Baffinland

Memo

From: Baffinland Iron Mines Corporation

Title: **NIRB Cumulative Effects Workshop Information Request No. 2:**

Listing of Cumulative Effects Information and Summary of Baffinland's Cumulative Effects Predictions and Conclusions

Date: January 18, 2024

The NIRB's Procedural Guidance of December 15, 2023 requested Baffinland provide three information summaries by January 18, 2024. This memo covers the second item as outlined here:

- *a listing of the cumulative effects information presented to date through the various assessments of the Mary River Project and subsequent amendments, and a high level summary of Baffinland's predictions and conclusions regarding cumulative effects provided in those assessments;*

This memo provides a listing of cumulative effects assessments presented to date in the original Final Environment Impact Statement (FEIS), the Early Revenue Phase (ERP) Addendum to the FEIS and the Production Increase and Sustaining Operations Proposals. In addition to the memo, Attachment 1 provides Baffinland's formal cumulative effects analysis (CEA) methodology and Attachment 2 also provides a high-level summary of the predictions in the most recent cumulative effects assessment for the SOP, which considers and incorporates all approved components of the Project and predictions from previous assessments.

INTRODUCTION

The Nunavut Impact Review Board (NIRB) defines a cumulative impact (or effect) as "the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time" (NIRB, 2009; 2020). As outlined in NIRB's Proponent's Guide (NIRB, 2020), "a project proposal causes a cumulative effect if, when the potential impacts associated with the project proposal, when added to other projects in the region, or projects reasonably foreseeable in the region, will cause an additive effect". Proponents of proposed developments subject to review under the *Nunavut Planning and Project Assessment Act* (NuPPAA) are required, as part of their Impact Statement, to present a cumulative effects analysis (CEA) to demonstrate how the effects of their project interacts with the effects of relevant past, present and reasonably foreseeable projects in a regional context (NIRB, 2020).

The Mary River Project is operated by Baffinland Iron Mines Corporation (Baffinland) under Project Certificate No. 005 (as amended to 2023) issued under the Nunavut Agreement and NuPPAA. As part of the initial project proposal for the Mary River Project submitted to the NIRB in 2012, Baffinland prepared a Final Environmental Impact Statement (FEIS), which included a CEA, which screened all Valued Ecosystem/Socio-Economic Components (VEC/VSEC) considered in the effects assessment. VEC/VSECs with no predicted project-related residual effects were not carried forward in the CEA since in those cases there would be no mechanism for the Mary River Project to have a cumulative effect. Since 2012, Baffinland has proposed various amendments to the Mary River Project, which have required a reconsideration of the Project Certificate and submission of FEIS addenda by Baffinland. Only where potential changes in project residual effects were predicted to occur as a result of the amended project proposal, the original CEA conclusions were updated to reflect the outcomes from those updated VEC/VSECs assessments, while all other VEC/VSEC conclusions remained the same as and relied on in the approved 2012 FEIS CEA. This document provides a summary of the CEAs that have been conducted to date for the Mary River Project (and associated addenda). A copy of the methodology used by Baffinland in developing its original and subsequent CEA's is included as Attachment 1.

LISTING OF CUMULATIVE EFFECTS ASSESSMENTS PRESENTED TO DATE

The table below includes a listing of the cumulative effects assessments presented as part of the FEIS, FEIS Addendums and NIRB Applications presented in relation to the Mary River Project to date. The years of release are identified, as are the specific volume and/or section references with corresponding NIRB Registry IDs. For a more detailed understanding of any single cumulative effects assessment please review the associated documents by accessing through the NIRB public registry (https://www.nirb.ca/application?strP=r).

Table 1: References to Mary River Project Cumulative Effects Assessments[1]

Document	Year	Cumulative Effects Assessment Reference
Mary River Project Final Environmental Impact Statement	2012	Volume 9, Section 1
Early Revenue Phase Addendum to the Final Environmental Impact Statement	2013	Volume 9, Section 1
Mary River Modification Application – Production Increase, Fuel Storage, and Milne Port Accommodations	2018	No change from ERP
Phase 2 Addendum to the Final Environmental Impact Statement (not discussed further in memo)	2018 - 2019	Main Document, Section 6; Technical Supporting Document 27, Section 1; Revised Addendum to TSD-27
Production Increase Proposal Extension Request, Supporting Information Summary Report	2020	No change from ERP

[1] NIRB Registry ID for each of the document referenced in this table are available in Information Request 1 - Scope of the Mary River Project as Approved and Currently Constructed and Operated

Document	Year	Cumulative Effects Assessment Reference
Production Increase Proposal Renewal Application Supplement	2022	No change from ERP
Mary River Project – Sustaining Operations Proposal Final Environmental Impact Statement Addendum	2023	Section 6.9

MARY RIVER PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

A CEA was conducted for the Mary River Project FEIS in 2012 (Volume 9) (Baffinland 2012). The CEA approach used for the Mary River Project was developed in accordance with the NIRB Guidelines for the Mary River Project, which are consistent with the Cumulative Effects Assessment Practitioners Guide (Hegman et al., 1999) published by the Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada or the Agency). The Cumulative Effects Assessment Practitioners Guide recognizes that two basic conditions must be met for a CEA to be warranted: "local effects on [Value Components (VCs)] occur as a result of the action under review; and those [VCs] are affected by other actions (i.e., other projects and activities)" (Hegmann et al., 1999). In the Mary River Project FEIS, cumulative effects were assessed when the Mary River Project was predicted to have a potential residual effect (measured or reasonably expected) on a VC and it was reasonably foreseeable that the residual effect of the Mary River Project would interact with the effects of past, present, or future projects or activities in the general region.

Also, in accordance with the *Cumulative Effects Assessment Practitioners Guide (Hegmann et al. 1999),* the CEA presented in the Mary River Project FEIS included the following key steps:

- Scoping
- Analysis of cumulative effects
- Identification of mitigation
- Determination of significance
- Identification of monitoring

This basic five-step approach identified by the Agency in 1999 and adopted by the NIRB was used by Baffinland in the Mary River Project FEIS (and applicable addenda) and remains the foundation of current advice provided by the Agency under the more recent Impact Assessment Act (IAAC, 2023).

As part of the CEA scoping phase, Baffinland identified applicable VCs (Valued Ecosystem Components [VECs] and Valued Socio-economic Components [VSECs]), spatial and temporal boundaries, and other projects and activities, which could potentially have residual effects that could combine with residual effects of the Mary River Project and result in cumulative effects.

All of the VCs selected for the assessment of project effects were screened for selection in the CEA. However, VCs with no predicted project-related residual effects were not carried forward in the CEA since in those cases there would be no mechanism for the Mary River Project to have a cumulative effect. Table 2 presents the VCs and key indicators (along with associated spatial boundary) carried forward in the CEA for the Mary River Project FEIS. Table 3 presents the VC's and key indicators excluded into the CEA with rationale for the Mary River Project FEIS.

