	SP Lite2 Kipp & Zonen Solar Radiation Sensor		SC932A CS I/O Interface
	SBS 500 Tipping Bucket Rain Gauge		
Steensby Meteorology Station	HC2-S3-XT Rotronics Temp and Relative Humidity Probe	CR 1000-55	9522B Iridium Satellite Modem
	05108 RM Young Wind Monitor		COM9522B Satellite Modem Interface
	SP Lite2 Kipp & Zonen Solar Radiation Sensor		SC932A CS I/O Interface
	SBS 500 Tipping Bucket Rain Gauge		

The gathered data were post processed to provide monthly averages for 2022. These datasets were then compared to the Canada Climate Normals, which are a set of monthly averages taken across a 30-year span beginning in 1981 and ending in 2010. This comparison provides context for year-over-year trends when compared to the 2022 dataset.

Additionally, ECCC provides guidance on data gathering and completeness for each type of data monitored. Data that do not adhere to the completeness standards can still be reported but will receive a code indicating that they are incomplete. In general, data with code A adhere to the listed completeness criteria, data with code B contain at least 25 years (83% of the 30-year Climate Normal data requirement), data with code C contain at least 20 years (67% of the 30-year Climate Normal data requirement), and data with code D contain at least 15 years (50% of the 30-year Climate Normal data requirement). For reference, the Climate Normals for Pond Inlet Airport are predominantly code C. Data that do not adhere to code A are noted in the tabulated results (ECCC 2020).

### 3.1.1 Quality Assurance and Quality Control

Table 3.3 summarizes the annual 2022 maintenance work completed for the three Baffinland meteorological stations and the tasks that could not be completed due to the lack of some specific items at site and require additional work.

**Table 3.3 Summary of the 2022 Annual Maintenance Completed for the Meteorological Stations**

<b>Meteorology Station</b>	<b>Maintenance Completed</b>	<b>Maintenance Not Completed and Requiring Additional Work</b>
Mary River	<ul style="list-style-type: none"> <li>Mary River meteorology station tipping bucket rain gauge (TBRG) mechanism was cleaned, the sensor cables and power supply system were checked. Loose connections were tightened for the solar panels. Bolts were tightened on the 10 m aluminum tower.</li> </ul>	<ul style="list-style-type: none"> <li>Potential installation of a wind screen around the tipping bucket rain gauges, to increase accuracy.</li> </ul>
Milne Port	<ul style="list-style-type: none"> <li>Milne Port meteorology station TBRG mechanism was cleaned, the sensor cables and power supply system were checked. No equipment problems were discovered.</li> </ul>	<ul style="list-style-type: none"> <li>Potential installation of a wind screen around the tipping bucket rain gauges, to increase accuracy.</li> </ul>
Steensby	<ul style="list-style-type: none"> <li>Steensby meteorology station maintenance included replacement of the TBRG, the cable for the wind sensor and a second solar panel was added. The brackets for the solar panels were reinforced. The TBRG had to be replaced because the funnel for the TBRG was destroyed.</li> </ul>	<ul style="list-style-type: none"> <li>Potential installation of a heated wind sensor.</li> <li>Potential installation of a doppler radar precipitation sensor.</li> <li>Potential installation of a wind screen around the tipping bucket rain gauges, to increase accuracy.</li> </ul>

## 3.2 Results and Discussion

The meteorology stations are situated in the Northern Arctic Ecozone. The climate is semi-arid with relatively little precipitation. Monthly mean temperatures at long-term ECCC climate stations range from approximately -34°C in February at Pond Inlet to about 7°C in July at Igloolik. Mean monthly precipitation at long-term ECCC climate stations range from 4 mm in February at Pond Inlet, Sanirajak and Nanisivik, to about 64 mm in August at Dewar Lakes. Variability in precipitation at the long-term ECCC stations ranges from about 5 mm in January to about 30 mm in August (Baffinland 2018).

Generally, snow melt occurs in late June and frost-free conditions last until late August. The onset of snow melt usually begins around early to mid-June when daytime temperatures are consistently above 0°C. Following the onset of snow melt, air temperatures rise, and the amount of daylight increases, triggering plant growth and green-up (Baffinland 2018).

The meteorology results compare the 2022 data received at each meteorology station with the Pond Inlet Airport Climate Station and the Canadian Climate Normals.

### **3.2.1 ECCC Recommendations**

When processing meteorological information, ECCC recommends that a climatological day be taken from 6:00 UTC one day to 6:00 UTC the following day. For the site of interest as agreed upon (and for a large portion of Canada), one climatological day will start at approximately midnight one day and end at midnight the following day (ECCC 2021).

ECCC defines temperature data completeness for the Canadian Climate Normal by the 3-and-5 rule (ECCC 2021). Months with more than three consecutive days without data or more than five total days without data are considered incomplete.

Definitions of completeness for humidity data, wind data and solar radiation data require a 90% completeness of hourly data per month (ECCC 2021). For precipitation data, 100% monthly collection is required for completeness (ECCC 2021).

### **3.2.2 Air Temperature**

Currently, all three stations (Mary River, Milne Port, and Steensby) record an hourly minimum and maximum air temperature reading. Therefore, the daily minimum and maximum values were taken from the hourly minimum and maximum values over the course of the climatological day. For the average air temperature, the hourly air temperature readings are averaged over the entire monthly period.

Summaries of the monthly averages for the daily minimum, daily maximum and average air temperatures are presented in Table 3.4, Table 3.5, and Table 3.6, respectively. The trends are presented graphically in Figure 3.1, Figure 3.2, and Figure 3.3, respectively. The datasets from each of the Project meteorology stations are compared to the 2022 data retrieved from the Pond Inlet Airport Climate Station, as well as the Canadian Climate Normal data (taken from Pond Inlet Airport). As indicated in Table 3.4, the Steensby meteorological station had stopped recording on December 13<sup>th</sup>, with approximately 443 hours of data missing. The average air temperatures for December 2022 could therefore not be considered complete as they do not meet the requirements of the ECCC recommended 3-and-5 rule.

The trends of lowest and highest recorded air temperatures are summarized in Table 3.7 and Table 3.8, respectively. The stations with recorded data are Mary River and Milne Port. The meteorological data summary for 2006 – 2015 was provided by Knight Piesold (Knight Piesold 2016). Data for 2018 and 2019, as well as the baseline data was provided in the 2018 and 2019 EDI TEAMR (EDI 2018, 2019).

For 2022, the results presented for average minimum, maximum and daily air temperatures indicate that each station follows the same general trend when compared to the Canadian Climate Normal for the Pond Inlet Airport. Peak low air temperatures occur during the early part of the year (January through March), with peak high air temperatures occurring during July. The daily average air temperatures tended to be higher than the trend indicated in the Climate Normal. This was particularly common in the spring and summer months. The notable exception was during November, where average daily air temperatures are lower. However, a similar temperature trend was observed at Pond Inlet for 2022 compared to the Pond Inlet Climate Normal.

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At Mary River, the lowest recorded 2022 air temperature was  $-45.3^{\circ}\text{C}$ . Typically, the minimum air temperature had been recorded in February (for 2021 and 2020) but it occurred in December in 2022. The minimum air temperature is within range of the summary provided by Knight Piesold (2016) and the 2018 minimum air temperature. It is slightly colder than the 2021 data, but only by less than a degree Celsius. Although the average air temperatures are typically higher than indicated by the Climate Normal, the minimum air temperature experienced has been getting colder in the past few years. The highest air temperature recorded was  $24.1^{\circ}\text{C}$ . This is consistent with previous data as it occurred in July. The maximum air temperature at Mary River was warmer than in 2021, returning to 2019 levels (but not as high as in 2020). In general, summer air temperatures were highest at the Mary River site (according to the averages presented in Figure 3.1 through Figure 3.3).

At Milne Port, the lowest recorded air temperature was  $-41.6^{\circ}\text{C}$ , which occurred in February and is consistent with previous data. The result indicates a slight warming trend over the past few years (since 2020). Compared to 2021, the 2022 lowest temperature was within 2 degrees Celsius. The highest air temperature recorded was  $22.6^{\circ}\text{C}$  (in 2022), which was similar to the Mary River site. The value occurred in July, which is consistent with previous years and the same as observed in 2020; the value was an increase from 2021. The average daily maximum air temperatures (Table 3.5) indicate a slightly warmer 2022 summer when compared with the Canadian Climate Normal, with Milne Port being the second highest (after Mary River).

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**Table 3.4 Summary of Historical Average Daily Minimum Temperature at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

Station	Daily Minimum Temperature (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mary River Meteorology Station	-32.9	-37.5	-29.9	-23.1	-13.5	0.6	8.7	4.3	-1.1	-13.6	-31.7	-27.5	-16.4
Milne Port Meteorology Station	-32.3	-36.4	-28.9	-21.6	-12.5	0.1	7.6	4.6	-0.9	-12.9	-27.5	-26.9	-15.6
Steensby Meteorology Station <sup>a</sup>	-30.2	-36.0	-28.7	-23.8	-15.7	-0.3	5.0	4.8	0.8	-9.1	-25.1	-	-14.4
Pond Inlet Airport Climate Station <sup>b</sup>	-32.9	-35.1	-28.9	-22.2	-11.8	0.3	4.6	3.7	-0.9	-11.0	-26.0	-26.0	-15.5
Pond Inlet Airport Climate Station <sup>c</sup>	-36.7	-37.1	-33.6	-26.1	-13.2	-0.6	2.7	1.7	-3.4	-12.9	-25.2	-31.8	-18.0

**NOTES:**

“-“ means data was incomplete or missing

<sup>a</sup> Data collection stopped on Dec. 13, 2022, at 13:00, therefore a total of 443 hours data were missing for the month.

