ATTACHMENT 22

Surface Water, Aquatic Ecosystem Management Plan

(160 Pages)

Baffinland Iron Mines Corporation

SURFACE WATER AND AQUATIC ECOSYSTEMS MANAGEMENT PLAN

BAF-PH1-830-P16-0026

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1.0 INTRODUCTION

This document describes Baffinland Iron Mines Corporation's (Baffinland's) plans to manage its activities to minimize effects on surface water and aquatic ecosystems.

1.1 PURPOSE AND SCOPE

This Plan outlines how potential Project impacts on water quantity and quality, aquatic ecosystems, and fish and fish habitat will be managed and monitored at all Project areas and for the life of the mine. This includes the management of runoff from Project facilities and non-point discharges to surface waters.

1.2 RELATIONSHIP TO OTHER MANAGEMENT PLANS

Project activities have the potential to affect site water quality, fish habitat, vegetation and other environmental components. Therefore, this Plan must be viewed in consideration with the Environmental Management and Monitoring Plans for the Project as listed and described in Table 1.1.

TABLE 1.1 RELATIONSHIP TO OTHER MANAGEMENT PLANS

Referenced Management Plan	Document Reference Number	Information Provided by Referenced Plan
Environmental Protection Plan	BAF-PH1-830-P16-0008	Provides relevant environmental protection measures
Spill Contingency Plan	BAF-PH1-830-P16-0036	Provides response plans for spills of fuels and other materials
Fresh Water Supply, Sewage and Wastewater Management Plan	BAF-PH1-830-P16-0010	Describes plans for managing fresh water supplies and the disposal of effluents (sewage, oily water and mine contact water)
Aquatic Effects Monitoring Plan	BAF-PH1-830-P16-0039	Monitors changes in the local aquatic environment from multiple Project stressors (effluent discharges, sedimentation, dust deposition)
Road Management Plan	BAF-PH1-830-P16-0023	Describes mitigation for managing dust along project roadways and specifically the Tote Road, including the application of dust suppressants
Snow Management Plan	BAF-PH1-300-P16-0002	Includes operational protocols and plans developed to manage freshet's high flows and mitigate freshet's potential negative impacts on surface water quality and associated infrastructure
Surface Water Sampling Program - Quality Assurance and Quality Control (QA/QC) Plan	BAF-PH1-830-P16-0001	Describes sampling methodologies and related QA/QC measures for sampling and testing water, sediment and effluents
Adaptive Management Plan	TBD	Describes the generic approach to adaptive management on the Project, including management plans. Includes objectives, indicators, thresholds and indicators (OITRs) related to the Project.

1.3 CORPORATE POLICIES

Baffinland has four corporate policies that apply to this management plan:

- **Sustainable Development (SD) Policy -** identifies Baffinland's commitment internally and to the public to operate in a manner that is environmentally responsible, safe, fiscally responsible and respectful of the cultural values and legal rights of Inuit.
- **Health, Safety and Environment (HSE) Policy -** describes the company's commitment to achieve a safe, healthy and environmentally responsible workplace.
- **Anti-Bribery and Anti-Corruption Policy -** describes Baffinland's commitment to ensuring its directors, officers, employees, contractors, and representatives conduct due diligence on third parties when promoting Baffinland's business.
- **Code of Business Conduct Policy -** describes Baffinland's minimum requirements for directors, officers, employees, contractors, and representatives to follow a Code of Business Conduct.

All employees and contractors must comply with the above mentioned policies. Copies of the first two policies are included in Appendix A.

1.4 REGULATORY REQUIREMENTS

This Plan outlines the Project's policies and procedures to ensure compliance with the relevant terms, conditions and regulations outlined in the following regulatory instruments:

- Type A Water Licence No. 2AM-MRY1325 issued by the Nunavut Water Board (NWB or the Board)
- Type B Water Licence No. 2BE-MRY1421 issued by the NWB
- Commercial Lease - Q13C301 (Commercial Lease) with the Qikiqtani Inuit Association (QIA)
- Inuit Certainty Agreement (QIA and Baffinland, 2020)
- Project Certificate No. 005 issued by the Nunavut Impact Review Board (NIRB)
- *Fisheries Act* Authorization No. NU-06-0084 (DFO, 2007), and subsequent amendments applicable to fish-bearing water crossings along the Tote Road

An Inuit Stewardship Plan (ISP) will be developed by the QIA pursuant to the Inuit Certainty Agreement referenced above (Section 2.2).

Additionally, Baffinland will seek an Authorization under Paragraph 35(2)(b) of the *Fisheries Act* for interactions of the North Railway with fish and fish habitat. Construction of the North Railway will involve construction of additional crossings and modifications to existing crossings along the Tote Road. A further update to this Plan may be necessary to incorporate additional mitigation or monitoring requirements specified in the future *Fisheries Act* Authorization.

The following legislation place specific requirements on the Project with respect to the operation and maintenance of Project roads:

- *Territorial Lands Act* and Territorial Land Use Regulations
- *Nunavut Waters and Nunavut Surface Rights Tribunal Act*
- *Canadian Environmental Protection Act*
- *Fisheries Act*

Project activities are monitored for compliance with the regulatory instruments listed above. Where it is determined that Project activities fail to comply with the regulatory requirements, further assessment shall be completed to modify activities such that compliance is achieved, or mitigation methods shall be implemented.

2.0 PLANNING

2.1 OBJECTIVES

The goal of this Plan is to protect aquatic ecosystems by meeting the objectives and performance indicators identified in Table 2.1.

TABLE 2.1 OBJECTIVES AND PERFORMANCE INDICATORS

Objective	Performance Indicator(s)
Mitigate potential impacts to water and protect aquatic ecosystems by controlling sedimentation and erosion: • During installations of and modifications to water crossings • From dust deposition and runoff into watercourses • From routine road management • From snow stockpiles • During freshet	• Runoff water quality • Receiving water quality • Visual evidence of erosion and sedimentation • Flooding and/or geomorphic changes • Seepage quality
Maintain receiving environment water quality	
Safeguard fish habitat and fish passage	• Fish habitat lost • Fish passage
(Insert Inuit objectives)	• (Insert Inuit indicators)

Baffinland and the QIA are jointly implementing an adaptive management process into management plans developed for the Project (Section 2.3), and this includes the development of Inuit objectives and indicators, as noted in Table 2.1.

The above stated objectives will be achieved by:

- Compliance with discharge limits specified in the Type A Water Licence
- Compliance with Section 36(3) of the *Fisheries Act*
- Compliance with authorizations under the *Fisheries Act*, including implementation of an Offsetting Plan
- Compliance with Inuit objectives, thresholds, and response action requirements
- Maintaining fish passage
- Ensuring appropriate mitigation measures and monitoring procedures are in place and followed to mitigate against adverse effects to the aquatic environment
- Adapting to feedback from Inuit

2.2 CONSIDERATION OF INUIT QAUJIMAJATUQANGIT

2.2.1 INUIT USE OF FRESHWATER IN THE PROJECT AREA

Inuit use of the freshwater environment in the region includes harvesting of arctic char and consumption of water and snow for drinking while on the land. Information on fishing areas from various sources suggest that nearly all fishing in the region occurs in river-lake systems that support sea run arctic char. This includes information collected in the mid-1970s for the Inuit Land Use and Occupancy Project (Brody, 1976); community information collected in the mid-1980s for the Nunavut Atlas (Riewe, 1992), fish harvest locations during the Nunavut Wildlife

Harvest Study (Priest and Usher, 2004), and information collected in the late 2000s as part of the Mary River IQ Study (KP, 2014a,b). These systems are not within the Project area.

The Project-affected waterbodies support only landlocked populations of arctic char. The inland landlocked arctic char lakes in the Project area are fished only occasionally when Inuit are in the area (KP, 2010 and 2014b; Riewe, 1992). Inuit have historically and continue to use Milne Inlet as an entrance to the interior of northern Baffin Island. Phillips Creek (from Katiktok to Milne Inlet) and the upper reaches of the Ravn River (south of Katiktok Lake) is an important travel corridor both for interior access for caribou hunting and for inter-community travel between Pond Inlet and Igloolik. The Tusaqtavut Studies (QIA, 2019a, b) identified fishing and freshwater resources in the region, including 12 subsistence values within 250 m of the Project footprint.

The Tusaqtavut studies also recorded community perspectives that the current Project is impacting land and resource use from the community perspective, including dust impacts to water quality along the road, access to fishing areas, and species avoidance of areas due to impacts to fish habitat and diminished water quality (QIA, 2019a,b).

2.2.2 FUTURE CONSIDERATION OF INUIT QAUJIMAJATUQANGIT

An Inuit Stewardship Plan (ISP) will be developed by the QIA pursuant to the Inuit Certainty Agreement referenced above. The ISP will describe how Inuit monitoring activities tie into the adaptive management system and other management, mitigation, and monitoring plans, and, how Inuit monitoring will relate to the protection and promotion of Inuit rights defined under the *Nunavut Agreement* and described under legal agreements with Baffinland related to management and stewardship of Inuit owned lands and resources. The ISP will be the framework for Inuit-led monitoring of impacts and changes within communities and on the land, waters and ice as a result of the Project. The ISP will embed a “boots on the ground” approach to monitoring whereby Inuit will be hired and trained as professional monitors for monitoring under the ISP. Through the ISP, Inuit will govern the use of Inuit knowledge and observations regarding the Project.

Further updates to this plan are expected as an outcome of the development of the ISP that articulate Inuit monitoring objectives, indicators, thresholds and responses (OITRs) related to the protection of surface waters and aquatic ecosystems.

In the interim, Table 2.2 identifies the opportunities that Baffinland has explored to incorporate IQ into this Plan.

TABLE 2.2 INCORPORATION OF IQ INTO THIS MANAGEMENT PLAN

Element	Description
Environmental sensitivities and receptors	Subsistence Fishing and Fresh Water values identified in Pond Inlet’s Tusaqtavut Study can be integrated into a future revision of the monitoring component of this Plan
Indicators and thresholds	Confirmation required with Inuit through QIA-Baffinland AMP Working Group; interim Inuit objectives, indicators, thresholds and responses to be identified in this Management Plan and subject to later revision through the ISP and AMP reviews on a scheduled basis
Mitigation measures	Confirmation required with Inuit through QIA-Baffinland AMP Working Group
Monitoring	Confirmation required with Inuit through QIA-Baffinland AMP Working Group
Adaptive management	Confirmation required with Inuit through QIA-Baffinland AMP Working Group

Element	Description
Validation of IQ Integration	To be verified by Inuit Committee
Management review	To be verified by Inuit Committee

An important aspect of integrating IQ is validating such integration with Inuit. For this reason, only potential opportunities for IQ integration have been identified. A more fulsome effort to incorporate IQ into this draft plan will be undertaken in the future, based on feedback from the Inuit Committee (to be established) and a standing Baffinland-QIA Adaptive Management Working Group, and consistent with the Adaptive Management Plan (Baffinland, 2020).

2.3 ADAPTIVE MANAGEMENT

2.3.1 DEFINING THE ADAPTIVE MANAGEMENT PROCESS

Adaptive management is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes (Canadian Environmental Assessment Agency, 2016). Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project.

Baffinland has developed a draft Adaptive Management Plan (AMP) that provides the framework by which adaptive management is to be incorporated into Project operations (Baffinland, 2020). The Project-wide adaptive management process begins with a planning phase, followed by iterative phases of implementing and monitoring the actions included in the plan(s), evaluating the effectiveness of actions included in the plans based on results of monitoring and other feedback mechanisms, and adjusting management strategies and actions and responses based on monitoring. The cycle begins anew with implementation and monitoring of a revised plan, which integrates the outcomes of the previous cycle. This cycle can occur, in real-time or over an extended period according to the nature of the situation or area of focus. In this way, a properly designed and well-implemented adaptive management process progressively diminishes uncertainty, as management strategies and processes are refined throughout a project's operational lifecycle.

Monitoring and responding to effects in the short-term is addressed in a Trigger Action Response Plan (TARP) described in Section 5.0. The TARP identifies the pre-defined actions to be taken should threshold levels be exceeded. A series of escalated actions to be implemented are detailed in Section 5.0. Longer term review of and response to monitoring data is addressed in an annual review of plan effectiveness in Section 6. The latter includes an annual comparison of project effects against impact predictions made in the Final Environmental Impact Statement (FEIS; Baffinland, 2012) and the addendums (Baffinland 2013, 2018), which are presented in Appendix B.

Implementation of the AMP will be overseen by a Baffinland-QIA Adaptive Management Working Group. Ongoing inputs from the Inuit Stewardship Plan as well as Baffinland's ongoing project monitoring will also form the basis of amendments and refinements to the objectives, indicators, thresholds, and response requirements over time.

Section 2.4 of the AMP states that with the QIA's approval of Baffinland's AMP and management plans, that implementation of pre-determined responses to effects as described in the management plan does not require additional approval by the QIA. Baffinland will communicate response actions to QIA prior to implementation unless this is not possible due to the expediency required by the circumstance. If, however, a new response not previously considered is proposed, QIA approval will be sought.

2.3.2 ADAPTIVE MANAGEMENT CHECKLIST FOR ENVIRONMENTAL MANAGEMENT

Table 2.3 presents an adaptive management checklist developed for the Surface Water and Aquatic Ecosystems Management Plan, identifying how adaptive management has been incorporated into the current revision of the Plan.

TABLE 2.3 INCORPORATION OF ADAPTIVE MANAGEMENT IN THIS PLAN

Adaptive Management Phases	Components	Proposed Adaptive Management Mechanisms	Status of Management Plan
Plan	Objectives	Are objectives clear and key desired outcomes defined?	In Progress Objectives are presented in Section 2.1. These will be augmented through the work of the AMP Working Group and later inputs by the Inuit Committee.
	Indicators	Are performance indicators adequately identified?	In Progress Performance indicators are presented in Sections 2.1 and 5.1. Resourcing in accordance with Inuit Agreements will need to be discussed through the AMP Working Group, with annual work plans and budgets developed
	Identification of Thresholds	Are thresholds for specific responses identified (e.g., early warning triggers, action levels, quantitative metrics or qualitative descriptions)?	In Progress Thresholds are identified in Section 3.1 and Table 5.2. Additional thresholds tied to Inuit Objectives and Indicators will be established through QIA-Baffinland engagement.
	IQ Integration / Influence	Are mechanisms for IQ integration/influence identified?	In Progress Integration of IQ will be clarified in the next draft of the SWAEMP through the AMP Working Group, and later firmed up through inputs by the Inuit Committee.
Implement and Monitor	Management Strategies and Responses	Are management strategies and response options clearly identified?	In Progress Management strategies are described in Sections 3.2 to 3.6. Threshold Action Response Plans are presented in Section 5. These will be augmented through the work of the AMP Working Group and later inputs by the Inuit Committee
	Resourcing	Are all phases of the adaptive management cycle properly resourced (in accordance with Inuit Agreements) to be fully implemented?	In Progress Resourcing in accordance with Inuit Agreements will need to be discussed through the AMP Working Group, with annual work plans and budgets developed.

Adaptive Management Phases	Components	Proposed Adaptive Management Mechanisms	Status of Management Plan
Implement and Monitor	Monitoring	Does the monitoring program provide the information needed to determine the effectiveness of management strategies and responses?	In Progress Section 5 presents Baffinland-led monitoring activities related to surface water runoff and aquatic ecosystem health, and identifies environmental monitoring covered by other plans. The role of Inuit monitors as per the Inuit Stewardship Plan, needs to be established and integrated into this Plan.
	Timeline for implementation	Is the possibility that rapid response may be necessary, considered in the implementation plan/process?	In Progress Trigger action response plans (TARPs) have been developed for key project activities (Table 5.2). This includes the identification of low, moderate, and high action responses that correspond to low, moderate, and high-risk conditions.
Evaluate and learn	Review Data and Feedback	Is the process for reviewing and evaluating management effectiveness (based on monitoring data and feedback) articulated?	Partially, further detail including adaptive management-related roles and responsibilities, reporting structures, and applicable response action forms need to be developed.
	Additional Mitigation	Are mechanisms for determining the need for additional mitigation described?	In Progress Table 5.2 identifies actions to be undertaken according to various triggers. Need for additional mitigation is determined based on results of monitoring programs described in Section 5.0.
Evaluate and learn	Input of IQ Holders	Are opportunities identified for IQ holders to review results and provide input into adaptive management responses / mitigations?	In Progress To be discussed at the AMP Working Group and later with the Inuit Committee. Mechanisms for this to occur to be defined in a future draft of the SWAEMP.
	Input of IQ Holders	Are opportunities identified for IQ holders to review results and provide input into adaptive management responses / mitigations?	In Progress To be discussed at the AMP Working Group and later with the Inuit Committee. Mechanisms for this to occur to be defined in the next draft of the SWAEMP.
Adjust	Unanticipated Effects or Issues	Is it apparent how unanticipated effects or issues will be actioned and resolved?	Pending Approval Section 6 (Figure 6.1 in particular) describes the process for incorporating repeat non-compliance and unanticipated effects into future plan updates.
	Reporting	Are reporting mechanisms for new / revised strategies and response actions established?	Pending Approval Section 6 describes the process for reporting mechanisms for new / revised strategies. A review schedule of the plan is provided in Table 6.1.
	Scheduled Updates	Is the frequency of scheduled updates to the management plan identified?	In Progress A review of the plan is provided in Table 6.1.

2.4 PROJECT DESIGN CONSIDERATIONS

The regional landscape, climate and hydrology have influenced project design and appropriate mitigation measures.

2.4.1 REGIONAL LANDSCAPE, CLIMATE AND HYDROLOGY

The Project lies within the zone of continuous permafrost, with an active layer thickness of up to two metres and a permafrost depth that may be as much as 610 m deep, based on extrapolation from temperature gradients measured in a 400 m-deep thermistor-instrumented drill hole located on site (Baffinland, 2012; Volume 3). The presence of permafrost greatly increases ground stability at depth but at surface it can affect the rates of soil erosion through the formation of ice wedges and patterned ground, pingos and palsas, massive ground ice, thermokarst, and mass wasting (i.e., solifluction).

Regional data near the Project indicates a mean annual temperature of approximately -15°C. The frigid temperatures result in very low precipitation values for northern Baffin Island due to the combined effect of the low moisture carrying capacity of cold air and the scarcity of liquid water throughout much of the year. According to Natural Resources Canada, the mean annual total precipitation ranges from 200 to 400 mm in the Project area, classifying it as semi-arid (Baffinland, 2012; Appendix 5A).

The extreme temperatures of the region, combined with permafrost ground conditions, result in a short period of runoff that typically occurs from June to September, extending into October in watersheds with significant lake surface areas. All rivers and creeks, with perhaps the exception of the very largest systems are frozen solid to the bottom during the winter months. The peak runoff period is quite short and the volume of the annual hydrograph is low, relative to the rest of Canada, due to the region's very low average annual precipitation (Baffinland, 2012; Appendix 7A). However, the proportion of annual precipitation that is realized as runoff is very high, due to low temperatures (low evaporation) and the permafrost ground conditions (low infiltration) and minimal vegetative cover (limited uptake by plants). Groundwater infiltration and storage in the region is limited due to the permafrost. The groundwater flow is restricted to the upper one to two metres within the summer active layer.

Peak instantaneous flows are significant due to frozen ground conditions and the lack of tall vegetation to provide subsurface root systems. This in turn produces very rapid basin runoff response. In larger watersheds, peak instantaneous flows are typically produced by snowmelt during the freshet, but in smaller watersheds (less than a few hundred square kilometres) rainfall, or rain on snow may produce the largest events and may occur at any time during the non-freeze period. Flood water levels in the smaller watersheds typically rise and fall very quickly with run-off response (Baffinland, 2012; Appendix 7A).

Baffinland continues to conduct hydrology monitoring at the Project, as required by the Project Certificate (conditions regarding the AEMP) and Type A Water Licence. Details on the ongoing hydrology monitoring conducted at the Project are provided in Section 5.9 of this Plan.

2.4.2 IMPLEMENTING EROSION AND SEDIMENT CONTROL MEASURES IN THE ARCTIC

A greater level of understanding of the unique site conditions that influence the selection of appropriate sediment and erosion control measures has been achieved through the ongoing construction and operation of the Project. Influences from climate, topography, and limited vegetation combine to produce short-term, high intensity discharges throughout May, June and July. Due to the impeded vegetation growth rate, sediment and erosion control techniques that involve vegetative covers (i.e., hydro seeding and the use of erosion control blankets) have been

dismissed as potential mitigation options. Furthermore, straw bales will not be brought to site due to the possibility of introducing foreign species.

2.4.3 DESIGN CONSIDERATIONS FOR WATER CROSSINGS

Culverts that are installed at water crossings shall meet the following criteria:

- Install culverts at the same slope as the existing stream, where feasible
- Minimize culvert lengths
- Culverts with lengths that exceed 50 m may be considered barriers to fish passage due to darkness. Examine and consider methods to provide light inside culverts and fish resting areas, where applicable
- Compare culvert velocities to the velocity in the existing watercourse to determine fish passage potential and apply mitigation measures to reduce velocities, increase the flow depth and provide resting locations for fish

2.4.4 PREVENTATIVE DESIGN MEASURES FOR GROUND DISTURBANCES

Ground disturbances have the potential to result in erosion that can lead to sedimentation of nearby watercourses. The design and construction of infrastructure in permafrost regions requires specialized design considerations, particularly in areas dominated by ice-rich soils (i.e., creep and thaw settlement). Interference with these ice-rich zones will potentially impact the thermal regime, leading to permafrost degradation. Impacts to local thermal regimes could be exacerbated by the long-term effects of climate change. Depending on the ice content and the nature of what is being constructed (i.e., road, rail embankment), creep settlement of frozen ground may also occur. This settlement can lead to changes in the hydrologic patterns (i.e. water ponding at embankment toes) and further degradation of the thermal regime, which can manifest as thaw settlement. General disturbance of the area can lead to other environmental conditions related to thermal degradation, such as erosion, siltation and the ponding of water. Differential settlement can occur at the transition of different ground conditions.

The railway and other major project infrastructure have been sited to avoid major ice-rich features to a large degree, and none of the ice-rich areas that must be crossed are located on a slope. All major cuts are predominantly in rock, and slopes will be cut at stable angles.

The following general mitigation measures will be applied to construction of the North Railway:

- No ground disturbance within 31 metres (m) of the high water mark of a water body, consistent with the Type ‘A’ Water Licence, unless authorized by the NWB
- Preserve low vegetative cover within 100 m of the crossing unless constructing as designed or effective erosion and sediment control are in place to protect water quality
- Excavations will be reduced, especially in areas of known ice-rich permafrost
- Prior to embankment construction, ground disturbance will be reduced, and vegetative or organic cover left in place to provide increased protection of the thermal regime
- In areas where excavation is required, the foundations will be over excavated and backfilled with 1.5 m of non-freeze/thaw susceptible fill to reduce frost heaving and settlement
- Slopes will be flattened as necessary when being constructed in ice-rich or thaw sensitive materials and will be protected with thermal and erosion protection material, if required
- In areas of thaw-sensitive active layer, stabilization berms will be used to reduce the effect of permafrost degradation at the toe of slopes
- For high embankment fills on ice-rich materials, the side slopes may be substantially flattened, or stabilization berms constructed to reduce the creep deformation potential

- To reduce the rate of creep settlement, embankments thicker than three metres should be constructed with side slopes no steeper than 5H:1V or with toe buttresses
- For construction during the summer, woven geotextile may be required over unstable ground
- Proper runoff collection and diversion drainage systems will be used to control runoff and erosion from affecting the modified thermal regime. As part of basic design, thermal modeling will be conducted for each typical embankment condition and configuration to identify the actual permafrost protection measures required and to predict the nature of the active layer and the effect that construction will have on the thermal regime over the life of the Project. The thermal modeling will incorporate potential warming trends resulting from climate change based on world-recognized global warming scenarios.
- Thaw settlements and surface sloughing of cut slopes is expected, particularly during the thaw seasons immediately following construction. The behaviour of both cut slopes and embankment fills will be monitored throughout these thaw seasons and remedial measures will be implemented, as necessary. For example, it is expected that many of the cut slopes will need to be monitored as thaw settlements occur. Silt fences and other erosion protection measures will be installed as necessary to prevent siltation of adjacent drainage courses and water bodies.
- Reduce changes to the hydrologic drainage patterns
- Reduce the potential for the accumulation of snow drifting and snowbanks or mitigate during operations with snow fencing or other measures, to avoid resultant changes to the thermal regime

2.4.5 SOIL SPOILS DISPOSAL

Construction of new facilities at Milne Port and along the North Railway will involve the removal and disposal of a significant quantity of soil spoils, approximately 1,500,000 m^3. A portion of these soils will be fine-grained and ice-rich and will be prone to slumping and sedimentation. As such, disposal locations will be required that are areas of low relief of existing depressions (ex. exhausted quarry) to avoid slumping and sedimentation issues.

Rail facilities will be constructed using a combination of cut and fill, with material gained from cuts filling the lower lying areas. The majority of cuts will be into rock, to minimize cuts in soils, particularly ice-rich soils, to avoid inducing thermal changes and causing geotechnical instability issues. Approximately half of the material will be unfrozen and excavated, while the other half will be frozen material that will require drilling and blasting before excavation.

The soil spoils will require disposal at locations and in a manner that does not result in runoff of sediment-laden water. To reduce the potential for sediment runoff into water bodies and to ensure long-term stability of these materials the following disposal criteria will be applied:

- Soil spoils will be placed in exhausted quarries and borrow pits along the Tote Road as a preferred option; Quarries and borrow areas represent an existing disturbed footprint with limited future use, and therefore make ideal disposal sites, provided they are not planned for use as explosive storage areas during construction
- Other disposal sites will be identified near to the construction activity. Local depressions or low-relief areas will be selected as opposed to slopes where material can run-off
- In all instances, as a standard condition of land-use approvals, disposed overburden materials will be placed >31 m from a surface water body
- Disposal locations will be approved by the appropriate construction personnel (i.e., engineer, construction superintendent or foreman) who have been given such authority, to avoid unauthorized and indiscriminate disposal
- Disposal locations will be well removed from the railway embankment

- The stockpile will be designed with a minimal slope that is physically stable
- Overburden spoils in construction will not be re-used without prior approval by the supervising engineer
- Overburden soils will be transported directly to the disposal site, without short-term storage and re-handling

Sediment and erosion control measures will be implemented as described elsewhere in this Plan to prevent runoff of sediment and to possibly divert runoff away from the disposed material.

Construction of the rail and stockpile facilities will generate approximately 120,000 m^3 of excavated soil that is not suitable for reuse as fill and will require disposal. Two soil spoils disposal areas have been identified in the Milne Port area to store approximately 120,000 m^3 of spoils generated in the immediate area (Appendix C).

Specific disposal sites have not been identified along the North Railway. Table 2.4 presents a reconciliation of the quantity of soil spoils with available capacity at existing borrow pits along the Tote Road and proposed quarries along the North Railway by 10 km segment of railway. There is sufficient capacity within these areas such that the expected additional footprint for dedicated soil spoils disposal sites may be minimal.