Table 2: Valued Ecosystem Component and Valued Socio-economic Components and Key Indicators selected for the 2012 FEIS CEA of the Mary River Project

VEC/VSEC	Key Indicator(s)	2012 Rationale for Inclusion in CEA	Spatial Boundary
Climate change	Greenhouse gas emissions	GHG emissions from a single project are typically negligible, but climate change is a cumulative effect arising from global GHG emissions	Nunavut Settlement Area (NSA)
Air quality	Air quality	The Project can contribute cumulatively to local air quality effects only	Air quality Local Study Area (LSA)
Noise	Noise levels	The Project can contribute cumulatively to local noise effects only	Noise LSA
Vegetation	Abundance and diversity Plant health Culturally valued plants	The Mary River Project combined with additional development within the terrestrial RSA has the potential to cumulatively affect vegetation	Terrestrial Regional Study Area (RSA)
Migratory birds and habitat	Peregrine falcon; Snow geese; King and Common eider; Lapland Longspur; Red-throated loon	The Mary River Project combined with additional development within the terrestrial RSA has the potential to cumulatively affect bird key indicators	Terrestrial RSA
Terrestrial mammals and habitat	Caribou	The Mary River Project combined with additional development within the range of the herd has the potential for cumulative effects	Range of North Baffin Caribou Herd
Freshwater quantity and quality	Water quantity; Water quality	The Project can contribute cumulatively to local water quantity and quality effects only	Freshwater LSA's
Freshwater biota	Arctic char	Separation Lake Hydroelectric Project would cross the RSA	Freshwater RSA
Sea ice	Landfast ice	Icebreaking may occur from other projects but only contribute cumulatively to local effects on ice	Marine LSA

VEC/VSEC	Key Indicator(s)	2012 Rationale for Inclusion in CEA	Spatial Boundary
Marine water and sediment quality	Marine water and sediment quality	Ore throughput at port sites contribute cumulatively at the local level only	Marine LSA
Marine habitat and biota	Marine habitat; Arctic char health; Invasive species introduction	Ore throughput at port sites contribute cumulatively at the local level only	Marine LSA
Marine mammals	Ringed seals; Bearded seals; Walrus; Beluga whale; Narwhal; Bowhead whale; Polar bear	Shipping and harvesting throughout the marine RSA have the potential to cumulatively affect marine mammals	Marine RSA
Population Demographics	Demographic stability	The Mary River Project and additional projects drawing employment from the same communities could cumulatively affect demographic stability through in- or out-migration	North Baffin LSA
Human health and well-being	Substance abuse Community and social stability	The Mary River Project and additional projects could draw employment from the same communities, affecting the availability of abused substances	North Baffin LSA
Community infrastructure and services	Competition for skilled workers	The Mary River Project could compete for workers within the direct-hire communities, adversely affecting staffing to provide community services	North Baffin LSA
Cultural Resources	Archaeology	The Mary River Project combined with additional development within the RSA has the potential for cumulative effects	RSA
Land and resource use	Inuit Harvesting, Travel and Camps	The Mary River Project combined with additional development within the land use study area has the potential to cumulatively affect land use	Land Use Study Area

Table 3: Valued Ecosystem Component and Valued Socio-economic Components and Key Indicators excluded (with rationale) from the 2012 FEIS CEA of the Mary River Project

VEC/VSEC	Key Indicator(s)	2012 Rationale for Exclusion in CEA
Vibration	Vibration levels	Residual effects for vibration are considered to be minimal.
Landforms, soil and permafrost	Sensitive landforms	No residual effect (disturbance of sensitive landforms) after mitigation
Migratory birds and habitat	Thick-billed Murre Species at risk: Ivory gull; Ross Gull; Red Knot; Harlequin Duck; Short Eared owl	Thick-billed Murre: No residual effects expected. Colonies are being avoided. Ivory and Ross's Gull: Observations rare within Project RSA, no residual effects expected. Red Knot: Field studies have not documented the species within the terrestrial RSA, no residual effects expected Harlequin Duck: No observations of the species in typical breeding habitat, no residual effects expected. Short-Eared Owl: Limited observations in Terrestrial RSA and not since 2007, no nesting confirmed or suspected in typical habitat, no residual effects expected.
Education & Training	Life skills Education and skills	Significant positive residual effect assessed. Only negative residual effects were scoped into CEA.
Livelihood and Employment	Wage employment Job progression and career advancement	Significant positive residual effect assessed. Only negative residual effects were scoped into CEA.
Economic Development and Self-reliance	Land People Community economy Territorial economy	Significant positive residual effect assessed. Only negative residual effects were scoped into CEA.
Contracting and business opportunities	Opportunities for businesses	Significant positive residual effect assessed. Only negative residual effects were scoped into CEA.
Cultural well-being	Cultural well-being	No adverse residual effects were assessed with regard to Cultural Well-Being.
Benefits, taxes and royalties	Territorial own source revenues	Significant positive residual effect assessed. Only negative residual effects were scoped into CEA.
Governance and leadership	Governance and leadership	Significant positive residual effect assessed. Only negative residual effects were scoped into CEA.

The Nunavut Settlement Area (NSA) boundary was adopted for the spatial boundary of the CEA since it represented a sufficiently large scale to identify other projects or activities that could reasonably be foreseen to interact with the Mary River Project and also represented the NIRB's administrative boundary. Shipping to and from the Raglan Mine in the Nunavik region of Quebec was also included in the CEA spatial scope. Specific regional and local study areas were also identified on a case-by-case basis for each Valued Component (VC), as applicable. See Figure 1 below for the overview of the marine and terrestrial LSAs and RSAs.

Temporal boundaries for the CEA considered the lifespan of the Mary River Project (2004 to 2045) and were inclusive of the lifespan of other projects and activities, where known or reasonably foreseeable (e.g., start of industrial development in northern Baffin Island) and therefore were indicated to span from approximately 1975 to 2045.

Other projects and activities considered in the CEA included other past, current or future activities proposed by Baffinland (e.g., previous exploration and bulk sampling programs; proposed monitoring programs concurrent with the Project); climate change; communities; traditional and recreational hunting, fishing and foraging; tourism and commercial recreation activities; designated conservation areas; and other past, current or future projects/activities proposed by other proponents. Other projects and activities included: mining and mineral exploration activities; marine transport/ shipping (including a naval refuelling station); air transport; military exercises and monitoring programs (e.g., DEW-line decommissioning); and hydroelectric facilities.

Potential effects of those other projects and activities were considered in combination with predicted residual effects of the Mary River Project. Mitigation identified to address possible cumulative effects were primarily mitigation measures previously identified to reduce and manage potential adverse effects of the project. Possible cumulative effects were identified for several VCs, particularly caribou and marine mammals. With the exception of marine mammals, most potential cumulative effects identified were the result of potential interactions with projects that may be induced by the Mary River Project (development of Deposits No. 2 to 9 or the Separation Lake hydroelectric project) and other potential industrial activities within the boundaries of the assessment (e.g.). Cumulative effects were predicted to be not significant for all VCs. No additional follow-up or monitoring was proposed to address cumulative effects specifically, however all VCs were included for Project-specific effects monitoring. Baffinland's participation in collaborative initiatives with the Qikiqtaaluk Socio-Economic Monitoring Committee was identified to help monitor the potential for socio-economic related cumulative effects.

See Attachment 2 for the Cumulative Effects Summary from the Mary River FEIS.

Figure 1: Marine and Terrestrial Local and Regional Study Areas

AMENDMENTS TO THE FEIS

Early Revenue Phase-FEIS Addendum (Amendment 1)

In 2013, due to various business drivers, Baffinland proposed to add transportation of ore through the Northern Transportation Corridor. This Early Revenue Phase (ERP) proposal involved the extraction of iron ore from the Mine Site to be transported by truck along the existing Tote Road and shipped from Milne Port to primarily European markets. Baffinland submitted an Addendum to the FEIS (ERP FEIS Addendum) (Baffinland, 2013), updating the FEIS as appropriate to account for the modification in activities.

As part of the ERP, the CEA was reviewed and updated to acknowledge changes in predicted project residual effects compared to what was assessed in the FEIS. Additional projects and activities considered in the ERP included the reasonably foreseeable future Bathurst Inlet Port and Road Project and changes in forecasted shipping activities through Milne Inlet and into Baffin Bay.

The CEA presented in the ERP FEIS Addendum concluded that there was limited potential overlap between the ERP and other projects and undertakings, including the approved Mary River Project and the Southern Transportation Corridor (previously assessed in the FEIS and approved as part of the Mary River Project). The ERP FEIS Addendum presented no changes in predicted cumulative effects, with the exception of the Sea Ice (no icebreaking required for Northern Transportation Corridor, but icebreaking was assessed in the FEIS for the Southern Transportation Corridor), and Marine Water and Sediment Quality (in recognition of the modification of the project footprint at Milne Port). Where overlap of residual effects occurred and potential cumulative effects were identified, the effect of the ERP in combination with other projects and undertakings was predicted to remain not significant (Baffinland, 2013).

