



The **BACK RIVER**
PROJECT

**FINAL ENVIRONMENTAL IMPACT STATEMENT
ADDENDUM**



February 2017

Submitted to:
Nunavut Impact Review Board
PO Box 1360
Cambridge Bay, NU X0B 0C0

BACK RIVER PROJECT

FEIS ADDENDUM

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VOLUME ADDENDA SUMMARY

INTRODUCTION

This FEIS Addendum is being provided to the NIRB, in response to the direction received on January 23, 2017, to provide new and updated information on the topic of the Marine Environment, as identified within the NIRB Hearing Decision Report (June 15, 2016) and the Ministers' Referral Letter (January 12, 2017).

For convenient reference, this FEIS Addendum follows the original FEIS heading and numbering scheme. In the interest of brevity, the volume and chapter numbers of the FEIS Addenda headers in the Table of Contents have been combined. For example, Section 6.4 in the FEIS Addendum Table of Contents corresponds to Volume 6, Chapter 4 Freshwater Water Quality in the FEIS. Where there is no new or updated information provided in the FEIS Addendum, the corresponding section number is omitted. For example, Section 6.2 and 6.3 are omitted from the FEIS Addendum Table of Contents for this reason. Wherever the original FEIS information is referenced, FEIS is used at the start of the reference (FEIS Volume 10 Chapter 19). Wherever the FEIS Addendum information supersedes the FEIS information, FEIS Addendum is used at the start of the reference (FEIS Addendum Volume 10, Chapter 21).

During development of the FEIS, the following marine components were selected as VECs: marine water quality, marine sediment quality, marine fish/aquatic habitat, marine fish communities, seabirds/seaducks, and ringed seals. Marine physical processes were considered Subjects of Note and all required information noted in the EIS guidelines is included in Volume 7. Additional information on the commercial shipping route, key migratory bird nesting areas, and marine mammals is included in the seabird/seaducks and ringed seals (marine mammals) chapters. A marine diesel fuel spill model was also developed for the Project and can be found in Volume 9 of the FEIS.

Potential effects on VECs were evaluated spatially within a Local Study Area (LSA) and a larger Regional Study Area (RSA). The marine LSA covered 32 km² and included the water portion of the Potential Development Area (PDA) for the Marine Laydown Area (MLA), as well as the over-water portion of the winter road across Bathurst Inlet (~14 km) to the Nunavut mainland. The marine RSA covered 3,000 km² and included the marine LSA plus all of Bathurst Inlet as far north as Omingmaktok. All potential Project effects were assessed during the Construction, Operations, Reclamation and Closure, and Post-closure Project phases. Specific legislation that was considered during the assessment included the *Fisheries Act*, the *Species at Risk Act* (SARA), the *Migratory Birds Convention Act*, and the *Nunavut Wildlife Act*. Canadian Council of Ministers of the Environment (CCME) water and sediment quality guidelines for the protection of marine and estuarine life were used in the water and sediment quality assessments.

CONFORMITY TO EIS GUIDELINES

Sabina has reviewed the EIS Guidelines (Section 8.1.13) in respect of the new information provided on the topic of the Marine Environment, and provided an updated Table of Conformity in FEIS Addendum Appendix V1-1A. This Table replaces the FEIS Table V1-1A.

MARINE PHYSICAL PROCESSES (FEIS VOLUME 7, CHAPTER 1)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No additional information is presented.

MARINE WATER QUALITY (FEIS VOLUME 7, CHAPTER 2)

In the Final Hearing Report, the NIRB concluded that there is uncertainty in relation to the effects predicted for the proposed saline water discharge at the MLA. Sabina has prepared new or updated information to address Section 4.13 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.13 under FHR-NIRB-4.13(A) - Saline Water Discharge from Desalination Plant at the MLA. More specifically, Sabina has provided additional clarity within the Environmental Management Plan - Marine Monitoring Program Supplemental Information (FEIS Addendum Appendix V7-2B).

The updated information provides details on our proposed monitoring within the marine environment including a map of marine sampling location, type of sample, purpose, and frequency. The information was originally presented within the Aquatic Effects Monitoring Plan (AEMP) (FEIS Volume 10, Chapter 19) but was subsequently removed from the AEMP, updated, and will be added to the Environmental Management Plan (FEIS Volume 10, Chapter 2) in the next revision of that Plan. This information adds to FEIS Volume 7, Section 2.9 to replace any reference to the AEMP.

The NIRB identified concerns with the adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment. Sabina has provided additional clarity to address Section 4.13 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.13 under FHR-NIRB-4.13(A).

None of the additional information presented in the FEIS Addendum affects the conclusions presented in the FEIS Marine Environment Volume including existing environment and baseline information, spatial and temporal boundaries, Project related effect assessments, cumulative effects, transboundary, and mitigation and adaptive management.

MARINE SEDIMENT QUALITY (FEIS VOLUME 7, CHAPTER 3)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

MARINE FISH/AQUATIC HABITAT (FEIS VOLUME 7, CHAPTER 4)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

MARINE FISH COMMUNITY (FEIS VOLUME 7, CHAPTER 5)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

SEABIRDS/SEADUCKS (FEIS VOLUME 7, CHAPTER 6)

No areas of concern noted within the Final Hearing Report or the Ministers' Referral Letter. No new or updated information or clarification is presented.

RINGED SEALS (FEIS VOLUME 7, CHAPTER 7)

Sabina agrees with the NIRB that the Project's potential effects to marine wildlife can be appropriately managed through the commitments provided and application of key mitigation measures. Sabina has prepared new or updated information to further clarify Section 4.14 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.14 - Marine Wildlife. More specifically, Sabina has further clarified our monitoring and mitigation measures associated with ringed seals.