TABLE 2.4 COMPARISON OF SOIL SPOILS VOLUMES WITH AVAILABLE CAPACITIES AT BORROW PITS AND QUARRIES

Chainage	Spoil Volume Generation				Spoil Volume Storage			Additional Storage Requirement
	Railway - Type 1 Excavation[2]	Railway - Type 2 Excavation[3]	Quarry - Type 1/2 Excavation	Total Spoils Generated[4]	Available Borrow Storage[5]	Available Quarry Storage[6]	Total Available Spoils Storage	
(km)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
Port Site (0)[7]	34,000	136,000	0	170,000	93,899	0	93,899	76,101
0 to 10	77,127	71,973	6,699	155,799	67,139	1,017,173	1,084,312	0
10 to 20	6,530	47,925	63,562	118,016	56,181	96,962	153,143	0
20 to 30	9,567	39,553	44,053	93,173	56,645	233,079	289,724	0
30 to 40	15,120	67,101	69,124	151,345	0	54,478	54,478	96,867
40 to 50	10,557	49,845	55,086	115,487	0	458,560	458,560	0
50 to 60	11,468	40,970	75,149	127,586	29,857	518,767	548,624	0
60 to 70	1,858	11,654	195,540	209,052	102,897	749,117	852,014	0
70 to 80	6,865	38,144	87,549	132,559	14,664	1,140,654	1,155,318	0
80 to 90	4,328	15,066	71,306	90,699	0	0	0	90,699
90 to 100	20,404	121,521	84,489	226,414	155,819	284,905	440,724	0
100 to 110	15,369	91,387	78,203	184,958	0	345,485	345,485	0
Mine Site (110)	18,825	0	51,237	70,062	0	0	0	70,062
TOTAL	**232,016**	**731,138**	**881,996**	**1,845,150**	**577,101**	**4,899,180**	**5,476,281**	**333,729**

NOTES:

1. All soil spoil storage locations are within the same 10 km increment as the soils spoil generation estimate.
2. Type 1 excavation consists of all soft waste that is not suitable for fill and may be susceptible to creep or flow (i.e. Ice rich soils in summer, soils with high silt/clay content, etc.)
3. Type 2 excavation consists of all waste that is not suitable for fill and is drilled and blasted, including ice rich soils in the winter months.
4. Required spoil volume at port site and by chainage provided by hatch via email on April 8, 2019.
5. Available storage area at port provided by hatch via email on April 8, 2019. Available storage area along tote road estimated by KP. Available storage volume estimated by KP, assuming each area is 1 m deep.
6. Available storage area estimated by KP based on current information. Available storage volume estimated by KP, assuming each area is 1 m deep.
7. Total excavation volume provided. 20% assumed to be type 1 excavation and 80 % assumed to be type 2 excavation, based on review of quantities along railway.

Excavation that will occur along the North Railway during construction will involve blasting of rock and frozen overburden. Prior to blasting near waterbodies, Baffinland will submit to the Board for review at least 30 days prior to implementation a separate Blasting Management Plan for blasting near water, in accordance with Part D, Item 24 of the Licence.

3.0 IMPLEMENTATION

Project elements relevant to this plan include:

- Construction Water Management
- Road and Rail Construction
- Working Near Waters
- In-Water Work
- Soil Spoils Disposal Areas
- Site Water Management
- Water Crossing Installations/Modifications
- Monitoring at Project Quarries and Borrow Sources
- Surveillance Network Program
- Northern Corridor Monitoring Program
- Fish Passage at Crossings
- Aquatic Effects Monitoring Program
- Snow Management Monitoring
- Groundwater Monitoring

Each of these project components and associated mitigation and adaptive management measures are described in the subsections below. Such measures may be implemented as a response to the results of monitoring.

3.1 THRESHOLDS

3.1.1 DISCHARGE LIMITS

Table 3.1 outlines the discharge limits applicable to various project activities.

TABLE 3.1 ACTIVITIES AND APPLICABLE WATER QUALITY LIMITS

Activity	Monitoring Program	Discharge Limits
Ground disturbance / construction	Surveillance Network Program (SNP)	Table 3.2
Quarries / borrow pits		
Soil disposal areas		
Operations		Table 3.3
Landfills		Table 3.4

Runoff generated from construction activities/sites must meet the discharge limits identified in Table 3.2, as required by the Type A Water Licence.

TABLE 3.2 SURFACE RUNOFF DISCHARGE LIMITS DURING CONSTRUCTION PHASE

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of any Grab Sample (mg/L)
Total Suspended Solids	50	100
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

NOTE:

1. Source: Type A Water Licence (2AM-MRY1325 Amendment No. 1) Table 1.

During operations, runoff generated from project areas must meet the discharge limits identified in Table 3.3, as required by the Type A Water Licence.

TABLE 3.3 SURFACE RUNOFF DISCHARGE LIMITS DURING OPERATION PHASE

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of any Grab Sample (mg/L)
Total Suspended Solids	15	30
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

NOTE:

1. Source: Type A Water Licence (2AM-MRY1325 Amendment No. 1) Table 11.

Runoff and seepage from the landfill facilities must meet the discharge limits identified in Table 3.4.

TABLE 3.4 EFFLUENT DISCHARGE LIMITS FOR THE LANDFILL FACILITIES

Parameter	Maximum Concentration of any Grab Sample (mg/L)
pH	**Between 6.0 and 9.5**
Total Arsenic	**0.5**
Total Copper	**0.3**
Total Lead	**0.2**
Total Nickel	**0.5**
Total Zinc	**0.5**
Total Suspended Solids (TSS)	**15**
Oil and Grease	**No visible sheen**

NOTE:

1. Source: Type A Water Licence (2AM-MRY1325 - Amendment No. 1) Table 7.

3.1.2 RECEIVING WATER QUALITY GUIDELINES

Water quality screening guidelines designed to assess the impact of Project activities on surface water have been developed in consultation with the QIA (Table 3.5), that are applicable to the construction or modification of water crossings (Section 5.3), and to the operation of the North Railway and Tote Road (Section 5.6).

TABLE 3.5 ACTIVITIES AND APPLICABLE WATER QUALITY LIMITS

Activity	Monitoring Program	Water Quality Limits
Water crossing installations/modifications	Environmental Guidelines for Project Water Crossing Repairs and/or Installations (Section 5.3)	
Railway and Tote Road operation	Northern Corridor Monitoring Program (Section 5.6)	

3.1.3 INUIT OBSERVATIONAL GUIDELINES

Inuit may identify thresholds that are applicable to the protection of surface water quality and aquatic ecosystems. In no instance will Inuit thresholds lead to non-compliance with regulatory objectives or requirements; Inuit requirements may be more sensitive - but not less sensitive - to environmental change than regulatory requirements.

3.1.4 EFFECTS PREDICTIONS

Adaptive management includes short-term and longer-term review and response cycles (Section 2.3). The thresholds described above (discharge limits, receiving water quality guidelines, and future Inuit observational guidelines) are applied to guide short-term adaptive management through implementation of the TARPs (Section 5).

The effects predictions from the FEIS and addendums are thresholds that are appropriate for longer-term review and response cycles, such as the annual review of regulatory compliance and unexpected effects. The effects predictions from the FEIS and addendums have been consolidated in Appendix B for comparison to the Project's performance as described in Section 6.1 Annual Review of Compliance and Unanticipated Effects. The Company may also identify the need for further adaptive management when unanticipated effects or effects that exceed FEIS predictions occur.

3.2 SURFACE WATER MANAGEMENT OVERVIEW

Ongoing construction and operations at the Project have the potential for soil disturbance and water diversions requiring sediment and erosion control planning to manage the discharge of site contact water. Best management practices, including preventative measures, shall be implemented throughout the lifecycle of the Project. The following section outlines the general measures used to mitigate potential environmental impacts arising from the storage and discharge of site contact water.

Monitoring of Project stream and river crossings, lakes and ponds adjacent to construction and operational areas will be completed during the life of the Project as outlined in Section 5 of this Plan. Subject to site-specific conditions, a variety of civil design structures or additional controls may be required to prevent localized erosion.

The deposition of debris or sediment into or onto any water body during the construction of access roads, site laydown pads and areas of other earthworks is prohibited. To prevent sedimentation into adjacent water bodies, stockpiling of debris must take place at a distance greater than 31 m from the ordinary high-water mark of nearby water bodies. In addition, removal of material below the ordinary high-water mark of any water body is prohibited, unless otherwise approved by the NWB.

Monitoring of weather events, including forecasted heavy rains, is conducted as a component of construction monitoring. In the event heavy rain is forecasted the frequency of internal compliance inspections increases and site staff ensure resources, such as pumps, are available and ready to deploy ahead of time.

All Project infrastructure and activities that have the potential to influence any watercourse (i.e., culvert modifications, diversion of watercourses, modifications to the Milne Inlet Tote Road, and other areas of the Project site), will be designed and constructed in a manner that is consistent with the approach presented in the FEIS and the conditions of existing permits and authorizations. Construction and operational activities are prohibited from preventing and/or restricting the movement of water in identified fish bearing streams and rivers.

3.3 CONSTRUCTION WATER MANAGEMENT

3.3.1 ROAD AND RAIL CONSTRUCTION

The main steps in road construction include layout, foundation preparation, fill placement, installation of drainage control measures, and road surfacing. The same steps exist for railway construction except instead of road surfacing the final steps involve the placement of ballast and rails. The construction of the rail will require multiple laydown sites, temporary construction camps, and quarries for aggregate.

Key design documents applicable to road and railway construction include:

- Railway design criteria (Hatch, 2017)
- Civil design philosophy (Hatch, 2018a)
- Geotechnical design criteria (Hatch, 2018b)

Quality Assurance and Quality Control

Baffinland representatives will provide QA/QC duties during road construction on a full-time basis. The QA/QC program will also include ongoing design modifications (field fitting) based on the foundation materials and drainage crossing spatial limitations encountered during construction. All design modifications will be tracked and reported.

QC testing will be carried out on fill materials from the borrow areas to assist with identification of suitable materials to be used in the work. Record testing of the placed fill will be carried out to document the quality of the completed work. Testing will include in-situ density, moisture content, grain size, and specific gravity determinations.

3.3.1.1 MEASURES TO PROTECT PERMAFROST

The removal of surface material in Arctic regions can cause the underlying permafrost to melt and result in the pooling of water, destabilization of landforms and sedimentation and erosion issues. To mitigate possible permafrost degradation from surface material removal, the following measures will be implemented during and after construction:

- Implement measures as soon as possible to stabilize banks disturbed by construction to avoid erosion or sediment releases to the water
- Implement measures for managing water flowing onto the site, as well as water being pumped/diverted from the site, such that sediment is filtered out prior to the water entering the waterbody (e.g., by discharging water to a vegetated area)
- Deposit all dredged material in a manner to prevent its re-entry into the watercourse
- Stabilize slopes with rocks, geotextiles, and/or other suitable engineered or natural materials
- Removal of surface material should be avoided where possible to reduce permafrost degradation and will occur only at approved locations
- Areas will be graded by filling in low areas rather than cutting into high areas, where feasible

- Pooling water will be diverted from low-lying areas through constructed drainages or pumping
- The grade of low-lying areas with pooling water resulting from the removal of surface material will be restored with material from other construction projects when possible
- Erosion control will be evaluated for areas where removal of surface material is required
- Use of insulating material or erosion control material, such as concrete fabric or riprap, will be utilized to reduce erosion and potential permafrost degradation, as required
- Fill material placed within 31 m of the high water level mark, where specifically authorized, will be either erosion resistant or protected from erosion and only clean fill (i.e. devoid of organic soils or silt) will be used
- No waste material resulting from work activities will be left in a manner such that it can enter the water (e.g., by being left on the ice)

Additional guidance for managing surface material and mitigating permafrost degradation during construction and operations at the Project are provided in the Environmental Protection Plan (EPP) and Borrow Pit and Quarry Management Plan.

3.3.1.2 EROSION AND SEDIMENT CONTROL MEASURES

Table 3.6 outlines the general sedimentation and erosion controls used at the Project. These controls may be used alone or in combination to achieve a more effective control.

TABLE 3.6 SEDIMENT AND EROSION CONTROL MEASURES

Armouring / Riprap	
Description	A rock lining that can be installed along a ground surface or structure to prevent erosion of the underlying material and/or sediments. Used as a barrier between water flow and materials that are susceptible to erosion. Clean quarry rock and/or clean naturally occurring granular borrow material are used to protect underlying fine-grained material from scour and erosion. May be combined with an underlying non-woven geotextile.
Installation Locations	In areas of cuts and/or excavations and for installation of culverts, typically on exposed erodible slopes. Along road and/or stream embankments and along the upstream and downstream ends of culverts. May also be installed at locations where existing flows may cause erosion of the present surface materials specifically where flows may become concentrated.
Substitute	Water diversion, berms, ditches, sumps and/or silt fencing may be used in some locations where armouring is not practical or where there is low risk of impacts to downstream receptors.
Performance Issues/Limitations	Potential limited material in various sizes available.
Benefits	Effective long-term solution for preventing erosion and re-suspension of susceptible fine-grained materials. Materials are local and are effective at protecting embankments from erosion. They may also be installed over non-woven geotextile (see below) to provide additional protection.
Gabion Baskets	
Description	Metal wire baskets filled with rock fill are used for erosion protection and/or slope stabilization by armoring the existing bank where erosion is weakening the slope.
Installation Locations	Eroding slopes and embankments that require stabilization to stop erosion.

Performance Issues/Limitations	Requires significant manpower, material and equipment to install and properly fill each gabion basket.
Benefits	Gabions can withstand strong erosion forces, providing significant stabilization to eroding slopes.
Concrete Fabric	
Description	Flexible concrete impregnated fabric installed along a ground surface or structure to prevent erosion of the underlying material and/or sediments. Rolled out at desired location and sprayed with water to set impregnated concrete.
Installation Locations	Installed in swales, ditches and areas with concentrated flows as well as along embankments and slopes.
Substitute	Riprap coupled with geotextile.
Performance Issues/Limitations	Expensive. Require heavy equipment for installation. Installation issues in colder temperatures.
Benefits	Permanent solution to control erosion and sedimentation. Quick installation with concrete achieving 80% strength within 24 hours. No mixing plant or equipment required.
Geotextile - Woven and Non-Woven	
Description	Low erodible lining material installed for temporary erosion control.
Installation Locations	Along stream embankments, water channels and/or ditches.
Performance Issues/Limitations	Required to be securely anchored and properly keyed in in order to be effective. Installed material is difficult to remove when it is no longer required or has reached its useful life. Has a relatively short useful life, good for temporary erosion protection only.
Benefits	Easy to install and an effective erosion barrier that can be installed along a variety of locations. Works best when combined with rockfill or riprap.
Polyacrylamides/Flocculants	
Description	Sediment and Turbidity Control Flocculants that are placed directly in the impacted watercourse to efficiently bind to particulate matter causing it to settle out providing clarification. Flocculants can also be used as an additive to settling ponds or sumps (temporary or permanent).
Installation Locations	Along stream embankments or directly in impacted channels and/or ditches. Product can also be used to settle out suspended sediment in dedicated/temporary settling ponds/sumps as required.
Performance Issues/Limitations	Performance issues in colder temperatures.
Benefits	Cost effective.
Silt Fence	
Description	Woven geotextile or fabric barrier that impedes the flow of surface water which potentially may cause suspended solids to be deposited upstream of installation. Typically supported using rebar (attached to the fabric with zip ties) and may be placed using methods such as digging a trench and backfilling material to ensure stability. Attempts are made to install silt fence in lines of equal elevation (along contour lines) to prevent channelling or focusing of the runoff. Standards for installation including trench excavation, insertion of fabric, and backfilling and compacting. Found on the Ontario Provincial Standard Drawing (OPSD) 219.110 Light Duty Silt Fence Barrier and 219.130 - Heavy Duty Silt Fence Barrier.

Installation Locations	Used in areas where surface water could potentially come into contact with disturbed sites causing elevated suspended solids. Typical installation locations are: • Downstream of drilling activities • Along roads where surface runoff is expected • Surrounding stockpiles of material or drill cuttings
Performance Issues/Limitations	Not permeable enough to be placed in streams with greater than low flow. Difficult to install rebar and dig trenches due to frozen ground conditions, weight and susceptibility to wind. Silt fence with wooden stakes may not be durable enough for installation in Arctic conditions.
Substitutes	Coir logs, spring berms, sandbags
Benefits	Effective in shoreline construction work where they are used to surround the installation of culvert crossings installed during open-water conditions. Can be used as diversion barriers around erosion prone areas and as flow impediment. Can be installed in a diagonal, staggered formation to create meanders and slow flow in higher velocity waters that would otherwise flow over a silt fence if installed across the flow.
Diversion/Collection Channel or Berm	
Description	Diversion/collection channels or berms are used to locally direct surface water runoff. Constructed using suitable materials to divert the surface water without causing erosion or suspension of additional sediment. Additionally, collection channels or berms may be constructed to collect runoff emerging from an area of soil disturbance. Also, used to ensure runoff is directed to a constructed mitigation measure such as an in-ground sump.
Installation Locations	Used in locations where diversion and/or collection of surface water is required. Diversion structures are installed to prevent runoff from entering a site where the surface soil has been disturbed and would cause suspension of sediment. May be constructed to collect runoff emerging from an area of soil disturbance.
Performance Issues/Limitations	Permeability of the berms may be too high depending on material size availability. Surface material of the channel or berm must not contain fine grained material that could contribute to additional suspended solids.
Substitute	Silt fences can be used as an alternative to construction of a channel or berm for lower flows.
Benefits	Effective method to direct runoff to a constructed mitigation measure such as an in-ground sump.
Check Dams	
Description	Constructed to slow surface runoff flows and create pooling to allow for suspended sediment particles to settle out. Designed to allow water to slowly flow through or over the check dam. Constructed using larger aggregate for the base, geotextile liner on the upslope side, and smaller aggregate to cap the berm.
Installation Locations	Across small valleys, natural depressions or ditches where there is surface runoff.
Performance Issues/Limitations	Potential limited material available in the various sizes required. Requires regular maintenance to excavate sediment build-up on the upslope side.
Substitutes	Containment Berms coupled with pumping.
Benefits	Surface water flow directions are unaltered. Sediment has time to settle out before reaching the receiving environment.

Containment Berm	
Description	Constructed to establish a sump, basin or pond to contain or collect water. The sump could be used to contain discharge water to allow settling of sediment before discharge or to temporarily contain the water for re-circulation (i.e., drilling activities). Constructed using native soils or acceptable man-made products which are nominally compacted to provide strength for the structure. Berm heights are minimized (typically <1 m).
Installation Locations	Across small valleys or around natural depressions to augment the capacity of the berms.
Performance Issues/Limitations	Care must be taken when constructing berms to ensure the base is on a solid foundation. Pumping required for a controlled discharge of the berm. Permeability of the berm may be too high depending on material size availability.
Substitutes	In-ground sumps or portable containment sumps or tanks can be used in place of a containment berm.
Benefits	Effective structure in forming sumps, basins or ponds to contain water and settle out suspended solids prior to discharge or reuse.
In-Ground Sump	
Description	Constructed to establish a sump, basin or pond to contain or collect water, similar to the containment berm. Constructed by excavating a depression into soil to provide water containment.
Installation Locations	Used in areas where excavation of soil is possible and other control measures are impractical or ineffective.
Performance issues/Limitations	Requires regrading of the excavated area when the sump is no longer needed to restore natural drainage patterns.
Substitutes	Containment berms, or portable containment sumps or tanks can be used in place of an in-ground sump.
Benefits	Excavated material from the sump can be used to construct a containment berm surrounding the sump to augment the capacity of the sump.
Portable Containment Sump	
Description	Used to establish a sump to contain water from a source such as a drill rig. Where required, can be connected together in a series to provide additional containment or settling capacity if required. Collected sediment or drill cuttings from the portable containment sumps are removed from the sumps as necessary and disposed of in pit locations approved by Baffinland management and located at distances of at least 31 m from water bodies.
Installation Locations	Used in areas where containment berms or in-ground sumps are impractical such as steep topography or in areas where overburden is not readily available.
Substitutes	Containment berms or in-ground sumps are used in place of a portable containment sump.
Benefits	Requires minimal excavation or construction to provide a level base for the sump.
Geotubes	
Description	A woven tube of geosynthetic fabric into which water is pumped to filter out and remove suspended solids in impacted water. Water pumped into the tube diffuses through the geosynthetic fabric across the length of the tube. Popular water treatment option for dewatering projects. Can be combined with Polyacrylamides/Flocculants to improve the sediment collection performance of the geotube.
Installation Locations	Installed downstream of a pump on ground that is not erosion prone to prevent erosion and the suspension of sediments downstream of geotube.

Performance Issues/Limitations	Non-passive water treatment method. Requires active pumping. Effectiveness limited by a maximum influx/pumping rate. Limited by the geotube material pore size in comparison to targeted sediment particle size.
Substitutes	Containment berms, portable containment sumps or tanks and/or chemical treatment can be used in place of a geotube to settle out suspended solids.
Benefits	Easy to deploy, inexpensive compared to chemical treatment or water filtering options. Can also be used as a containment berm to augment the capacity of a sump or temporary settling pond.
Bag Filters	
Description	Water treatment method where bag filters installed in line during active pumping filter out suspended solids.
Installation Locations	Installed in the discharge line to filter out suspended solids before the water is released to the receiving environment.
Performance Issues/Limitations	Ineffective once they become clogged with sediment and require regular replacement. Requires monitoring of inlet pressures to ensure filters are changed. Limited by the filter pore size in comparison to targeted sediment particle size.
Substitutes	Geotubes, containment berms and portable sumps.
Benefits	Suspended sediments are captured in the bag filter, enabling both sediment removal and easy disposal of the sediment.
Spring Berms	
Description	Made up of a loose spring/coil covered with a geosynthetic fabric for filtering turbid water and removing suspended sediments.
Installation Locations	Across small channels and/or shallow outlets of in-ground sumps or ponds.
Performance Issues/Limitations	Limited by the berm material pore size in comparison to targeted sediment particle size.
Substitutes	Silt fences or containment berms can be used in place of a spring berm.
Benefits	Easy to deploy, low cost and effective when combined with other mitigation measures.
Coir Logs	
Description	Coir fibre rolls constructed from coconut husks for filtering turbid water and removing suspended sediments.
Installation Locations	Across small channels and/or shallow outlets of in-ground sumps or ponds.
Performance Issues/Limitations	Ineffective once when they become clogged with sediment. Heavy when wet and full of sediment, impeding effective removal.
Substitutes	Silt fences, spring berms.
Benefits	Natural, biodegradable option for removing suspended sediments. Minimal resources required for installation.

Floating Silt Curtains	
Description	Floating panels/sections made of geosynthetic fabric used to contain and limit the spread of turbid water in low flow environments (i.e. lakes, marine environment). Suspended vertically in the water column using floats and weights on the top and bottom of each section, respectively. Additional anchors used on shore to fix silt curtains in place.
Installation Locations	Installed in low flow environments such as stream/lake outfalls or in open water for large construction projects.
Performance Issues/Limitations	Limited to low flow environments. Cannot be used to treat suspended solids in high flow environments (i.e. rivers, large streams). Effective deployment of multiple sections for large construction projects requires a significant level of knowledge, expertise, equipment and manpower.
Substitutes	None
Benefits	Effective at containing turbid water/suspended solids in low flow/ open water settings. Able to connect multiple panels together for large scale construction projects (i.e. marine docks) or use single sections for small scale sedimentation control at stream/lake outfalls. Multiple curtains can be used together to provide secondary protection.
Molecords	
Description	Strips of fabric made of chenille fibers engineered to ensure rapid adhesion to particulates and suspended solids in turbid water. Turbid water streams are directed through draped sections of partially submerged molecords to remove suspended solids and particulates in impacted water.
Installation Locations	Used in multiple applications. Typical setups involve pumping turbid water through a series of molecords draped over a holding tank to remove particulates in turbid water.
Performance Issues/Limitations	Limited effective lifespan. Must be replaced regularly based on particulate levels in impacted water streams requiring treatment.
Substitutes	Chemical treatment (i.e. flocculants)
Benefits	Effective alternative to chemical treatment. Effective at removing particulates without changing water chemistry. Easy to deploy.

3.3.2 WORKING NEAR WATERS

Working near waters relates to activities occurring within 31 m from the high-water mark. Construction related activities have the possibility of occurring parallel or adjacent to streams and or ponds, without disturbing the waters directly. However, sedimentation or dust generated during construction has the possibility of entering the adjacent waters. To reduce potentially adverse effects to the aquatic environment mitigation and monitoring measures will be applied.

Contractors will be required to include appropriate sedimentation and dust control measures prior to the start of work. These mitigation measure will be reviewed and approved by Baffinland and the IEM. Monitoring stations may also be established to ensure mitigation measures are effective. General mitigation measures that may be apply include, but are not limited to:

- Erosion and sediment control measures will be implemented prior to the start of construction and maintained until all disturbed ground has been permanently stabilized
- Preserve low vegetative cover within 100 m of the crossing unless constructing as designed or effective erosion and sediment control are in place to protect water quality

- Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site, will be implemented such that sediment is filtered out prior to the water entering the waterbody (e.g., by discharging water to a vegetated area)
- No waste material resulting from work activities will be left in a manner such that it can enter the water
- Machinery will be washed, refuelled and serviced, and fuel and other materials will be store in such a way to prevent any deleterious substances from entering the water. Such activities typically occur at least 50 m from the high water mark.
- In the event of a sediment release or spill of a deleterious substance, response measures will be identified and implemented immediately consistent with the procedures outlined in the Spill Contingency Plan
- Machinery will arrive at site in a clean condition and be maintained free of fluid leaks, invasive species and noxious weeds
- In the event of a spill release into a waterbody, Baffinland will report the unauthorized discharge in accordance with provisions outlined in Part H, Item 9 of the Type A Water Licence

3.3.3 IN-WATER WORK

Various types of in-water work will be undertaken:

- Installation of pipe culverts, arch culverts and bridges
- Modification and/or relocation of existing culverts
- Partial infilling of ponds
- Stream diversions and realignments
- Fish habitat offsetting measures

A portion of these activities will occur in fish habitat and will be subject to an authorization under the *Fisheries Act*. Mitigation relevant to each of these features is described below.

3.3.3.1 TIMING WINDOWS FOR IN-WATER WORK

The Nunavut Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat (DFO, 2013) outlines timing constraints to protect fish and fish habitat during in-stream construction projects. In the Project area this time period runs from September 1 to June 30.

All or most of the watercourse crossings in the region dry up and/or freeze to the bottom each winter, starting in the second half of September for the smallest watercourses. Fish are not typically present during this time. Watercourses that freeze solid during the winter do not provide over-wintering habitat for fish.

Because all or most of the watercourse crossings in the region dry up and/or freeze to the bottom each winter, the installation of water crossings during this period presents several advantages, even though it is within the Nunavut restricted activity timing window. As such, approval from DFO to work during this period is required. No temporary diversions are required, which can simplify and expedite the culvert or bridge installations.

The mitigation measures specific to the installation of water crossings in winter include:

- Confirm that the larger streams are completely frozen
- Remove snow and ice from the bed of the watercourse to ensure that the culvert is properly placed
- Remove loose or spilled sediment from the channel upon completion of the work. Install sediment and erosion control measures for when the thaw occurs

Permission to conduct winter installation of crossings will be sought from the DFO as part of an authorization under the *Fisheries Act*.