See Attachment 2 for the Cumulative Effects Summary from the Early Revenue Phase Addendum to the FEIS.

Production Increase Amendments (Amendments 2-4)

No CEA update was conducted for the Production Increase Proposal (PIP) proposed by Baffinland in 2018 for several reasons. The PIP represented an incremental increase to a nominal trucking and shipping (increase from 4.2 Mtpa to 6 Mtpa), but included no new activities or added infrastructure beyond those assessed for the ERP, and was planned to be a temporary change to the Mary River Project (2018). For the same reasons, no CEA update was conducted for the Production Increase Proposal Extension (PIPE) (2020) or the Production Increase Proposal Renewal (PIP Renewal) (2022) which were intended to temporarily extend the current trucking and shipping activities using the Northern Transportation Corridor at a level of 6 Mtpa.

Sustaining Operations Proposal (Amendment 5)

The Sustaining Operations Proposal (SOP) involved maintaining the Northern Transportation Corridor with a nominal trucking and shipping rate of 6 Mtpa with no new activities or added infrastructure, (as approved for the ERP, PIP, PIPE and PIP Renewal) but extended the timeframe of the use of Northern Transportation Corridor (2023-2024).

The SOP application included an updated CEA using the same methods and approach used to assess the cumulative effects of the original FEIS (Baffinland 2012), and the ERP FEIS Addendum (Baffinland 2013). All VCs evaluated in the project-specific effects assessment were considered and screened for inclusion in the CEA. VCs for which residual effects were predicted to occur were carried through the CEA. Spatial and temporal boundaries for the CEA were established in consideration of boundaries used in the previous CEAs. Although the scope of the SOP application was primarily focused on a temporal extension of activities previously approved through the ERP, PIP, PIPE and PIP Renewal applications, the SOP CEA provided an update to the CEA presented for the ERP (Baffinland, 2013) and therefore considered the increase in trucking and shipping levels from 4.2 Mtpa to a nominal rate of 6 Mtpa.

As was the case for the previous CEAs, the overall spatial boundary for identification of other projects and activities for the CEA remained the NSA. However, the expected zone of influence of residual effects within the RSA was considered on a case-by-case basis for each VC when determining whether there was spatial overlap of effects and thus potential for cumulative effects. The temporal boundaries for the SOP CEA were consistent with the temporal boundaries used in the CEAs presented in the FEIS and ERP FEIS Addendum which considered the lifespan of the Mary River Project as well as the lifespan of other projects and activities within the NSA. The SOP CEA included consideration of the previously approved Southern Transportation Corridor (i.e., Steensby Railway and Steensby Port).

The SOP CEA considered changes in residual effects from the PIP (and inherently the PIPE and PIP Renewal) and the SOP in combination with residual effects from other past, present and/or reasonably foreseeable projects and activities (including all approved Mary River Project activities and components). Other projects and activities with potential residual effects that could potentially overlap with residual effects of the SOP were carried forward in the assessment and potential cumulative effects were evaluated for applicable VCs in consideration of proposed mitigation and monitoring programs. The method of assessing significance of cumulative effects remained the same as assessing project-specific residual effects.

Importantly, the SOP application included environmental effects monitoring results (some of which pre-dated operation of the Mary River Project) which helped to verify residual project effects predictions and the effectiveness of mitigation measures including the need for adaptive management. The results of effects monitoring informed the effects assessment of the SOP, including the CEA. Several additional mitigative commitments were made by Baffinland as part of the SOP and it holds that the implementation of these mitigation measures would reduce the project’s contribution to adverse cumulative effects. The

CEA presented in the SOP application concluded that cumulative effects of the SOP in combination with other projects and activities would be not significant.

See Attachment 2 for the Cumulative Effects Summary from the Sustaining Operations Proposal Addendum to the FEIS.

SUMMARY

The CEA approach adopted by Baffinland for the Mary River Project in the FEIS is consistent with NIRB and Agency guidance (Hegmann et al., 1999; NIRB, 2009). As the Mary River Project has evolved since 2012, Baffinland's proposals for project amendments have reconsidered and updated the original CEA where applicable. Both NIRB and the Agency have updated their CEA guidance in recent years (NIRB, 2020; IAAC, 2023), and Baffinland's approach remains consistent with applicable guidance. Cumulative effects from the Mary River Project to date have been found to be not significant.

A near-term initiative that will enhance the ability of communities to identify and propose responses to potential cumulative effects will occur through the Qikiqtani Inuit Association's (QIA) Inuit Stewardship Plan, including completing a Culture, Resources and Land Use (CRLU) Assessment to establish the scope and contents of the CRLU Monitoring Program. Baffinland also agreed to participate in regional government initiatives and programs including federal initiatives aimed at evaluating regional cumulative effects in the Eastern Canadian Arctic and a marine spatial planning exercise should an appropriate regional body lead the initiative.

Baffinland continues to work with regulatory agencies and local communities to reduce residual effects from the Mary River Project and is committed to participating in collaborative initiatives aimed at managing regional cumulative effects in the Eastern Canadian Arctic.

REFERENCES

Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling and D. Stalker. 1999. Cumulative Effects Assessment Practitioners Guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency, Hull, Quebec.

IAAC (Impact Assessment Agency of Canada). 2023. Policy Framework for Assessing Cumulative Effects under the Impact Assessment Act. May 2023.

NIRB (Nunavut Impact Review Board). 2009. Guidelines for the Preparation of an Environmental Impact Statement for Baffinland Iron Mines Corporation's Mary River Project (NIRB File No. 08MN053). Dated November 16, 2009.

NIRB (Nunavut Impact Review Board). 2020. Proponent's Guide. NIRMB Technical Guide Series. February 2020.

Attachment 1

Baffinland CEA Methodology

Extract from FEIS Volume 9

1.2.1 Methodology

The CEA process adopted for this analysis is illustrated in Figure 9-1.1, which in accordance with the methodology put forth by the Canadian Environmental Assessment Agency (CEAA) (Hegmann *et al*., 1999), includes the following.

- Scoping:
  - Identification of Project residual effects and receiving VCs;
  - Identification of other past, present and future projects and activities with the potential to interact with residual Project effects; and
  - Determine where residual Project effects interact with other past, present and future projects and activities, resulting in the potential for cumulative effects.
- Analysis of cumulative effects;
- Identification of mitigation;
- Determination of significance; and
- Identification of monitoring.

A systematic screening method was used to identify and evaluate potential cumulative effects. The cumulative effects reported herein are based on residual effects identified in the discipline-specific impact statements (Volumes 4 through 8). On a VC specific basis, the zone of influence (ZOI) of residual Project effects was compared with the ZOI of other projects and activities. Cumulative effects were identified where an overlapping interaction in time and space was determined. Where cumulative effects were identified, they were ranked as described in Section 1.2.5.