<sup>b</sup> Based on 2022 hourly data, with data missing on Jun. 03, at 12:00 to 15:00, Jul. 07, 11:00, Aug. 17, at 3:00 to 8:00, 2022

<sup>c</sup> Based on 1981 to 2010 Climate Normal data

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**Table 3.5 Summary of Historical Average Daily Maximum Temperature at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

Station	Daily Maximum Temperature (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mary River Meteorology Station	-24.6	-29.5	-20.4	-13.2	-4.4	6.1	17.4	11.4	3.2	-7.6	-21.3	-19.0	-8.5
Milne Port Meteorology Station	-26.3	-29.9	-22.5	-15.3	-6.2	4.7	15.0	9.9	2.5	-7.9	-21.8	-20.1	-9.8
Steensby Meteorology Station <sup>a</sup>	-23.7	-29.9	-21.3	-13.7	-5.5	4.5	14.0	9.9	3.9	-4.5	-18.5	-	-7.7
Pond Inlet Airport Climate Station <sup>b</sup>	-28.3	-29.9	-24.2	-16.3	-6.6	4.3	11.8	8.5	2.6	-6.3	-21.0	-19.5	-10.4
Pond Inlet Airport Climate Station <sup>c</sup>	-30.0	-30.2	-26.2	-17.6	-5.3	5.2	10.5	7.8	1.8	-6.4	-17.8	-24.5	-11.1

**NOTES:**

“-“ means data was incomplete or missing

<sup>a</sup> Data collection stopped on Dec. 13, 2022, at 13:00, therefore a total of 443 hours data were missing for the month.

<sup>b</sup> Based on 2022 hourly data, with data missing on Jun. 03, at 12:00 to 15:00, Jul. 07, 11:00, Aug. 17, at 3:00 to 8:00, 2022

<sup>c</sup> Based on 1981 to 2010 Climate Normal data

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**Table 3.6 Summary of 2022 Average Daily Temperature at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

Station	Daily Average Temperature (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mary River Meteorology Station	-29.0	-33.7	-25.0	-17.8	-8.7	3.4	13.4	8.0	1.1	-10.6	-26.9	-23.3	-12.4
Milne Port Meteorology Station	-29.4	-33.4	-25.8	-18.7	-9.3	2.4	11.3	6.9	0.7	-10.3	-24.8	-23.7	-12.8
Steensby Meteorology Station <sup>a</sup>	-27.1	-32.7	-25.1	-18.2	-10.1	2.0	9.3	7.0	2.3	-6.8	-21.8	-	-11.0
Pond Inlet Airport Climate Station <sup>b</sup>	-30.7	-32.6	-26.3	-19.0	-8.8	2.5	8.3	6.2	0.9	-8.4	-23.4	-22.8	-12.8
Pond Inlet Airport Climate Station <sup>c</sup>	-33.4	-33.7	-30.0	-21.9	-9.3	2.4	6.6	4.8	-0.8	-9.7	-21.7	-28.2	-14.6

**NOTES:**

“-“ means data was incomplete or missing

<sup>a</sup> Data collection stopped on Dec. 13, 2022, at 13:00, therefore a total of 443 hours data were missing for the month.

<sup>b</sup> Based on 2022 hourly data, with data missing on Jun. 03, at 12:00 to 15:00, Jul. 07, 11:00, Aug. 17, at 3:00 to 8:00, 2022

<sup>c</sup> Based on 1981 to 2010 Climate Normal data

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**Table 3.7 Summary of Lowest Temperature Trends at the Baffinland Meteorology Stations**

Station	Minimum Temperature (°C)						
	2005 – 2010 Baseline <sup>a</sup>	2006 -2015 Summary <sup>b</sup>	2018 <sup>c</sup>	2019 <sup>a</sup>	2020 <sup>d</sup>	2021 <sup>d</sup>	2022 <sup>d</sup>
Mary River Meteorology Station	-59.1	-46.6	-45.8	-40.3	-40.1	-44.9	-45.3
Milne Port Meteorology Station	-46.9	-44.2	-44.4	-50.2	-45.5	-43.2	-41.6

NOTES:

- <sup>a</sup> excluding erroneous readings of extreme lows below -60°Celsius (EDI, 2023)
- <sup>b</sup> excluding an erroneous low of -73°Celsius in September 2014 (EDI, 2023).
- <sup>c</sup> EDI, 2018
- <sup>d</sup> Taken from absolute minimum temperature in recorded data

**Table 3.8 Summary of Highest Temperature Trends at the Baffinland Meteorology Stations**

Station	Maximum Temperature (°C)						
	2005 - 2010 Baseline <sup>a</sup>	2006 -2015 Summary <sup>b</sup>	2018 <sup>c</sup>	2019 <sup>a</sup>	2020 <sup>d</sup>	2021 <sup>d</sup>	2022 <sup>d</sup>
Mary River Meteorology Station	22.8	22.8	19.4	21.3	33.0	16.9	24.1
Milne Port Meteorology Station	22.3	22.3	18.7	10.7	22.6	16.3	22.6

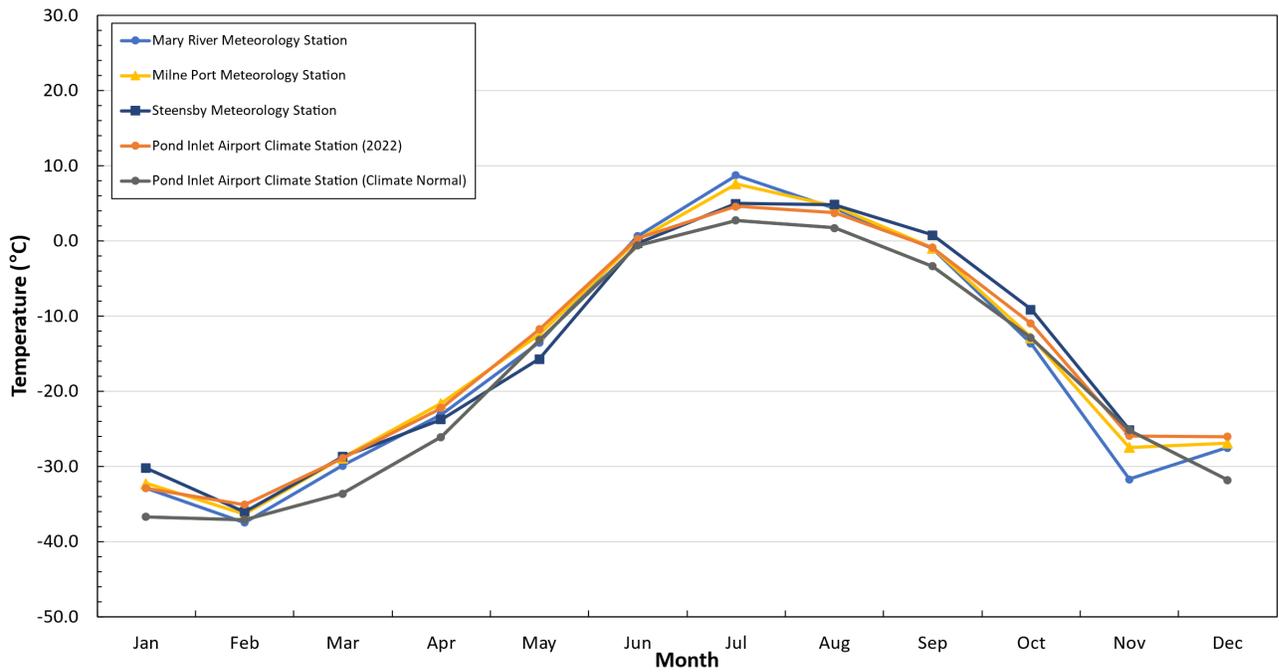
NOTES:

- <sup>a</sup> EDI, 2019
- <sup>b</sup> Knight Piesold, 2016
- <sup>c</sup> EDI, 2018
- <sup>d</sup> Taken from absolute maximum temperature in recorded data