3.3.3.2 FISH PROTECTION

Fish and fish habitat are present throughout streams and water bodies near Project infrastructure and have been identified as an important VEC for the Project. As such, several operational protocols and plans were developed to prevent and mitigate negative impacts on fish and fish habitat at the Project. Project protocols and plans include the following measures:

- Construction of rocky ramps at locations where scour and erosion at culvert outlets are problematic
- Monitoring Project water crossings and completing the appropriate repairs/modifications to improve fish passage
- To the greatest extent possible, the natural channel width will be maintained within crossing structures
- All fill placed under and around the culverts will be clean (i.e. devoid of organic soils or silt)
- Adhering to the Fisheries and Oceans Canada (DFO) guidance "*Guidelines for Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky, 1998)*,* including a more protective overpressure threshold of 50 kPa for work in or near fish bearing water (the guideline states a 100 kPa threshold
- Using silt curtains to prevent the dispersion of sediments during work activities in/near marine waters (dredging, piling, backfilling) and/or freshwater lakes
- Ensuring compliance for Project activities with the No-Net-Loss principle (DFO, 2001) to prevent or mitigate direct or indirect fish and fish habitat losses
- Continued implementation of the Dust Mitigation Action Plan (Golder, 2016), Sediment Mitigation Action Plan (Golder, 2016), and Tote Road Earthworks Execution Plan (TREEP, Golder, 2017) to address surface water drainage and water quality concerns at Project sites and mitigate potential impacts to fish and fish habitat
- Implementing the appropriate erosion and sedimentation mitigation measures, as outlined in Section 3.1.1 and 3.1.2 of this Plan
- In-stream work will not be performed during the restricted activity window, September 1 through June 30 where there is water flowing and spawning habitat is present or at sites where fall spawning movements are occurring to avoid effects on Arctic Char spawning and egg incubation
- Culverts installed in fish-bearing streams in the open-water season will be isolated from flow prior to construction using diversion channels and cofferdams, and a fish salvage program will be conducted in the isolated section prior to dewatering (see section 3.2.3.1)
- If dewatering is required, salvage fish prior to dewatering and release to adjacent surface waters; if water is pumped from within a cofferdam prior to fish salvage, screens meeting criteria set out by DFO will be used
- Design mitigation for potential effects of increased flows on fish habitat include channel widening, regrading, construction of habitat features (in fish bearing streams), and channel stabilization
- All water intake hoses will be equipped with a screen of an appropriate mesh size (as approved by the DFO) to ensure that fish are not entrained, and operators will ensure the water intake hoses withdraw water at such a rate that fish do not become impinged on the screen
- In developing Project quarries, a minimum 100 m naturally-vegetated buffer between the high-water mark of any fish-bearing water bodies and any permanent quarries with potential for acid rock drainage or metal leaching will be maintained

3.3.3.3 OPERATING EQUIPMENT IN AND NEAR WATER

Surface water runoff from areas of intense vehicular activity is susceptible to contamination from minor spills and/or leakage of machinery and equipment. Additionally, machinery and equipment can cause inadvertent sedimentation and/or erosion. As such, the following mitigation measures will be followed to minimize potential impacts:

- Machinery arriving at site will be inspected to ensure it is in clean condition, free of fluid leaks, invasive species and noxious weeds
- Erosion and sediment control measures will be implemented prior to the start of construction and maintained until all disturbed ground has been permanently stabilized
- Low vegetative cover within 100 metres of a waterbody will be preserved unless effective erosion and sediment control measure are in place to protect water quality
- Measures for managing water flowing onto the site, as well as water pumped/diverted from the site, will be implemented such that sediment is filtered out prior to the water entering the waterbody (e.g., by discharging water to a vegetated area)
- No waste material resulting from work activities will be left in a manner such that it can enter the water
- Machinery will be inspected prior to its use in or near water by the Maintenance Department, to ensure it is clean, in working order and free of fluid leaks
- Machinery will be washed, refueled and serviced, and fuel and other materials will be stored at least 31 m from the high water mark and in such a way as to prevent any deleterious substances from entering the water
- Limit fording of the watercourses by machinery to a one-time event (i.e., over and back), and only if no alternative crossing method is available; if repeated crossings of the watercourse are required, a temporary crossing structure will be constructed
- Temporary ice crossings used in the winter season will have all sediment and impacted snow removed from the crossing prior to spring freshet, and the surface of the ice scarified to promote breakup

3.3.3.4 EROSION AND SEDIMENT CONTROL MEASURES AT WATER CROSSINGS

The following subsections discuss the mitigation measures implemented at the Project to control sedimentation and erosion at Project water crossings.

Drainage crossings along access roads and the railway will consist of the installation of corrugated steel culvert pipes. Some crossings will require multiple culvert installations in order to provide the required capacity to pass the design flows. The largest crossings may require the installation of bridges and select crossings along the railway will use arch culverts.

All crossings will be installed in accordance with the IFC drawings provided for the work, the supplier's recommendations, the Technical Specifications, and in compliance with all applicable regulatory requirements. The IFC drawings provided by contractors will also indicate the environmental protection measures that will be taken at each crossing.

Foundation preparation for the culvert installations will generally involve the removal of unsuitable materials, fill placement, grading, levelling, and preparation of a compacted pad. Culverts will be installed on fill material consisting of well graded sand and gravel.

Culverts will typically be available in 6 m lengths. Couplers will be required to connect multiple culverts together and provide sufficient length to accommodate the road cross-section width. Culvert backfill will be placed and compacted

in accordance with the Technical Specifications. Backfill around pipes (i.e., haunching, crown, etc.) shall be carefully placed in thin lifts and compacted using hand compaction equipment to prevent damage to the pipes. All other fill material shall be compacted using standard vibratory roller equipment.

The primary "measures to avoid causing harm" include conducting all instream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoiding the introduction of sediment into the watercourse (DFO, 2016). Temporary diversion channels may be required to isolate the worksite if the streams are flowing; the diversion channels will be designed by a professional engineer to accommodate peak flows.

Erosion protection measures may be required to protect the abutment fill at the major crossings. Soil reinforcement may be required to stabilize some of the higher abutments at the major crossings. Non-woven geotextile may also be used to provide additional support and erosion protection during periods of high flows. A site assessment by the Contractor and Baffinland representative is recommended, prior to installation, to identify the stabilization requirements.

Table 3.7 outlines the mitigation measures to control sedimentation and erosion at water crossings.

TABLE 3.7 CONTROL MEASURES AT WATER CROSSINGS

Pumping	
Description	Pumps are used to transfer water from one side of the road/structure to the other.
Installation Locations	At crossings where culverts are not installed, incorrectly installed, blocked, or not allowing sufficient flow. Pumping is required prior to culvert installation for dewatering. Pumps may also be used as a temporary solution during freshet or prior to culvert installation. In addition, siphons can be used as an alternative, but require a pump to prime the system and sufficient slope between upstream and downstream locations.
Performance Issues/Limitations	Ineffective during high flows. Erosion control measures are required at pump discharge points. The associated risk of fuel spills requires secondary containment. Temporary solution requiring additional resources. Additional considerations and mitigation measures (e.g. fish intake screens) are required in conjunction with pumping for fish bearing watercourses.
Benefits	Effective temporary solution to lower water levels in places where water levels are high or prior to culvert installation. Also, useful at low flow locations where culverts have not been installed.
Culvert	
Description	Pipes installed through embankments to allow the passage of water while maintaining access over the site. The size and/or number of culverts required for installation is determined by a hydraulic design study, conducted to assess suitable hydraulic design criteria to avoid flooding or washouts. Culvert flow capacities are assigned using hydraulic analysis methods assuming an appropriate return period with allowance for ice accumulation. Permitting process may be required for watercourses where authorizations are required depending upon watercourse classifications.
Installation Locations	At points where roads intersect streams, rivers or seasonal drainages (freshet) or at locations where there is potential for water to flow over roads.
Performance Issues/Limitations	Potential for siltation during installation. Requires labour, equipment and materials (compacted backfill) for proper installation. Concentration of flows cause potential for erosion at downstream discharge points. Increased velocities may prevent fish passage upstream through the culvert. Culverts may become perched, requiring installation of fish ladders. Clearing of snow and/or ice prior to spring freshet is required to minimize the potential for blockages.

Benefits	High flow capacities can be achieved depending on culvert selection. Culverts also permit fish passage under roads where crossings have been identified as fish habitat.
French Drain	
Description	A ditch or channel filled with rock to provide a flow path for water. The clean rock material can be covered with a non-woven geotextile to prevent the ingress of finer material which could reduce the permeability of the drain.
Installation Locations	At points where roads intersect streams/drainages and where fish passage is not a consideration. May be used as an alternative for a culvert if culverts are not available.
Performance Issues/Limitations	Ice blockage potential in French drains has not been adequately assessed. Susceptible to blockage by siltation. Long-term performance has not been assessed. Design capacity is not as well defined as those for a culvert. Clean rockfill is critical to the performance of the French Drain.
Benefits	Constructed of natural local and/or local materials.
Bridge	
Description and Installation Locations	Bridges are required for the crossing of larger streams or rivers where culvert crossings are not feasible. The installation of bridges requires hydraulic design studies undertaken to evaluate suitable hydraulic design criteria to avoid flooding or any unexpected damage to the adjacent ground. Bridge abutments typically rest on foundations constructed on either side of the watercourse, unless mid-stream support columns are required to support the bridge span.
Installation Location	Bridge locations are assessed using a river hydraulics analysis assuming an appropriate return period with an allowance for ice accumulation. Typically rest on foundations constructed on either side of the watercourse. Typically installed at locations where hydraulic efficiency, fish habitat, and/or fish passage are considered important.
Performance Issues/Limitations	Permitting process may be required for watercourses where authorizations are required depending upon watercourse classifications. Possibility for sediment on the bridges from vehicle crossings to build up and release into the water, requiring routine maintenance to ensure the platform prevents this release.
Benefit	Can maintain the original stream width (assuming no mid-stream support columns) and streambed materials and has increased hydraulic efficiency.
Arch Culvert	
Description	A culvert consisting of an arch with an open bottom such that native streambed is exposed. Arch culverts typically rest on foundations constructed on either side of the watercourse.
Installation Locations	Typically installed at locations where hydraulic efficiency, fish habitat, and/or fish passage are considered important.
Performance Issues/Limitations	Reduced potential for siltation during installation as water diversion structures are typically not needed. Requires labour, equipment and materials (compacted backfill) for proper installation. Clearing of snow and/or ice prior to spring freshet is required to minimize the potential for blockages.
Benefits	Maintains the original stream width and streambed materials and has increased hydraulic efficiency.

Armoring	
Description	Used as a barrier between water flow and materials that are susceptible to erosion. Clean quarry rock and/or clean naturally occurring granular borrow material are used to protect underlying fine-grained material from scour and erosion around crossings. May be combined with an underlying non-woven geotextile.
Installation Locations	Around culvert inlet/ outlets, typically on exposed erodible slopes.
Benefits	Effective long-term solution for preventing erosion and re-suspension of susceptible fine grained materials from runoff into crossings.

3.3.3.5 BRIDGE CONSTRUCTION

Bridges will be constructed in larger streams along the railway. Construction will be undertaken in winter, to allow for the installation of steel piles for the piers. It will be necessary to create a temporary gravel pad within the streambed during winter to support pile driving equipment. All sediment placed within the dry streambed will be removed prior to the spring. Bridge abutments will also be constructed during the winter to minimize potential interactions with fish and fish habitat.

3.3.3.6 TEMPORARY STREAM CROSSINGS

During construction temporary stream crossings may be required. The types of temporary crossings include fords, temporary bridges, and winter crossings such as ice bridges and snow fills. The DFO has developed an Interim Code of Practice for Temporary Stream Crossings (DFO, 2020), which identifies measures to follow to ensure that fish and fish habitat are protected. The measures identified in the code, which Baffinland will adhere to are provided below:

Protection of Fish

- Plan in water works, undertakings and activities to respect timing windows to protect fish and fish habitat (see also Section 3.3.3.1)
- Limit the duration of in-water works, undertakings and activities so that it does not diminish the ability of fish to carry out one or more of their life processes (e.g., spawning, rearing, feeding, migrating)
- Maintain an appropriate depth and flow (i.e. base flow and seasonal flow of water) for the protection of fish

Protection of Fish Passage

- Maintain fish passage during all phases of works, undertakings and activities:
  - Avoid changing flow or water levels
  - Avoid obstructing and interfering with the movement and migration of fish

Protection of the Riparian Zone

- Use existing trails, roads access points or cut lines wherever possible
- Avoid tree/shrub removal whenever possible
- Avoid stockpiling of material on stream banks and riparian zones
- Do not grade stream banks or approaches
- Use methods to prevent substrate compaction (e.g., swamp mats, pads)
- Limit access to banks or areas adjacent to water bodies
- Construct roads, access points and approaches perpendicular to the watercourse or water body
- Prune or top the vegetation instead of grubbing/uprooting wherever possible

- Limit grubbing on watercourse banks to the area required for the footprint of the works, undertakings and activities
- Remove vegetation or species selectively and in phases
- Restore stream banks and riparian vegetation affected by the works, undertakings and activities to their natural state (substrate granularity, profile, vegetation, etc.)
- Re-vegetate the disturbed banks and adjacent areas with native species suitable for the site

Protection of Aquatic Habitat

- Avoid disturbing or removing aquatic vegetation, natural wood debris, rocks, sand or other materials from the banks, shoreline or the bed of the water body
- Ensure there is no temporary or permanent increase in existing footprint below the ordinary high water mark
- Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks
- Maintain an appropriate depth and flow (i.e., base flow and seasonal flow of water) for the protection of fish habitat
- Conduct in-water works, undertakings and activities during periods of low flow, or at low tide

Protection of Fish Habitat from Sedimentation

- Use only clean materials (e.g., rock, coarse gravel, wood, steel, snow) for works, undertakings and activities
- Install effective erosion and sediment control measures prior to beginning works, undertakings and activities in order to stabilize all erodible and exposed areas:
    - Develop and implement an erosion and sediment control plan to avoid the introduction of sediment into any water body during all phases of the works, undertakings and activities
    - Schedule work to avoid wet, windy and rainy periods (and heed weather advisories) that may result in high flow volumes and /or increase erosion and sedimentation
    - Operate machinery on land in stable dry areas
    - Regularly inspect and maintain the erosion and sediment control measures and structures during all phases of the project
    - Regularly monitor the watercourse for signs of sedimentation during all phases of the works, undertakings and activities and take corrective action if required
    - Use biodegradable erosion and sediment control materials whenever possible
    - Keep the erosion and sediment control measures in place until all disturbed ground has been permanently stabilized
    - Remove all sediment control materials once site has been stabilized
    - Dispose of, and stabilize, all excavated material above the ordinary high water mark or top of bank of nearby waterbodies and ensure sediment re-entry to the watercourse is prevented

Protection of Fish and Fish Habitat from Deleterious Substances (including suspended sediments)

- Develop and immediately implement a response plan to prevent deleterious substances from entering a water body:
    - Stop works undertakings and activities in the event of a spill of a deleterious substance
    - Immediately report any spills (e.g., sewage, oil, fuel or other deleterious material), whether near or directly into a water body
    - Keep an emergency spill kit on site during all phases the works, undertakings and activities
    - Contain any water with deleterious substances

- Ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse
- Clean-up and appropriately dispose of water contaminated with deleterious substances
- Maintain all machinery on site in a clean condition and free of fluid leaks
- Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water
- Dispose of all waste materials (e.g., construction, demolition, commercial logging) above the ordinary high water mark to prevent entry into the water body

Additional Measures for Temporary Crossings - General

- Locate temporary crossing site where streambanks are stable and where approaches have low slopes
- Locate temporary crossing site where the stream is straight, unobstructed and well defined
- Locate temporary crossing at a right angle to the stream
- Ensure approach grades are kept to a minimum for at least 15 m on each side of the crossing

Additional Measures for Fords

- Locate fording site where stream substrate is stable or is a bedrock outcrop
- Limit machinery fording of the watercourse to a one-time event (over and back)
- Conduct fording during periods of low flow
- Stabilize approaches with non-erodible materials such as brush mats, corduroy or clean stone
- Restore approaches and banks of the watercourse to its natural state
- Do not skid or drag anything across ford
- Do not use ford if the water depth is greater than the axle height of the vehicle
- Do not manipulate material in the wetted portion of the watercourse while fording the watercourse

Additional Measures for Winter Crossings (ice bridges and snow fills)

- Construct snow bridges on large watercourses that have sufficient stream flow and water depth to prevent the ice bridge from coming into contact with the stream bed or restricting the water movement beneath the ice
- Use only clean water, ice or snow to construct winter crossing
- Construct approaches using clean compacted snow and ice to a sufficient depth to protect the banks of the watercourse
- Do not exceed 10% of the instantaneous flow if withdrawing any water, in order to maintain existing fish habitat and flow under the ice
- Screen intake pipes to prevent entrainment or impingement of fish:
  - Use the interim code of practice for end-of-pipe fish protection screens for small water intakes in freshwater
- Where logs are used to stabilize the approaches of an ice bridge or snow fill:
  - Do not leave logs or woody debris within the water body or on the banks or shoreline where they can wash back into the water body
  - Ensure that the logs are clean and securely bound together so they can be easily removed either before or immediately following spring freshet
- Maintain natural, under ice water flow where it occurs

- Place notch in center of the ice bridge to encourage proper melting and reduce flooding, to ensure that fish passage is maintained
- Remove compacted snow from the snow fills prior to the spring freshet

Additional Measures for Temporary Clear Span Bridges

- Ensure the single-span bridge structure, including approaches, abutments, footings, and armouring is built entirely above the ordinary high water mark
- Design the bridge so that storm water runoff from the bridge deck, side slopes and approaches directly run off into a retention pond or vegetated area to prevent sediment and other deleterious substances from entering the watercourse
- Design temporary bridges to accommodate any expected high flows of the watercourse during the construction period
- Remove bridge crossing prior to the spring freshet, unless the crossing has been constructed above the annual spring high water level

Prior to the use of the above DFO Interim Code of Practice for Temporary Stream Crossings, Baffinland will submit a notification form (Appendix D) to the DFO, 10 working days before starting work on temporary stream crossings.

3.3.3.7 POND ENCROACHMENTS

Railway construction will involve infilling portions of ponds, a portion of which are fish habitat. Lost fish habitat will be offset in accordance with an authorization under the *Fisheries Act*. Flow and fish passage through the railway embankments will be maintained. Railway construction will involve infilling portions of ponds, a portion of which are fish habitat. Lost fish habitat will be offset in accordance with an authorization under the *Fisheries Act*. Flow and fish passage through the railway embankments will be maintained by installing culverts at the mouths of streams where the encroachments affect pond and stream outflow/inflows. Fish and fish habitat will be protected by isolating the work area with cofferdams or silt curtains and temporary water diversions.

Prior to the start of construction, contractors will be required to provide IFC drawings which also indicate environmental protection measures, specific to each encroachment area.

Environmental monitoring will occur during the construction period. Fish will be removed from the instream work site according to a fish salvage protocol developed in consultation with QIA Environmental Monitors (or QIA site environmental staff). Daily site inspections will occur during construction to confirm the mitigation measures are functioning. Pond water quality will be monitored periodically as an additional measure to confirm mitigation measures. Monitoring plans will be provided in the Application for *Fisheries Act* Authorization where they will become conditions of DFO approval. The plans will include post-construction monitoring measures. maintained by installing culverts at the mouths of streams where the encroachments affect pond and stream outflow/inflows. Fish and fish habitat will be protected by isolating the work area with cofferdams or silt curtains and temporary water diversions.

3.3.3.8 TEMPORARY COFFERDAMS AND DIVERSION CHANNELS

Measures to divert water will typically include ditch excavation and berm construction. Ditches and berms will be typically lined with non-woven geotextile and riprap to prevent erosion from flowing water.

The DFO has prepared an interim code of practice for temporary cofferdams and diversion channels (DFO, 2020b). This code, which Baffinland will follow, outlines national best practices for the temporary isolation of a section of a watercourse in order to conduct works, undertakings and activities in the dry while maintaining the natural downstream flow. Measures identified in the code of practice to ensure that fish and fish habitat are protected include:

Protection of Fish

- Plan in water works, undertakings and activities to respect timing windows to protect fish and fish habitat (also see Section 3.3.3.1)
- Limit the duration of in-water works, undertakings and activities so that it does not diminish the ability of fish to carry out one or more of their life processes (e.g., spawning, rearing, feeding, migrating)
- Screen intake pipes to prevent entrainment or impingement of fish:
  - Follow Interim code of practice: End of pipe fish protection screens for small water intakes in freshwater, when using pumps
- Capture and relocate any fish trapped within an isolated/enclosed work area and safely relocate them to an appropriate location in the same water body:
  - Dewater gradually to reduce the potential for stranding fish
  - Relocate any fish as per applicable permits for capturing and relocating fish

Protection of Fish Passage

- Maintain fish passage during all phases of works, undertakings and activities:
  - Avoid changing flow or water levels
  - Avoid obstructing and interfering with the movement and migration of fish

Protection of the Riparian Zone

- Use existing trails, roads, access points or cut lines wherever possible
- Avoid tree/shrub removal whenever possible
- Use methods to prevent soil compaction (e.g. swamp mats, pads)
- Do not grade streambanks or approaches
- Avoid stockpiling of material on stream banks and riparian zones
- Limit access to banks or areas adjacent to water bodies
- Prune or top the vegetation instead of grubbing/uprooting to ensure root structure stability
- Limit grubbing on watercourse banks to the area required for the footprint of the works, undertakings and activities
- Construct access points and approaches perpendicular to the watercourse or water body
- Remove vegetation or species selectively and in phases
- Re-vegetate the disturbed areas with native species suitable for the site
- Restore the banks affected by the work, undertakings and activities to their natural state (profile, vegetation, etc.).

Protection of Aquatic Habitat

- Avoid disturbing or removing aquatic vegetation, natural wood debris, rocks, sand or other materials from the banks, shoreline or the bed of the water body
- Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks
- Salvage, reinstate or match habitat structure (e.g. large wood debris, boulders, instream aquatic vegetation/substrate) to its natural state

Protection of Fish Habitat from Sedimentation

- Use only clean materials (e.g. rock, coarse gravel, wood, steel, snow) for works, undertakings and activities
- Develop and implement a sediment and erosion control plan to minimize sedimentation of the water body during all phases of the works, undertakings and activities
- Conduct all in-water works, undertakings and activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse
- Maintain the natural flow regime for any diversion works
- Schedule work to avoid wet, windy and rainy periods and heed weather advisories
- Regularly inspect and maintain the sediment control measures and structures during all phases of the project
- Regularly monitor the watercourse for signs of sedimentation during all phases of the works, undertakings and activities and take corrective action when needed
- Use biodegradable erosion and sediment control materials whenever possible
- Keep the erosion and sediment control measures in place until all disturbed ground has been permanently stabilized
- Remove all sediment control materials once site has been stabilized
- Operate machinery on land, from barges or on ice
- Use methods to prevent substrate compaction (e.g. swamp mats, pads)
- Dispose of and stabilize all excavated material above the ordinary high water mark or top of bank of nearby water bodies and ensure sediment re-entry to the watercourse is prevented
- Use appropriate isolation materials and designs to minimize disturbance to the bed and banks of the watercourse or water body
- Protect pump discharge areas to prevent erosion and the release of suspended sediments downstream
- Pump any residual water from the isolated worksite into a designated treatment area (e.g. settling pond, behind filter fabric dam, vegetated areas, envirobags):
    - Remove accumulated sediments from the isolated area before removing the isolation barrier
    - Partially reflood the dewatered site in order to re-suspend remaining deposits and pump any residual sediment-laden water from the site

Protection of Fish and Fish Habitat from Deleterious Substances (including suspended sediment)

- Develop and immediately implement a response plan to prevent deleterious substances from entering a water body:
    - Stop works, undertakings and activities in the event of a spill of a deleterious substance
    - Immediately report any spills (e.g. sewage, oil, fuel or other deleterious material), whether near or directly into a water body
    - Keep an emergency spill kit on site during the works, undertakings and activities
    - Contain any water with deleterious substances

- Ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse
- Clean-up and appropriately dispose of the sediment-laden water and water contaminated with deleterious substances
- Maintain all machinery on site in a clean condition and free of fluid leaks
- Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water
- Dispose of all waste materials (e.g. construction, demolition, commercial logging) above the ordinary high water mark to prevent entry into the water body
- Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, poured concrete or other chemicals do not enter the watercourse

Additional Measures for Cofferdams

- Construct the cofferdam using non-earthen material (e.g. water-inflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs):
  - Take the necessary measures to seal the cofferdams and thus minimize the amount of water to be managed
  - Use clean rock void of erodible material
  - Use adequately sized material (i.e. moderately sized rock and not sand or gravel) to withstand anticipated flows during construction
  - Construct cofferdams sufficiently high to prevent overtopping in the event of sudden increases in water levels
- Regularly inspect and maintain cofferdam during all phases of the projectt
- Do not excavate inside the cofferdam or sediment filtering curtain until the cofferdam/curtain/work area is completely isolated from flow
- Only install and operate dewatering pumps once the cofferdam is complete and isolation has been achieved:
  - Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure or high flow events

Additional Measures for Diversion Channels

- Design the diversion channel to accommodate the peak seasonal flows for the time period the diversion will be in place:
  - Ensure that the diversion channel is no longer than necessary
  - Stabilize and line temporary diversion channel with appropriate watertight material before any water flow is diverted from a natural channel into a diversion channel
  - Ensure slope of the diversion channel is similar to or lower in gradient than the natural watercourse
  - Use natural material to simulate natural stream conditions whenever possible
  - Install energy dissipation structures (i.e. rocks, sandbags) within the diversion channel
  - Align the downstream connection of the temporary diversion with the natural watercourse in a manner that avoids erosion on the opposite bank
- Regularly inspect and maintain the diversion channel during all phases of the project

- When connecting the diversion channel to the watercourse:
  - Excavate the downstream end of the diversion channel towards the upstream point, where a 'plug' of earth should be left to prevent the entry of streamflow into the diversion before channelization
  - Place a cofferdam immediately below the upstream point of the diversion to reroute the flow of water into the diversion
  - Remove 'plug' once the channel is lined and lining secured
  - Place another cofferdam immediately above the downstream point of the diversion channel to isolate the work area
  - Proceed with the works, undertakings and activities once the area is effectively isolated from the stream
- When the diversion is no longer in use remove impermeable material, fill in, stabilize and revegetate the area of the temporary diversion channel to prevent erosion

Rewatering/Reflooding the Isolation Area (partial or complete)

- Ensure that the watercourse is void of un-natural deposits of sediment within the footprint of the dewatered area
- Maintain sediment control measures during re-watering of the work site and removal of the cofferdam to ensure sediment is not released into the water body
- Remove the remainder of the cofferdam structure to allow the full return of flow to the permanent channel
- When returning flow (rewatering/reflooding):
  - Ensure all components of the watercourse bed and banks within the footprint of the disturbed area and between the upstream and downstream water control structure(s) have been stabilized including any reinstated habitat features
  - Ensure a maintenance flow is provided downstream to fish and fish habitat until the natural flow meets the water discharge location
  - Gradually remove the downstream cofferdam first to ensure equalization of water levels inside and outside of the isolated area to allow suspended sediments to settle and to reshape the watercourse prior to the return of flow from the upstream reach
  - Remove the upstream water control structure slowly as to allow for a partial return of water to the dewatered channel
- Once the banks are stabilized and the diversion channel is filled in, the diversion channel cofferdams can be removed

Prior to the use of the above DFO Interim Code of Practice for Temporary Cofferdams and Diversion Channels, Baffinland will submit a notification form (Appendix D) to the DFO, 10 working days prior to starting work.