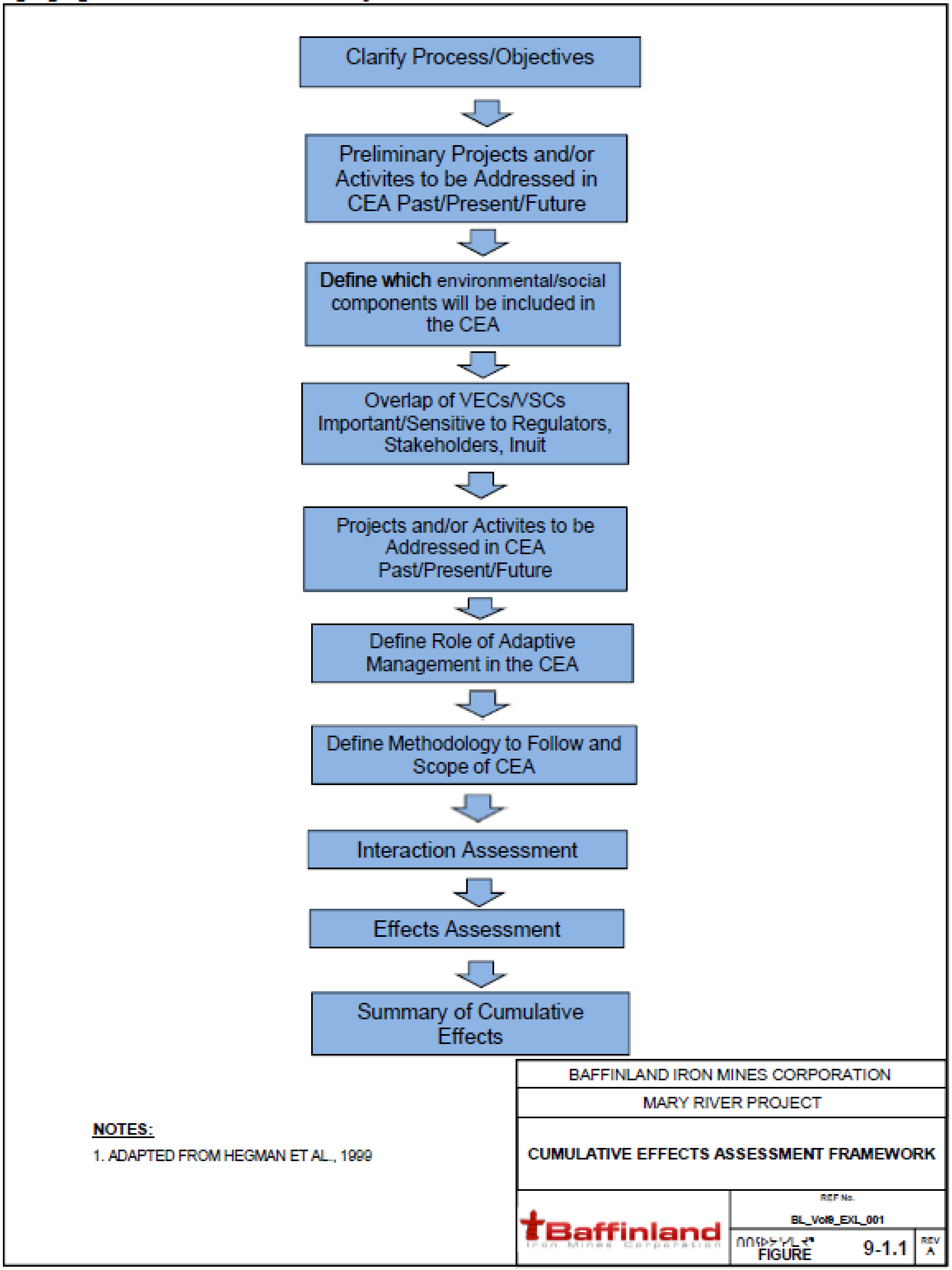
For this assessment, cumulative effects were assessed when:

- A residual effect of the Project had a demonstrable effect (measured or reasonably expected) on a biophysical or human component; and
- It was reasonably foreseeable that the residual effect of the Project would interact with the effects of past, present, or future projects or activities.

For each residual Project effect, the CEA identified if there was:

- No anticipated interaction with other projects and activities that could result in cumulative effects;
- An anticipated interaction with other projects or activities, which could result in cumulative effects and available information allowed for consideration of measurable effects;
- An anticipated interaction with other projects or activities, which could result in cumulative effects and available information did not allow for consideration of measurable effects;
- An interaction with accidents and/or malfunctions of other projects and activities that could result in cumulative effects; these effects cannot be assessed, because they are dependent on other

BL_Vol9_EXL_001 Cumulative Effects Assessment Framework Figure 9-1-1



project/activity specific practises for prevention and response to accidents and malfunctions; and

- An interaction with accidents and/or malfunctions of other projects and activities, which could result in cumulative effects. Effects cannot be assessed due to the lack of information on the status or trends in the condition of the VC over time. Potential effects are dependent on the adoption and success of regionally based adaptive management practises.

1.2.2 Temporal Boundaries

Temporal boundaries define the period analyzed within which the Project or Project activities interact with environmental or socioeconomic components. The Project's own temporal boundaries are defined by Project phase as follows:

- Pre-development or Definition Phase (nine years - 2004 to 2012);
- Construction Phase (four years - 2013 to 2016);
- Operation Phase (21 years - 2017 to 2037); and
- Closure (three years - 2038 to 2040) and Post-Closure Phase (minimum five years – 2041 to 2045).

With respect to the above temporal boundaries, the following is noted:

- The Definition Phase is inclusive of all exploration and research programs, as well as the bulk sampling program carried out in 2007 and 2008; and
- The Closure and Post-Closure Phase, the period required for decommissioning and/or removing Project infrastructure.

The CEA considers the Project's residual effects in the context of the past, present and future actions of the Project and actions by others. The temporal boundary for the CEA was chosen based on the following criteria:

- The lifespan of the Mary River Project, including the pre-development, construction, decommissioning and monitoring phases (42 years); and
- To be inclusive of the lifespan of other projects and activities, where known or reasonably foreseeable.

Industrial development in the northern Baffin Island area started in the late 1970s with the development of the Nanisivik and Polaris mines, which opened in 1976 and 1980, respectively, and were preceded by several years of mineral exploration. Therefore, the temporal boundaries selected for the cumulative effects assessment is the 75-year period from 1970 to 2045.

1.2.3 Spatial Boundaries

A CEA scoping study area was adopted for initial consideration of other projects and activities that could potentially interact with the Project's residual effects. The Nunavut settlement area boundary (4,025,445 km2) was adopted, as it represents a sufficiently large scale to be inclusive of any other project or activity that could reasonably be foreseen to interact with the Project, and it represents NIRB's administrative boundary. Shipping to and from the Raglan Mine in the Nunavik region of Quebec was also included in the CEA scope. Current and future projects and activities in this area are listed in Section 1.3.3.

Study areas were determined on a VC-specific basis. The following describes the criteria and assumptions that were adopted for determining VC specific CEA study area boundaries.

Spatial boundaries were determined specifically for each VC on the basis of the following:

- To provide context to assess the magnitude of Project effects as well as interacting effects of other land uses;
- Overlaps with the expected ZOI likely affected by the Project;
- Conservative assumptions about the magnitude and probability of the effect;
- Adoption of an adaptive approach; and
- Large enough to allow meaningful assessment of VECs and VSECs that may be affected by the Project.

Where appropriate, they are different from (i.e., larger than) the boundaries for the corresponding residual Project effects;

- Set at a point at which potential cumulative effects become insignificant; and
- Determined based on ecological and/ or sociologically defensible rationale and/ or professional judgment.

1.2.4 Consideration of Alternative Development Scenarios

Several alternative means of delivering the Mary River Project were considered by Baffinland in the alternatives analysis (Volume 3, Section 6) as follows:

- Production rate - of greater, less than or equal to the proposed production rate of 18 Mt/a, which would not meaningfully affect the conclusions of the cumulative effects assessment;
- Power supply - the potential to induce the development of the potential hydro-electric scheme at Separation Lake, to supply power to the Project - evaluated in Section 1.3.2.16;
- Port location - no other port location was deemed viable in the alternatives analysis, so the cumulative effects of alternate port locations was not evaluated;
- Ore transport method - ore could potentially be transported to Steensby Port by truck;
- Railway routing to Steensby Port – five overland routes from the Mine Site to Steensby Port were evaluated and, while the selected route was identified to have fewer effects to the environment, none of the alignments are substantially different such that an evaluation of the cumulative effects of these scenarios is useful or meaningful; and
- Alternatives to year-round shipping - including open-water shipping only and/or decreasing the production rate - has been assessed with the use of year-round shipping via the Railway and Steensby Port and with open water shipping at a lower production rate via Milne Port.