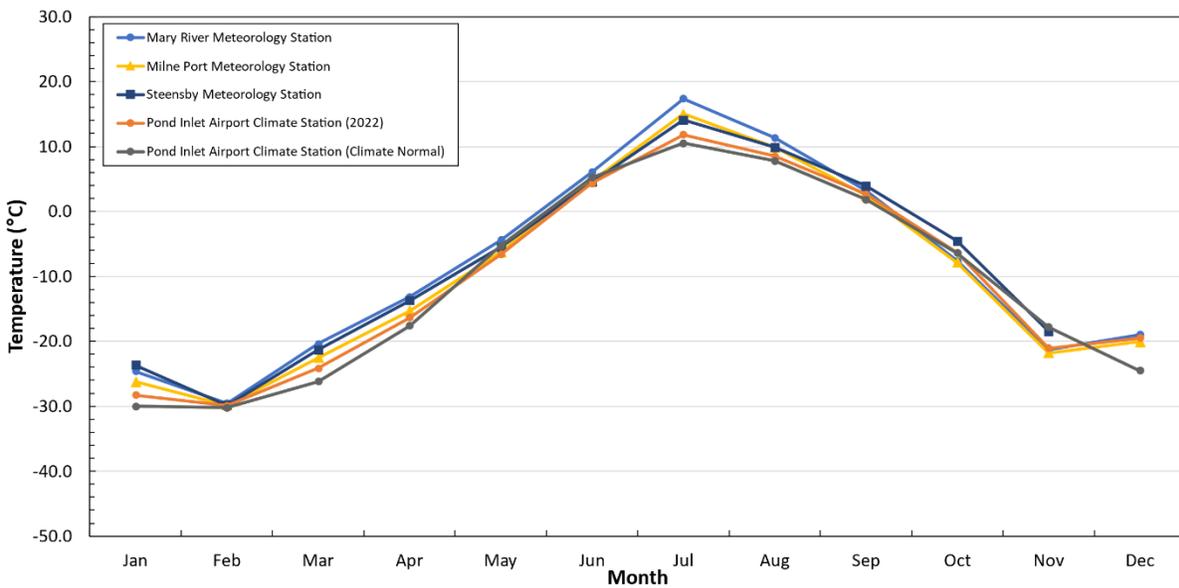
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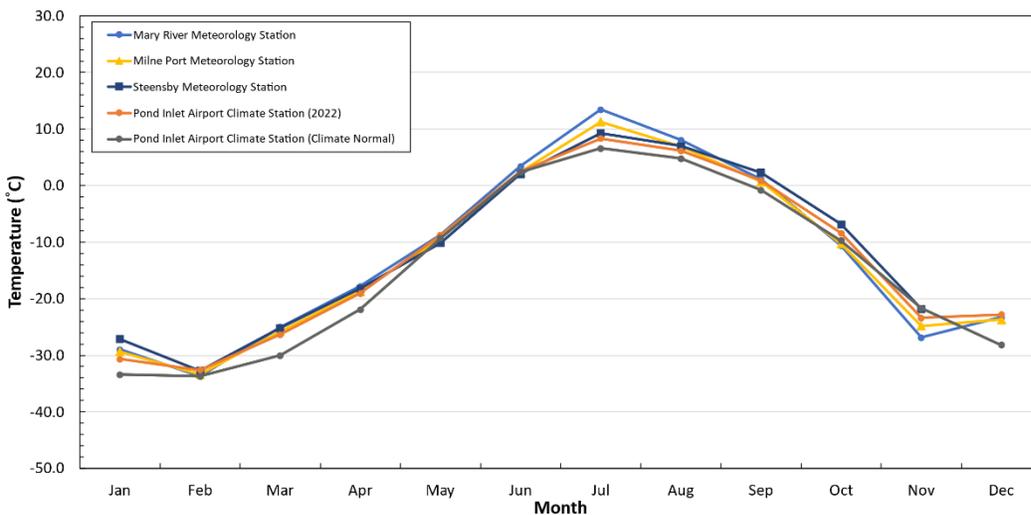
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**Figure 3.1 Summary of Daily Minimum Temperature at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**



**Figure 3.2 Summary of Daily Maximum Temperature at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**



**Figure 3.3 Summary of Average Daily Temperature at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

### 3.2.3 Relative Humidity

Summaries of the monthly averages for the relative humidity are presented in Table 3.9. The trends are presented graphically in Figure 3.4. Each meteorology station is compared to the 2022 data retrieved from the Pond Inlet Airport Climate Station, as well as the Canadian Climate Normal data (taken from Pond Inlet Airport).

The 2022 data from the three meteorology stations and the data from the Pond Inlet Airport Climate Station were processed in the same way. The hourly relative humidity data was averaged by month. For the Climate Normal data, however, only the relative humidity at 6:00 LST and 15:00 LST are provided. In this case, the average was taken between the two values and presented.

As indicated in Table 3.9, the Steensby meteorological station had stopped recording on December 13, with approximately 443 hours of data missing. The average relative humidity for December could therefore not be considered complete as the records did not meet the requirements of the ECCC recommended 90% rule.

The results indicate that there was not much variation in the relative humidity over the course of 2022, with the minimum average value approximately 53% (Mary River, in July), and the maximum at 85% (Pond Inlet, in September). High relative humidity is common on islands and near the coastline. In general, the trends presented at the meteorological stations tend to match the Climate Normal, with higher values around the end of spring (May - June), and then again in the fall (September–October). The values are clustered around the Climate Normal and are likely due to variations of terrain and elevation at individual sites.

When compared to 2021 data, there was a more pronounced reduction in relative humidity at the peak of summer, during July. This occurred, to varying degrees, for each site, with the Mary River site having the lowest humidity at 53%.

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**Table 3.9 Summary of Average Relative Humidity at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

Station	Relative Humidity (%)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mary River Meteorology Station	59.3	55.4	63.6	69.8	72.9	71.7	53.9	68.4	81.1	80.7	67.7	71.9	68.0
Milne Port Meteorology Station	71.2	70.0	72.1	74.8	77.2	73.8	61.2	73.5	83.0	81.4	74.3	75.7	74.0
Steensby Meteorology Station <sup>a</sup>	63.2	58.3	67.1	72.0	78.3	81.8	71.8	77.7	84.6	79.1	69.5	-	73.0
Pond Inlet Airport Climate Station <sup>b</sup>	74.0	70.5	76.2	78.2	79.8	77.8	71.0	79.5	85.3	81.9	77.7	77.4	77.4
Pond Inlet Airport Climate Station <sup>c</sup>	65.1	65.4	65.3	70.7	79.6	78.8	76.6	79.4	79.9	80.5	72.4	67.3	73.4

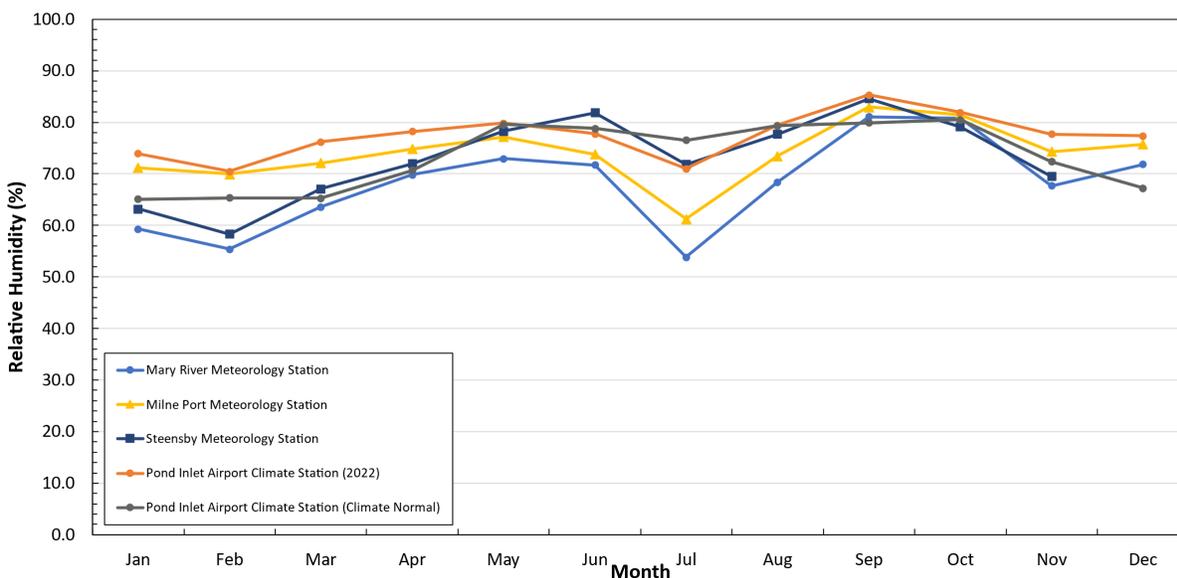
**NOTES:**

"-" means data was incomplete or missing

<sup>a</sup> Data collection stopped on Dec. 13, 2022, at 13:00, therefore a total of 443 hours data were missing for the month.

<sup>b</sup> Based on 2022 hourly data, with data missing on Jun. 03, at 12:00 to 15:00, Jul. 07, 11:00, Aug. 17, at 3:00 to 8:00, 2022

<sup>c</sup> Based on 1981 to 2010 Climate Normal data



**Figure 3.4 Summary of Average Relative Humidity at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

### 3.2.4 Rainfall Precipitation

Summaries of the monthly rainfall totals are presented in Table 3.10. The trends are presented graphically in Figure 3.5. Each meteorology station is compared to the 2022 data retrieved from the Pond Inlet Airport Climate Station, as well as the Canadian Climate Normal data (taken from Pond Inlet Airport).

The data from the three meteorology stations and the 2022 data from the Pond Inlet Airport Climate Station were processed in the same way. The hourly rainfall quantity was summed for each day, and then for each month. In the case where comments or flags in the data were provided, hours with snow were neglected since the Baffinland meteorology station sensors were not designed to measure SWE precipitation.

For Mary River and Milne Port sites, there were some incongruous sampling points where rain was recorded during freezing conditions. These may have been a result of melting ice or snow. They were removed from the data pool for those months. For the Steensby site, a destroyed funnel on the tipping bucket gauge rendered the device inoperable between June and September. Additionally, the data logger stopped collecting information on December 13. At the Pond Inlet site, data was missing for part of the day on June 3, July 7, and August 17. Additional data was missing for all of October 19. As a result, these dates did not meet the criteria for 100% completeness as proposed by ECCC.

The results indicate that the Mary River site experienced most of its rainfall between May and October 2022, with lower rainfall during July (where humidity was also low). The Milne Port site experienced rainfall between June and September 2022, also with a lower rainfall in July. When compared to the Climate Normal, the rainy period is consistent, though both sites had lower than expected rainfall in July, and more rainfall in the fall (September).

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**Table 3.10 Summary of Total Rainfall at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

Station	Total Rainfall (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mary River Meteorology Station <sup>a</sup>	0.0	0.0	0.0	0.0	1.0	33.2	7.4	32.0	35.8	10.6	0.0	0.0	120.0
Milne Port Meteorology Station <sup>b</sup>	0.0	0.0	0.0	0.0	0.0	6.8	2.4	13.6	39.0	0.0	0.0	0.0	61.8
Steensby Meteorology Station <sup>c,d</sup>	0.0	0.0	0.0	0.0	0.0	-	-	-	-	10.2	0.0	-	-
Pond Inlet Airport Climate Station <sup>e</sup>	0.0	0.0	0.0	0.1	0.0	-	-	-	9.6	-	0.0	0.0	-
Pond Inlet Airport Climate Station <sup>f</sup>	0.0	0.0	0.0	0.0	0.0	12.1	31.5	35.9	9.8	1.3	0.4	0.0	91.0

NOTES:

"-" means data was incomplete or missing,

<sup>a</sup> 0.6 mm of rainfall was recorded on May 29, 2022, at 14:00, and 0.2 mm of rainfall was recorded on Oct. 21, 2022, at 9:00. These were removed because the hourly maximum air temperatures were -3.9 and -6.4 degrees Celsius, respectively. No rain should have been recorded during freezing temperatures.