A fish salvage program will be required prior to re-routing the stream into the diversion channel, as described in Appendix F. A fish collection salvage permit will be required for salvage operations and the salvage must be completed by qualified professionals. Fish will be re-located in areas upstream or downstream of the work site in suitable habitat. If pumping is required in the isolated stream channel between the cofferdams prior to fish salvage, water intakes will be screened to prevent fish entrainment, and pumps and intake screens will be sized to prevent impingement of fish.

3.3.3.9 FISH OFFSETTING MEASURES

Baffinland will propose fisheries offsetting measures as part of a permit application to the DFO. Site specific drawings and plans will be developed as part of the final offsetting plan that will accompany the permit application. These site-specific measures will be implemented prior to construction.

3.3.4 QUARRIES

Aggregate for the Project will be sourced from a number of borrow pits and quarries located at the Mine Site, Milne Port and along the transportation corridor. Quarrying is a ground disturbance activity that has the potential to adversely affect local aquatic ecosystems through erosion and sedimentation and water quality impacts if blasting residues are present in runoff above guidelines. Mitigation measures and monitoring related to quarries and borrow pits are described in the Borrow Pit and Quarry Management Plan and individual quarry specific plans. Monitoring activities of quarries and borrow pits are discussed briefly in Section 5.5.

3.3.5 SOIL SPOILS DISPOSAL

Soil spoils will often consist of fine-grained and/or ice-rich soils that have the potential to generate sediment-laden water. Criteria for selecting disposal areas and managing the soil spoils are described in Section 2.4.5. To the extent practical, soil spoils will be disposed of in exhausted quarries and former borrow pits. Where disposal is in an exhausted quarry, it may be possible to implement the mitigation measures and monitoring programs developed within the quarry-specific management plans. Otherwise, the mitigation measures generally implemented to manage runoff at quarries and borrow pits will need to be implemented to effectively contain the soil spoils and avoid or reduce potential sediment releases.

3.4 TRANSPORTATION CORRIDOR WATER MANAGEMENT

The transportation corridor consists of the Tote Road and the North Railway once constructed. The Tote Road is currently used to haul ore from the Mine Site to Milne Port, this activity will continue during the construction of the North Railway. After the rail is fully operational, ore will be transported by rail from the Mine Site to Milne Port, and there will be reduced Project truck traffic and potentially incidental community use of the road by ATV or snowmobile.

Access roads at project sites are regularly used by project personnel to move equipment and materials and supplies from one location to another.

Potential effects of transportation infrastructure on surface water quality and aquatic ecosystems include:

- Erosion and sedimentation issues, resulting from construction activities, freshet and heavy rainfalls
- Potential sediment releases from fugitive dust emissions
- Interruption of fish passage due to stream crossings
- Potential accidental releases (i.e., spills)
- Potential effects on Arctic Char health

Mitigation measures applicable to the Tote Road, North Railway and access roads are described in the subsections below.

3.4.1 FRESHET MITIGATION

Extreme flows occurring during freshet can result in significant erosion and damage to water crossing structures. Operational protocols and plans, including the Snow Management Plan, Sedimentation Mitigation Action Plan (Golder, 2016), and the Northern Corridor Monitoring Program (Section 5.6) were developed to manage freshet high flows and mitigate freshet potential negative impacts on surface water quality and associated infrastructure. Project protocols and plans include the following measures:

- Stake priority culverts and physically marking fish-bearing water crossings, where possible, so that they can be easily identified in the spring, prior to snow/ice melt
- Clearing snow from roads adjacent to water crossings and stockpiling snow in approved locations as outlined in the Snow Management Plan
- Monitoring snow stockpiles during freshet as outlined in the Snow Management Plan
- Monitoring culverts for clearance of snow and ice prior to freshet
- Re-establishing flows through culverts by removing snow and ice blockages by excavation and steaming
- Implementing the appropriate erosion and sedimentation mitigation measures, as outlined in Section 3.2.1
- Ensuring sufficient fish migration passage through routine monitoring and mitigation (Section 3.5.3 and 5.8)
- Inspections, snow/ice removal, and maintenance should be completed prior to spring freshet to allow free passage of water during freshet
- Monitoring Project water crossings (Appendices F and H) and completing the appropriate repairs/modifications

The requirement and selection of effective sedimentation and erosion controls to be employed at areas along the Tote Road will be subject to Project authorizations and applicable DFO guidance, and informed by in field monitoring and site experience. Water crossings have been designed and constructed to minimize the potential loss of fish habitat. Erosion and sedimentation controls for water crossings as outlined in Section 3.2.1 of this Plan will be utilized as required to address erosion and sedimentation from construction and ongoing operations of the Tote Road. Scheduled monitoring for fish, fish habitat and water quality at water crossings along the Tote Road is outlined Section 5.5 of this Plan.

In 2017, the Tote Road Earthworks Execution Plan (TREEP; Golder, 2017) was developed to address sedimentation concerns observed along the Tote Road by improving the road's surface water drainage infrastructure. Improvements outlined in the Tote Road Earthworks Execution Plan (TREEP) include culvert extensions, lining drainage ditches with riprap, improving roadbed material and stabilizing road embankments. Improvements outlined in the TREEP along with the Issued-For-Construction drawings developed by Hatch for the Early Revenue Phase of the Project will continue to be implemented along the Tote Road as required by Project operations. Scheduled monitoring of water quality, water quantity and fish passage at water crossings along the Tote Road, as detailed in Section 5 of this Plan, will be used to inform and prioritize Tote Road maintenance activities and surface water drainage improvements.

Several design features of the North Railway are expected to reduce the potential for effects to surface water and aquatic ecosystems:

- Watercourse crossings are designed to the 1 in 200-year storm event, with an additional sizing allowance for ice accumulation
- The embankment is entirely constructed from aggregates, rather than borrow materials
- North Railway crossings will be constructed with armouring techniques to protect the underlying fine-grained material from erosion and sedimentation

3.4.2 DUST MITIGATION

The Air Quality and Noise Abatement Management Plan describes mitigation for managing dust, including the application of dust suppressants (water, calcium chloride, Dust Stop®, etc.). Dust suppressants will be applied in accordance with applicable guidelines to minimize runoff into local watercourses.

3.4.3 FISH PASSAGE

Fish passage may be interrupted along the Tote Road due to perched culverts. Annual monitoring is undertaken to identify and address such issues (Section 5.7).

Fish passage through railway culverts was identified as a potential concern in the environmental review (North/South Consultants Inc., 2018), based on flow velocities through culverts estimated by hydrological modelling that were compared to published fish passage thresholds (Knight Piésold, 2017b). Fish-bearing culverts that have been identified as potential fish passage barriers will be assessed on a case-by-case basis during the final detailed engineering design phase of the Project to include appropriate fish passing promoting measures. There are a few ways that streamflow velocities can be reduced:

- Install culverts at the same slope as the existing stream, where feasible
- Install additional culverts if the channel width allows for this
- Insert boulders, baffles, baffle inserts, or weirs to increase friction in the culvert and mimic stream bed conditions

It is expected that with additional engineering design, flow velocities that currently exceed fish passage thresholds will be able to be reduced below the thresholds. Monitoring of fish passage through fish-bearing culverts along the North Railway is proposed to validate modelling and the effectiveness of mitigation measures to facilitate fish passage (Section 5.7).

3.4.4 ACCIDENTAL RELEASES

Surface water runoff from areas of intense vehicular activity is susceptible to contamination from minor spills and/or leakage of machinery and equipment. Detection of a spill will trigger implementation of the Spill Contingency Plan. Surface water suspected to be impacted by hydrocarbons will be addressed using spill response absorbents and/or by transporting impacted surface water to a Hazardous Materials Containment Area for temporary storage and subsequent treatment and discharge using the Project's mobile Oily Water Treatment System (OWTS; refer to the Freshwater Supply, Sewage, Wastewater Management Plan).

3.4.5 CULVERT MAINTENANCE

The DFO has developed an Interim Code of Practice for Culvert Maintenance (DFO, 2020c). The code outlines national best practices for culvert maintenance. The code of practice applies to routine culvert maintenance only provides measures to follow to ensure that fish and fish habitat are protected. The contents of the code, which Baffinland will adhere to, are provided below.

Protection of Fish

- Plan in water works, undertakings or activities to respect timing windows to protect fish and fish habitat
- Conduct in-water works, undertakings and activities during periods of low flow
- Limit the duration of in-water works, undertakings and activities so that it does not diminish the ability of fish to carry out one or more of their life processes (e.g. spawning, rearing, feeding, migrating)

- Employ fish exclusion netting (up and downstream) to isolate the work site if fish are observed in the vicinity of the works, undertakings and activities
- Maintain an appropriate depth and flow (i.e. base flow and seasonal flow of water) for the protection of fish

Protection of Fish Passage

- Maintain fish passage during the works, undertakings and activities:
  - Avoid changing flow and water level
  - Avoid obstructing and interfering with the movement and migration of fish

Protection of the Riparian Zone

- Limit access to shorelines and banks or areas adjacent to water bodies
- Prune or top the vegetation instead of grubbing/uprooting
- Limit grubbing on watercourse banks to the area required for the footprint of works, undertakings and activities
- Construct roads, access points and approaches perpendicular to the watercourse or water body
- Remove vegetation or species selectively and in phases
- Re-vegetate the disturbed areas with native species suitable for the site
- Restore the stream banks and riparian vegetation affected by the works, undertakings and activities to their natural state (substrate granularity, profile, vegetation, etc.)

Protection of Fish Habitat from Sedimentation

- Use only clean materials (e.g., rock, coarse gravel, wood, steal, snow) for works, undertakings and activities
- Install effective erosion and sediment control measures prior to beginning works, undertakings and activities in order to stabilize all erodible and exposed areas:
  - Develop and implement an erosion and sediment control plan to avoid the introduction of sediment into any water body during all phases of the works, undertakings and activities
  - Schedule work to avoid wet, windy and rainy periods and heed weather advisories
  - Regularly inspect and maintain the erosion and sediment control measures and structures during all phases of the works, undertakings and activities
  - Regularly monitor the watercourse for signs of sedimentation during all phases of the works, undertakings and activities and take corrective action if required
  - Use biodegradable erosion and sediment control materials whenever possible
  - Keep the erosion and sediment control measures in place until all disturbed ground has been permanently stabilized
  - Remove all sediment control materials once site has been stabilized
  - Dispose of, and stabilize, all excavated material above the ordinary high water mark or top of bank of nearby waterbodies and ensure sediment re-entry to the watercourse is prevented

Protection of Fish and Fish Habitat from Deleterious Substances (including suspended sediment)

- Develop and immediately implement a response plan to prevent deleterious substances from entering a water body:
  - Stop works, undertakings and activities in the event of a spill of a deleterious substance
  - Immediately report any spills (e.g., sewage, oil, fuel or other deleterious material), whether near or directly into a water body
  - Keep an emergency spill kit on site during all phases of the works, undertakings and activities

- Contain any water with deleterious substances
- Ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse
- Clean-up and appropriately dispose of water contaminated with deleterious substances
- Maintain all machinery on site in a clean condition and free of fluid leaks
- Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water
- Dispose of all waste materials (e.g., construction, demolition, commercial logging) above the ordinary high water mark to prevent entry into the water body

Additional Measures for Culvert Maintenance

- Limit the removal of accumulated material and debris (e.g., branches, stumps, other woody materials, garbage, etc.) to the area within the culvert and immediately upstream and downstream of the culvert:
  - Remove accumulated materials and debris slowly to allow clean water to pass, to prevent downstream flooding and to reduce the amount of sediment-laden water going downstream
  - If maintenance activities reduce the water level within the culvert, take appropriate measures to restore previous streambed elevation/conditions
- If replacement rock reinforcement/armouring is required to stabilize eroding inlets and outlets, the following measures should be implemented:
  - Place appropriately-sized, clean rocks into the eroding area
  - Do not obtain rocks from below the ordinary high water mark of any water body
  - Ensure that acid generating rock is not used
  - Avoid the use of rock that fractures and breaks down quickly when exposed to the elements
  - Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment

Prior to the use of the above DFO Interim Code of Practice for Culvert Maintenance, Baffinland will submit a notification form (Appendix D) to the DFO, 10 working days prior to starting work.

3.5 MINE SITE WATER MANAGEMENT

3.5.1 MINE SITE FACILITIES

The following facilities have been designed and have or will be constructed at the Mine Site to facilitate Deposit No. 1 mining operations:

- Open Pit
- Mine Haul Road
- Run-of-Mine (ROM) Ore Stockpile Facility
- Crusher Facility
- Mine Site Rail Loadout
- Waste Rock Facility

The surface water runoff associated with these facilities is directed to appropriate water management ponds where it is monitored and treated if required to ensure effluent meets applicable water quality discharge criteria outlined in Baffinland's Type A Water Licence and Metal and Diamond Mining Effluent Regulations (MDMER). The details

regarding mitigation measures associated with surface runoff from the above-mentioned project facilities are addressed in the Fresh Water Supply, Sewage and Wastewater Management Plan.

Non-mining related facilities at the Mine Site include the following:

- Accommodation complex
- Freshwater intake
- Waste management facilities (landfill, incinerator, landfarm, various waste containment areas)
- Sewage treatment plant
- Bulk fuel storage
- Aerodrome
- Laydown areas

Water withdrawals and effluent discharges (treated sewage effluent, water collecting in tank farms and the landfarm) are addressed in the Fresh Water Supply, Sewage, and Wastewater Management Plan.

Mitigation measures related to the landfill are addressed in the Landfill Operation Maintenance and Monitoring Manual (BAF-PH1-320-T07-0005; Appendix K of the Waste Management Plan). Applicable discharge limits for runoff from landfill facilities are identified in Table 3.3 , and monitoring is described in Section 5.6.

This Plan describes the mitigation measures that apply to general site runoff including runoff from these facilities.

3.5.2 WATER MANAGEMENT PLANS

A detailed drainage/monitoring plan was developed for the Mine Site for the Phase 2 Proposal, which shows the local drainage routes and their flow direction (Appendix C). Detailed water management plans have also been developed (Hatch, 2019a).

3.5.3 MITIGATION MEASURES

Mitigation measures at the Mine Site will include periodic site inspections to ensure existing drainage routes are maintained and surface water infrastructure is operating as designed. Erosion and sedimentation controls as outlined in Section 3.3.1.2 of this Plan will be utilized as required to address erosion and sedimentation from construction and ongoing operations at the Mine Site. Berms and other drainage control measures shall be established as required to limit erosion, maintain positive drainage, divert water away from Project areas or to the appropriate water management structure, and minimize ponding. Contouring, building berms and installation of silt fences will be conducted as required for sediment and erosion control. Routine monitoring shall be completed to ensure compliance with applicable regulations and prescribed threshold values.

Mitigation measures identified during freshet in Section 3.4.1 apply to the Mine Site management of freshet.

To minimize impacts on surface drainage and water quality, the Project footprint (i.e. laydowns, roads, quarries) is required to be constructed at least 31 m from the ordinary high-water mark of any water body unless otherwise approved by the NWB.

As shown in Appendix C, drainage structures have been installed to divert surface water runoff to specific points of discharge to facilitate monitoring of site contact water as required by the Type A Water Licence.

Surface water management infrastructure required for mining operations continue to be developed to ensure compliance with applicable regulations. Where required, these structures will be maintained throughout the lifecycle of the Project. Open pit mine and waste rock stockpile management activities and accountabilities will progress over time to accommodate future development and changes, management reviews, incident investigations, regulatory changes or other Project related modifications.

3.6 MILNE PORT WATER MANAGEMENT

Throughout the year, key activities at Milne Port focus around the management of ore transported to the Port from the Mine Site and materials and equipment received annually by conventional sealifts. During the open-water season (July - October), stockpiled ore is loaded onto ore carrier vessels for shipment to international markets while materials and equipment received by sealift vessels are unloaded using barges. Equipment and materials received from sealift vessels are placed in designated laydowns at Milne Port or transported overland by trucks to the Mine Site via the Tote Road.

Surface water runoff from areas of intense vehicular activity is susceptible to contamination from minor spills and/or leakage of machinery and equipment. Mitigation measures identified in Section 3.2.2 of this Plan will be implemented at these sites to divert non-contaminated surface runoff away from these areas and minimize the potential for contamination. Surface water suspected to be impacted by hydrocarbons will be addressed using spill response absorbents and/or transported to containment areas at Milne Port, such as the Milne Port Landfarm Facility.

To minimize impacts on surface drainage and water quality, the Project footprint (i.e. laydowns, roads, quarries) is required to be constructed at least 31 m from the ordinary high-water mark of any water body unless otherwise approved by the NWB.

3.6.1 MILNE PORT FACILITIES

Key ore loading/unloading and stockpiling facilities at Milne Port include:

- Rail unloading facilities
- Ore stockpiles and bulk material handling facilities (crusher, screener, stacker/reclaimer, shiploader)
- Ore and freight docks

The surface water runoff associated with these facilities is directed to appropriate water management ponds where it is monitored and treated if required to ensure effluent meets applicable water quality discharge criteria outlined in Baffinland's Type A Water Licence and Metal and Diamond Mining Effluent Regulations (MDMER). The details regarding mitigation measures associated with surface runoff from the above-mentioned project facilities are addressed in the Fresh Water Supply, Sewage, and Wastewater Management Plan.

Non-ore related facilities at Milne Port include:

- Accommodation complex
- Water treatment facilities
- Waste management facilities (landfill, incinerator, landfarm, various waste containment areas)
- Sewage treatment plant
- Bulk fuel storage
- Laydown areas

Water withdrawals and effluent discharges (treated sewage effluent, water collecting in tank farms and the landfarm) are addressed in the Fresh Water Supply, Sewage, and Wastewater Management Plan.

Mitigation measures related to the future landfill to be constructed within the exhausted Quarry Q1 following Phase 2 construction will be addressed in the Landfill Operation Maintenance and Monitoring Manual (BAF-PH1-320-T07-0005; Appendix K of the Waste Management Plan). Applicable discharge limits for runoff and seepage from landfill facilities are identified in Table 3.4, and monitoring is described in Section 5.6.

This Plan describes the mitigation measures that apply to general site runoff including runoff from these facilities.

3.6.2 WATER MANAGEMENT PLANS

A detailed drainage/monitoring plan was developed for Milne Port for the Phase 2 Proposal, which shows the local drainage routes and their flow direction (Appendix C). A site water balance for Milne Port is presented in Appendix E. Detailed water management plans have also been developed (Hatch, 2019b).

3.6.3 MITIGATION MEASURES

Mitigation measures at Milne Port will include periodic site inspections to ensure existing drainage routes are maintained and surface water infrastructure is operating as designed. Erosion and sedimentation controls as outlined in Section 3.2.2 of this Plan will be utilized as required to address erosion and sedimentation from construction and ongoing operations at Milne Port. Berms and other drainage control measures shall be established as required to limit erosion, maintain positive drainage, divert water away from Project areas or to the appropriate water management structure, and minimize ponding. Contouring, berming and installation of silt fences will be conducted as required for sediment and erosion control. Routine monitoring shall be completed to ensure compliance with applicable regulations and prescribed threshold values.

Mitigation measures identified during freshet in Section 3.4.1 apply to the Milne Port management of freshet.

To minimize impacts on surface drainage and water quality, the Project footprint (i.e. laydowns, roads, quarries) is required to be constructed at least 31 m from the ordinary high-water mark of any water body unless otherwise approved by the NWB.

As shown in Appendix C, drainage structures have been installed to divert surface water runoff to specific points of discharge to facilitate monitoring of site contact water as required by the Type A Water Licence.

Surface water management infrastructure required for mining operations continue to be developed to ensure compliance with applicable regulations. Where required, these structures will be maintained throughout the lifecycle of the Project. Open pit mine and waste rock stockpile management activities and accountabilities will progress over time to accommodate future development and changes, management reviews, incident investigations, regulatory changes or other Project related modifications.

4.0 ROLES AND RESPONSIBILITIES

Resourcing is an important element of environmental management. This section outlines the roles and responsibilities of Baffinland staff, as well as QIA staff with a role in environmental management.

4.1 CONSTRUCTION

The personnel responsible for implementing this plan and their respective roles during the construction phase of the Project are described in Table 4.1. Professional Engineers and/or Professionals Geoscientists shall be used as appropriate.

TABLE 4.1 CONSTRUCTION PHASE ROLES AND RESPONSIBILITIES FOR WATER MANAGEMENT

Position	Responsibilities
General Manager - Owner	• Reports to the Chief Executive Officer • Responsible for providing oversight for all Project construction and allocating the necessary resources for construction management
Construction Manager - Contractor	• Reports to the General Manager • Responsible for providing oversight for all Project construction and allocation of Contractor resources
QIA Regulatory Manager (IIBA)	• Directs QIA's onsite environmental resources • Liaise with Baffinland's Permitting and Compliance Manager and/or Environmental Superintendents • Reviews regulatory submissions on behalf of the QIA • Member of the QIA-Baffinland Adaptive Management Working Group
QIA Environmental Monitor (IIBA)	• Monitors implementation of commitments, environmental compliance, and QIA interests • Participate in routine compliance inspections and monitoring alongside Baffinland staff • Participate follow-up corrective action undertaken regarding non-compliance events including spills • Weekly reporting to the QIA Regulatory Manager • Presents annual monitoring data to communities • The core responsibilities of this position are described completely in the IIBA
QIA Construction Inspector (ICA 8.3.1)	• To be defined by the QIA
QIA Construction Monitor (ICA 8.2.2 (j))	• To be defined by the QIA
Departmental Manager / Superintendent - Owner and Contractor	• Reports to the General Manager • Responsible for providing departmental oversight for all Project construction

Position	Responsibilities
Health, Safety & Environment (Sustainable Development) Departments	• Report incidents to senior management and the appropriate regulatory agencies and stakeholders • Conduct inspections and monitoring to ensure compliance with applicable regulations and commitments, including full-time supervision of in-water works • Provide training sessions to departments on the appropriate mitigation measures and strategies for managing surface water flows and effluents at the Project
All Departmental Supervisors	• Reports to the Departmental Manager / Superintendent • Responsible for reading and understanding applicable sections of this Plan and directing departmental personnel on the appropriate mitigation measures and strategies for managing surface water flows and effluents in their Project area
All Project Personnel	• All Project personnel will be responsible to comply with the requirements of the Plan in the management of surface water flows and effluents at the Project

4.2 OPERATIONS

The personnel responsible for implementing this plan and their respective roles during the operations phase of the Project are described in Table 4.2. Professional Engineers and/or Professionals Geoscientists shall be used as appropriate.

TABLE 4.2 OPERATIONS PHASE ROLES AND RESPONSIBILITIES FOR WATER MANAGEMENT

Position	Responsibilities
Chief Operations Officer (COO)/General Manager	• Reports to the Chief Executive Officer • Responsible for providing oversight for all Project operations and allocating the necessary resources for the operation, maintenance and management of Project infrastructure
Mine Operations Manager/Superintendent	• Reports to the COO / General Manager • Provides oversight for all Deposit No. 1 mining operations, including the operation, construction and maintenance of surface water management infrastructure at Deposit No. 1 mining areas, Waste Rock Facility and along the Mine Haul Road, including culverts, ditches, surface water management ponds and associated water treatment systems • In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods
Crushing Manager/Superintendent	• Reports to the COO / General Manager • Provides oversight for all ore crushing operations, including the operation, construction and maintenance of surface water management infrastructure at Mine Site Crusher Facility, including culverts, ditches, surface water management ponds and any associated water treatment systems • In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods

Position	Responsibilities
Site Services Manager/Superintendent	• Reports to the COO / General Manager • Provides oversight for all Site Services operations, including the operation, construction and maintenance of surface water management infrastructure associated with Project service roads at the Mine Site and Milne Port • Responsible for managing water retained in containment areas associated with Project bulk fuel facilities and hazardous materials/waste storage areas, including landfarm facilities • In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods
Road Maintenance Manager/Superintendent	• Reports to the COO / General Manager • Provides oversight for all Road Maintenance operations, including the operation, construction and maintenance of surface water management infrastructure for the Tote Road that runs between Milne Port and the Mine Site, including culverts, bridges, ditches and swales • In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods
Health, Safety & Environment (Sustainable Development) Departments	• Support the management of the Project surface water management infrastructure by advising on-site environment staff and obtaining the appropriate regulatory approvals for necessary changes and modifications • Advise the Environmental Coordinator and/or Technician on the implementation of the appropriate controls to manage surface water at the Project, including the implementation of sedimentation and erosion controls outlined in Section 3 of this Plan • Manage all on-site aquatic effects monitoring programs at the Project, discussed in Section 5 of this Plan • Conduct inspections and monitoring to ensure compliance with applicable regulations and commitments • Report incidents to senior management and the appropriate regulatory agencies and stakeholders • Provide training sessions to operational departments on the appropriate mitigation measures and strategies for managing surface water flows and effluents at the Project • The on-site Environmental Superintendent in concert with the corporate Sustainable Development team is responsible for data management and reporting related to surface water management and monitoring
Inuit Monitor (ISP)	To be defined by the QIA
QIA Regulatory Manager (IIBA)	• Directs QIA's onsite environmental resources • Liaise with Baffinland's Permitting and Compliance Manager and/or Environmental Superintendents • Reviews regulatory submissions on behalf of the QIA • Member of the QIA-Baffinland Adaptive Management Working Group

Position	Responsibilities
QIA Environmental Monitor (IIBA)	• Monitors implementation of commitments, environmental compliance, and QIA interests • Participate in routine compliance inspections and monitoring alongside Baffinland staff • Participate follow-up corrective action undertaken regarding non-compliance events including spills • Weekly reporting to the QIA Regulatory Manager • Presents annual monitoring data to communities • The core responsibilities of this position are described completely in the IIBA
QIA Construction Inspector (ICA 8.3.1)	• To be defined by the QIA
QIA Construction Monitor (ICA 8.2.2 (j))	• To be defined by the QIA
All Departmental Supervisors	• Reports to the Departmental Manager / Superintendent • Responsible for reading and understanding applicable sections of this Plan and directing departmental personnel on the appropriate mitigation measures and strategies for managing surface water flows and effluents in their Project area • Report any visual observations, or reports, of erosion and sediment issues to the Environment Department • Assist in implementing appropriate erosion and sediment control measures
All Project Personnel	• All Project personnel will be responsible to comply with the requirements of the Plan in the management of surface water flows and effluents at the Project • Report any visual observations of erosion and sediment issues to their respective supervisors • Assist in implementing appropriate erosion and sediment control measures

5.0 MONITORING

The monitoring programs related to this plan and the Project phase in which they are applied are identified in Table 5.1.

TABLE 5.1 MONITORING PROGRAMS

Monitoring Program	Construction Phase	Post-Construction Verification	Operation Phase
Water Crossing Installations / Modifications	X	X	X
Monitoring at Project Quarries and Borrow Sources	X	X	X
Surveillance Network Program (SNP)	X		X
Northern Corridor Monitoring Program (NCMP)	X		X
Fish Passage Monitoring		X	X
Snow management Monitoring	X		X
Rail Stream Diversions		X	
Groundwater Monitoring			X
Type B Water Licence Monitoring			X
Aquatic Effects Monitoring Program (AEMP)			X

These monitoring programs are described in Sections 5.2 to 5.12. Consistent with the adaptive management plan described in Section 2.3, trigger action response plans (TARPs) have been developed for key project activities and related monitoring plans (Table 5.2). This includes the identification of low, moderate, and high action responses that correspond to low, moderate, and high-risk conditions.