Additionally, alternative development scenarios could include the mining of other iron ore deposits owned by Baffinland. These scenarios are described in Section 1.3.2.5.

1.2.5 Ranking of Cumulative Effects

The significance of cumulative effects uses the same evaluation criteria applied elsewhere in the EIS, as described in Volume 2, Section 3. This includes an effect’s magnitude, duration, frequency, extent and reversibility and consideration of the significance determination in the original assessment for each VC.

1.2.6 Cumulative Effects of Accidents and Malfunctions and other Projects

Project related accidents and malfunctions are considered in the Project residual effects analysis (Section 3). There is no systematic inventory of historical accidents and malfunctions from other projects that could interact with the Mary River Project, so consequently it is not possible to quantitatively assess the potential contribution of cumulative effects from other project accidents and malfunctions. Although no residual effects from accidents and malfunctions are anticipated, the CEA considers the possibility of cumulative effects from accidents and malfunctions from shipping activities (Section 1.4.4).

The CEA also considers cumulative effects of potential environmental effects generated from an array of existing and proposed projects in Nunavut. Sources of uncertainty include imperfect knowledge of the scope of planned or proposed projects, potential changes and modifications to existing and planned projects and their interactions with shared environmental and social receptors. Therefore, the complexity associated with other projects scope and scale, and the inherent uncertainties associated with predicting future events and activities are greater in cumulative effects assessments. For example, project effects associated with existing mining operations (Meadowbank, Doris North, and, Raglan) are quantifiable, whereas potential effects from project under development (Roche Bay, Meliadine, and, Kiggavik) are less certain. As these planned projects evolve, more information on potential interactions will be available and the uncertainties with the cumulative effects predictions may in some instances be reduced or increased. Adaptive management and the use of information generated by regional institutions can assist in reducing uncertainties.

1.2.7 Adaptive Management

Baffinland has committed to mitigation, environmental management, adoption of best management practices, and monitoring in order to:

- Avoid, eliminate, or reduce adverse potential environmental effects of the Project, including cumulative effects;
- Verify the effectiveness of mitigation;
- Confirm effects predictions, including cumulative effects; and
- Contribute to a better understanding of the effects of mine development in Arctic regions and of potential cumulative effects in the North Baffin Region.

The data obtained through monitoring will help the proponent to continually improve the environmental management and environmental effects prediction. However, while Baffinland can manage effects of the Project, management of cumulative effects requires a coordinated, multi-stakeholder approach that focuses on managing specific effects on specific resources. In the absence of adequate data and jurisdiction for determining and managing cumulative effects, the best response to cumulative effects is adaptive management using coordinated information-sharing and feedback loops to reduce risk and increase the success of management actions. Baffinland has agreed to contribute data, where reasonable or possible, to the Nunavut General Monitoring Program with the objective of contributing to the knowledge base of changes to the long-term state and health of Nunavut.

Currently in development, the Nunavut General Monitoring Program (NGMP) is a regionally based monitoring program being developed as a requirement of the Nunavut Land Claims Agreement. The objective of the NGMP is to identify changes in the long-term state and health of Nunavut, identifying changes in the environment. The NGMP is being developed jointly by Nunavut Tunngavik Incorporated (NTI), the Government of Nunavut (GN), AANDC, Aboriginal Affairs and Northern Development Canada (formerly Indian and Northern Affairs Canada - INAC) and the Nunavut Planning Commission (NPC). With the intention of contributing to the avoidance and/or mitigation of negative cumulative effects in Nunavut, Baffinland is committed to contribute to the NGMP by sharing data used in the preparation of the EIS.

Attachment 2

Cumulative Effects Summary

Table 9-1.4 Cumulative Effects Summary

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
GREENHOUSE GASES								
Greenhouse gas emissions	Negative	Reduce project emissions to the extent possible	Level 1 - minor in relation to global emissions	Level II - life of mine	Level III - Continuous	Level III - beyond the RSA	Level III - irreversible	Not Significant
AIR QUALITY								
Air quality emissions of criteria of concern (COC) at the Mine Site from concurrent development of Deposits No. 2 and/or 3	Negative	Implement air quality abatement measures, in Project design and/or as adaptive management	Level II, possibly Level III	Level II - life of mine	Level III - Continuous	Possibly Level II for some parameters, based on current project	Level I - reversible	Not Significant
Air quality emissions of criteria of concern (COC) along the Milne Inlet Tote Road or Railway, from concurrent development of Deposits No. 2 and/or 3, or development of other deposits in the region that utilize the tote road or railway	Negative	Implement air quality abatement measures, in Project design and/or as adaptive management	Level II, possibly Level III	Level II - life of mine	Level III - Continuous	Possibly Level II for some parameters, based on current project	Level I - reversible	Not Significant
Air quality emissions of criteria of concern (COC) at Milne Port or Steensby Port from larger tonnages of ore handled through the port sites, from concurrent development of Deposits No. 2 and/or 3, or development of other deposits in the region, and construction of the Separation Lake hydroelectric site staged from Steensby Port	Negative	Implement air quality abatement measures, in Project design and/or as adaptive management	Level II, possibly Level III	Level II - life of mine	Level III - Continuous	Level I, or possibly Level II	Level I - reversible	Not Significant

Table 9-1.4 Cumulative Effects Summary (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	Direction	Mitigation Measure (s)	Magnitude	Duration	Frequency	Extent	Reversibility	
NOISE								
Increased noise within the noise study areas of each of the Project sites, resulting from an increased mining production rate and construction of the Separation Lake hydroelectric project (applicable to Steensby Port)	Negative	Implement noise abatement measures, in Project design and/or as adaptive management	Level I for main Project, could increase to Level II with additional activities	Level II - life of mine	Level III - Continuous	Level I, or possibly Level II	Level I - reversible	Not Significant
VEGETATION								
Reduction in vegetation abundance and diversity within the terrestrial RSA	Negative	Minimize area of disturbance	Level I - Effect expected to be indistinguishable from natural variation	Level III - beyond life of the Project (permanent)	Level I - Infrequent	Level I - will occur within the PDA	Level II - partially irreversible (some natural regeneration will occur, post-closure)	Not Significant
Reduction in vegetation health due to deposition of dust and metals in soil	Negative	Dust suppression	Level I - Effect expected to be indistinguishable from natural variation	Level III - beyond life of the Project (permanent)	Level III - Continuous	Level I, or possibly Level II	Level III - irreversible	Not Significant
Reduction in culturally valued vegetation (represented by blueberries)	Negative	Minimize area of disturbance	Level I - Effect expected to be indistinguishable from natural variation	Level III - beyond life of the Project (permanent)	Level III - Continuous	Level I, or possibly Level II	Level III - irreversible	Not Significant

Table 9-1.4 Cumulative Effects Summary (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	Direction	Mitigation Measure (s)	Magnitude	Duration	Frequency	Extent	Reversibility	
TERRESTRIAL WILDLIFE AND HABITAT								
Reduction in caribou habitat	Negative	Minimize area of disturbance; manage dust emissions; minimize noise and other sources of sensory disturbance	Level I - Effect expected to be indistinguishable from natural variation	Level III - beyond life of the Project (permanent)	Level III - Continuous	Level III - confined to RSA	Level II - partially irreversible (some natural regeneration will occur, post-closure)	Not Significant
Reduction in caribou movement	Negative	Utilize existing transportation corridors for future development activities	Level I - Effect expected to be indistinguishable from natural variation	Level II - life of mine	Level III - Continuous	Level III - confined to RSA	Level I - reversible	Not Significant
Caribou mortality	Negative	Apply mitigation in current Project to minimize potential for additional mortality	Level I - Effect expected to be indistinguishable from natural variation	Level II - life of mine	Level I - Infrequent	Level II - confined to LSA	Level I - reversible	Not Significant
Migratory birds	Negative	Apply mitigation in current Project to minimize potential for additional mortality	Level I - Effect expected to be indistinguishable from natural variation	Level II - life of mine	Level I - Infrequent	Level II - confined to LSA	Level I - reversible	Not Significant
FRESHWATER QUANTITY AND QUALITY								
Doubling of water takes from water supply lakes at Milne Port, the Mine Site and Steensby Port	Negligible	No mitigation required - water taking is below thresholds	Level I - Effect expected to be indistinguishable from natural variation	Level II - life of mine	Level III - Continuous	Level II - confined to LSA	Level I - reversible	Not Significant