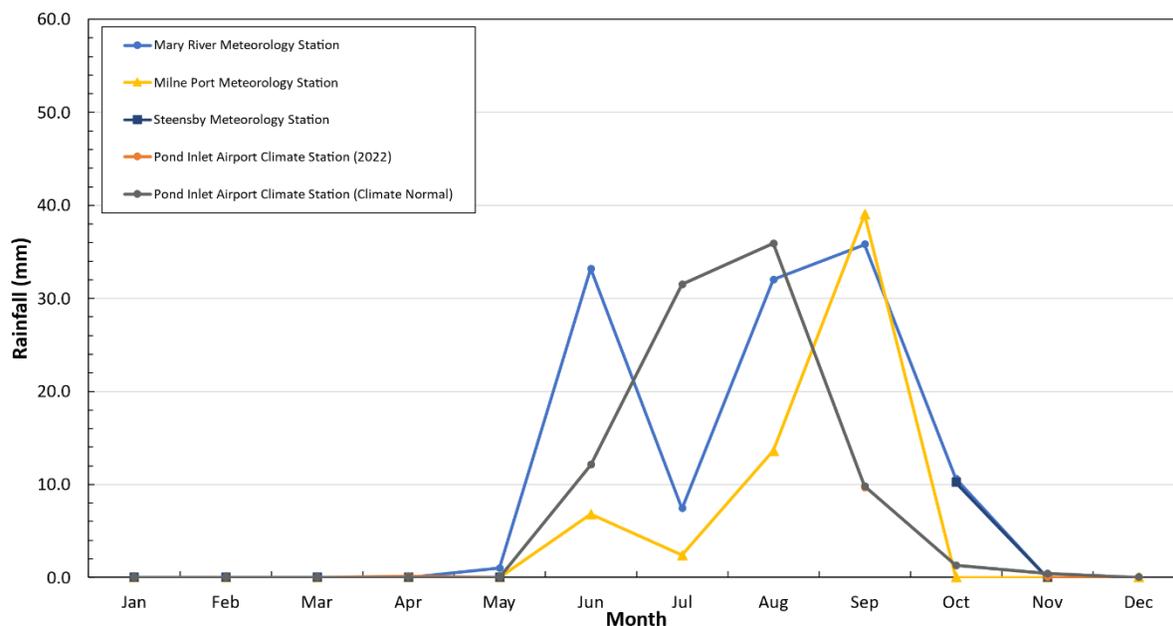
<sup>b</sup> 0.2 mm of rainfall was recorded on May 07, 2022, at 13:00, as well as on May 28, 2022, at 21:00, and on Oct. 14, 2022, at 12:00. These were removed because the maximum air temperatures were -5.8, -8.3, and -7.3 degrees Celsius, respectively. No rain should have been recorded during freezing temperatures.

<sup>c</sup> From June 1, 2022, at 3:00 PM to September 17, 2022, at 9:00 AM, there are total 2,587 hours with zero rain data, likely due to the destroyed funnel for the tipping bucket rain gauge (TBRG)

<sup>d</sup> Data collection stopped on Dec. 13, 2022, at 13:00, therefore total 443 hours of data were missing.

<sup>e</sup> Based on 2022 hourly data; data was missing on Jun. 03, at 12:00 to 15:00, Jul. 07, 11:00, Aug. 17, at 3:00 to 8:00, as well as on Oct. 19

<sup>f</sup> Based on 1981 to 2010 Climate Normal data



**Figure 3.5 Summary of 2022 Total Rainfall at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

### 3.2.5 Wind Speed and Direction

Summaries of the monthly averages and monthly maximums (gusts) for the wind speed are presented in Table 3.11 and Table 3.12, respectively. The trends of monthly average and monthly maximum are presented graphically in Figure 3.6 and Figure 3.7, respectively. Each meteorology station is compared to the 2022 data retrieved from the Pond Inlet Airport Climate Station, as well as the Canadian Climate Normal data (taken from Pond Inlet Airport).

Although there were months with data collection errors at the Mary River and Milne Port sites, the total number of hours missing did not result in less than 90% of all monthly hours being recorded. Therefore, the data can be presented. However, for the Steensby site, many hours were lost due to rime ice buildup and the datalogger stopping functioning on December 13<sup>th</sup>. From a completeness perspective, only October and November have more than 90% of the monthly data required.

The results indicate that the average windspeeds at the Mary River and Milne port sites were consistently higher than the Climate Normal data. However maximum windspeeds were at or below the Climate Normal levels. The trends between each site are similar, though wind speeds were higher in spring than the trend observed in the Climate Normal data. From the available Steensby data, the wind speeds are substantially higher than Mary River and Milne Port and Pond Inlet.

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**Table 3.11 Summary of Average Wind Speed at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

Station	Average Wind Speed (m/s)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mary River Meteorology Station <sup>a,b</sup>	2.1	2.2	2.4	4.5	3.6	4.1	3.4	3.8	5.6	5.2	2.4	5.1	3.7
Milne Port Meteorology Station <sup>a,c</sup>	3.7	3.3	4.4	6.4	5.5	5.3	4.7	5.7	6.6	6.0	4.0	6.4	5.2
Steensby Meteorology Station <sup>a,d,e</sup>	-	-	-	-	-	-	-	-	-	12.7	8.7	-	-
Pond Inlet Airport Climate Station <sup>a,f</sup>	-	-	-	-	-	-	-	-	-	4.3	3.5	-	-
Pond Inlet Airport Climate Station <sup>g</sup>	1.9	1.8	2.0	2.2	2.4	2.5	2.6	2.8	3.1	3.8	2.8	2.1	2.5

**NOTE:**

"-" means data was incomplete or missing

<sup>a</sup> Based on 2022 hourly data

<sup>b</sup> There were 44 hours data with zero wind speed and wind direction due to rime ice buildup: 8 hours in Jan., 7 hours in Feb., 5 hours in Mar., 4 hours in Sep., 8 hours in Nov., and 12 hours in Dec.

<sup>c</sup> 251 hours data with zero wind speed and wind direction due to rime ice buildup and other unknown root causes were removed from analysis: 63 hours in Jan., 35 hours in Feb., 54 hours in Mar., 11 hours in Apr., 5 hours in May, 3 hours in Jul., 8 hours in Sep., 2 hours in Oct., 46 hours in Nov., and 24 hours in Dec.

<sup>d</sup> 4,109 hours data with zero wind speed and wind direction due to rime ice buildup, a faulty wind sensor cable, and other unknown root causes were removed from analysis: 685 hours in Jan., 669 hours in Feb., 665 hours in Mar., 563 hours in Apr., 501 hours in May, 266 hours in Jun., 264 hours in Jul., 389 hours in Aug., 107 hours in Sep. <sup>e</sup>Data collection stopped on Dec. 13, 2022, at 13:00, therefore total 443 hours data were missing for Dec.

<sup>f</sup> October and November were the only months that achieved the > 90% data completeness threshold.

<sup>g</sup> based on 1981 to 2010 Climate Normal data

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**Table 3.12 Summary of Maximum Wind Speed at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

Station	Maximum Wind Speed (m/s)												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mary River Meteorology Station <sup>a,b</sup>	20.4	13.3	14.4	16.5	12.7	14.0	13.8	15.1	17.3	17.8	13.4	18.5	20.4
Milne Port Meteorology Station <sup>a,c</sup>	13.74	16.5	15.23	22.17	17.56	19.81	19.73	21.17	19.9	24.9	14.5	22.2	24.9
Steensby Meteorology Station <sup>a,d,e</sup>	-	-	-	-	-	-	-	-	-	32.7	28.5	-	-
Pond Inlet Airport Climate Station <sup>a,f</sup>	-	-	-	-	-	-	-	-	-	15.0	12.8	-	-
Pond Inlet Airport Climate Station <sup>g</sup>	21.1	19.4	18.1	20.6	19.4	17.5	19.4	19.4	20.6	20.6	25.3	25.8	25.8

NOTES:

"-" means data was incomplete or missing

<sup>a</sup> Based on 2022 hourly data

<sup>b</sup> There were 44 hours data with zero wind speed and wind direction due to rime ice buildup: 8 hours in Jan., 7 hours in Feb., 5 hours in Mar., 4 hours in Sep., 8 hours in Nov., and 12 hours in Dec.

<sup>c</sup> 251 hours data with zero wind speed and wind direction due to rime ice buildup and other unknown root causes were removed from analysis: 63 hours in Jan., 35 hours in Feb., 54 hours in Mar., 11 hours in Apr., 5 hours in May, 3 hours in Jul., 8 hours in Sep., 2 hours in Oct., 46 hours in Nov., and 24 hours in Dec.

<sup>d</sup> 4,109 hours data with zero wind speed and wind direction due to rime ice buildup and other unknown root causes were removed from analysis: 685 hours in Jan., 669 hours in Feb., 665 hours in Mar., 563 hours in Apr., 501 hours in May, 266 hour in Jun., 264 hours in Jul., 389 hours in Aug., 107 hours in Sep.

<sup>e</sup> Data collection stopped on Dec. 13, 2022, at 13:00, therefore total 443 hours data were missing for Dec.