Monitoring programs associated with the TARP focus on short-term detection of impacts and immediate to short-term responses. These short-term impacts and responses are intended to provide immediate feedback pertaining to the effectiveness of mitigation measures, allowing changes to be made in real-time. They also generate most of the monitoring data that feeds into annual reporting, which includes analysis and reporting of annual monitoring data along with trend analyses using historical monitoring data. The QIA Environmental Monitor (as described in Section 4) works directly alongside the Site Environment Department in the monitoring and implementation of mitigation measures, including response actions as identified in the TARP. This allows for continued communication between Baffinland and the QIA is responded to exceeded thresholds.

The review of trends over time through the annual review process will inform adaptive management in the long term. This may include triggering of plan updates as described in Section 6.

TABLE 5.2 SURFACE WATER AND AQUATIC ECOSYSTEMS TRIGGER ACTION RESPONSE PLANS

Project Activity	Objectives	Performance Indicators	Monitoring Program / Plan	Condition Status / Threshold			Pre-defined Response(s)		
				Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk
Construction activities	Mitigate potential impacts to water and aquatic ecosystems by controlling sedimentation and erosion control.	TSS, oil and grease, and pH	Surveillance Network Program (SNP)	Construction: Below discharge limits in Water Licence Table 1 (TSS 50 mg/L max avg and 100 mg/L max grab; no visible sheen and pH 6-9.5).	Construction: Exceed discharge limits in WL Table 1 (TSS 50 mg/L max avg and 100 mg/L max grab; visible sheen and pH outside range of 6-9.5.	Sustained[2] non-compliance, even after applying standard mitigation under moderate risk response.	Env't Dept: Report potential erosion and sedimentation issues to Projects Dept. Continue to monitor at regular frequency (weekly). Projects Dept: Implement precautionary mitigation to avoid potential exceedance of discharge limits.	Env't Dept: Report exceedance of discharge limits to Projects Dept. immediately[1] after receiving results. Notify QIA in accordance with the Lease Operations Guide. Additional monitoring will be conducted to confirm the success of implemented mitigation measures. Projects Dept: Assess cause and take immediate action to implement enhanced mitigation measures, including stop work if this will address the non-compliance.	In addition to moderate risk responses: Env't Dept: Cease or modify construction activities in the area. Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Implement mitigations to reverse trend.
		Visual evidence of erosion and sedimentation	Routine inspections	Visual indication of practices or conditions that may lead to erosion and sedimentation.	Visual indication of a project-related erosion event causing the release of sediment laden water, or a visible sheen is observed.	Not applicable[3]	All staff: Notify Env't Dept. Env't Dept: Conduct sampling; report potential erosion and sedimentation issues to Projects Dept. Projects Dept: Implement precautionary mitigation to avoid potential sedimentation. Conduct sampling to verify TSS content of water.	All staff: Notify Env't Dept. of visual indications of erosion and/or sedimentation. Env't Dept: Conduct sampling (scheduled or supplemental) to quantify visual observations. Continue to sample following implementation of mitigation measures Projects Dept: Assess cause and Implement mitigations to reverse trend and prevent further exceedances, including stop work if this will address the non-compliance..	Not applicable[3]
Water crossing installations and/or modifications		Field Monitoring: Turbidity, pH, specific conductivity, water temperature, dissolved oxygen; presence/absence of sheen Analytical parameters: TSS, TDS, pH	Environmental Guidelines for Water Crossing Repairs, Modifications and/or Installations	Downstream turbidity and/or TSS are between 75% and 100% of the applicable water quality action level (+25 NTU turbidity and/or +100 mg/L TSS over background).	Downstream turbidity and/or TSS exceed the applicable water quality action level (>25 NTU turbidity and/or >100 mg/L TSS over background).	Sustained[2] non-compliance, even after applying standard mitigation under moderate risk response.	Env't Dept: Report potential erosion and sedimentation issues to Projects Dept. Continue to monitor at regular frequency (during construction: field monitoring every 4 hours, water sampling every 8 hours; post construction June, July, August) Projects Dept: Implement precautionary mitigation to avoid potential exceedance of discharge limits.	Env't Dept: Increase monitoring to re-sample water quality within 7 days of sampling event. Report exceedance of discharge limits to Projects Dept. immediately[1] after receiving results. Notify QIA in accordance with the Lease Operations Guide. Projects Dept: Assess cause and take immediate action to implement enhanced mitigation measures, including stop work if this will address the non-compliance.	Env't Dept: Cease or modify construction activities in the area. Continue increased monitoring – maintain enhanced monitoring schedule until a compliant sample analytical result is received. Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Implement mitigations to reverse trend and prevent further exceedances.

Project Activity	Objectives	Performance Indicators	Monitoring Program / Plan	Condition Status / Threshold			Pre-defined Response(s)		
				Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk
Road operation	Mitigate potential impacts to water quality and aquatic ecosystems by controlling sedimentation and erosion.	Field monitoring: turbidity, pH, specific conductivity, temperature, dissolved oxygen, oil and grease Analytical parameters: pH, TSS, TDS, conductivity, oil and grease, hardness, alkalinity, chloride, ammonia, total phosphorus, nitrate, nitrite, dissolved organic carbon, total organic carbon, total dissolved metals	Northern Corridor Monitoring Program	Elevated TSS (>30 mg/L[4]) that is not project related (downstream TSS does not exceed upstream TSS by more than 50 mg/L or 10% when >250 mg/L).	Downstream TSS exceeds upstream TSS by more than 50 mg/L or 20% when >250 mg/L.	Sustained[2] non-compliance, even after applying standard mitigation under moderate risk response.	Env't Dept: Increase frequency of monitoring, investigate cause and determine need for additional mitigation. Continue monitoring at regular frequency (weekly during freshet; monthly during summer). Projects Dept: Implement any additionally recommended mitigation.	Env't Dept: Increase monitoring to re-sample non-compliant crossing 48 hours after and within 7 days of documented TSS exceedance. Report exceedance of discharge limits to Projects Dept. immediately[1] after receiving results. Notify QIA in accordance with the Lease Operations Guide. Projects Dept: Assess cause and take immediate action to implement enhanced mitigation measures.	Env't Dept: Continue increased monitoring – maintain enhanced monitoring schedule until a compliant sample analytical result is received. Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Implement mitigations to reverse trend.
		Visual observations of erosion or sedimentation	Routine inspections	Visual indication of practices or conditions that may lead to erosion and sedimentation.	Visual indication of a project-related erosion event causing the release of sediment laden water, or a visible sheen is observed.	Not applicable[3]	All staff: Notify Env't Dept. Env't Dept: Conduct sampling; report potential erosion and sedimentation issues to Projects Dept. Projects Dept: Implement precautionary mitigation to avoid potential sedimentation.	All staff: Notify Env't Dept. of visual indications of erosion and/or sedimentation. Env't Dept: Conduct sampling (scheduled or supplemental) to quantify visual observations. Increase monitoring based on sample results. Projects Dept: Triage issue as high priority to complete remedial works.	Not applicable[3]
	Safeguard fish habitat and fish passage	Fish habitat lost; fish passage	Annual assessments of identified fish-bearing water crossings	Evident that fish passage may be impeded by high or low flows, blockage or a perched culvert. Electrofishing confirms fish presence upstream the crossing, indicating some fish passage is occurring.	Evident that fish passage is not possible due to flows, blockage or perched culvert. Electrofishing confirms fish presence downstream but not upstream the crossing.	Restriction of fish passage is sustained for more than one open water season.	Env't Dept: Notify Road Maintenance regarding blockage or perched culvert with assignment of priority/urgency. Road Maintenance: Triage issue and complete remedial works to remove potential partial barrier in accordance with assigned priority.	Env't Dept: Notify Road Maintenance regarding blockage or perched culvert with high urgency to respond. Conduct follow-up monitoring for remainder of season to ensure fish passage is preserved. Follow DFO fisheries guidelines. Road maintenance: Triage issue as high priority to complete remedial works.	Env't Dept: Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Implement mitigations to reverse trend and prevent future blockage of fish passage, report ongoing blockages to DFO.

Project Activity	Objectives	Performance Indicators	Monitoring Program / Plan	Condition Status / Threshold			Pre-defined Response(s)		
				Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk
Site operations including stockpiling snow		TSS, oil and grease, and pH; visual signs of erosion or sedimentation	SNP and additional site-specific sampling, routine inspections	Below discharge limits in WL Table 11 (TSS 15 mg/L max avg and 30 mg/L max grab; no visible sheen and pH 6-9.5).	Exceed discharge limits in WL Table 11 (TSS 15 mg/L max avg and 30 mg/L max grab; visible sheen; and pH outside range of 6-9.5).	Sustained[2] non-compliance, even after applying standard mitigation under moderate risk response.	Env't Dept: Report potential erosion and sedimentation issues to Projects Dept. Continue to monitor at regular frequency (weekly). Projects Dept: Implement precautionary mitigation to avoid potential exceedance of discharge limits.	Env't Dept: Report exceedance of discharge limits to Projects Dept. immediately[1] after receiving results. Notify QIA in accordance with the Lease Operations Guide. Additional monitoring will be conducted to confirm the success of implemented mitigation measures. Projects Dept: Assess cause and take immediate action to implement enhanced mitigation measures.	Env't Dept: Cease or modify construction activities in the area. Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Stop work if this will address the non-compliance. Implement mitigations to reverse trend and prevent further exceedances.
Rail stream diversions	Mitigate potential impacts to water quality and aquatic ecosystems by controlling sedimentation and erosion.	Flooding and/or geomorphic changes	Stream diversion monitoring	Minor flooding and/or changes in stream morphology occur during high flows.	Significant erosion and sedimentation occur because of the stream diversion.	Existing stream channel has been compromised.	Env't Dept: Report monitoring results to Projects Dept. to determine if action is required. Projects Dept: triage issue and complete remedial works in accordance with assigned priority.	Env't Dept: Notify Projects Dept. regarding issue with high urgency to respond. Road maintenance: triage issue as high priority to complete remedial works.	Env't Dept: Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Implement mitigations to reverse trend and prevent further exceedances.
Quarry and Borrow Pit Operation		TSS, oil and grease, and pH; visual signs of erosion or sedimentation	SNP, stations identified in quarry management plans	Below discharge limits in WL Table 1 SWAEMP Table 3.2 (TSS 50 mg/L max avg and 100 mg/L max grab; no visible sheen and pH 6-9.5).	Exceed discharge limits in WL Table 1 (TSS 50 mg/L max avg and 100 mg/L max grab; visible sheen; and pH outside range of 6-9.5).	Sustained[2] non-compliance, even after applying standard mitigation under moderate risk response.	Env't Dept: Report potential erosion and sedimentation issues to Projects Dept. Continue to monitor at regular frequency (weekly). Projects Dept: Implement precautionary mitigation to avoid potential erosion and sedimentation.	Env't Dept: Report exceedance of discharge limits to Projects Dept. immediately[1] after receiving results. Notify QIA in accordance with the Lease Operations Guide. Additional monitoring will be conducted to confirm the success of implemented mitigation measures. Projects Dept: Implement precautionary mitigation to avoid potential erosion and sedimentation.	Env't Dept: Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Implement mitigations to reverse trend and prevent further exceedances.

Project Activity	Objectives	Performance Indicators	Monitoring Program / Plan	Condition Status / Threshold			Pre-defined Response(s)		
				Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk
Landfill operation		pH, total arsenic, total copper, total lead, total nickel, total zinc, TSS, oil and grease	SNP	Discharge limits in WL Table 7 (SWAEMP Table 3.4) are not exceeded, but routine inspections identify practices or conditions that may lead to exceedance of discharge limits.	Above discharge limits in WL Table 7 (SWAEMP Table 3.4).	Sustained[2] non-compliance, even after applying standard mitigation under moderate risk response.	Env't Dept: Report potential issue to Site Operations. Continue to monitor at regular frequency (monthly). Site Operations: Address potential issue.	Env't Dept: Report exceedance of discharge limits to Site Operations immediately[1] after receiving results. Notify QIA in accordance with the Lease Operations Guide. Additional monitoring will be conducted to confirm the success of implemented mitigation measures. Site Operations: Identify source causing exceedance of discharge limits, undertake remedial action.	Env't Dept: Communicate issue to the QIA; conduct an investigation of cause as to why the non-compliance has not been adequately addressed. Implement mitigations to reverse trend and prevent further exceedances.

NOTES:

1. Immediately means without delay, understanding that there could be competing urgent work or emergencies that may affect this response time.
2. Sustained refers to exceedances that continue to occur despite application of mitigation measures and pre-defined responses.
3. "Not applicable" is used as a visual indicator is consider binary as either erosion and sedimentation is observed or not. Further the moderate risk condition triggers sampling with defined low, moderate and high risk conditions and pre-defined responses defined under the Runoff Water Quality performance indicator
4. As an early warning trigger for the low action criteria Baffinland adopted the operation phase TSS limit prescribed in the Water Licence.

5.1 MONITORING DURING CONSTRUCTION

Construction activities not monitored under activity specific monitoring programs (such as water crossing installations and modifications, rail stream diversions, and quarry and borrow source monitoring) will be subject to general construction monitoring that will be developed by contractors during the tendering process.

Contractors will comply with the objectives set out in the plan and applicable regulatory requirements including the Type A Water Licence and *Fisheries Act* Authorizations.

- Monitoring will occur at active work areas along the North Railway during construction, as prescribed in a future Fisheries Authorization for crossings.
- This is expected to include turbidity monitoring downstream of active work areas, including crossing locations as well as downstream of quarries and soil spoils disposal areas (mainly former borrow pits and quarries).
- Fish-bearing streams will be monitored for fish passage in accordance with the future *Fisheries Act* Authorization.

5.2 ROUTINE INSPECTIONS

In addition to the specific monitoring and reporting requirements subject to applicable regulatory approvals, routine inspections of Project areas will be conducted. Routine surface water management inspections shall be conducted at drill sites, Project camp sites and infrastructure, roadways, the railway and other areas associated with Project development. Where required, inspection locations will be modified to reflect current Project infrastructure and activities.

Table 5.3 outlines the basic components of typical routine inspections conducted at the Project. For the current compliance inspection forms used at the Project, refer to the EPP.

TABLE 5.3 ROUTINE INSPECTIONS AND MONITORING REQUIREMENTS

Site / Area	Routine Inspections
Milne Port Mine Site North Railway (construction phase only)	• Water management systems and infrastructure • Sediment and erosion control structures • Fuel storage and transfer operations • Drip pans and equipment condition (i.e., leaks, hydrocarbon staining) • Use of secondary containment (i.e., lined containment areas, spill trays, etc.) • Water intakes • Flow meter readings • Land disturbance (i.e., vehicle rutting) • Spill kits

Site / Area	Routine Inspections		
Tote Road North Railway	• Water management systems and infrastructure • Sediment and erosion control structures • Snow stockpiles • Fuel storage and transfer operations • Drip pans and equipment condition (i.e., leaks, hydrocarbon staining) • Use of secondary containment (i.e., lined containment areas, spill trays, etc.) • Water intakes		
Borrow Sites Quarries	• Drip pans and equipment condition (i.e., leaks, hydrocarbon staining) • Supervision of fuel transfer operations • Sediment and erosion control structures • Spill kits		
Drill Sites	*Pre-Drilling*	*Drilling Period*	*Post-Drilling*
	• Drill hole coordinates • Water source coordinates • Site photo • Water source photo • Distance to nearest water source • Archaeological approval • Wildlife survey	• Fuel leaks • Sediment and erosion control structures • Drip pans • Equipment condition • Rutting by vehicles • Water intake • Water management • Flow meter reading	• Fuel leaks • Sediment and erosion control structures • Drip pans • Equipment condition • Rutting by vehicles • Water intake • Water management • Flow meter reading
Waste Rock Facility	• Water management systems and infrastructure • Sediment and erosion control structures • Drip pans and equipment condition (i.e. leaks, hydrocarbon staining) • Deposition of Waste Rock to encapsulate PAG		
Bulk Fuel Storage Areas	• Primary containment structure • Evidence of hydrocarbon staining or leaks from containment devices • Equipment condition • Spill kits		
Explosives Storage Areas	• Primary containment structure • Access and security • Equipment condition		
Laydown and Storage Areas	• Sediment and erosion control structures • Evidence of hydrocarbon staining or leaks from containment devices • Fuel leaks • Drip pans • Equipment condition		

5.3 WATER CROSSING INSTALLATIONS/MODIFICATIONS

Environmental Guidelines for Project Water Crossing Repairs and/or Installations were developed by Baffinland in consultation with the QIA in 2018. These guidelines apply to all repairs, modifications, and installations of a water crossing along the transportation corridor. The guidelines provide monitoring protocols applicable to pre-, during and post-construction, during open water and frozen conditions. A summary of the monitoring activities is presented in Table 5.4.

TABLE 5.4 SUMMARY OF WATER QUALITY MONITORING

Monitoring Method and Parameters	Monitoring Phase		
	Pre-Construction	**During Construction**	**Post Construction**
Water Sampling • TSS • TDS • pH	One (1) sampling event at locations 100 m downstream and 50 m upstream of the affected water crossing.	Every eight (8) hours at locations 100 m downstream and 50 m upstream of the affected water crossing. Adaptive water sampling events will also be conducted when downstream flows are suspected of encroaching on TSS and turbidity action levels.	One sampling event in June, July and August at locations 100 m downstream and 50 m upstream of the affected water crossing. Sampling events will occur at least 10 days apart.
Field Monitoring • Turbidity • pH • Specific Conductivity • Water Temperature • Dissolved Oxygen • Presence/Absence of Sheen	One (1) monitoring event (alongside water sample event) at locations 100 m and 50 m downstream and 50 m upstream of the affected water crossing.	Every four (4) hours at locations 100 m and 50 m downstream and 50 m upstream of the affected water crossing. One (1) Field monitoring will also be conducted alongside adaptive water sampling events outlined above.	Field monitoring will be conducted concurrently with the water sampling events listed above.

NOTES:

1. Field monitoring should be conducted concurrently with water samples collected every eight (8) hours to allow for TSS/turbidity curve development.
2. Culverts constructed in winter will be added to the monitoring program for the following year to monitor performance.
3. Additional monitoring may be required if applicable water quality action levels are exceeded. Refer to action response framework for post-construction response monitoring presented in Section 7 of Appendix F.

For construction during frozen conditions, no pre-construction monitoring or monitoring during construction will take place, however post construction monitoring will be conducted during the following open water season. An action response framework has been developed for the monitoring program during and post construction. The framework requires Baffinland to reassess and modify, if necessary, their mitigation measures for sedimentation and erosion control if water quality samples indicate an exceedance of TSS and/or turbidity. The action response framework is further described in Section 7 of Appendix F.

5.4 MONITORING AT PROJECT QUARRIES AND BORROW SOURCES

In accordance with Part I, Items 24 of the Type A Water Licence, during periods of flow and following major precipitation events, Baffinland conducts monthly water quality monitoring of surface water flows downstream of active quarries and borrows sources. In accordance with Part I, Item 23 of the Type A Water Licence, monitored water quality parameters include:

- Total suspended solids (TSS)
- Oil and grease
- Ammonia
- Nitrate (total NO_3-N)
- pH
- Conductivity
- Acute toxicity

In accordance with Part D, Item 15 of the Type A Water Licence, weekly water quality sampling is also completed where it is determined that surface water runoff from active quarries flows directly or indirectly into a water body, to ensure that water quality of flows are in compliance with the water quality criteria outlined in Part D, Item 15.

Monitoring locations for developed quarries and borrows sources are documented in the site-specific Quarry and Borrow Source Management Plans.

As required, Baffinland will incorporate best management practices including sediment and erosion control measures installed as per Section 3 of this Plan. Berms and other drainage control measures shall be established where necessary to minimize or prevent surface runoff from nearby water bodies entering active quarries and borrow sources.

In developing Project quarries, efforts are made to ensure that a minimum 100 m naturally-vegetated buffer between the high-water mark of any fish-bearing water bodies and any permanent quarries with potential for acid rock drainage or metal leaching is maintained.

5.5 SURVEILLANCE NETWORK PROGRAM

The Surveillance Network Program (SNP) includes water sampling stations where contact water from Project sites directly enters into the receiving environment through drainages and ditches. The SNP is prescribed under Baffinland's Type A Water Licence (No: 2AM-MRY-1325). The applicable SNP sampling locations correspond with areas of ground disturbance at the Mine Site and Milne Port. Monitoring group parameters include:

- Group 1
  - Water withdrawal or discharge volumes
- Group 8
  - Ammonia
  - Nitrate
  - pH
  - Conductivity
  - TSS
  - Oil and Grease

A detailed schedule of the applicable SNP monitoring stations is provided in Appendix G. The full extent of the SNP program, which includes the monitoring of effluent, is discussed in the Fresh Water Supply, Sewage, and Wastewater Management Plan.

5.6 NORTHERN CORRIDOR MONITORING PROGRAM

The Northern Corridor Monitoring Program (NCMP), previously called the Tote Road Monitoring Program (TRMP), was developed by Baffinland to monitor the water quality of surface water flows at select water crossing (culverts, bridges) along the Tote Road and the North Railway, with a primary focus on monitoring total suspended solids (TSS) concentrations upstream and downstream of Tote Road water crossings. Monitoring data collected under the NCMP is used by the Project to:

- Inform Project operations of potential water quality impacts from Project activities at water crossings along the Tote Road
- Guide and prioritize Tote Road maintenance work, corrective actions and improvements projects for surface water management infrastructure
- Adjust mitigation measures and management strategies for Project activities along the Tote Road
- Expand the Project's understanding of natural water quality conditions along the Tote Road (upstream) and the natural factors that contribute to changes in surface water quality

Water crossings monitored under the NCMP have been selected to give a geographically representative sample set of water crossings for each given watershed intersected by the Tote Road and North Railway (Phillips Creek, Ravn River, Mary River). In selecting the Tote Road and North Railway water crossings within each watershed, the following factors were considered:

- Key depositional habitats downstream of the Tote Road (e.g. fish habitat)
- Areas historically prone to sedimentation events
- Historical borrow source locations
- Existing monitoring locations and programs

In addition to TSS, the NCMP monitors for additional parameters, including metals, nutrients, oil & grease, and routine chemistry, such as dissolved anions (e.g. chloride), turbidity and total dissolved solids (TDS). Details regarding sampling frequency and monitored parameters are presented in Appendix H.

The monitoring program will utilize a response-action framework to identify, mitigated and monitor for Project related changes in TSS concentrations, if present. If results of a sampling event identify a potential Project related change, Baffinland will implement new mitigation measures and/or assess the effectiveness of existing mitigation measures. Figure 5.1 illustrates the NCMP action response framework. This diagram is intended to be used jointly with the TARP provided in Section 5, to determine the appropriate predetermined actions based on the level of risk identified through monitoring. Additional details on the response action framework are provided in Section 6 of Appendix H.

5.7 FISH PASSAGE MONITORING

In accordance with Baffinland's DFO authorizations, Letters of Advice and other related amendments, Baffinland continues to conduct an annual assessment each year of identified fish-bearing water crossings. Annual assessments are conducted by a Professional Fisheries Biologist to confirm compliance with Baffinland's Fish Habitat No-Net-Loss

and Monitoring Plan (Knight Piésold, 2007) by assessing the presence of fish, changes in quality of fish habitat and condition of fish passage at each identified fish-bearing water crossing. Concerns identified during the annual assessment are promptly addressed by the Project's Road Maintenance Department.

Fish passage issues are assessed and mitigated on an annual basis by a fisheries biologist who inspects culverts and makes recommendation to the Site Environment Department. The Site Environment Department summarizes and prioritizes the issues identified in a Culvert Remediation Register that is then provided to Road Maintenance. Road Maintenance schedules the mitigation work to be completed considering various factors such as environmental urgency and the need for DFO guidance, as well as approval from QIA to modify the Tote Road as required. Finally, the remedial work is completed by Road Maintenance. The process undertaken to assess and mitigate fish passage issues on an annual basis is presented on Figure 5.2

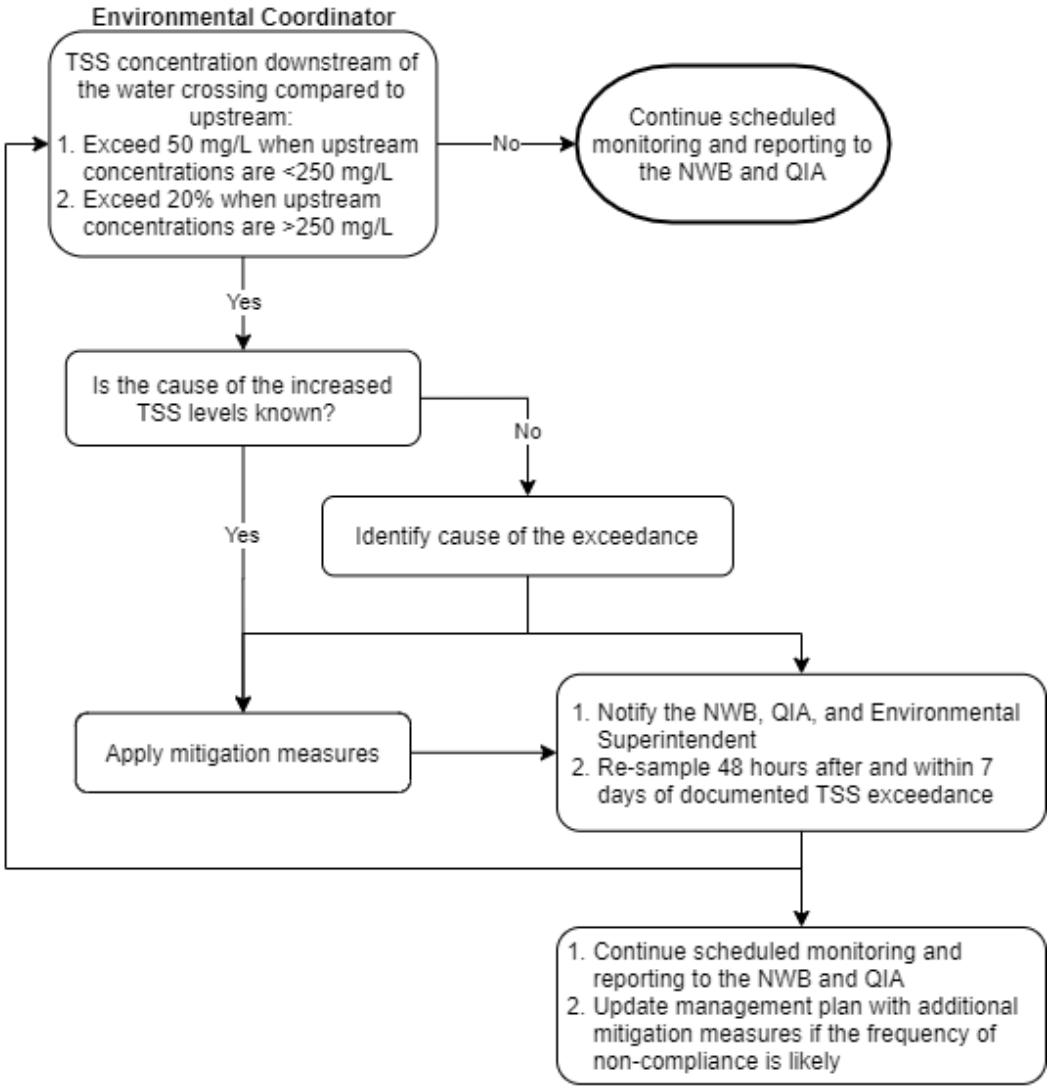

FIGURE 5.1 NORTHERN CORRIDOR MONITORING PROGRAM ADAPTIVE MANAGEMENT FRAMEWORK

Basic metrics on fish health (fish presence, catch per unit effort, fish length and fork length) are collected from the crossing sites monitored along the Tote Road. Baffinland has agreed to a QIA request (Technical Review Comment QIA-42) during the review of the Phase 2 Proposal to add observations regarding physical condition (e.g., lesions, injuries) to such monitoring programs. The same data will be collected at railway crossings, unless otherwise directed by DFO in the FAA.