Table 9-1.4 Cumulative Effects Summary (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
Increased loading of runoff from mining areas into the Mary River	Negative	Water management (diversion to alternate receiving waters) or water treatment, if necessary	Level II - Effect expected to be moderate magnitude following mitigation, meeting compliance requirements of water licence, fisheries authorization and aquatic effects monitoring (MMER) requirements.	Level II - life of mine	Level II - Intermittent	Level II - confined to LSA	Level I - reversible	Not Significant
FRESHWATER FISH								
Effects to Arctic char health and habitat resulting from water quality effects	Negative	Mitigation to be identified within an authorization under the *Fisheries Act*. Compliance with water licence and aquatic effects monitoring under the MMER.	Level I - Effects expected to be low magnitude after mitigation	Level II - life of mine	Level II - Intermittent	Level II - confined to LSA	Level I - reversible	Not Significant
SEA ICE								
Disruption of fast ice (ringed seal habitat)	Negative	Confine ice breaking to narrow corridor to manage disturbance of fast ice to less than 10 % threshold	Level II - Effect expected to approach but not exceed established threshold.	Level II - life of mine	Level III - Continuous	Level II - confined to LSA	Level I - reversible	Not Significant

Table 9-1.4 Cumulative Effects Summary (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
Changes to marine water quality at port sites due to more frequent shipping and discharge of ballast water	Negative	Ballast water exchange as required by law	Level I - Effects expected to be low magnitude after mitigation	Level II - life of mine	Level II - Intermittent	Level II - confined to LSA	Level I - reversible	Not Significant
Effects to marine biota, including Arctic char, due to potential water and sediment quality changes.	Negligible	Apply mitigation for water and sediment quality	Level I - Effects expected to be low magnitude after mitigation	Level II - life of mine	Level II - Intermittent	Level II - confined to LSA	Level I - reversible	Not Significant
RINGED SEAL								
Increased disruption of fast ice in Steensby Inlet	Negative	Confine ice breaking to narrow corridor to manage disturbance of fast ice to less than 10 % threshold	Level II - Effect expected to approach but not exceed established threshold	Level II - life of mine	Level III - Continuous	Level II - confined to LSA	Level I - reversible	Not Significant
BEARDED SEAL								
Habitat change, disturbance, and masking.	Negative	Apply mitigation in current Project	Level I - low (habitat change); Level II - moderate (disturbance, masking)	Level II - life of mine	Level III - Continuous	Level II - confined to LSA	Level I - reversible	Not Significant
WALRUS								
Habitat change, disturbance, and masking.	Negative	Apply mitigation in current Project	Level I - low	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA	Level I - reversible	Not Significant

Table 9-1.4 Cumulative Effects Summary (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
NARWHAL								
Habitat change, disturbance, and masking.	Negative	Apply mitigation in current Project	Level I - low (habitat change); Level II - moderate (disturbance, masking)	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA; possibly Level II - beyond the LSA and within the RSA	Level I - reversible	Not Significant
BELUGA WHALE								
Habitat change, disturbance, and masking.	Negative	Apply mitigation in current Project	Level I - low (habitat change); Level II - moderate (disturbance, masking)	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA; possibly Level II - beyond the LSA and within the RSA	Level I - reversible	Not Significant
BOWHEAD WHALE								
Habitat change, disturbance, and masking.	Negative	Apply mitigation in current Project	Level I - low (habitat change); Level II - moderate (disturbance, masking)	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA; possibly Level II - beyond the LSA and within the RSA	Level I - reversible	Not Significant
POLAR BEAR								
Habitat change, disturbance, and possibly mortality.	Negative	Apply mitigation in current Project	Level I - low	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA	Level I - reversible	Not Significant

NOTE(S):
1. CACs = CRITERIA AIR CONTAMINANTS [TSP, PM10, PM2.5, SO2, NO2, CO, Fe, Mn, As, Ca, Co and POI (potential acid input).

Table 9-1.4 Cumulative Effects Summary (Change)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
GREENHOUSE GASES								
Greenhouse gas emissions	No change	No change	No change	No change	No change	No change	No change	Not Significant
AIR QUALITY								
Air quality emissions of criteria of concern (COC) at the Mine Site from concurrent development of Deposits No. 2 and/or 3	No change	No change	No change	No change	No change	No change	No change	Not Significant
Air quality emissions of criteria of concern (COC) along the Milne Inlet Tote Road or Railway, from concurrent development of Deposits No. 2 and/or 3, or development of other deposits in the region that utilize the tote road or railway	No change	No change	No change	No change	No change	No change	No change	Not Significant
Air quality emissions of criteria of concern (COC) at Milne Port or Steensby Port from larger tonnages of ore handled through the port sites, from concurrent development of Deposits No. 2 and/or 3, or development of other deposits in the region, and construction of the Separation Lake hydroelectric site staged from Steensby Port	No change	No change	No change	No change	No change	No change	No change	Not Significant

Table 9-1.4 Cumulative Effects Summary (Change) (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
NOISE								
Increased noise within the noise study areas of each of the Project sites, resulting from an increased mining production rate and construction of the Separation Lake hydroelectric project (applicable to Steensby Port)	No change	No change	No change	No change	No change	No change	No change	Not Significant
VEGETATION								
Reduction in vegetation abundance and diversity within the terrestrial RSA	No change	No change	No change	No change	No change	No change	No change	Not Significant
Reduction in vegetation health due to deposition of dust and metals in soil	No change	No change	No change	No change	No change	No change	No change	Not Significant
Reduction in culturally valued vegetation (blueberries)	No change	No change	No change	No change	No change	No change	No change	Not Significant
TERRESTRIAL WILDLIFE AND HABITAT								
Reduction in caribou habitat	No change	No change	No change	No change	No change	No change	No change	Not Significant
Reduction in caribou movement	No change	No change	No change	No change	No change	No change	No change	Not Significant
Caribou mortality	No change	No change	No change	No change	No change	No change	No change	Not Significant
Migratory birds	No change	No change	No change	No change	No change	No change	No change	Not Significant
FRESHWATER FISH								
Effects to Arctic char health and habitat resulting from water quality effects	No change	No change	No change	No change	No change	No change	No change	Not Significant

Table 9-1.4 Cumulative Effects Summary (Change) (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
SEA ICE								
Disruption of fast ice (ringed seal habitat)	No change	No change	No change	No change	No change	No change	No change	Not Significant
Changes to marine water quality at port sites due to more frequent shipping and discharge of ballast water	No change	No change	No change	No change	No change	No change	No change	Not Significant
Effects to marine biota, including Arctic char, due to potential water and sediment quality changes.	No change	No change	No change	No change	No change	No change	No change	Not Significant
RINGED SEAL								
Increased disruption of fast ice in Steensby Inlet	No change	No change	No change	No change	No change	No change	No change	Not Significant
BEARDED SEAL								
Habitat change, disturbance, and masking	No change	No change	No change	No change	No change	No change	No change	Not Significant
WALRUS								
Habitat change, disturbance, and masking	No change	No change	No change	No change	No change	No change	No change	Not Significant
NARWHAL								
Habitat change, disturbance, and masking	Negative	Apply mitigation in current Project	Level I - low (habitat change); Level II - moderate (disturbance, masking)	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA; possibly Level II - beyond the LSA and within the RSA	Level I - reversible	Not Significant

Table 9-1.4 Cumulative Effects Summary (Change) (Cont'd)