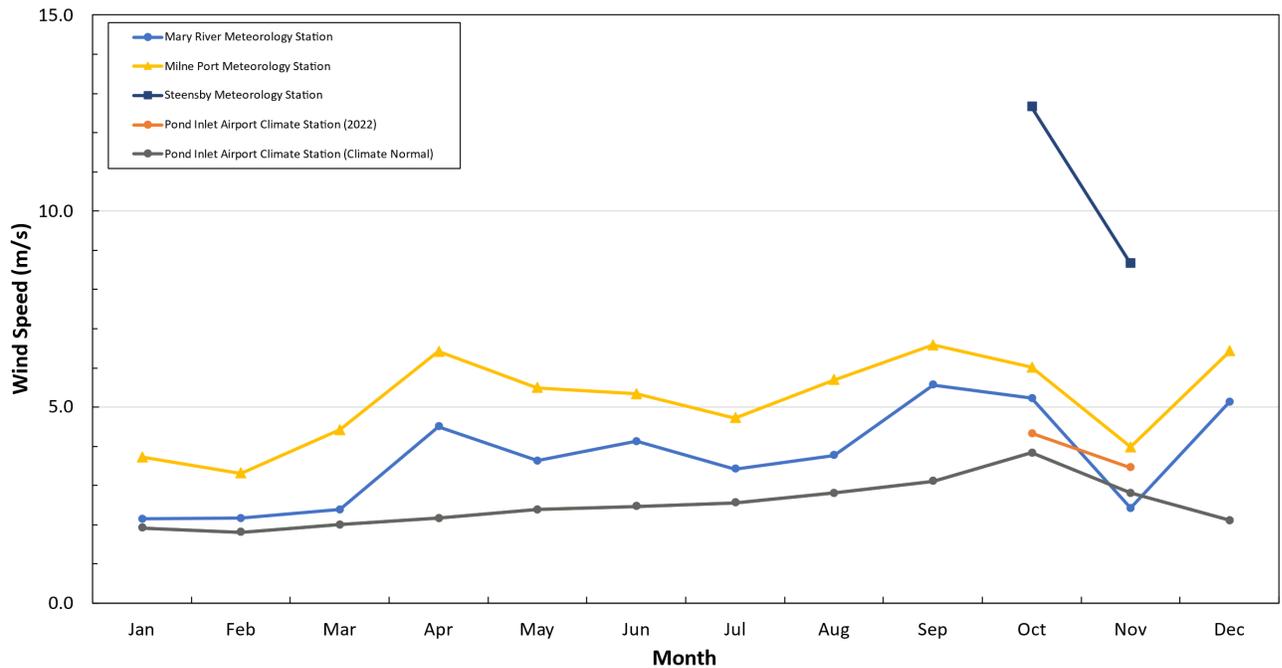
<sup>f</sup> October and November were the only months that achieved the > 90% data completeness threshold.

<sup>g</sup> based on 1981 to 2010 Climate Normal data

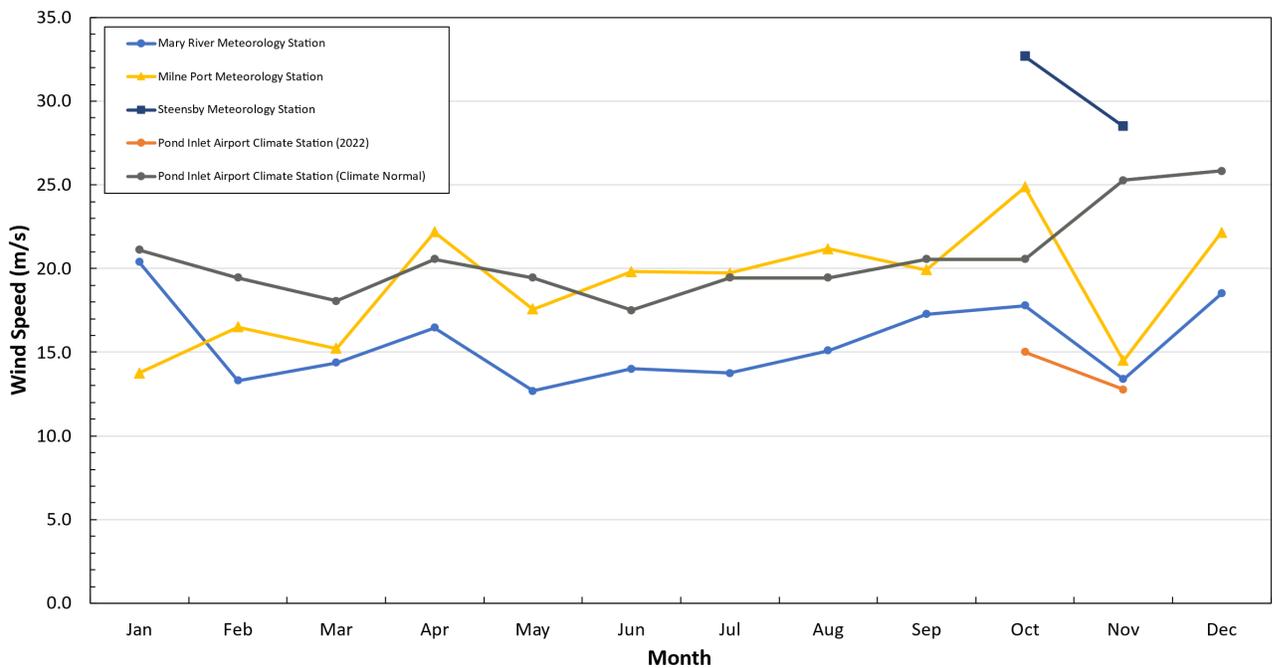
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**Figure 3.6 Summary of Average Wind Speed at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**



**Figure 3.7 Summary of Maximum Wind Speed at the Baffinland Meteorology Stations and the Pond Inlet Airport Climate Station**

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Summaries of prevalent wind direction and wind speed class frequency distributions are presented in Figure 3.8, Figure 3.9, Figure 3.10, and Figure 3.11 for Mary River, Milne Port, Steensby, and the Pond Inlet Airport, respectively. The sites are not directly comparable to the Climate Normal because the wind direction will not be as consistent across the geographical distances as the other meteorological variables.

At Mary River, south-easterly winds were prevalent during 2022, which is consistent with the observed trends from previous years (2020 and 2021).

At Milne Port, north-westerly and south-westerly winds were prevalent during 2022. Although north-north-easterly winds were prevalent during 2020, the 2022 trend matches with the data observed in 2021.

At Steensby, north-westerly, and easterly winds were prevalent during 2022, with the limited dataset. This is partially consistent with 2021, which had primarily north-westerly winds, as well as 2020. However, both 2022 and 2021 had limited datasets in general, with many missing hours due to rime ice buildup.

At the Pond Inlet Airport, southerly and south-easterly winds are prevalent during 2022, which is consistent with the prevalent southerly winds in 2021 and 2020. This is also consistent with the Canadian Climate Normal for the climate station location, which demonstrates that southerly winds are the most common. However, there was limited data available for 2022.