While this health-related data will be provided, Baffinland notes that determining causation may be difficult. As such, thresholds have not been established for this component of the aquatic monitoring program.

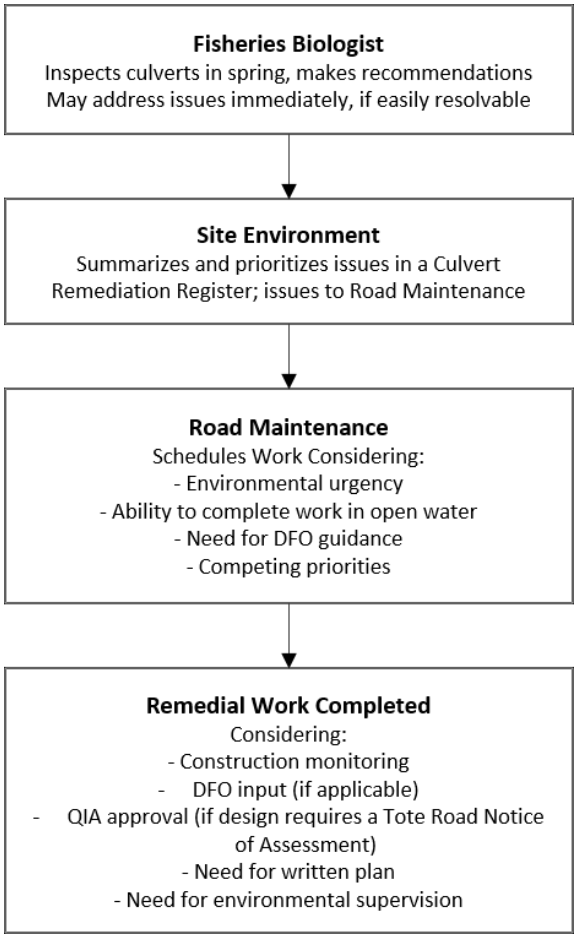

FIGURE 5.2 FISH PASSAGE MONITORING AND CORRECTIVE ACTION PROCESS

The Phase 2 Proposal will involve construction work in streams or other waterbodies including culvert and bridge installations, stream and pond encroachments and infilling, and stream diversions as part of the North Railway, access roads and realignments of the Tote Road. Bridges will be used to cross the four largest rivers, and plate arch culverts will be installed at 11 crossings previously identified as being a high risk for unencumbered fish passage. An estimated 412 corrugated steel pipe (CSP) culverts will be installed in watercourses and to manage runoff. Culverts can present a potential obstacle to upstream migration of fish as a result of increased water velocity, decreased water depth, culvert length, and height of the culvert outlet related to the natural channel.

KP (2019) conducted a desktop assessment of the hydrologic and hydraulic characteristics within CSP culverts located in streams with known or potential Arctic char populations (for the purpose of the assessment all sites with

the potential to have Arctic char populations were assumed to be fish-bearing). Culvert diameters in the fish-bearing watercourses will range from 600 mm to 1800 mm and will be installed at slopes between 1% and 5%. Each crossing will have between one and five pipes, and culvert length will vary from 12 m to 95 m. At least one culvert at each fish-bearing crossing will be embedded with bed material at 20% of the diameter. All CSP culverts will be installed at the elevation of the downstream beds.

Average velocity and maximum water depth were calculated for each of the embedded CSP culverts based on mean monthly July and August flows, culvert diameter, and culvert slope. The risk to fish passage was rated as Low, Moderate, or High in 93 of the culverts to be installed in fish-bearing watercourses, based on the calculated average culvert velocity and velocity thresholds for two sizes of Arctic char (88 mm and 256 mm) in July and August. A total of 29 of the culverts were rated as presenting a high risk to fish passage.

Site-specific assessments at these high-risk sites will be conducted prior to construction to collect baseline information on water depth, velocities and discharge, channel morphology and fish use. Measures to mitigate fish passage issues will be proposed (e.g., baffles installed in CSP culverts; additional culvert pipes, or alternative crossing structures such as arch culverts) and fish passage risk will be re-assessed with these additional mitigation measures. This information will be presented in the application for an authorization under the *Fisheries Act*.

Following installation, an annual inspection of the 29 culverts previously assessed as high risk to fish passage along the North Rail will be conducted each year by a Professional Fisheries Biologist. The focus of the annual inspection will be to determine fish passage success by surveying the presence of fish and document habitat quality upstream and downstream of the culverts, following the protocol established for the Northern Corridor Monitoring Program. The proposed duration of the program is 5 years following completion of installation of all crossings in fish-bearing watersheds. The need for further monitoring will be determined following the 5-year program based on the monitoring results.

Following the first year of Phase 2 Project approval, it was recommended that a survey of the outflow of Camp Lake occur during late summer/fall. The timing shall be dependent on the timing when the water withdrawals occur and during a low flow event, to ensure that there is no stranding of Arctic Char. In the event that stranding is observed, a fish salvage would be undertaken to relocate the stranded fish to a local waterbody. A brief description of fish salvage options is provided in Appendix F.

Rail Stream Diversions

The upstream portions of 10 non-fish-bearing streams that will be intersected by railway construction will be diverted to adjacent streams on the upstream side of the railway. This will result in increased flows to the receiving streams and conversely may result in decreased flows to previous receiving streams.

Of the 10 diversions, 9 are considered low risk. Crossings CV-68-1 and CV-68-1a are branches of the same stream, and channel alterations will occur maintaining both branches (i.e., no transfer of flow from one branch to another). Additionally, one of the diversions (CV-105-4 to downstream pond) is a channel realignment with flows reporting to the same receiving water body (a pond adjacent to CV-105-3).

One diversion (CV-47-1c into CV-47-1b) is considered medium risk. The stream at crossing CV47-1b will receive increased flows, but the channel meets the CV47-1c channel approximately 100 m downstream of the crossing, at which point flows become unchanged from baseline.

The nine low-risk stream diversions will be visually monitored monthly during the first complete open water season (and the preceding partial open water season, if applicable) to identify evidence of:

- Flooding if the capacity of the channel is being exceeded
- Subsidence or slope instability
- Channel bed scour or bank erosion
- Deposition of previously eroded materials

An inspection form developed to record appropriate information will be completed, and photographs will be taken from a consistent vantage point. If subsidence or erosion is evident, an incident form will be completed and turbidity and/or TSS monitoring and any resultant actions and reporting will be carried out in accordance with the water quality monitoring program described in Section 3 of Appendix F.

Inspection forms and photos will be included with a summary discussion in the annual report to the QIA and NWB for operations for the full and partial year(s) monitored.

The medium risk stream diversion at CV-47-1b will be subject to a pre-construction site assessment and possible design mitigation to address any concerns that may be identified regarding potential flooding, subsidence, channel bed scour or bank erosion. The assessment is likely to include: the establishment of transects, survey (level and rod), and take. Post-construction monitoring of this site will be conducted as described above for the low-risk stream diversions, with implementation of the sediment and erosion monitoring program and associated response framework implemented as described in Section 3 of Appendix F.

Some parameters, such as TSS, have accurate action levels that will trigger the action response framework (Appendix F and H). Others, such as flooding and/or changes to stream morphology, are subjective and will require an exercise of professional judgement regarding action response, as there are no definitive action level triggers.

5.8 SNOW MANAGEMENT MONITORING

The monitoring of snowmelt and surface water runoff at the Mine Site and Milne Port will be monitored via the Surveillance Network Program (SNP) stipulated by the Project's Type 'A' Water License, and along the Tote Road via the Northern Corridor Monitoring Program (NCMP). Additional temporary monitoring locations may be established during freshet to support the SNP and NCMP for areas down gradient of snow stockpile locations. The frequency of water quality monitoring will be consistent with existing monitoring programs (i.e. SNP, NCMP). For further details, refer to Baffinland's Snow Management Plan (BAF-PH1-300-P16-0002) where it outlines the required monitoring of snow management and snow stockpiles at the Project.

5.9 RAIL STREAM DIVERSIONS

The upstream portions of 10 non-fish-bearing streams that will be intersected by railway construction will be diverted to adjacent streams on the upstream side of the railway. This will result in increased flows to the receiving streams and conversely may result in decreased flows to previous receiving streams. If flows increase sufficiently, flows in the receiving stream may exceed the channel capacity and result in flooding, may affect permafrost and frozen soil proximal to the channel causing subsidence and slope instability, and changes in fluvial morphology. The magnitude of flow change must be sufficient and the channel morphology sensitive to flow changes, in order to

realize these potential effects. An evaluation was completed to assess the potential risk (KP, 2019), and the results are presented in Table 5.5.

TABLE 5.5 SUMMARY OF STREAM DIVERSION EFFECTS SCREENING

Diverted Stream	Receiving Stream	Description	Easting	Northing	Fish-bearing at Crossing?	Risk of Geomorphic Change
Milne Port						
CV-0-2		Cut	504234	7975572	No	
	CV-0-1	Daylight + culvert	504289	7975593	No	Low
CV-1-6		Cut	504292	7974064	No	
	CV-1-5	Culvert	503938	7974336	No	Low
North Railway						
CV-1-7		Cut	504662	7973667	No	
	CV-1-9	Daylight + culvert	504926	7973382	No	Low
CV-5-5		Cut	506643	7971540	No	
	CV-5-7	Daylight + culvert	506775	7971413	No	Low
CV-47-1c		Cut	525543	7937715	No	
	CV47-1b	Culvert	525454	7937939	Yes	Medium
CV-68-1		Stream Crossing, infilling and diversion	528236	7918847	Yes	
	CV-68-1a	Stream Crossing, infilling and diversion	528254	7918912	Yes	Low
CV-97-5		Cut	551410	7916785	No	
	CV-97-4	Culvert	551291	7916898	No	Low
CV-97-6		Cut	551457	7916754	No	
	CV-97-7	Culvert	551550	7916660	No	Low
CV-101-1b		Cut	554883	7915453	No	
	CV-101-1	Culvert	554672	7915456	No	Low
Mine Site						
CV-105-4		Stream Crossing, infilling and diversion	559222	7914359	Yes	
	Pond	Pond	558852	7914615	Yes	Low

Where diversions cause a greater than 10% increase in flow and the combined catchment area (baseline plus diverted catchments) is greater than 0.5 km^2, it is considered that there is potential to cause more frequent overbank flooding, and potential changes in permafrost, frozen soil conditions and fluvial morphology.

The nine low-risk stream diversions will be visually monitored monthly during the first complete open water season (and the preceding partial open water season, if applicable) to identify evidence of:

- Flooding if the capacity of the channel is being exceeded
- Subsidence or slope instability
- Channel bed scour or bank erosion
- Deposition of previously eroded materials

An inspection form developed to record appropriate information will be completed, and photographs will be taken from a consistent vantage point. If subsidence or erosion is evident, an incident form will be completed and turbidity and/or TSS monitoring, and any resultant actions and reporting will be carried out.

Inspection forms and photos will be included with a summary discussion in the annual report to the QIA and NWB for operations for the full and partial year(s) monitored.

The medium risk stream diversion at CV-47-1b will be subject to a pre-construction site assessment and possible design mitigation to address any concerns that may be identified regarding potential flooding, subsidence, channel bed scour or bank erosion. The assessment is likely to include: the establishment of transects, survey (level and rod), and take. Post-construction monitoring of this site will be conducted as described above for the low-risk stream diversions.

The triggers for taking action such as flooding and/or changes to stream morphology, are subjective and will require an exercise of professional judgement regarding action response, as there are no definitive action level triggers.

5.10 GROUNDWATER MONITORING

Condition 23 of the Project Certificate requires groundwater monitoring to be conducted at the Project. Initiated in 2017, Baffinland conducts a groundwater monitoring program at the Project's Mine Site Landfill Facility. The current monitoring program involves establishing shallow groundwater wells in the inferred up- and down-gradient direction of the Landfill Facility using drive-point piezometers and collecting water samples near the depth of the active layer during September of each year; the time of year where the active layer should be at its maximum depth. The groundwater monitoring program is undergoing review to determine the applicability of expansion of the program to other project facilities, and optimization of methodologies to collect and monitor groundwater in an arctic permafrost environment.

5.11 TYPE B WATER LICENCE MONITORING

Surface water monitoring requirements stipulated under the Type B Water Licence are related to exploration and geotechnical drilling programs and the establishment of satellite camps required to support these programs. Due to temporary and transitory nature of drilling programs, water quality monitoring programs will be established for drilling programs on as needed basis and in accordance with the monitoring requirements outlined in the Type B Water Licence. Proposed water quality monitoring programs will be included in Baffinland's notification(s) to regulators and stakeholders for planned drilling programs and satellite camps.

5.12 AQUATIC EFFECTS MONITORING PROGRAM

The Aquatic Effects Monitoring Plan (AEMP) describes how monitoring of the aquatic environment will be undertaken at the Project. The AEMP was identified as a follow-up monitoring program in Baffinland's Final Environmental Impact Statement (FEIS; Baffinland, 2012) and is prescribed by the Type A Water Licence. The AEMP, specifically, is a monitoring program designed to:

- Detect the short-term and long-term effects of the Project's activities on the surrounding aquatic environment
- Evaluate the accuracy of impact predictions
- Assess the effectiveness of planned mitigation measures
- Identify additional mitigation measures to avert or reduce unforeseen environmental effects

The AEMP focuses on the key potential impacts to freshwater environment valued ecosystems components (VECs), as identified in the Final Environmental Impact Statement and Addendum for the Early Revenue Phase (ERP). The freshwater VECs include water quantity, sediment quality, and freshwater biota and fish habitat. The AEMP has been structured to serve as an overarching 'umbrella' that conceptually provides an opportunity to integrate results of individually monitored but related aquatic monitoring programs.

The following are the component studies that comprise the Project's AEMP.

- Core Receiving Environment Monitoring Program (CREMP), provides a basis for the evaluation of any mine-related influences on water quality, sediment quality and/or biota (including phytoplankton, benthic invertebrates and/or fish) within aquatic environments located near the Mine Site
- Lake Sedimentation Monitoring Program evaluates baseline and Project-influenced lake sedimentation rates at Sheardown Lake NW
- Hydrometric Monitoring Program assesses flow in several streams and rivers near Project sites and supports the AEMP
- Dustfall Monitoring Program evaluates dustfall rates in proximity to the Tote Road, Milne Port and Mine Site and informs aquatic effects monitoring programs on the potential effects of dust generated by the Project on surrounding aquatic ecosystems and water bodies
- Stream Diversion Barrier Study was an initial study evaluating the potential for fish barriers under natural conditions and due to Project-related stream diversions. This study has been deferred due to the low impact anticipated by the reduced footprint of the Waste Rock Facility during the Early Revenue Phase of the Project
- Environmental Effects Monitoring (EEM) Program, as required under the MDMER, includes both water quality, benthic and fish monitoring studies in the receiving water bodies of effluent discharges at the Mine Site

Monitoring data collected requires a systematic data evaluation process, as well as management responses that would be taken, in response to certain data evaluation outcomes. An assessment and management response framework is described in detail in Section 5 of the AEMP.

5.13 REPORTING

The on-site Environmental Superintendent in concert with the corporate Sustainable Development team is responsible for data management and reporting related to surface water management and monitoring. The data management system includes conducting routine inspections and monitoring, and forwarding results to appropriate parties as prescribed by Baffinland's applicable approvals, permits and authorizations.

The annual reports include the review of monitoring data collected during the reporting year, trend analyses of monitoring data over time, and a comparison of annual performance against impact predictions.

Table 5.6 summarizes the data reporting associated with the monitoring programs outlined in above.

TABLE 5.6 REPORTING SUMMARY FOR MONITORING PROGRAMS

Monitoring Program	Applicable Regulatory Instrument	Reporting	Responsibility
Surveillance Network Program (Schedule I; Part I)	Type A Water Licence	Monthly Monitoring Reports Annual QIA & NWB Report for Operations	Environment and Sustainable Development Department
Fisheries Crossings Assessment	Applicable DFO Authorizations and Letters of Advice Project Certificate	Annual DFO Tote Road Monitoring Report Annual QIA & NWB Report for Operations - Appendices Annual Report to the NIRB	Environment and Sustainable Development Department
Tote Road Monitoring Program	-	Annual QIA & NWB Report for Operations - Appendices	Environment and Sustainable Development Department
Snow Stockpile Monitoring	-	Annual QIA & NWB Report for Operations - Appendices	Environment and Sustainable Development Department
AEMP (excluding Dustfall Program)	Type A Water Licence, Project Certificate	Annual QIA & NWB Report for Operations - Appendices Annual Report to the NIRB	Environment and Sustainable Development Department
Groundwater Monitoring	Project Certificate	Annual QIA & NWB Report for Operations - Appendices Annual Report to the NIRB	Environment and Sustainable Development Department
Type B Water Licence (Part B, Item 6)	Type B Water Licence	Annual QIA & NWB Report for Exploration and Geotechnical Activities	Environment and Sustainable Development Department
Dustfall Program	Type A Water Licence Project Certificate	Annual Terrestrial Environment Monitoring Report (Baffinland Document Portal) Annual Report to the NIRB	Environment and Sustainable Development Department

5.14 MITIGATION TOOLKIT

The preliminary Moderate and High Action Pre-Defined Responses to be implemented in the event of an exceedance of a moderate risk or high risk threshold are outlined in Table 5.7. These responses should not be considered exhaustive and may be supplemented pending the results of adaptive management investigations and subsequent QIA approval.

Note - The Moderate and High Action Pre-Defined Responses are preliminary and subject to further review and assignment into specific Moderate and High Risk categories before finalization of the adaptive management components of the Environmental Management Plans, currently planned for August 2021. Even when finalized these responses should not be considered exhaustive and may be supplemented pending the results of adaptive management investigations and subsequent QIA approval.

TABLE 5.7 FRESHWATER ENVIRONMENT - MODERATE AND HIGH ACTION PRE-DEFINED RESPONSES

Mitigation	Key Stressor	Potential Responses
Avoid/reduce	Dust emissions	• Redesign engineering controls • Spray (or respray piles) with approved dust suppressant • Research for alternate dust suppression products • Evaluate surface watering and sprinkler system options via mister trucks or trailers • Where applicable, install or redesign conveyor shrouding for fugitive dust • Further evaluate blasting practices • Conduct review of new technology and solutions available on the market for dust control • Reduction or cessation of activity • Adapt production rate to environmental conditions • Develop site-specific risk-based guidelines • Complete risk assessment
	Erosion and sedimentation	• Stabilize eroding surfaces with rip rap or other measures • Install sediment control infrastructure (i.e., check dams) • Explore redesign of water conveyance structures and culverts • Construct diversion ditches or berms • Direct non-contact water away from site infrastructure • Conduct review of new technology and solution available on the market for erosion and sedimentation control • Explore options for temporary vegetation of disturbed land (progressive reclamation) • See Table 3.6 for additional information on erosion and sediment control measures • The grade of low-lying areas with pooling water resulting from the removal of surface material will be restored with material from other construction projects when possible • Replace materials on destabilized slopes with engineered fill in order to mitigate permafrost degradation
	Water management	• Assess potential use and effectiveness of batch water treatment with reagents, and/or flocculants • Construct water management structures (i.e., additional settlement ponds, dams etc.) • Install stream specific water treatment plant • Implement alternate water treatment technologies (i.e., permeable reactive barriers)
Compensation	Any/all stressors	• Compensation under ICA or WCA

6.0 REVIEW OF PLAN EFFECTIVENESS

An important element of Baffinland's management system is reviewing the continued suitability, adequacy and effectiveness of each management plan. This will occur through an annual review process as well as scheduled updates.

6.1 ANNUAL REVIEW OF COMPLIANCE AND UNANTICIPATED EFFECTS

Baffinland conducts internal inspections and audits throughout the year, as described in Section 5.2. Throughout the year, immediate corrective actions are taken as appropriate to address instances of non-compliance, as well as unanticipated effects observed. Follow-up corrective actions may also be required. These immediate and follow-up corrective actions are documented in the annual report.

One follow-up corrective action may be to revise mitigation measures or monitoring programs described in the applicable management plans. During the annual reporting cycle, Baffinland staff will review instances of non-compliance as well as unanticipated effects and determine if a review of plan effectiveness is appropriate. Should there be a significant unanticipated effect determined by the Inuit Committee and/or community observations, a review of plan effectiveness will be completed. This process is articulated on Figure 6.1.

Part of this annual review cycle is the incorporation of IQ, which may include feedback from the Inuit Committee and/or community observations. This process may occur annually whether repeat non-compliance and/or unanticipated effects are identified (Figure 6.1).

6.2 SCHEDULED UPDATES

In addition to the annual review cycle described above, scheduled Plan reviews will occur according to the schedule presented in Table 6.1.

TABLE 6.1 PLAN REVIEW SCHEDULE

Review Event	Description
Prior to construction[1]	Incorporate any additional requirements specified in the DFO *Fisheries Act* Authorization and Amended Water Licence
Post-construction	Mandatory management review
Every 3 years during operation	Mandatory management review

NOTE:

1. This is a generic term that applies to Project expansions or other major sustaining capital works.

Plan updates will be recorded in the Document Revision Record located at the front of the Plan. Each plan update will be provided to the QIA for review and approval before being finalized for implementation.

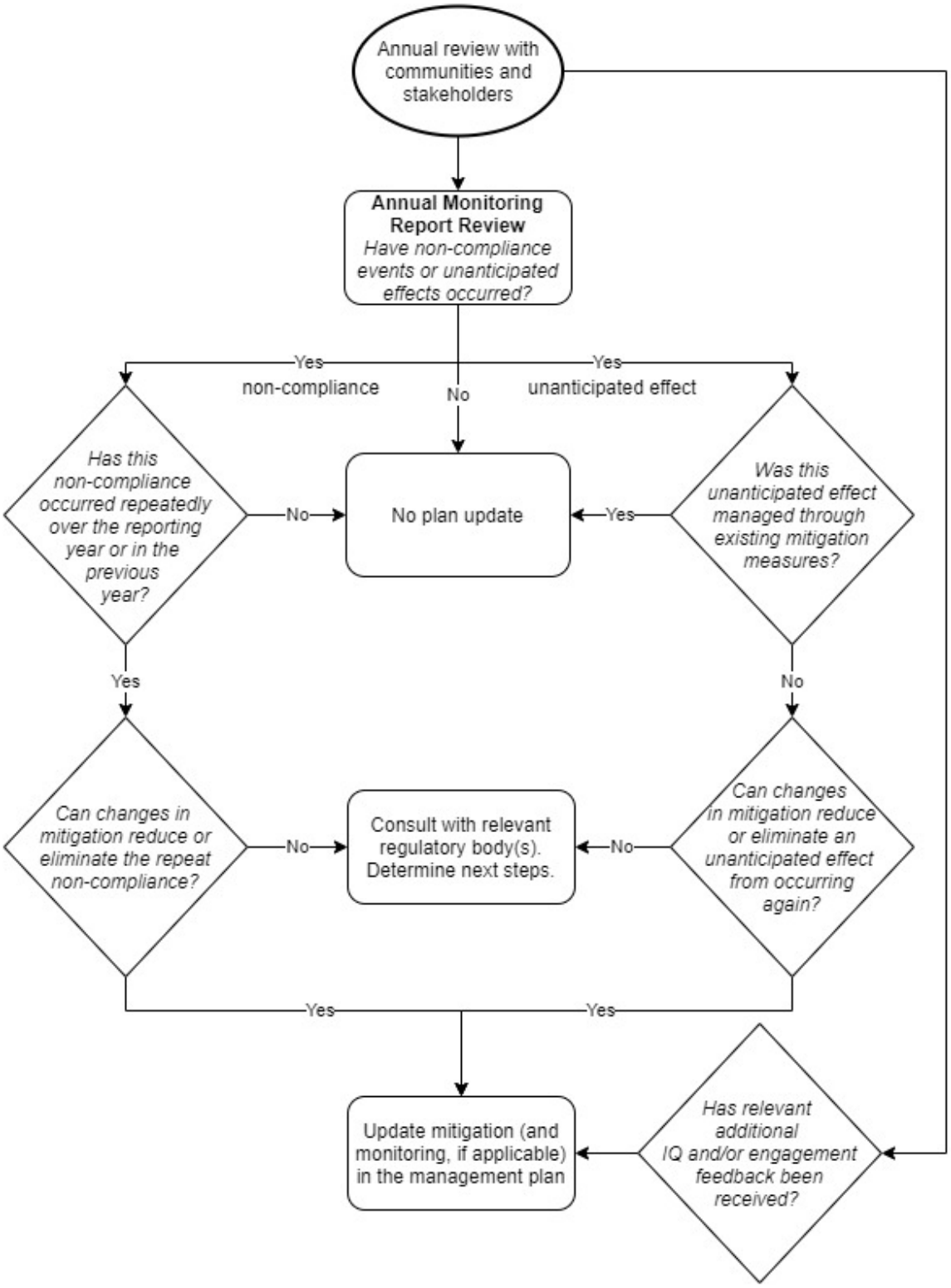

FIGURE 6.1 ANNUAL REVIEW OF PLAN EFFECTIVENESS

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Appendix A
Corporate Policies

Baffinland Iron Mines Corporation

Health, Safety and Environment Policy

BAF-PH1-800-POL-0001

Rev 2

Approved By: Brian Penney

Title: Chief Executive Officer

Date: April 20th, 2018

Signature: 

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
05/07/15	0	EM	TP	For Use
03/07/16	1	JS	BP	Minor edits
04/20/18	2	TS	SA/BP	Minor edits

This Baffinland Iron Mines Corporation Policy on Health, Safety and Environment is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goals.

We implement this Policy through the following commitments:

- Continual improvement of safety, occupational health and environmental performance
- Meeting or exceeding the requirements of regulations and company policies
- Integrating sustainable development principles into our decision-making processes
- Maintaining an effective Health, Safety and Environmental Management System
- Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts
- Engaging stakeholders through open and transparent communication.
- Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
- Reclamation of lands to a condition acceptable to stakeholders.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- As evidenced by our motto “Safety First, Always” and our actions Health and Safety of personnel and protection of the environment are values not priorities.
- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution through courageous leadership is essential for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The health and safety of all people working at our operation and responsible management of the environment are core values to Baffinland. In ensuring our overall profitability and business success every Baffinland and business partner employee working at our work sites is required to adhere to this Policy.

Brian Penney
Chief Executive Officer
April 2018

Sustainable Development Policy

At Baffinland Iron Mines Corporation (Baffinland), we are committed to conducting all aspects of our business in accordance with the principles of sustainable development & corporate responsibility and always with the needs of future generations in mind. Baffinland conducts its business in accordance with the Universal Declaration of Human Rights.

Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and with utmost respect for the cultural values and legal rights of Inuit. We expect each and every employee, contractor, and visitor to demonstrate courageous leadership in personally committing to this policy through their actions. The four pillars of our corporate responsibility strategy are:

1. Health and Safety
2. Environment
3. Upholding Human Rights of Stakeholders
4. Transparent Governance

Health and Safety

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness, where everyone goes home safe everyday of their working life. Why? Because our people are our greatest asset. Nothing is as important as their health and safety. Our motto is “Safety First, Always”
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour, awareness and promoting active courageous leadership. We allow our employees and contractors the right to stop any work if and when they see something that is not safe

Environment

- Baffinland employs a balance of the best scientific and traditional Inuit knowledge to safeguard the environment
- We apply the principles of pollution prevention, waste reduction and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop more sustainable practices. We strive to develop more sustainable practices
- Baffinland ensures that an effective closure strategy is in place at all stages of project development to ensure reclamation objectives are met

Upholding Human Rights of Stakeholders

- We respect human rights, the dignity of others and the diversity in our workforce. Baffinland honours and respects the unique cultural values and traditions of Inuit
- Baffinland does not tolerate discrimination against individuals on the basis of race, colour, gender, religion, political opinion, nationality or social origin, or harassment of individuals freely employed
- Baffinland contributes to the social, cultural and economic development of sustainable communities in the North Baffin Region

Sustainable Development Policy

- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions
- We expect our employees and contractors, as well as community members, to bring human rights concerns to our attention through our external grievance mechanism and internal human resources channels. Baffinland is committed to engaging with our communities of interest on our human rights impacts and to reporting on our performance

Transparent Governance

- Baffinland will take steps to understand, evaluate and manage risks on a continuing basis, including those that may impact the environment, employees, contractors, local communities, customers and shareholders.
- Baffinland endeavours to ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We measure and review performance with respect to our safety, health, environmental, socio-economic commitments and set annual targets and objectives.
- Baffinland conducts all activities in compliance with the highest applicable legal & regulatory requirements and internal standards.
- We strive to employ our shareholder's capital effectively and efficiently and demonstrate honesty and integrity by applying the highest standards of ethical conduct.

Brian Penney
Chief Executive Officer
March 2016

Anti-Bribery and Anti-Corruption Policy

1. Purpose

The purpose of this policy is to define the requirements of Baffinland Iron Mines Corporation ('Baffinland') that the directors, officers, employees, contractors and representatives are required to follow. The directors, employees and contractors are expected to conduct reasonable due diligence on third parties when promoting Baffinland's business.

2. Scope

This policy applies to all directors, officers, employees, contractors and representatives of Baffinland, performing any function whatsoever.

3. Responsibilities

It is the responsibility of all directors, employees, contractors and representatives of Baffinland to follow the Company's anti-bribery and anti-corruption policy, which prohibits the following:

- Under no circumstances shall an officer, director, employee, or any third party acting on Baffinland's behalf, give or pay (or make an offer, promise, or grant authority to pay) anything of value to a government official or any other person or entity, including those in the private or commercial sector, where the gift or payment is intended to induce the recipient to misuse his or her position or to obtain an improper business advantage.
- Employees are not authorized to make "facilitation" or expediting payments to facilitate or secure the performance of certain routine, non-discretionary functions or routine government actions. Employees may only pay official service fees which are publicly posted on fee schedules and for which payment is properly documented.
- An employee's violation of this policy will result in disciplinary action, which may include termination and/or notice to appropriate enforcement agencies. A third party's violation of this policy may lead to the suspension or termination of any or all agreements and/or notice to appropriate enforcement agencies.
- All employees shall participate in annual anti-bribery and anti-corruption training that are arranged by Baffinland.
- All employees shall annually sign an Acknowledgement Form confirming their understanding of this policy and the consequences of non-compliance.
- Employees will not provide gifts or hospitality with the intention of persuading anyone to, or rewarding anyone for, acting improperly or misusing his or her authority.
- Contributions of money or services on behalf of Baffinland to any political parties or individual politicians in any region, trade unions or union members may only be made in accordance with applicable law and all requirements for public disclosure must be fully complied with. Such contributions are subject to the prior written approval of the Baffinland's General Counsel.

If employees, directors, officers, contractors or representatives are concerned about any non-compliance, please submit your concerns or complaints to the Baffinland ConfidenceLine, a service provided by an independent third party, 'Xpera' HR Services Inc. The reporting contact details are as follows:

Contact details for Xpera HR Services Inc:

- Phone Number: +1 888-455-8662
- Address: 101 - 8333 Eastlake Drive, Burnaby, British Columbia. V5A 4W2 Canada
- Email address: confidenceline@xpera.ca

4. Protocol

4.1 Definitions

4.1.1 Bribery

Bribery can be defined as the offering, giving, receiving, or soliciting of anything of value to influence an act or a decision. Payments, benefits or other advantages extended to domestic or foreign public or government officials or employees, to obtain or maintain business are strictly prohibited. Similarly, directors, employees, contractors and representatives who deal with government representatives will not, under any circumstance personally, accept any benefit or advantage offered by a government representative.

Furthermore, directors, employees, contractors and representatives must not act outside of the scope of their official roles in order to assist private entities or persons in their dealings with the Company where this would result in unwarranted preferential treatment to any person or organization.

4.1.2 Facilitation Payments

Facilitation payments, which are payments to government officials or representatives to expedite routine services, are prohibited.

4.2 Protocol

4.2.1 Government Relations

All directors, employees, contractors and representatives shall conduct their dealings with government officials and employees in compliance with the Criminal Code (Canada), Corruption of Foreign Public Officials Act (Canada) (the "CFPOA"), the Foreign Corrupt Practices Act (United States) (the "FCPA") and local laws.

4.2.2 Books and Records

Prior to paying or authorizing a payment to a domestic or foreign official or government employee, directors, employees, contractors and representatives must ensure that no part of such payment is to be made for any purpose other than that to be fully and accurately recorded in the Company's books and records.

4.2.3 Gifts and Entertainment

Baffinland expects employees, contractors and representatives to conduct business in a way that avoids even the perception of illegal or unethical conduct, when offering or receiving entertainment, gifts, or favours, the following standards should be followed:

- The entertainment, gift or favour should be incidental or customary hospitality and of nominal value; it cannot be meant or perceived to influence the recipient's judgment or to secure preferential treatment for the giver.
- The receipt or the giving by any director, employee, contractor or representative for entertainment, gift or benefit valued at more than CAD $500 one-time or cumulatively should be disclosed to the individual's immediate supervisor and must be recorded in the Company's Gift/Benefit Register, located on Baffinland's SharePoint Site. In addition, the individual is responsible for any personal income tax implications. Purchasers involved in a bid process should reject all entertainment, gifts or favours.
- **Gift/Benefit Register Link:** http://finance.baffinland.com/Lists/GiftBenefit%20Register%20%20List

4.2.4 Reporting

Should a director, employee, contractor or representative be solicited for or offered a bribe or incentive of any type, or suspect that a bribe or incentive will be solicited for, directors, employees, contractors and representative are required to report their concern to any of the following:

- Chief Executive Officer
- General Counsel
- Chief Financial Officer
- Director, Internal Audit

Any violation of this policy following a review of the situation, may lead to disciplinary action, including dismissal of the director, employee, contractor or representative for cause.

4.3 Enforcement

Any violation of this policy following a review of the situation, may lead to disciplinary action, including dismissal of the director, employee, contractor or representative for cause.

Please refer to **Appendix A** for Baffinland Anti-Bribery and Anti-Corruption policy acknowledgement document.

5. References and Records

Criminal Code of Canada: https://laws-lois.justice.gc.ca/PDF/C-46.pdf
Corruption of Foreign Public Officials Act (CFPOA): https://laws-lois.justice.gc.ca/PDF/C-45.2.pdf
Foreign Corrupt Practices Act (FCPA): https://www.justice.gov/criminal-fraud/foreign-corrupt-practices-act

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Human Resources

Anti- Bribery and Anti- Corruption Policy

BAF-PH1-700-POL-0022 r0

Brian Penney
President & CEO

APPENDEX A: Anti-Bribery and Anti-Corruption Policy Acknowledgement Document

I acknowledge receipt of "Anti-Bribery and Anti-Corruption policy"; I confirm that I have read and understood this policy and that I will abide by its provisions in handling the business of the Company.

(Please print)

_____

Name

_____

Department

_____

Date and place

_____

Signature

Please complete this acknowledgement document and forward it to Baffinland Human Resources Department. This document will be placed in your employee file.

Code of Business Conduct Policy

1. Purpose

The purpose of this policy is to define the minimum requirements for Baffinland Iron Mines Corporation's ("Baffinland") directors, officers, employees, contractors and representatives in order to follow the Code of Business Conduct ("Code").

Baffinland values honesty and integrity in its management practices and in all its business transactions. It is vital for the Company that we adopt these values and maintain the relationship of trust with all individuals and companies with whom Baffinland has a business dealing with. Each new director, officer, employee, contractor and representative is required to certify their awareness and compliance with this Code. All Baffinland officers and employees will be required to reiterate their awareness and compliance to the Code on an annual basis. Declining to certify their awareness and compliance to the Code may lead to disciplinary action, up to and including termination for cause.

2. Scope

This Code of Conduct applies to all directors, officers, employees, contractors and representatives of Baffinland. It is designed to help understand the ethical and legal obligations in handling Baffinland's business. Although this code does not cover every issue that may arise, it is intended to establish guidelines to which Baffinland personnel can refer to, in situations where the proper course of conduct may not seem clear.

The guidelines set out in this code are mandatory and, as such, must be observed by all Baffinland personnel at all times.

3. Responsibilities

It is the responsibility of all directors, officers, employees, contractors and representatives of Baffinland to adhere to this Code of Business Conduct and report any actual or suspected violations to their supervisors, the General Counsel, President & CEO, CFO, Human Resources (HR) or Director, Internal Audit, in a timely manner.

3.1 Competition and Anti-trust

Baffinland is committed to strict observance compliance of the competition and antitrust laws of the countries in which it does business and to avoid any conduct that could be considered illegal.

Agreements or arrangements may be considered illegal even if they are not in writing, since the conduct of the party involved can be sufficient to establish that a violation has occurred. Consequently, no Baffinland personnel may take part in any formal or informal discussions, agreements, arrangements, projects or accords with current or potential competitors related to pricing, terms of sale or bids, allocation of customers or any other activity that restrains or could restrain free and open competition.

The courts may impose large fines and, in certain circumstances, lengthy prison terms for violations of antitrust laws, and these penalties may be imposed on both employees and companies. In view of the serious legal consequences, at both the civil and criminal levels, to which such violations could expose the Company, Baffinland will take the necessary steps that may be warranted against employees who disobey these laws. Ignorance, overzealousness, good faith or the

argument that time did not permit the advice of the General Counsel to be sought will not be accepted as an excuse. All questions in the competition/antitrust area should be submitted to the General Counsel before any action is taken.

4. Protocol

4.1 Exemptions

A waiver of any provision of this code will only be given if it is deemed absolutely appropriate under the circumstances. Any change in or waiver of this Code may be made only by the Board or by a Board Committee and will be promptly disclosed as required by law or regulation.

Although the various matters dealt with in this Code do not cover the full spectrum of employee activities, they are indicative of Baffinland's commitment to the maintenance of high standards of conduct and are to be considered representative of the type of behavior expected from employees in all circumstances.

4.2 Reporting Code Violations

All officers and managers at all levels shall maintain an "open door" policy regarding questions of business conduct as they relate to this Code and its applicability. Employees, contractors and representatives shall be encouraged to raise their concerns regarding potential code violations. Concerns regarding violations to the Code can be reported anonymously to Baffinland ConfidenceLine.

- Phone Number: +1 888-455-8662
- Address: 101 - 8333 Eastlake Drive, Burnaby, British Columbia. V5A 4W2. Canada.
- Email address: confidenceline@xpera.ca

Retaliation against any employee or contractor who, in good faith, reports a concern about any illegal or unethical conduct will not be tolerated. Persons involved in illegal or unethical conduct may be subject to disciplinary action up to and including termination. Reporting a Code violation knowing it to be false may also result in disciplinary action up to and including termination.

If a member of management receives a report of any alleged violation of the Code, he or she must promptly inform the the Audit Committee Chairperson, General Counsel, President & CEO, CFO, Human Resources (HR) or Director, Internal Audit. An investigation will be conducted to determine whether a violation has in fact occurred.

Any director, officer, employee, contractor or representative who withholds information during the course of an investigation regarding a possible violation of the Code is subject to disciplinary action, up to and including termination.

4.3 Legal Compliance

Compliance with Laws and Regulations

The Company and its employees shall comply with all laws, rules and regulations and governmental requirements of those jurisdictions in which it conducts business. Baffinland's activities are subject to complex, changing and, in some

cases, conflicting laws, in Canada and abroad. Ignorance of the law is not a defense and is not acceptable. Moreover, agreements or arrangements need not be in writing for a contravention to be inferred from the conduct of the parties.

Baffinland employees must diligently seek to avoid conduct which might be interpreted as being in contravention of laws governing the affairs of the Company. Employees must not permit their decisions to be improperly influenced nor shall they improperly influence the decisions of others, irrespective of any perceived benefits to the Company.

4.4 Third Party Relationships

Conflicts of Interest

In discharging their duties, directors, officers, employees, contractors and representatives must act honestly and in good faith with a view to Baffinland's best interests. Directors, officers, employees, contractors and representatives must avoid situations involving a conflict between their personal interests and the interests of the Company. Actions taken, and decisions made by any director, officer, employee, contractor or representative should be documented and based on impartial and objective assessment of the facts in each situation, free from influence by gifts and, favors and the like, which may adversely affect the director, officer, employee, contractor and representative's judgments.

Gifts and Entertainment

Employees must not profit from their position with Baffinland so as to derive personal benefits conferred on them by persons who deal or seek to deal with the Company. Consequently, accepting any personal benefit, such as a sum of money, a gift, a loan, services, pleasure trips or vacations, special privileges or living accommodations or lodgings, with the exception of promotional items of modest value, is forbidden.

Any entertainment accepted or given must also be of a modest nature. In general, offers of entertainment in the form of meals and drinks may be accepted or given, provided that they are inexpensive, infrequent and, as much as possible, reciprocal.

The receipt or the giving by any director, employee, contractor or representative of entertainment, gift or benefit valued at more than CAD $500 one-time or cumulatively should be disclosed to the individual's immediate supervisor and must be recorded in the Company's Gift/Benefit Register, located on Baffinland's SharePoint Site.

Gift/Benefit Register Link: http://finance.baffinland.com/Lists/GiftBenefit%20Register%20%20List

In case of continuing doubt, employees should consult their direct Supervisor or the General Counsel.

4.5 Fair Competition

Subject in all cases to the provisions of the Inuit Impact and Benefit Agreement (IIBA) in place between Baffinland and the Qikiqtani Inuit Association, the following shall apply:

All procurement decisions shall be based exclusively on normal commercial considerations, such as quality, price, availability, service, reputation and other factors impacting the product, service or supplier. Customers and potential customers of Baffinland shall be provided with equal rights to make purchasing decisions based on the same competitive terms.

Baffinland will neither seek, encourage nor tolerate special favors or arrangements with suppliers or customers that impair, or give the appearance of impairing, fair commercial relationships. Under no circumstances is it acceptable to offer, give, solicit or receive any form of bribe, kickback, or inducement in fact or in appearance.

4.6 Dealing with Public or Government Officials

Baffinland's funds, assets, property or services must not be used to induce any public or government officials, in any country, to perform any action in violation of, or refrain from performing, their lawful duty. All directors, officers, employees, contractors and representatives shall conduct their dealings with government officials and employees in compliance with the Corruption of Foreign Public Officials Act (Canada) (the "CFPOA"), criminal code of Canada and local laws in such a way that Baffinland's integrity and reputation, the government and the government officials or employees, will not be brought into question.

Baffinland will also comply with the anti-corruption laws of the countries in which it conducts business, including the US Foreign Corrupt Practices Act. Baffinland will not directly or indirectly offer or give anything of personal value to any government official, including employees of state- owned enterprises, for the purpose of influencing any act or decision in order to assist the Company in obtaining or retaining business or to direct business to anyone. Baffinland will also ascertain that any agents that Baffinland engages to conduct business on behalf of the Company are reputable and that they also will comply with these guidelines.

4.7 Community Relations

Baffinland is committed to conducting its business responsibly within the communities associated with it's operations, and to making a positive contribution to the well-being and development of such communities. Every director, officer, employee, contractor and representative shall reflect this commitment in his or her everyday dealings and respect the different cultures, dignity and rights of individuals where Baffinland carries out its activities.

4.8 Outside Directorship

Baffinland employees may not serve as directors of any outside business organization unless such service is specifically approved by Baffinland management.

4.9 Confidentiality

Baffinland's records, reports, documents, processes, plans and methods are considered by the Company to be confidential and should not be revealed to outside parties without proper authorization.

Information and documents pertaining to the Company are to be used strictly for the performance of Baffinland personnel's duties and may be disclosed or communicated to persons outside the Company only to the extent that the information in question is needed by such persons in connection with their business relations with the Company, or where the information is already in the public domain or is required to be disclosed by law or court order. In case of doubt as to whether the information may be disclosed and to whom it may be sent, Baffinland personnel should consult their supervisor or the Legal Department.

Employees are required, for the duration of their employment with the Company and after their employment terminates, to keep such information confidential and to use the utmost discretion when dealing with sensitive or privileged information. Such information includes, in addition to the technology used by the Company, intellectual property, business and financial information relating to sales, earnings, balance sheet items, business forecasts, business plans, acquisition strategies and other information of a confidential nature.

Confidential information must not be discussed with or disclosed to any unauthorized persons, whether Company personnel or persons outside the Company. Necessary steps must be taken to ensure that documents containing confidential information, when sent by electronic media, are transmitted through secured means. Similarly, appropriate security measures must be taken when destroying documents that contain confidential information.

Public statements on behalf of the Company can be made exclusively by authorized persons. Any request for information concerning the Company that originates with the media or a government agency should be directed to the General Counsel.

4.10 Enforcement

Any violation of this policy following a review of the situation, may lead to disciplinary action, including dismissal of the director, officer, employee, contractor or representative for cause.

4.11 Appendices

Additional sections covered under this policy are:

a) Corporate Board of Directors
b) Political Activities
c) Corporate Opportunities
d) Fair Dealing
    1. Customer Relations
    2. Offering Gifts and Entertainment
    3. Supplier Relations
    4. Personal Information
e) Protection and Proper Use of Company Assets
    1. Accuracy of Records
    2. Property of the Company
    3. Email and Internet

f) Respecting the Baffinland Community
    1. Work Environment Free of Harassment and Discrimination
    2. Occupation Health and Safety
    3. Respect for the Environment
    4. A Shared Responsibility

Please refer to **Appendix A** for descriptions of the aforementioned sections.
Please refer to **Appendix B** for Baffinland Code of Business Conduct acknowledgement document.

5. References and Records

Human Resources
Code of Business Conduct Policy
BAF-PH1-700-POL-0023 r0

Brian Penney
President & CEO

APPENDIX A: Additional Areas Covered under Code of Business Conduct Policy

Corporate Boards of Directors

Before agreeing to sit on the Board of Directors of a business corporation, an employee must obtain the authorization from Baffinland Management. The purpose of this step is to ensure that there is no possible conflict of interest.

Political Activities

Employees who run for an elected office are required to inform the Human Resource Department or the General Counsel. Employees who wish to participate in activities of a political or public nature must do so in a personal capacity only and during non-working hours.

Corporate Opportunities

The directors, officers or employees, are prohibited from (a) taking personal opportunities that are not properly within the scope of the Company's activities, (b) using corporate property, information or position for personal gain, and (c) competing with the Company; unless otherwise authorized by the Board of Directors or the General Counsel.

Fair Dealing

Customer Relations

The Company's prosperity is founded on customer satisfaction. Baffinland expects us to preserve the quality of our customer relations by maintaining business relationships that are based on integrity, fairness and mutual respect. Only clear, concrete, pertinent and honest information is to be given to customers. We must be careful to avoid making any statement to a customer that could be misinterpreted. The Company does not tolerate the making of promises to customers which may be impossible to keep, including promises regarding product quality and characteristics, delivery times and prices.

Offering Gifts and Entertainment

The Company expects all personnel to refrain from offering gifts or granting favours outside the ordinary course of business to current or prospective customers, their employees or agents or any person with whom the Company has a contractual relationship or intends to negotiate any agreements.

Employees who are called upon to do so may incur reasonable expenses for the entertainment of current or prospective customers or other persons who deal with the Company, provided that such entertainment is in keeping with the person's position and is related to business discussions and that appropriate accounts are kept. Employees must record gifts in value excess of CAD $500.

Supplier Relationships

Subject in all cases to the provisions of the Inuit Impact and Benefit Agreement (IIBA) in place between Baffinland and the Qikiqtani Inuit Association, the following shall apply:

Suppliers of the Company are to be chosen in consideration of objective criteria, based on quality, reliability, price, utility and performance or service. Suppliers are to be treated justly, fairly and honestly. Fees and commissions are to be paid to consultants only in the course of ordinary business relations. Any fees must be substantiated by documentation demonstrating that the amount charged is representative of the value of services rendered.

Personal Information

Personal information, that is, information relating to an individual that allows that individual to be identified, is protected, among other things, by laws in most of the jurisdictions where Baffinland is conducting business. Baffinland fully supports the objectives of such legislation and applies rigorous measures to ensure compliance with its provisions. Any collection, retention, use or communication to third parties of personal information must be carried out in a manner that is respectful of the individual and in compliance with the law at all times. Personal information is to be used strictly for the performance of respective duties and may be disclosed to third parties only where such disclosure has been authorized by the individual concerned. Such information must be kept in a secure location. In case of doubt as to the handling of personal information, Baffinland personnel should consult the Human Resources or the Legal Department.

Protection and Proper Use of Company Assets

Accuracy of Records

The books, records, files and statements of Baffinland must accurately reflect the entirety of the Company's assets and liabilities, as well as all of its operations, transactions and any other items related to its business, without omission or concealment of any kind, in accordance with applicable standards and regulations.

All transactions must be authorized and carried out in accordance with the instructions of management. Transactions must be recorded in a manner that will allow accurate financial statements to be prepared and the utilization of assets to be accounted for.

Company sensitive data or information is not to be destroyed without the authorization of the respective supervisor. Such authorization will be granted only if it is in compliance with applicable laws and Company policy.

Company Property

The protection of the Company's property by each Baffinland personnel is a matter of integrity and honesty. All Baffinland personnel must use any property of the Company entrusted to them in an appropriate manner, ensure that it is secure, and prevent theft, damage and premature wear from occurring. Company property must be used exclusively for the business of the Company and must not to be used for personal purposes unless there is permission from their supervisor.

Baffinland encourages initiative, creativity and innovation on the part of its employees. Nevertheless, intangible property such as inventions, ideas, documents, software, patents and other forms of intellectual property related to the Company's business, created or conceived by employees in connection with the performance of their duties, belongs, on that basis, to the Company. Subject to any mandatory applicable law, Baffinland personnel may not derive profit

from, or apply for a patent in their personal name for, any creation or invention conceived or made by them in the course of performing our duties.

Software developed or acquired by the Company may not be reproduced or tampered with, nor may it be used for any purposes other than those intended by the Company. Software that is not owned or licensed by the Company is not to be used on the work premises or in the Company's business.

E-mail and the Internet

Baffinland owns the e-mail and internet systems used in the workplace and thus all personnel should use these systems for work-related communications. Although each Baffinland personnel has an individual password to access the e-mail and internet systems, the Company reserves the right, subject to applicable law, to access and monitor the use of these systems in appropriate circumstances.

Baffinland strictly prohibits the use of e-mail and internet systems for any improper or illegal purpose, including the transmission of messages that may be viewed as insulting or offensive to another person, such as messages, cartoons or jokes that could be construed as harassment of others on the basis of race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sexual orientation, gender identity, gender expression, age, record of offences, marital status, family status or disability.

Respecting the Baffinland Community

Work Environment Free of Harassment and Discrimination

Baffinland is committed to providing a work environment that is free of any form of sexual or other harassment, whether it be harassment by an employee or harassment by an employee of a customer or supplier or vice-versa.
Baffinland is committed to ensuring that each employee is treated with fairness and dignity; accordingly, any discriminatory practice based on race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sexual orientation, gender identity, gender expression, age, record of offences, marital status, family status or disability will not be tolerated. The Company seeks to provide its employees with equal opportunity for advancement without discrimination. However, distinguishing between individuals based on the aptitudes or qualifications required for a particular employment does not constitute discrimination.

An employee who believes he or she has been the victim of, or a witness to, a situation involving harassment or discrimination should report the incident to the employee’s Supervisor or reporting contact. If the worker’s supervisor or reporting contact is the person engaging in the workplace violence or harassment, or if the harassment activities persist, the complainant should report to the Vice President Sustainable Development & Human Resources. If the complainant does not feel it is possible to discuss the incident with Human Resources, he/she should contact the Baffinland’s General Counsel. All such reports will be treated in confidence. Incidents will be fully-investigated and those responsible will be disciplined accordingly.

Baffinland permits family members of existing employees to work for the Company, provided that they are evaluated and selected objectively and on the basis of the same criteria as other candidates and provided that their respective positions will not be potentially in conflict or collusion.

Occupational Health and Safety

Baffinland makes every effort to provide its employees with a healthy and safe work environment, to conduct regular inspections so as to eliminate any dangerous conditions or behavior and their causes, and to develop programs dedicated to our safety and well-being. All Baffinland personnel must abide by the Company's standards in safety matters, do their part to maintain a healthy and safe work environment and take the necessary steps to ensure their own safety and the safety of others.

Respect for the Environment

Respecting and protecting the environment is an important value to which Baffinland subscribes. Employees must comply at all times with the environmental legislation applicable to Baffinland, and they have an important role to play in implementing the guidelines issued by the Company in this regard.

A Shared Responsibility

Each director, officer, employees, contractor and representative is responsible for adhering to the values of Baffinland in their daily lives and for making every effort to ensure that their rules of conduct are respected by all. Conduct that is contrary to these rules is punishable by disciplinary action up to and including termination of employment, in compliance with all applicable laws and procedures.

APPENDIX B: Code of Business Conduct Policy Acknowledgement Document

I acknowledge receipt of "Baffinland Code of Business Conduct"; I confirm that I have read and understood this policy and that I will abide by its provisions in handling the business of the Company.

(Please print)

_____
Name

_____
Department

_____
Date and place

_____
Signature

Please complete this acknowledgement document and forward it to Baffinland Human Resources Department. This document will be placed in your employee file.