Potential Effects			Evaluation Criteria					Rated Significance of Residual Effects
Effect	**Direction**	**Mitigation Measure (s)**	**Magnitude**	**Duration**	**Frequency**	**Extent**	**Reversibility**	
BELUGA WHALE								
Habitat change, disturbance, and masking	Negative	Apply mitigation in current Project	Level I - low (habitat change); Level II - moderate (disturbance, masking)	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA; possibly Level II - beyond the LSA and within the RSA	Level I - reversible	Not Significant
BOWHEAD WHALE								
Habitat change, disturbance, and masking	Negative	Apply mitigation in current Project	Level I - low (habitat change); Level II - moderate (disturbance, masking)	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA; possibly Level II - beyond the LSA and within the RSA	Level I - reversible	Not Significant
POLAR BEAR								
Habitat change, disturbance, and possibly mortality	Negative	Apply mitigation in current Project	Level I - low	Level II - life of the Project	Level III - Frequent	Level I - confined to LSA	Level I - reversible	Not Significant

NOTE(S):

1. CACs = CRITERIA AIR CONTAMINANTS [TSP, PM10, PM2.5, SO2, NO2, CO, Fe, Mn, As, Ca, Co and POI (potential acid input).

Table 6.34: Potential Cumulative Effects on Valued Ecosystem Components

VECs	Nanisivik Naval Facility and Military Exercises	Back River Project	Raglan Mine	Meadow Bank Mine	Meliadine Project	Hope Bay Project	Mary River Approved Project (up to 2022)	Regional Ship Traffic	Regional Air Transport	Communities; Traditional/Recreational Land	Regional Monitoring Programs	Sirmilik National Park	Baffinland Regional Explorations	Climate Change	Tullurutiup Imanga/ Lancaster Sound NMCA	Cumulative Effects Assessment Summary
Climate Change	X	X	X	X	X	X	X	X	X	X	X		X			The SOP will result in incremental emissions of GHGs associated with road transportation and shipping. However, residual effects on Climate Change are predicted to be negligible and consistent with what has been assessed previously. With the exception of protected areas (e.g., Sirmilik National Park and the Tullurutiup Imanga/Lancaster Sound NMCA), all other past, existing and reasonably foreseeable projects and activities are also expected to generate GHG emissions and will contribute to climate change, although none of these on their own, or in combination with the SOP are expected to result in measurable cumulative effects on Climate Change. Baffinland remains committed to improving energy efficiency and greenhouse gas emissions performance, and working with Nunavummiut to monitor and adapt to climate change. Cumulative effects on Climate Change are predicted to be not significant.
Air Quality	X						X	X	X		X		X			The SOP will result in incremental, localized emissions of dust and other air contaminants due to road transportation and shipping. However, ongoing improvements to mitigation measures to control these emissions will reduce cumulative effect contributions from the SOP as well as the Approved Project. With the exception of protected areas (e.g., Sirmilik National Park and the pending Tullurutiup Imanga/Lancaster Sound NMCA), all other past, existing and reasonably foreseeable projects and activities are also expected to generate dust and/or other air emissions, although given the relative location of these other projects and activities and environmental management measures implemented, cumulative effects on Air Quality are predicted to be not significant.
Noise and Vibrations							X		X		X		X			The SOP will result in incremental noise emissions associated with road transportation which could interact cumulatively with noise emissions from the Approved Project and ongoing regional exploration. However, cumulative effects on Noise and Vibrations are predicted to be not significant.

VECs	Nanisivik Naval Facility and Military Exercises	Back River Project	Raglan Mine	Meadow Bank Mine	Meliadine Project	Hope Bay Project	Mary River Approved Project (up to 2022)	Regional Ship Traffic	Regional Air Transport	Communities; Traditional/Recreational Land	Regional Monitoring Programs	Sirmilik National Park	Baffinland Regional Explorations	Climate Change	Tallurutiup Imanga/ Lancaster Sound NMCA	Cumulative Effects Assessment Summary
Vegetation							X						X	X		Although no new direct habitat loss is predicted, the SOP, primarily through dust deposition along the Tote Road, may contribute to changes in vegetation abundance and distribution resulting from the Approved Project, however, new mitigations to control dust will aim to maintain or reduce the levels of dust present in the current operation. Ongoing regional exploration may also affect vegetation abundance and distribution resulting in future cumulative effects. Climate change is expected to alter the species composition of vegetation with an expansion of shrub and graminoid coverage, and this effect will overlap with changes in vegetation diversity that will occur via the loss of vegetation from ground disturbance activities and effects to vegetation health that result from dust and other air emissions. Despite uncertainty associated with the realized emissions pathways over the lifetime of other projects and activities, including the Approved Project, and the accuracy of climate models to predict responses within the Arctic, cumulative effects on Vegetation are predicted to be not significant. .
Birds and Bird Habitat	X	X				X	X	X	X	X	X		X	X		Although the SOP will not result in any new habitat loss, other projects and activities (including the Approved Project) may contribute to direct and indirect habitat loss. Shipping and road transportation of iron ore will result in noise disturbance to migratory birds along the Northern Transportation Route. Direct mortality of a few individual birds because of collisions with Project vehicles is also expected to occur as a result of the SOP. However, in-project cumulative bird mortalities are expected to remain as a few individuals and not measurable at the population level. Although the potential effects of climate change on bird habitats is difficult to quantify, the likelihood of climate change affecting migratory birds and their habitat as a result of sustained operating levels is very low and not expected to change the effects determination. Cumulative effects on Birds and Bird Habitat are predicted to be not significant.

VECs	Nanisivik Naval Facility and Military Exercises	Back River Project	Raglan Mine	Meadow Bank Mine	Meliadine Project	Hope Bay Project	Mary River Approved Project (up to 2022)	Regional Ship Traffic	Regional Air Transport	Communities; Traditional/Recreational Land	Regional Monitoring Programs	Sirmilik National Park	Baffinland Regional Explorations	Climate Change	Tullurutiup Imanga/ Lancaster Sound NMCA	Cumulative Effects Assessment Summary
Terrestrial Wildlife and Habitat	X						X		X	X	X	X	X	X		Shipping and road transportation of iron ore will result in noise disturbance to terrestrial wildlife along transportation corridor for the SOP and direct mortality of individual animals may also occur as a result of collisions with Project vehicle. Dust deposition, particularly along the Tote Road, is also expected to result in localized changes in vegetation abundance and distribution. However, project monitoring to date (which has involved ore transportation of 6 Mtpa) has not identified any significant risk to ecological health. Similarly to what has been observed to date for the Approved Project and predicted for the SOP, most of the activities are minor contributors to habitat loss and/or sensory disturbance to terrestrial wildlife within the RSA or the range of North Baffin caribou. The exceptions include the harvesting of wildlife by communities, which though important to community food security and cultural well-being, results in mortalities that may have the potential to affect caribou at the population level. Mitigation and monitoring commitments that Baffinland has made for the Approved Project will extend for the SOP, as well as new mitigations introduced in 2022 and through this Proposal, including a highly sensitive and responsive form of adaptive management (refer to Section 6.3.4.4) This will reduce cumulative effects on terrestrial wildlife and habitat. Climate change may have a disruptive effect for many wildlife species on northern Baffin Island. Effects on wildlife species population parameters such as survival, fecundity, abundance and distribution are likely, but difficult to predict. Changes in environmental processes as a result of climate change will occur independently of the SOP. Therefore, potential interactions of climate change with the Project and their effects on wildlife are limited and likely not measurable within the life of the Project. In recognition of the scope of the SOP and ongoing mitigation and monitoring commitments to reduce adverse effects, cumulative effects on Terrestrial Wildlife and Habitat are predicted to be not significant.