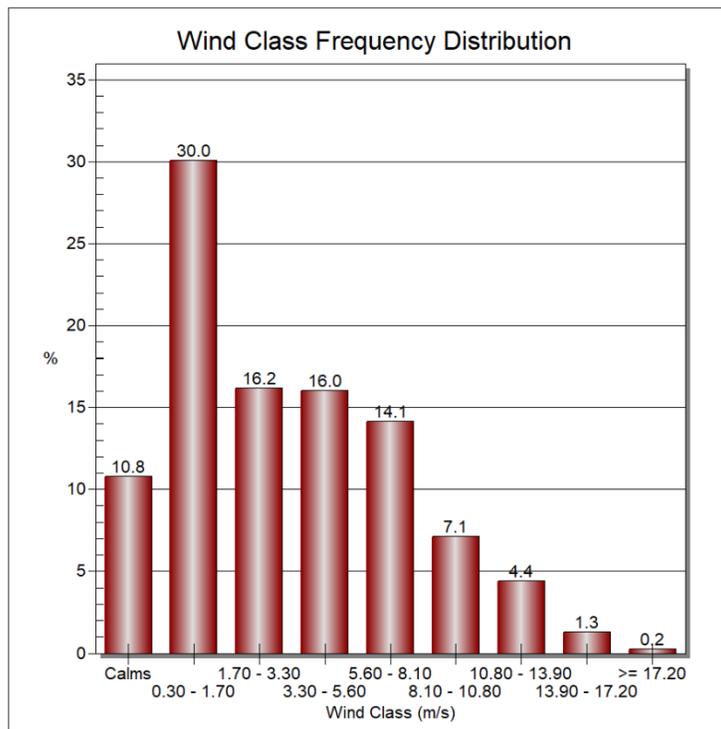
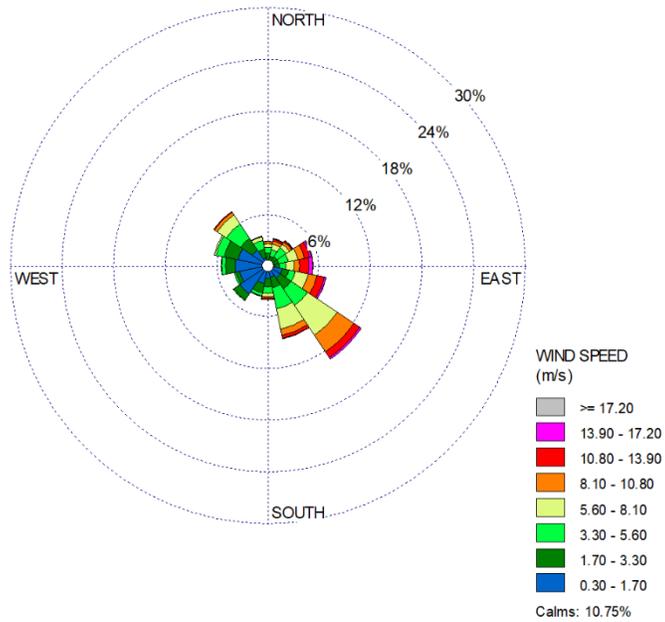
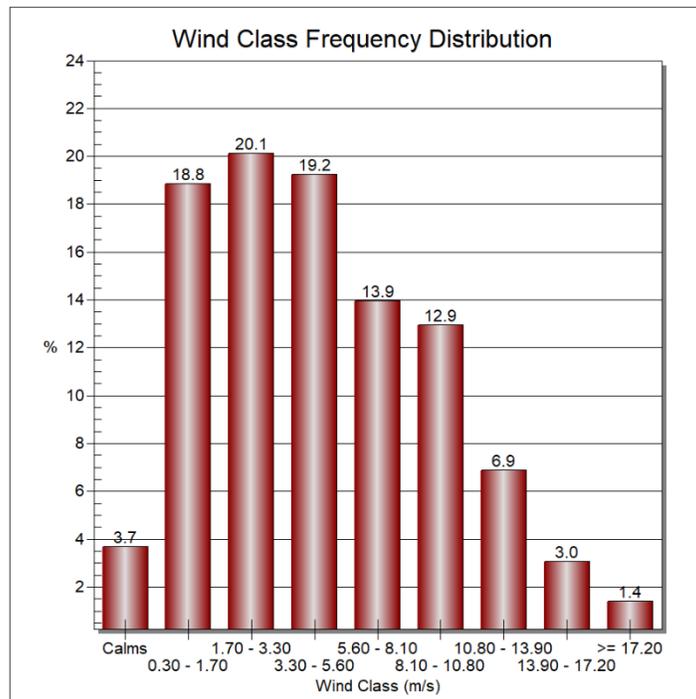
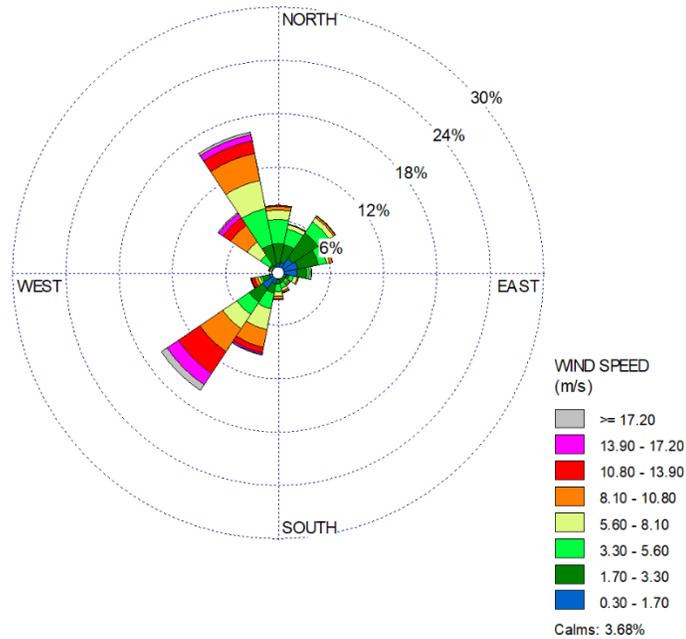
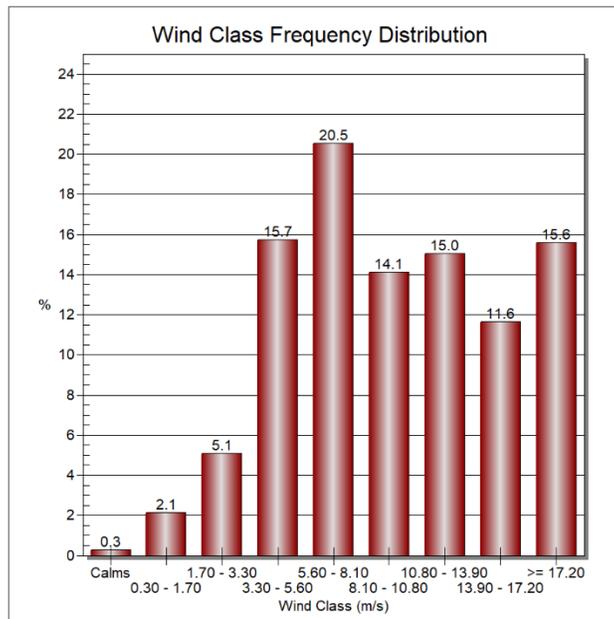
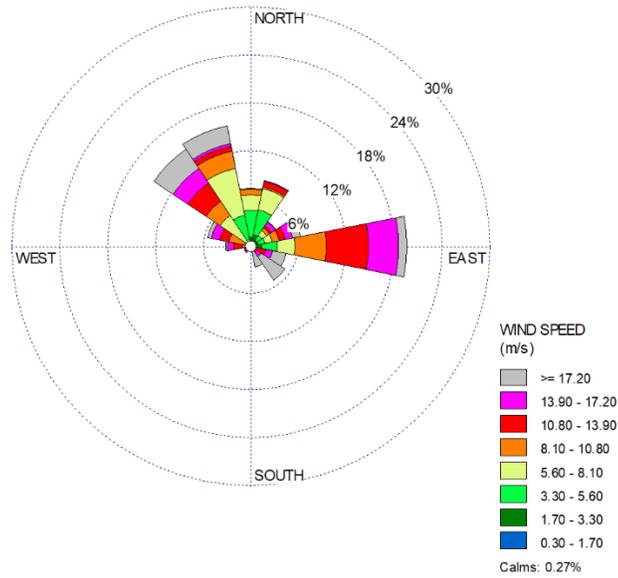


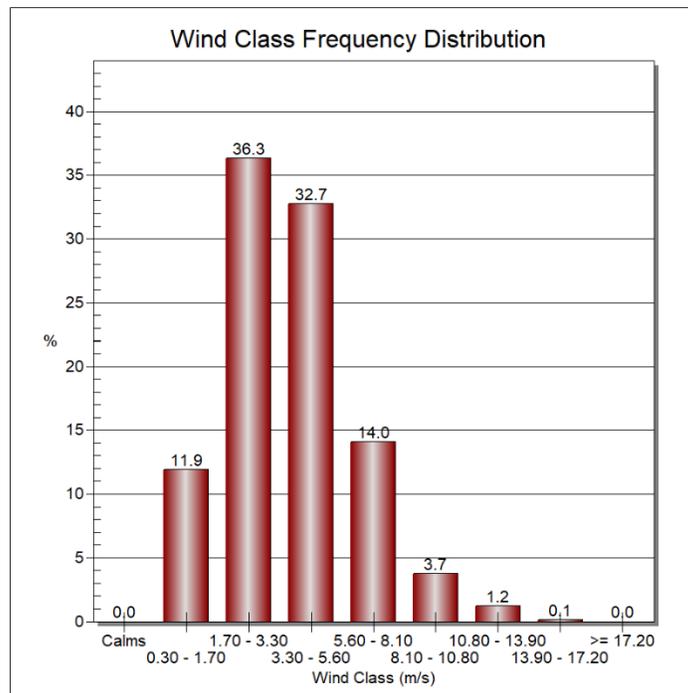
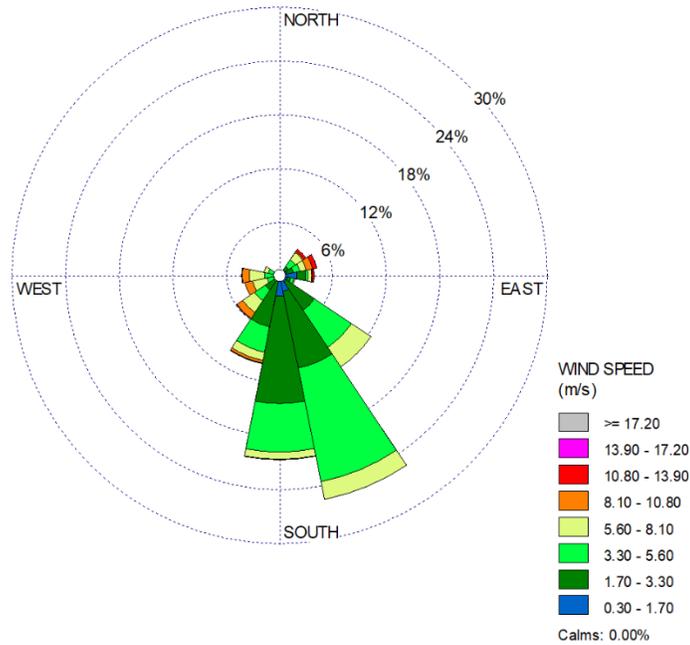
Figure 3.8 2022 Wind Rose and Wind Class Frequency Distribution at the Mary River Meteorology Station



**Figure 3.9 2022 Wind Rose and Wind Class Frequency Distribution at the Milne Port Meteorology Station (251 hours of wind data was compromised and not included)**



**Figure 3.10 2022 Wind Rose and Wind Class Frequency Distribution at the Steensby Port Meteorology Station (4,552 hours of data were missing or compromised and not included)**



**Figure 3.11 2022 Wind Rose and Wind Class Frequency Distribution at the Pond Inlet Airport Climate Station (only data from October and November met the >90% data completeness threshold)**

### **3.2.6 Solar Radiation**

Summaries of the monthly averages for solar radiation are presented in Table 3.13. The trends are presented graphically in Figure 3.12. Currently, the Pond Inlet Airport Climate Station does not record average solar radiation, so values are not compared to a Climate Normal.

The data from the three meteorology stations were processed in the same way. The hourly average solar radiation was averaged each month. For the Steensby site, there was no data available beyond December 13 due to the datalogger stopping operations.