Appendix B
Predicted Impacts to the Freshwater Environment

Baffinland

TABLE B.1

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER AND AQUATIC ECOSYSTEMS MANAGEMENT PLAN
PREDICTED ADVERSE EFFECTS TO SURFACE WATER AND SEDIMENT QUALITY

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Pathway	Effect			Residual Effect Evaluation Criteria					Activity Occurred in Reporting Year	Monitoring Program	2020 Monitoring Result Compliance with Predictions	
	Code	Description	Nature of Effect	Magnitude / Complexity	Geographical Extent	Frequency	Duration	Reversibility			Magnitude / Complexity	Other Effect Evaluation Criteria
Aqueous Source Emissions	SWSQ-1	Ground preparation & earthworks	Water quality (pH, TSS, metals, nutrients and hydrocarbons)	Level II	Level I	Level I	Level II	Level I				
	SWSQ-2	Site Water Management	Water quality (pH, TSS, metals, nutrients and hydrocarbons)	Level II	Level I	Level I	Level I	Level II		SNP / MDMER		
	SWSQ-3	Laydown Areas	Water quality (pH, TSS, metals, nutrients and hydrocarbons)	Level II	Level I	Level I	Level I	Level I				
	SWSQ-4	Explosives	Water quality (pH, TSS, metals, nutrients and hydrocarbons)	Level II	Level I	Level I	Level II	Level I		SNP		
	SWSQ-5	Quarries and Borrow Areas	Water quality (pH, TSS, metals, nutrients and hydrocarbons)	Level II	Level I	Level I	Level I	Level I		Quarry / Borrow Specific / SNP		
	SWSQ-6	Tunnelling and Rock Cuts	Water quality (pH, TSS, metals, nutrients – ammonia, brine and hydrocarbons)	Level II	Level I	Level I	Level I	Level I		NCMP?		
	SWSQ-7	Camps and Fuel Management	Water quality (pH, TSS, metals, nutrients and hydrocarbons)	Negligible	Level I	Level II	Level II	Level II		SNP		
	SWSQ-8	Water Use and Management	Water quality (pH, TSS, metals, nutrients and hydrocarbons)	Negligible	Level I	Level III	Level II	Level I		SNP		
	SWSQ-9	Airstrips and Airstrip Use	TSS and Petroleum Hydrocarbons	Level II	Level I	Level I	Level III	Level I				
	SWSQ-10	West Waste Rock Stormwater Discharge to Camp Lake and Tributaries	Water quality (pH, TSS, metals, ammonia, nitrite)	Level II	Level I	Level II	Level III	Level II		SNP / MDMER		
	SWSQ-11	Waste Rock and Ore Stormwater Discharge to Mary River	Water quality (pH, TSS, metals, ammonia, nitrite)	Level I	Level I	Level II	Level II	Level II		SNP / MDMER		
	SWSQ-12	Exploration Drilling Runoff to Mary River	Water quality (pH, TSS, chlorides)	Level I	Level I	Level II	Level II	Level I				
	SWSQ-13	Pit Lake and Waste Rock Discharges to Mary River in Post-closure	Water quality (pH, TSS, metals)	Level I	Level I	Level II	Level III	Level II		SNP / MDMER		
	SWSQ-14	Exploration Camp WWTF Effluent Discharge to Sheardown Lake	Water quality (pH, TSS, BOD, nutrients, ammonia)	Negligible	Level I	Level II	Level II	Level I		SNP		
	SWSQ-15	Mine Site WWTF Effluent Discharge to Mary River	Water quality (pH, TSS, BOD, nutrients, ammonia)	Negligible	Level I	Level II	Level II	Level I		SNP		
Airborne Emissions	SWSQ-16:	Construction phase fugitive dust	Water quality (TSS) All LSAs	Level I	Level I	Level II	Level I	Level I		SNP		
	SWSQ-17: a	Increased TSS from Dust Deposition in Local Watercourses around the Mine Site	Water quality (TSS) in Mine Site LSA	Level I	Level I	Level II	Level II	Level II		SNP		
	SWSQ-17: b	Increased TSS from Dust Deposition in Local Watercourses around the Mine Site	Water quality (metals) in Mine Site LSA	Level I	Level I	Level II	Level II	Level II		MDMER		
	SWSQ-17: c	Increased TSS from Dust Deposition in Local Watercourses around the Mine Site	Sediment quality (metals) in Mine Site LSA	Level I	Level II	Level II	Level II	Level II		MDMER		
Aqueous Source Emissions	P2P-2	Construction phase erosion and sedimentation	Elevated TSS in local watercourses (site-wide)	Level I	Level I	Level I	Level I	Level I				
	P2P-3	Mine Effluent Discharges	Increased loading to the Mary River	Level I	Level I	Level II	Level II	Level I		SNP		
	P2P-8	Quarries	ARD/ML	Level I	Level I	Level I	Level III	Level II		Quarry / Borrow		
	P2P-9	Fuel Storage and Handling		Negligible	Level I	Level II	Level II	Level II		SNP		
	P2P-10	Camps and Sewage Treatment Plants		Negligible	Level I	Level III	Level II	Level I		SNP		
Airborne Emissions	P2P-1	Construction phase fugitive dust emissions	Elevated TSS in local watercourses (site-wide)	Level I	Level I	Level II	Level I	Level I				
	P2P-4	Operation phase dust deposition and sedimentation	Elevated TSS in Mine Site waterbodies	Level I	Level I	Level II	Level II	Level I		CREMP		
	P2P-5	Dust deposition	Increased sedimentation in Mine Site lakes	Level I	Level I	Level III	Level II	Level III		CREMP		
	P2P-6	Dust deposition	Increase in metal and sediment concentrations in Mine Site water	Level II	Level I	Level II	Level II	Level III		CREMP		
	P2P-7	Dust deposition	TSS increases in Phillips Creek	Level I	Level I	Level II	Level II	Level I		NCMP?		

I:\1\02\00181\60\A\Correspondence\NB20-00596 - Ph2 Surface Water and Aquatic Ecosystems - Rev D\Appendices\Appendix B - Impact Predictions\[Table B.1and B.2 - FEIS water quality impact tables.xlsm]Table B.1 WQ-SQ

NOTES:

1. SWSQ - SURFACE WATER AND SEDIMENT QUALITY EFFECTS ASSESSED IN FEIS AND RELATIVE TO CURRENT OPERATIONS; P2P - SURFACE WATER AND SEDIMENT QUALITY EFFECTS ASSESSED IN PHASE 2 PROPOSAL.
2. MAGNITUDE/COMPLEXITY RATINGS: NEGLIGIBLE - CONCENTRATIONS OF INDICATOR(S) PREDICTED TO BE LESS THAN THRESHOLD VALUE(S); LEVEL I - CONCENTRATIONS OF INDICATOR(S) PREDICTED TO BE ABOVE BUT WITHIN AN ORDER OF MAGNITUDE OF THRESHOLD VALUE(S) (1 TO 10X THE THRESHOLD); LEVEL II - CONCENTRATIONS OF INDICATORS PREDICTED TO BE EXCEED THRESHOLD VALUE(S) BY AN ORDER OF MAGNITUDE OR GREATER (10 TO 100X THE THRESHOLD); LEVEL III - CONCENTRATIONS OF INDICATORS PREDICTED TO BE EXCEED THRESHOLD VALUE(S) BY MORE THAN TWO ORDERS OF MAGNITUDE (GREATER THAN 100X THE THRESHOLD).
3. GEOGRAPHICAL EXTENT RATINGS: LEVEL I: CONFINED TOLSA; LEVEL II: BEYOND THE LSA AND WITHIN THE RSA.
4. FREQUENCY RATINGS: Level I: INFREQUENT / WILL RARELY OCCUR; LEVEL II: WILL OCCUR FREQUENTLY/INTERMITTENTLY; LEVEL III WILL OCCUR CONTINUOUSLY.
5. DURATION RATINGS: LEVEL I: WILL OCCUR FOR THE CONSTRUCTION PHASE; LEVEL II WILL OCCUR FOR THE OPERATION PHASE (LIFE OF THE PROJECT); LEVEL III LONG-TERM / PERMANENT.
6. REVERSIBILITY RATINGS: LEVEL I: EFFECT IS REVERSIBLE AFTER ACTIVITY IS COMPLETE; LEVEL II EFFECT IS PARTIALLY REVERSIBLE AFTER ACTIVITY IS COMPLETE / WATER TREATMENT IF REQUIRED OR EFFECT IS PARTIALLY REVERSIBLE WITH COST/EFFORT; LEVEL III EFFECT IS NOT REVERSIBLE.
7. MAGNITUDE NON-POINT SOURCE AQUEOUS EMISSIONS CONSERVATIVELY RATED AS LEVEL II MAGNITUDE FOR SWSQ EFFECTS DUE TO UNCERTAINTY IN EFFECTIVENESS OF MITIGATION MEASURES IN EXTREME CLIMATIC CONDITIONS. CONSERVATISM NOT CARRIED FORWARD IN P2P EFFECTS.
8. ALL RESIDUAL EFFECTS RATED AS NOT SIGNIFICANT.

Baffinland

TABLE B.2

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER AND AQUATIC ECOSYSTEMS MANAGEMENT PLAN
PREDICTED ADVERSE EFFECTS TO FRESHWATER BIOTA

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Pathway	Effect			Residual Effect Evaluation Criteria							2020 Monitoring Result Compliance		
	Code	Description	Nature of Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Activity Occurred in Reporting Year	Monitoring Program	Magnitude	Geographical Extent	Frequency
?	FWB-15	Effects on lower trophic level biota: Camp Lake Tributary 1	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level II	Level III	Level III	Level I	Level II					
	FWB-16	Effects on lower trophic level biota: Camp Lake Tributary 2	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level I	Level III	Level III	Level I	Level II					
	FWB-17	Effects on lower trophic level biota: Other Camp Lake Tributaries	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level I	Level II	Level III	Level I	Level II					
	FWB-18	Effects on Lower Trophic Level Biota: Camp Lake	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level II	Level III	Level III	Level I	Level II					
	FWB-22	Effects on lower trophic level biota: Sheardown Lake Tributaries 1, 9, and 12	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level I	Level III	Level III	Level I	Level II					
	FWB-23	Effects on lower trophic level biota: Other Sheardown Lake Tributaries	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level I	Level II	Level III	Level I	Level II					
	FWB-24	Effects on Lower Trophic Level Biota: Sheardown Lake	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level II	Level III	Level III	Level I	Level II					
	FWB-25	Effects on Lower Trophic Level Biota: Mary River	Negative effect on productive capacity of Arctic Char habitat in Mine LSA	Level I	Level III	Level III	Level I	Level II					
	FWB-29	Project Effects on Lower Trophic Level Biota	Change in Productive Capacity of Arctic Char Habitat in Railway Alignment LSA	Level I	Level II	Level III	Level I	Level II					
	FWB-33	Effects on lower trophic level biota	Change in Productive Capacity of Arctic Char Habitat in Steensby Port LSA	Level I	Level II	Level IIII	Level I	Level II					
Change in water and sediment quality	FWB-1	Effects of Non-Point Sources on Water Quality	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Milne Port LSA	Level I	Level II	Level I	Level I	Level II					
	FWB-2	Effects of Fugitive Dust on Water Quality During Construction	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Milne Port LSA	Level I	Level I	Level III	Level I	Level I					
	FWB-3	Effects of Non-Point Sources on Water Quality	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Milne Inlet Tote Road LSA	Level I	Level II	Level I	Level I	Level II					
	FWB-4	Effects of Fugitive Dust on Water Quality During Construction	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Milne Inlet Tote Road LSA	Level I	Level I	Level III	Level I	Level I		SNP / Ambient AQMP			
	FWB-5	Ore and Waste Rock Dust Generation and Dispersion: water quality changes	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Mine LSA	Level I	Level II	Level II	Level I	Level II					
	FWB-6	Ore and Waste Rock Dust Generation and Dispersion: sediment quality changes	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Mine LSA	Level II	Level III	Level III	Level I	Level II					
	FWB-7	Discharge of West Waste Rock Stockpile Runoff to Camp Lake Tributary 1	Negative Effect on Water Quality (TSS, metals, nutrients, and Petroleum Hydrocarbons) in and Arctic Char health and condition in Camp Lake Tributary 1 and Camp Lake in Mine LSA	Level II	Level III	Level III	Level I	Level II					
	FWB-8	Discharge of East Waste Rock, Ore Stockpile Runoff and Pit Water/Run of Mine Stockpile to the Mary River	Negative Effect on Water Quality (TSS, metals, nutrients, and Petroleum Hydrocarbons) and Arctic Char health and condition in the Mary River in Mine LSA	Level I	Level III	Level III	Level I	Level II					
	FWB-9	Exploration drilling Release to the Mary River	Negative Effect on Water Quality (TSS, metals, nutrients, and Petroleum Hydrocarbons) and Arctic Char health and condition in the Mary River in Mine LSA	Level I	Level II	Level II	Level I	Level I					
	FWB-10	Aqueous Non-Point Sources	Negative Effect on Water Quality (TSS, metals, nitrogenous compounds and Petroleum Hydrocarbons) and Arctic Char health and condition throughout the LSA in Mine LSA	Level I	Level II	Level I	Level I	Level II					
	FWB-26	Non-Point Sources due to Various Construction and Operation Activities	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Railway Alignment LSA	Level I	Level II	Level I	Level I	Level II					
	FWB-27	Effects of Fugitive Dust on Water Quality During Construction	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Railway Alignment LSA	Level I	Level I	Level III	Level I	Level I					
	FWB-30	Non-Point Sources due to Various Construction, Operation, and Closure Activities	Negative Effect on Water Quality (TSS, metals, nutrients, and Petroleum Hydrocarbons) and Arctic Char health and condition throughout the LSA in Steensby Port LSA	Level I	Level II	Level I	Level I	Level II					
	FWB-31	Effects of Fugitive Dust on Water Quality During Construction	Negative Effect on Water and Sediment Quality and Arctic Char health and condition in Steensby Port LSA	Level I	Level I	Level III	Level I	Level I					

Baffinland

TABLE B.2

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER AND AQUATIC ECOSYSTEMS MANAGEMENT PLAN
PREDICTED ADVERSE EFFECTS TO FRESHWATER BIOTA

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Pathway	Effect			Residual Effect Evaluation Criteria							2020 Monitoring Result Compliance		
	Code	Description	Nature of Effect	Magnitude	Duration	Frequency	Extent	Reversibility	Activity Occurred in Reporting Year	Monitoring Program	Magnitude	Geographical Extent	Frequency
Change in sediment quantity	**FWB-11**	Sedimentation of habitat	Alteration in Arctic Char spawning habitat in Mine LSA	Level I	Level II	Level III	Level I	Level I		CREMP			
Change in water quantity	**FWB-13**	Water diversion: Camp Lake Tributary 1	Change in wetted area of Arctic Char habitat in Mine LSA	Level I	Level III	Level III	Level I	Level II					
	FWB-14	Water diversion: Camp Lake Tributary 2	Change in wetted area of Arctic Char habitat in Mine LSA	Level I	Level III	Level III	Level I	Level II					
	FWB-19	Water diversion: Sheardown Lake Tributary 1	Change in wetted area of Arctic Char habitat in Mine LSA	Level I	Level III	Level III	Level I	Level II					
	FWB-20	Water diversion: Sheardown Lake Tributary 9	Change in wetted area of Arctic Char habitat in Mine LSA	Level I	Level II	Level III	Level I	Level I					
	FWB-21	Water diversion: Sheardown Lake Tributary 12	Change in wetted area of Arctic Char habitat in Mine LSA	Level I	Level II	Level III	Level I	Level I					
	FWB-32	Water diversions	Loss of Arctic Char Habitat in Steensby Port LSA	Level I	Level II	Level IIII	Level I	Level I					
	PSP-3	Water withdrawals for dust suppression	Change in wetted area of Arctic Char habitat	Level I	Level II	Level I	Level I	Level I					
Project footprint	**FWB-12**	Project footprints in Arctic Char habitat	Direct loss of Arctic Char habitat in Mine LSA	Level I	Level II	Level III	Level I	Level I					
	FWB-28	Project Footprints in Waterbodies	Direct Habitat Loss (footprints) in Railway Alignment LSA	Level I	Level II	Level III	Level I	Level I					
	PSP-1	Project footprints in Arctic Char habitat - culverts, bridges, and lake/pond encroachments/infill	Direct loss/alteration of Arctic Char habitat in North Railway and Tote Road footprint	Level I	Level II	Level III	Level I	Level II					
	PSP-2	Project footprints in Arctic Char habitat - stream diversions	Direct loss/alteration of Arctic Char habitat in North Railway and Tote Road footprint	Level I	Level III	Level III	Level I	Level III					

I:\1\02\00181\60\A\Correspondence\NB20-00596 - Ph2 Surface Water and Aquatic Ecosystems - Rev D\Appendices\Appendix B - Impact Predictions\[Table B.1and B.2 - FEIS water quality impact tables.xlsm]Table B.2 Freshwater Biota

NOTES:

1. FWB - FEIS EFFECTS ASSESSMENT; PSP - EFFECTS ASSESSED IN PHASE 2 PROPOSAL.
2. MAGNITUDE RATINGS ARCTIC CHAR HABITAT - REDUCTION IN PRODUCTIVE CAPACITY : NEGLIGIBLE - <1 % ; LEVEL I - 1-10 % ; LEVEL II - 10-20 % R; LEVEL III - >20 % .
3. MAGNITUDE RATINGS DIRECT MORTALITY OF ARCTIC CHAR: NEGLIGIBLE - SEDIMENTATION RATE < 1 MM/YEAR; LEVEL III - SEDIMENTATION RATE > 1 MM/YEAR.
4. GEOGRAPHICAL EXTENT RATINGS: LEVEL I - CONFINED TO THE LSA; LEVEL II - BEYOND THE LSA AND WITHIN THE RSA; LEVEL III - BEYOND THE RSA.
5. FREQUENCY RATINGS: LEVEL I - INFREQUENT; LEVEL II - INTERMITTENT; LEVEL III - FREQUENT OR CONTINUOUS.
6. DURATION RATINGS: LEVEL I - SHORT TERM (EFFECT LASTS UP TO FOUR YEARS); LEVEL II - SHORT TERM (EFFECT LASTS UP TO FOUR YEARS); LEVEL III - LONG TERM (BEYOND THE LIFE OF THE PROJECT) OR PERMANENT.
7. REVERSIBILITY RATINGS: LEVEL I - FULLY REVERSIBLE; LEVEL II - REVERSIBLE WITH COST/EFFORT; LEVEL III - IRREVERSIBLE.
8. ALL RESIDUAL EFFECTS RATED AS NOT SIGNIFICANT.

Appendix C
Site Drainage and Monitoring Figures

SAVED: I:\1\02\00181\53\A\Acad\FIGS\B18 R1, 9/8/2021 4:07:33 PM , ASIMPSON PRINTED: 9/8/2021 4:08:03 PM, Layout1, ASIMPSON
XREF FILE(S): X-B-SI~~-MONI-LOCA-2019; X-N-TOPO-BASE-LAND-USE~~CLAS; C-PH02-YR21-MILNE-PORT; X-C-TOPO-MILN-INDEX IMAGE FILE(S):

502 500 E
503 000 E
503 500 E
504 000 E
504 500 E
7 977 000 N
7 976 500 N
7 976 000 N
7 975 500 N
7 975 000 N

MILNE INLET
PHILLIPS CREEK

SHIPLOADER NO. 2
CAPE-SIZE ORE DOCK NO. 2
ORE DOCK NO. 1
SHIPLOADER NO. 1
FREIGHT DOCK
BARGE RAMP
MARINE FUEL MANIFOLD BUILDING
SEWAGE EFFLUENT PIPE DISCHARGE
HTO CABIN
STORMWATER POND NO. 2
STORMWATER POND NO. 2A
STORMWATER POND NO. 1A
STORMWATER POND NO. 1
MP-C-A
MP-06
MP-05
MP-C-D
MP-C-E
MP-C-F
MP-C-H
MP-03
FUEL TANK FARM
MP-HWB-
MP-02
SERVICE AREA
TREATED SEWAGE EFFLUENT PIPELINE
STORMWATER POND #3
NEW CONVEYOR BERM
PWSP-No. 1
MP-01A
MP-HWB-3
MP-HWB-4
MP-HWB-2
MP-01
PORT SITE COMPLEX
PSC EXPANSION
LAYDOWN LP-2
MP-07
MP-C-B
FINE ORE STOCKPILES
PORT SITE WEATHERHAVEN CAMP
EASTERN CLEARWATER POND
LUMP ORE STOCKPILES
LAND FARM
SNOW DUMP
MP-04
MP-04A
QUARRY Q1 EXTENTS
MP-C-K
MP-10B
MP-10A
MAINT. BUILDING
SPOILS DISPOSAL LOCATION 1
SUMMER WATER SUPPLY FROM PHILLIPS CREEK
MP-MRY-2
380 PERSON CAMP
LAYDOWN W10A AND W10B
SOUTHERN BYPASS
STORMWATER POND #4
ROTARY CAR DUMPER
RAILYARD AND WORKSHOP
MP-11
CRUSHING AND SCREENING PLANT
CRUSHING FEED STOCKPILE
MP-08
ORE TRANSFER TOWER
TRANSFER CONVEYOR
FINES STOCKPILE AREA
LAYDOWN LP-7
MP-12
MP-C-J
MP-09
STORMWATER POND #5
MP-C-F
FUEL CONTAINMENT BERM
MP-03
FUEL TANK FARM
MP-HWB-1
HAZARDOUS WASTE BERM
MAINTENANCE BUILDING
MP-02
MAINTENANCE BUILDING
LANDFILL
TOTE ROAD (OLD ALIGNMENT)
TREATED SEWAGE EFFLUENT PIPELINE
SPOILS DISPOSAL LOCATION 2
POLISHING WASTE STABILIZATION POND
MP-01A
PWSP-No. 1
ACCOMMODATION COMPLEX
WASTE MANAGEMENT BUILDING
MP-HWB-2
MP-01
SEWAGE TREATMENT FACILITY

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED MILNE PORT INFRASTRUCTURE PROVIDED BY HATCH MAY 25, 2018.
4. CONTOUR INTERVAL IS 2.5 m.

LEGEND:

- WATER
- SPOILS DISPOSAL LOCATION
- INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
- WASTE STORAGE AREA
- ROAD
- REGULATED SURVEILLANCE NETWORK PROGRAM (SNP) STATION
- VERIFICATION SNP STATION
- COMMERCIAL LEASE BOUNDARY
- PROJECT DEVELOPMENT AREA (PDA)
- PDA EXPANSION FOR PHASE 2 PROPOSAL
- FORESHORE LEASE BOUNDARY / MARINE PDA
- RIVER/STREAM/DRAINAGE
- TREATED SEWAGE EFFLUENT PIPELINE

SCALE A: 100 50 0 100 200 300 400 500 m

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BAFFINLAND IRON MINES CORPORATION

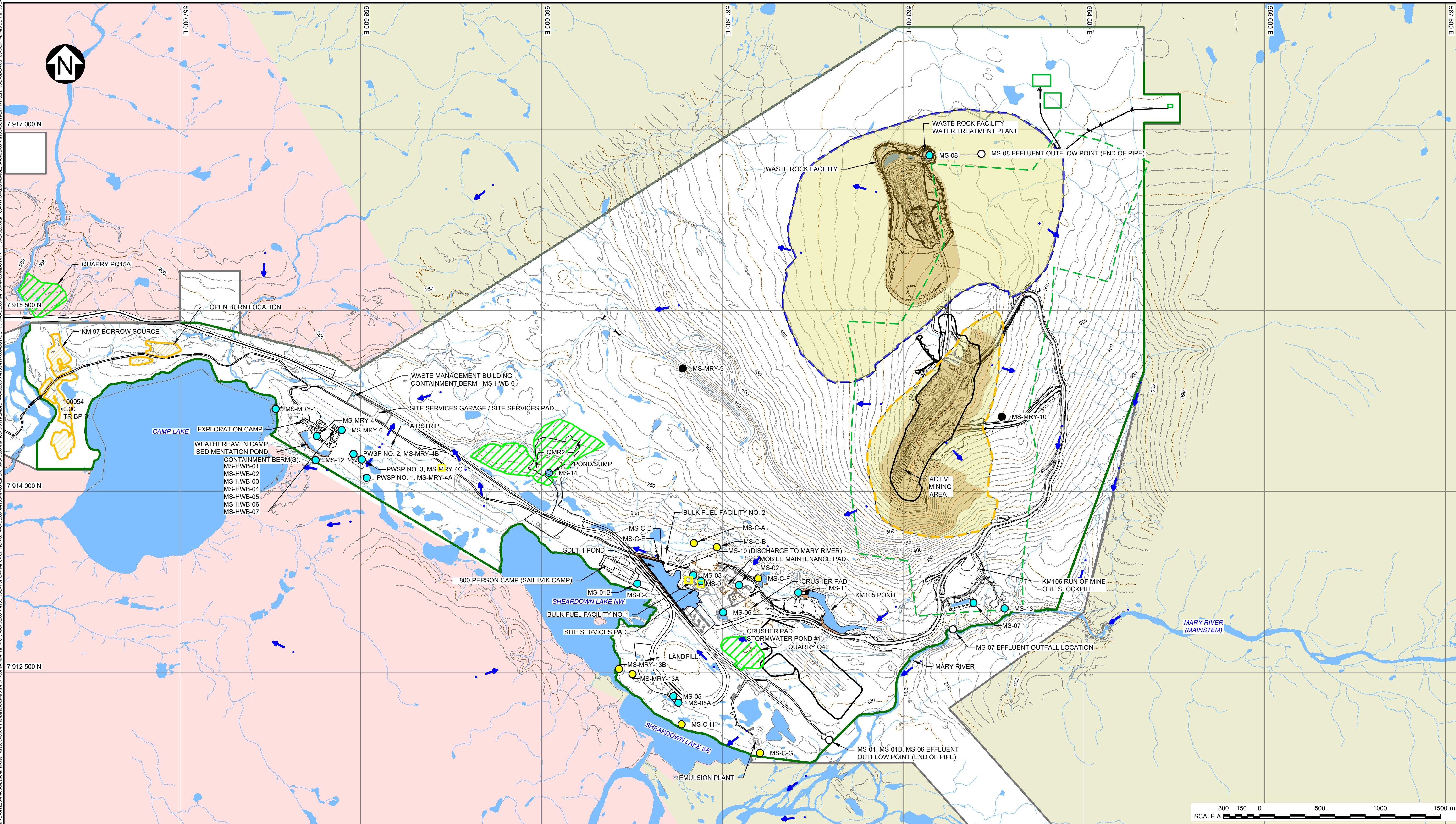
MARY RIVER PROJECT

PHASE 2 PROPOSAL MILNE PORT LAYOUT SHOWING WATER LICENCE MONITORING STATIONS

Knight Piésold CONSULTING

P/A NO. NB102-181/53 | REF NO. 3

FIGURE 6.1 | REV 1



LEGEND:

- EXISTING BORROW AREA
- QUARRY
- INUIT OWNED LAND SURFACE AND SUBSURFACE
- INUIT OWNED LAND SURFACE ONLY
- WATER
- QIA SURFACE COMMERCIAL LEASE BOUNDARY
- POTENTIAL DEVELOPMENT AREA BOUNDARY
- ULTIMATE DEPOSIT NO. 1 PIT LIMITS
- ULTIMATE WASTE ROCK STOCKPILE LIMITS
- CONTOUR
- REGULATED SURVEILLANCE NETWORK PROGRAM (SNP) STATION
- VERIFICATION SNP STATION
- INACTIVE SNP STATION
- EFFLUENT OUTFLOW POINT (END OF PIPE)
- DRAINAGE DIRECTION

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. DETAILED WATER FROM EAGLE MAPPING (2005). CONTOUR PROVIDED BY BAFFINLAND (2019) INTERVAL IS 10 m.
3. CURRENT MINE AREA FROM THE WASTE DUMP TO THE CRUSHER PAD, AND DITCHES ALONG THE HAUL ROAD PROVIDED BY BIM (MARCH 12, 2018).
4. ALL OTHER SITE INFRASTRUCTURE PROVIDED BY HATCH (AUGUST 2, 2016). AND SIMPLIFIED BY KP STAFF (JAN, 2018).

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	07SEP'21	ISSUED WITH REPORT	RAC	AS	SRA

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

PHASE 2 PROPOSAL
MINE SITE LAYOUT SHOWING
WATER LICENCE MONITORING STATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/53	3

FIGURE 6.2 REV 1

SAVED: I:\102\00181\53\A\Acad\FIGS\B19 R1, 9/8/2021 4:01:34 PM, FIG 6.2, ASIMPSON PRINTED: 9/8/2021 4:01:08 PM, ASIMPSON ACAD VERSION: 24.1S (LMS TECH)