VECs	Nanisivik Naval Facility and Military Exercises	Back River Project	Raglan Mine	Meadow Bank Mine	Meliadine Project	Hope Bay Project	Mary River Approved Project (up to 2022)	Regional Ship Traffic	Regional Air Transport	Communities; Traditional/Recreational Land	Regional Monitoring Programs	Sirmilik National Park	Baffinland Regional Explorations	Climate Change	Tallurutiup Imanga/ Lancaster Sound NMCA	Cumulative Effects Assessment Summary
Freshwater Quantity and Quality							X						X	X		Other than activities associated with the Mary River Project, there are no other developments or activities occurring or expected to occur within the catchments affected by the SOP. Mitigation and monitoring commitments that Baffinland has made for the Approved Project, will extend for the SOP and Phase 2 Proposal (if applicable) (refer to Section 6.3.5 and Appendix 7) and will reduce cumulative effects on terrestrial wildlife and habitat. Cumulative effects on Freshwater Quantity and Quality are predicted to be not significant.
Freshwater Biota and Habitat							X						X	X		See above. Cumulative effects on Freshwater Biota and Habitat are predicted to be not significant.
Marine Ice, Water, and Sediment Quality	X						X	X		X				X	X	The SOP will occur within the same shipping season used in relation to the Approved Project. Other shipping in the area and/or potential restrictions in the Tallurutiup Imanga National Marine Conservation Area will influence shipping through ice. Ballast water releases will remain unchanged from the Approved Project. There are therefore no changes in in cumulative effects predicted to occur for Marine Ice, Water and Sediment Quality as a result of the SOP.
Marine Habitat and Biota																The SOP is not predicted to have negligible effects on marine habitat and biota. There are therefore no cumulative effects predicted to occur for Marine Habitat and Biota as a result of the SOP.

VECs	Nanisivik Naval Facility and Military Exercises	Back River Project	Raglan Mine	Meadow Bank Mine	Meliadine Project	Hope Bay Project	Mary River Approved Project (up to 2022)	Regional Ship Traffic	Regional Air Transport	Communities; Traditional/Recreational Land	Regional Monitoring Programs	Sirmilik National Park	Baffinland Regional Explorations	Climate Change	Tallurutiup Imanga/ Lancaster Sound NMCA	Cumulative Effects Assessment Summary
Marine Mammals	X	X				X	X	X	X	X	X	X		X	X	Shipping associated with the SOP, similar to all other projects and activities involving shipping, has the potential to interact with marine mammal populations through acoustic disturbances, and vessel strikes. Marine mammal monitoring for the Approved Project (which has only included shipping from Milne Port thus far) suggests temporary and localized avoidance behaviour of marine mammals due to shipping. Narwhal abundance and distribution near Milne Port has not significantly changed and no known vessel strikes have been reported. Nonetheless, cumulative effects on marine mammals, notably narwhal, remains an important issue of concern raised by North Baffin communities. In the future, once shipping also begins from Steensby Port (as part of the Approved Project), there will be an increased potential for acoustic disturbances and vessel strikes on marine mammals. However, there is no overlap between shipping impacts on the Northern Shipping Route and those on the Southern Shipping Route for marine mammals. If shipping operations were to occur in both project areas at the same time, shipping impacts in each respective area would be impacting different populations of marine mammals. The only exception to this is with bowhead whale. Bowhead whales occurring in the Northern and Southern RSAs belong to the same population (Eastern Canada / West Greenland population). This population winters in Hudson Strait and Davis Strait, and spend their summers all around Baffin Island and in Hudson Bay. Satellite tag data indicates that some individuals have in the past circumnavigated Baffin Island during a single summer. However, this would be considered rare, and it should be noted that in this case, individual animals will not be in the same areas at once, so any Project shipping effect on these animals would be consecutive, rather than simultaneous. There are no bowhead summering grounds in the northern RSA, it is considered a migratory route during the early shoulder season for several weeks, and the number of bowhead that pass through this area is relatively low. Noise from regional air transport may also contribute to acoustic disturbance of marine mammals and harvesting of marine mammals by communities, which though important to community food security and cultural well-being, results in mortalities. Effects of climate change on the marine environment may affect marine mammal populations, although the nature and extent of these effects is uncertain. Mitigation and monitoring commitments associated with the Approved Project (refer to Section 6.5.4 and Appendix 7), including new shipping mitigation outlined in the 2022 Narwhal Adaptive Management Plan, will be implemented for the SOP and will reduce the likelihood and severity of cumulative effects on marine mammals. Cumulative effects on Marine Mammals are predicted to be not significant.

Table 6.35: Potential Cumulative Effects on Valued Socio-economic Components

VSECs	Mary River Approved Project	Nanisivik Naval Facility and Military Exercises	Back River	Raglan Mine	Meadow Bank Mine	Meliadine Project	Hope Bay Project	Regional Ship Traffic	Regional Air Transport	Communities; Traditional/Recreational Land	Regional Monitoring Programs	Sirmilik National Park	Bylot Island Migratory Bird Sanctuary	Baffinland Regional Explorations	Climate Change	Tullurutiup Imanga/ Lancaster Sound NMCA	Mary River Phase 2 Proposal	Cumulative Effects Assessment Summary
Human Health and Well-being	X			X	X	X								X			X	The SOP is predicted to result in positive and adverse residual effects on Human Health and Well-Being. Positive effects are not carried forward in the CEA. Adverse effects predicted for the Approved Project including changes in parenting, transport of substances though Project sites, and absence from the community during work rotation, are predicted to continue for the SOP and will result in cumulative effects with the Approved Project and Baffinland's regional exploration activity. Mitigation and monitoring commitments associated with the Approved Project (Section 6.6.4 and Appendix 7) will be implemented for the SOP and will serve to enhance positive cumulative effects and reduce adverse cumulative effects. Cumulative effects on Human Health and Well-Being are predicted to be not significant.

VSECs	Mary River Approved Project	Nanisivik Naval Facility and Military Exercises	Back River	Raglan Mine	Meadow Bank Mine	Meliadine Project	Hope Bay Project	Regional Ship Traffic	Regional Air Transport	Communities; Traditional/Recreational Land	Regional Monitoring Programs	Sirmilik National Park	Bylot Island Migratory Bird Sanctuary	Baffinland Regional Explorations	Climate Change	Tullurutiup Imanga/ Lancaster Sound NMCA	Mary River Phase 2 Proposal	Cumulative Effects Assessment Summary
Culture, Resources and Land Use	X	X		X	X	X	X	X		X			X	X	X		X	The SOP is predicted to have no residual effect on archaeology (no new ground disturbance) but residual effects may occur on other key indicators associated with this VSEC. Cumulative effects with other projects and activities (as well as climate change) on air quality, noise and vibration, vegetation, birds and bird habitat, terrestrial wildlife and habitat, freshwater quantity and quality, freshwater biota and habitat and marine mammals, can negatively affect Inuit Culture, Land and Resource Use, including travel and use of the land, harvesting practices, public safety, and food security. Baffinland's monitoring data of recorded land-use at the Project site suggests Inuit land use and harvesting coexists with the Project to some degree, in general. Through the IIBA, Baffinland provides compensation for Inuit hunters and harvesters impacted by the Mary River Project through the Wildlife Compensation Fund, which is administered by the QIA. Ore dust from the Approved Project (and by extension, the SOP) is not predicted to result in levels of metals in the local study area that would be harmful to the health of animals or people harvesting in the area. A number of commitments were made related to country foods, including the development of dustfall thresholds and triggers with Inuit participation within the Air Quality monitoring framework, and monitoring of certain chemicals in country foods if metals are found to be increasing in the environment, as well as the development of an Inuit-focused risk communication strategy are other important commitments made by Baffinland related to country foods. Mitigation and monitoring commitments associated with the Approved Project (Section 6.6.4 and Appendix 7) will be implemented for the SOP and will serve to reduce adverse cumulative effects on Culture, Resources and Land Use. No additional mitigation is proposed to address cumulative effects on this VSEC. Cumulative effects on Culture, Resources and Land Use are predicted to be not significant.