The results indicate that solar radiation was low during the winter (November through February), and then increased until the early summer (May, June, and July), where it peaked. All three sites offer consistent data which indicates peak solar radiation in the summer occurred in June and were approximately 265–312 W/m<sup>2</sup> in 2022. The Steensby site had the highest solar radiation. There were six months of solar radiation records available for Steensby during 2021, so only limited comparisons can be made. For the Mary River and Milne Port sites, the trend was like 2021 (and Steensby follows the same trend for the available data), but the peak solar radiation was slightly higher than the 250 kW/m<sup>2</sup> in 2021

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**Table 3.13 Summary of 2022 Monthly Average Solar Radiation at the Baffinland Meteorology Stations**

Station	Solar Radiation (W/m <sup>2</sup> )												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mary River Meteorology Station	0.5	16.6	69.4	165.3	263.0	265.0	246.5	138.3	54.4	26.1	1.4	0.0	103.9
Milne Port Meteorology Station	0.4	14.9	72.6	168.1	278.9	272.8	229.1	99.5	32.9	15.0	0.9	0.0	98.8
Steensby Meteorology Station <sup>a</sup>	1.1	23.7	81.6	185.6	300.3	312.3	263.0	154.6	51.6	22.0	2.3	-	127.1

**NOTES:**

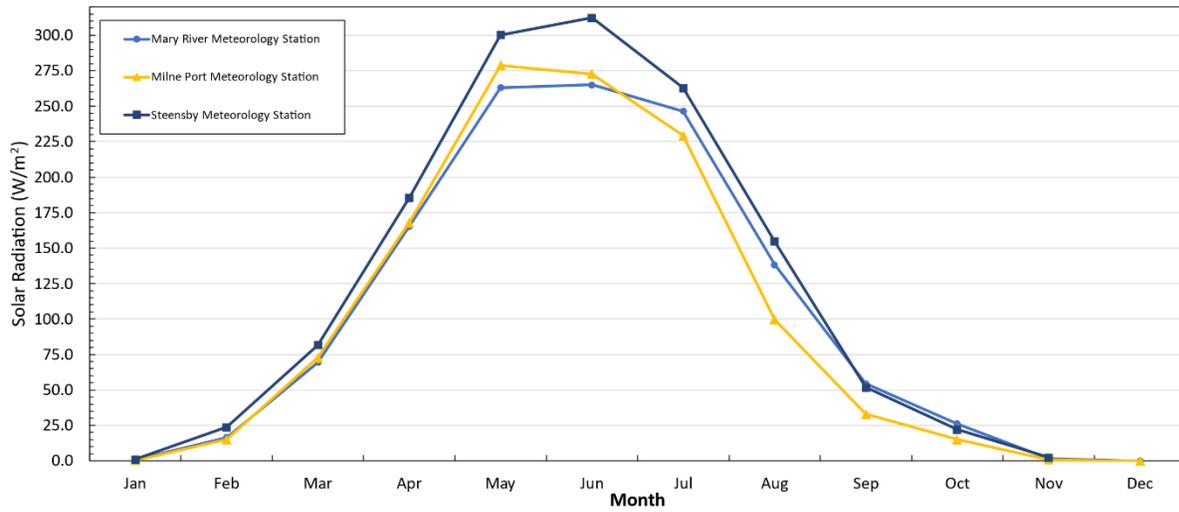
“-“ means data was incomplete or missing

<sup>a</sup> Data collection stopped on Dec. 13, 2022, at 13:00, therefore a total of 443 hours data were missing for the month.

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**Figure 3.12 Summary of 2022 Monthly Average Solar Radiation at the Baffinland Meteorology Stations**

## 4 Dustfall

The dustfall monitoring program used a total of 53 passive dustfall collectors in 2022 to measure dust deposition related to Project activities, following the same methodology and analysis as in previous years (EDI 2022). Thirty-six (36) of these collectors are changed out monthly, while the rest are changed out during summer months due to their remote location. Figure 1.1 shows the location of the 2022 dustfall monitoring stations at the Mine Site. Figure 1.2 shows the location of the 2022 dustfall monitoring stations at Milne Port.

The methodology, including analytical methods for the passive dustfall monitors, is described in the 2022 TEAMR prepared by Environmental Dynamics Inc. (EDI 2023). EDI (2023) summarized the magnitude and extent of the 2022 dustfall, seasonal comparisons, and the inter-annual trends for seasonal and total annual dustfall. The purpose of this section is to review the 2022 dustfall results presented by EDI (2023) and determine what correlations can be made with the 2022 meteorology data. The two meteorology variables that have the most influence on the generation of fugitive dust and dustfall are wind speed and rain precipitation.

Within the Early Revenue Program Final Environmental Impact Statement, (Baffinland Iron Mines 2013) dustfall management action trigger levels were developed with input from the results of the dust dispersion models, existing literature related to air quality guidelines and dust deposition, and similar dust monitoring programs in place at other northern mines. The dustfall management action trigger levels are:

- **Low:** 1 to 4.5 g/m<sup>2</sup>/year
- **Moderate:** 4.6 to 50 g/m<sup>2</sup>/year
- **High:** ≥50 g/m<sup>2</sup>/year

The dustfall management action trigger levels are part of an adaptive management strategy to regularly review monitoring data to determine if operational change(s) and adoption of other mitigating measures are warranted. The results of the 2022 dustfall sampling program for monitoring site with year-round data collection were converted from units of mg/dm<sup>2</sup>-day to g/m<sup>2</sup>/year. They were compared with the modelled dust deposition isopleths for the Project to determine if deposition rates exceed the predicted range. Data for each month were converted to g/m<sup>2</sup>/day, and then summed to add up to one year (EDI 2023).

The magnitude of annual dustfall at the Mine Site sample locations were elevated in comparison with recent years. In 2022, the highest dustfall at the Mine Site area was associated with the airstrip and the Tote Road. The magnitude of dustfall at Milne Port has remained constant, or in some cases has slightly decreased, a trend that began in 2018. Along the Tote Road the 2022 dustfall was consistent at the north crossing location when compared with recent years. However, increased 2022 dustfall was noted at the south crossing. Future monitoring will continue to investigate dustfall at the 47 monitoring locations through the summer and a subset of 36 year-round monitoring stations (EDI 2023).

The general correlations between the 2022 dustfall data and the meteorological conditions (e.g., wind speed and rain precipitation) are presented below.

## **4.1 Results and Discussion**

The 2022 dustfall data trends and statistical analysis were summarized by EDI (2023) for four areas within the regional study area:

- Mine Site
- Milne Port
- Tote Road North crossing (km 28), and
- Tote Road South crossing (km 80)

The general relationships among the 2022 dustfall results for these four areas are discussed below in the context of 2022 wind speed and rain precipitation data collected at the Mary River and Milne Port automated meteorology stations. In general, dustfall deposition rates did not respond consistently to the changing seasonal wind speed and rain precipitation conditions.

Dustfall monitoring conducted during 2022 at two different heights (2.0 and 0.5 m above ground) found no differences. The normal height for dustfall monitoring is 2.0 m above ground (EDI 2023).

### **4.1.1 Mine Site**

Fugitive dust arises from mechanical disturbance of granular material exposed to the air. Dust generated from open sources is termed “fugitive” because it is not discharged to the atmosphere in a confined flow stream. Fugitive dust is generated by:

- pulverization and abrasion of surface materials by application of a mechanical force (e.g., wheels, blades), or
- entrainment of dust particles by the action of turbulent air currents (e.g., wind erosion of an exposed surface by wind speeds greater than 5.3 m/s) (US EPA 1995).

Common sources of fugitive dust include unpaved roads, blasting, and wind erosion of open storage piles. Fugitive dust results in suspended particulate matter in the atmosphere which, under the effects of gravity, settles to the earth’s surfaces as dustfall. Rain precipitation provides natural mitigation for the fugitive dust generated by Mine Site vehicle traffic and from open sources that are subject to wind erosion (e.g., storage piles). Snow on the surfaces of unpaved roads and open storage piles also provides natural mitigation for fugitive dust and dustfall.

The 2022 daily dustfall deposition rates at the Mine Site monitoring stations showed peaks during February, April and May and the rates were substantially lower for the other months (Figure 8-4 in EDI 2023). No rain was recorded at the Mary River meteorology station during February and April. There were two days with precipitation during May 2022 (Figure 4-2 in EDI 2023). Hence, the two months for the peak dustfall rates were dry; however, it should be noted that the Mary River meteorology station does not have the ability to measure snow depth or snow-water-equivalent (SWE) precipitation, so the total precipitation is unknown for May 2022. The daily maximum air temperature for May 2022 was 3.3°C and therefore it is possible that rain occurred. The daily dustfall deposition rates for the Mine Site monitoring stations were relatively low for the open water season extending from June to October 2022. The low

dustfall during September 2022 could partially be attributed to wet conditions because it was unusually wet with twice as much rain as normal. There were 14 days with rain in September 2022 (35.8 mm) and normally there is seven days with rain (approximately 18 mm).

The elevated dustfall levels during February, April, and May 2022 did not correlate with elevated wind speeds. The average wind speeds at the Mary River meteorology station during February and May 2022 (2.2 and 3.6 m/s, respectively, see Table 3.11) were less than the annual average (3.7 m/s). The average wind speed for April 2022 (4.5 m/s) was greater than the annual average. The month with the greatest average wind speed (September 5.5 m/s) did not coincide with elevated dustfall rates. Hence, the Mine Site monthly dustfall rates did not correlate well with the 2022 average and maximum monthly wind speeds.

#### **4.1.2 Milne Port**

The 2022 monthly dustfall values recorded by the Milne Port monitoring stations displayed elevated values during February, April, and May (Figure 8-4 in EDI 2022). The elevated February, April, and May dustfall rates for the Milne Port monitoring stations corresponded with low monthly rainfall at the Milne Port meteorology station. Lower rates of dustfall were recorded by the Milne Port dustfall stations during June, July, August and September when there was rainfall recorded at the Milne Port meteorology station (5, 2, 9 and 13 days with recordable precipitation, respectively, Figure 4-4 in EDI 2023). When there is rain it provides natural mitigation for fugitive dust. The Milne Port meteorology station does not record SWE precipitation which is needed to calculate total precipitation.

The elevated dustfall levels during April and May correlated with elevated wind speeds. The average wind speed at the Milne Port meteorology station (summarized in Table 3.11) during April and May 2022 (6.4 and 5.5 m/s, respectively) was greater than the annual average (5.2 m/s). The average wind speed at the Milne Port meteorology station during February (3.3 m/s) was less than the annual average (5.2 m/s). The month with the greatest average wind speed (September 2022, 6.6 m/s) had nearly the lowest overall dustfall rates. Apart from April and May 2022, there was no correlation between elevated dustfall values and greater than average monthly wind speed.

#### **4.1.3 Tote Road North Crossing**

The Tote Road North Crossing dustfall stations showed elevated values during May and June 2022 (Figure 8-4 in EDI 2023). The closest meteorology station to the Tote Road North Crossing is at Milne Port. May and June had slightly elevated monthly average wind speeds (5.5 and 5.3 m/s, respectively compared to annual average 5.2 m/s) and somewhat close to normal precipitation (2 and 5 days, respectively). Low dustfall rates were recorded during September 2022 coinciding with wetter than normal conditions (13 days, Figure 4-4 in EDI 2023).

#### **4.1.4 Tote Road South Crossing**

The Tote Road South Crossing dustfall stations showed the same trend as the North Tote Road Crossing dustfall stations, with elevated values during May and June 2022. The closest meteorology station to the Tote Road South Crossing is at the Mine Site. The May monthly average wind speed (3.6 m/s) was close to the annual average (3.7 m/s) and the June average wind speed (4.1 m/s) was only slightly higher than the annual average. May and June 2022 were relatively dry with 2 and 6 days of precipitation, respectively (Figure 4-2 in EDI 2023). Low dustfall rates were recorded during September 2022 coinciding with wetter than normal conditions (15 days, Figure 4-2 in EDI 2023).

## 5 Summary

### 5.1 Ambient Air Quality Monitoring Program

Ambient air quality data were collected at the MSC and PSC in 2022. Ambient air quality was analyzed for SO<sub>2</sub>, NO<sub>2</sub>, NO, and NO<sub>x</sub> using Teledyne API SO<sub>2</sub>/NO<sub>x</sub> analyzers. TSP and PM<sub>2.5</sub> in ambient air were analyzed using BAM 1020 monitors at MSC and PSC. 2022 was the first year of monitoring for TSP and PM<sub>2.5</sub> concentrations in ambient air. The 2022 SO<sub>2</sub> and NO<sub>2</sub> data were tabulated and compared to 2015, 2017, 2018, and 2021 reports to analyze historical trends. The following summary observations are provided in relation to 2022 ambient air quality data:

- The measured concentrations of NO<sub>2</sub> and SO<sub>2</sub> at the MSC and PSC were below the Nunavut NAAQS for 2022.
- The 2022 measured concentrations of NO<sub>2</sub> and SO<sub>2</sub> were highest in the winter and lowest in the summer, consistent with the previously reported historical trends.
- During 2022 the SO<sub>2</sub> and NO<sub>x</sub> analyzers at the MSC monitoring station had 87.15% and 94.44% data with 7,634 and 8,273 valid data points, respectively.
- During 2022 the SO<sub>2</sub> and NO<sub>x</sub> analyzers at the PSC monitoring station had 74.70% and 99.97% valid data respectively for the year, with 6,544 and 8,757 valid data points each.
- Permeation data results indicate consistent calibration cycles. The SO<sub>2</sub> monitor pumps were replaced in early 2022 in the MSC and PSC. After pump replacement the meters were calibrated and brought back online to resume data collection.
- The BAM TSP and PM<sub>2.5</sub> measured concentrations at the MSC ambient air quality monitoring station had 63.14% and 55.84% valid data for 2022, respectively.
- Data were not available from January to April for the MSC and PSC TSP and PM<sub>2.5</sub> monitors due to set-up and configuration (equipment testing and commissioning).
- The measured 24-hour average TSP concentrations at MSC were greater than the project standard TSP 24-hour concentration (120 µg/m<sup>3</sup>) for 82 events comprising 32.8% of the available period of record.
- The average annual measured TSP concentration at MSC for the available period of record (116.91 µg/m<sup>3</sup>) was greater than the project standard (60 µg/m<sup>3</sup>).
- The average annual measured PM<sub>2.5</sub> concentrations at MSC for the available period or record (4.08 µg/m<sup>3</sup>), was less than the project annual standard (10 µg/m<sup>3</sup>).
- Additional controls to limit the amount of fugitive dust that escapes during ore crushing and transportation activities at the mine site should be investigated and implemented where possible.
- The measured TSP and PM<sub>2.5</sub> concentrations were highest in the spring and were lower in July and August then began to increase again in September before falling in November and remaining low through December 2022.

- The BAM PM<sub>2.5</sub> and TSP data at the PSC ambient air quality monitoring station had 69.11% and 67.53% valid data for 2022, respectively.
- During 2022 the PSC ambient air station recorded one measured 24-hour average PM<sub>2.5</sub> concentration greater than the project standard. The PM<sub>2.5</sub> exceedance coincided with the TSP exceedance on the same day (September 22, 2022).
- The measured PM<sub>2.5</sub> and TSP concentrations at PSC were highest in the spring then decreased and remained relatively low through the remainder of the year.
- The average measured PM<sub>2.5</sub> concentration at the PSC ambient air quality monitoring station for the available period of record (2.27 µg/m<sup>3</sup>) was less than the project annual standard (10 µg/m<sup>3</sup>).
- There were eleven out of the 246 measured 24-hour TSP averages that were greater than the project standard (120 µg/m<sup>3</sup>) at the PSC ambient air quality monitoring station comprising 4% of the total reading. The annual average of the measured TSP concentrations at the PSC for the available period of record (27.64 µg/m<sup>3</sup>) was less than the project standard for an annual TSP concentration (60 µg/m<sup>3</sup>).

It is important to note that the PSC and MSC ambient air monitoring stations are both within the PDA, and therefore not in locations to determine compliance with the project standards. The comparison of TSP monitoring results (inside the PDA boundary) to the project standards is being done to guide management actions for the protection of ambient air quality.

## 5.2 Meteorology

Meteorological data were collected at three meteorology stations in 2022 (Mary River, Milne Port and Steensby). Data collected included ambient air temperature, relative humidity, rainfall precipitation, wind speed and wind direction, and solar radiation.

The data collected at the three stations were compared to 2022 data recorded at the Pond Inlet Airport Climate Station, as well as the 30-year Climate Normal data (1981-2010) produced by the station. The following summary observations are provided in relation to 2022 meteorological data.

- In general, the trends observed for temperature, relative humidity, and rainfall precipitation matched well with the Climate Normal data set recorded at Pond Inlet.
- Average temperatures in 2022 tended to be slightly higher than the Pond Inlet Airport Climate Normal for most of the year, with a warmer March and April, as well as July. August through November were also slightly warmer (though less pronounced than the early portion of the year). However, these trends were also noted for Pond Inlet Airport during 2022.
- Mary River and Milne Port observed higher maximum air temperatures in 2022 than previous trends in 2021. Minimum air temperatures seemed consistent.
- Relative humidity tended to be a little lower in the summer (July) when compared with previous years.
- Rainfall precipitation recorded at the Mary River site indicated a rainy spring/early summer (June), but lower summer rainfall (July, consistent with the relative humidity dip). Rainfall was heavier in the fall (September) at the Mary River and Milne Port sites compared to the Pond Inlet

Climate Normal. Unfortunately, Pond Inlet was missing most of its 2022 summer rainfall data (June, July, August, and October were missing).

- The average wind speeds for the Mary River and Milne Port sites tended to be higher when compared to the Pond Inlet Airport Climate Normal dataset. During April to October the Mary River and Milne Port average wind speeds are roughly 30% to over 100% higher than the average wind speeds at the Pond Inlet Airport.
- Wind directions at the sites seemed generally consistent with the previous year.
- Although there is no solar radiation dataset in the Pond Inlet Climate Normal for comparison, solar radiation appears to be consistent between Mary River and Milne Port, although higher than the previous year during summer. Steensby observed higher solar radiation than Mary River and Milne Port, but the trend is similar.
- In general, Steensby's wind data set was inadequate due to rime ice buildup on site. The datalogger was inoperable for most of the second half of December 2022.

### **5.3 Dustfall**

The data from the dustfall stations at Tote Road North Crossing and Tote Road South Crossing showed peaks during May and June 2022 (Figure 8-4 in EDI 2023) which coincided with dry conditions (between 2 and 6 days of rain, Figures 4-2 and 4-4 in EDI 2023). Dustfall was low at the Tote Road North Crossing and the Tote Road South Crossing dustfall stations during September 2022 which coincided with unusually wet conditions (13 to 15 days with rain). There was little correlation between the 2022 peak monthly dustfall values for the Tote Road North Crossing and the Tote Road South Crossing monitoring stations and higher than average monthly wind speeds recorded at the nearest meteorology station.

Elevated dustfall values recorded at the Mine Site and Milne Port monitoring stations during May 2022 coincided with dry conditions recorded at the Mine Site meteorology station (2 days with measurable precipitation). Low dustfall values at the Mine Site and Milne Port monitoring stations coincided with unusually wet conditions during September 2022. There was little correlation between monthly average wind speeds and dustfall values at the Mine Site and Milne Port monitoring locations during 2022.

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