None of the additional information presented in the FEIS Addendum affects the conclusions presented in the FEIS Marine Environment Volume including existing environment and baseline information, spatial

and temporal boundaries, Project related effect assessments, cumulative effects, transboundary, and mitigation and adaptive management.

OTHER TOPIC-RELEVANT INFORMATION IN FEIS ADDENDUM

The NIRB identified concerns with the adequacy of emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet for the Project. Sabina has prepared new or updated information to address Section 4.13 of the Final Hearing Report. This information can be found in response FHR-NIRB-4.13 under FHR-NIRB-4.13(B) - Adequacy of Emergency Preparedness, Shipping Response Capacity. More specifically, Sabina has provided a response to this concern in response FHR-NIRB-6.2 - Accidents and Malfunctions Assessment.

APPENDICES (FEIS VOLUME 7)

FEIS Appendix	Title	Summary of Change
Appendix V7-1A	Back River Project: 2012 Marine Baseline Report	No changes
Appendix V7-2A	Back River Project: 2013 Marine Baseline Report	No changes
Addendum Appendix V7-2B	Marine Monitoring Supplemental Information	New
Appendix V7-4A	Back River Project: 2012 Marine Fish and Fish Habitat Baseline Report	No changes
Appendix V7-4B	Back River Project: 2013 Marine Fish and Fish Habitat Baseline Report	No changes
Appendix V7-6A	Shipping Sensitivity Report	No changes

7.4 MARINE FISH/AQUATIC HABITAT (ADDENDA)

NIRB Section:	Section 4.13 - Marine Environment	Ref No.:	FHR-NIRB-4.13
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Reference to NIRB Report:
Section 4.13 - Marine Environment

Conclusions and Recommendations of the Board (Section 4.13.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board has concluded that there is considerable uncertainty in relation to the effects predicted for the proposed saline water discharge at the Marine Laydown Area **[FHR-NIRB-4.13(A)]** and the adequacy of emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet for the Project **[FHR-NIRB-4.13(B)]**. Given the Board's need to ensure adequate protection of the pristine marine environment in Bathurst Inlet, the Board has outstanding concerns for the adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment **[FHR-NIRB-4.13(A, B)]**.

Issues Highlighted within the Ministers' Referral Letter:

On the issue of the marine environment, the Board's conclusion was that it saw "considerable uncertainty" in the effects predicted for the proposed saline water discharge and emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet. Having reviewed the Board's recitation of the evidence, and the Board's views and conclusions, it is not clear why this uncertainty remains.

While we would have expected that the information before the Board on effects predictions and emergency preparedness would meet the appropriate standard for impact assessment, the Board appears to have concluded otherwise. However, at this stage, we do not have enough of an understanding of the Board's concern to come to our own conclusions.

This issue thus requires further review to make sure the Board's concerns are well understood by the parties and that, most importantly, they are given the opportunity to try to address them. By this approach, it seems reasonable to believe that the remaining uncertainty could be resolvable, and this process may bring with it the ability to make refined impact predictions and to develop additional mitigations if necessary.

Sabina Response:

The Board has stated that they have uncertainty in relation to the effects predicted, and the adequacy of proposed mitigation, management, and regulatory oversight for the proposed saline water discharge at the Marine Laydown Area (MLA).

For the NIRB's consideration, Sabina has provided additional clarity with regards to the proposed saline water discharge at the MLA, and is providing supplemental information marine monitoring for the Project (FEIS Addendum Appendix V7-2B). Sabina also confirmed that the four federal departments who have interaction with or oversight of the facility and marine discharge (INAC, ECCC, DFO, and TC) have no concerns with the potential for effects on the marine environment.

The NIRB identified concerns regarding emergency preparedness, fuel shipping response capacity into Bathurst Inlet, and regulatory oversight for proposed Project marine activities, Sabina has provided a response to this concern in FEIS Addendum Volume 9, Section 6.2 (FHR-NIRB-6.2 (A)).

The Board also remains concerned that efforts would be necessary to ensure shipping operations do not, and are not seen to adversely affect the marine environment or marine wildlife through the life of the Project. In recognition of NIRB's concern, Sabina has provided supplemental information regarding

marine wildlife and its marine mammal observation program in FEIS Addendum Volume 5, Section 4.14 (FHR-NIRB-4.14(A)).

For the NIRB’s convenience, a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by ECCC and agreed to by Sabina that are relevant to the topic of saline water discharge in the marine environment are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	ECCC-T-1	The Proponent shall design and implement a marine monitoring program at the Marine Laydown Area to identify potential impacts of the project on the marine environment and inform adaptive management actions. <i>Commentary: The monitoring program shall be in line with the proposed monitoring in the Aquatic Effects Monitoring Plan presented in the FEIS Vol. 10 Chapter 19.</i>	ECCC, INAC

FHR-NIRB-4.13(A) - MLA Saline Water Discharge and Regulatory Oversight

The Board has stated that they have uncertainty in relation to the effects predicted, and the adequacy of proposed mitigation, management, and regulatory oversight for the proposed saline water discharge at the MLA.

Sabina would like to provide additional clarity with regards to the proposed saline water discharge at the MLA. The desalination plant will pull seawater from Bathurst Inlet, and will produce a concentrated seawater discharge as a by-product of producing potable water. None of the concentrated seawater discharge will come into contact with any mining facilities and the discharge will remain isolated. No additives are used in this process. The concentrated sea water will be mixed with sea water to ensure the saline water remains within 10% of the natural variation of salinity. The only change to the seawater before it is returned to the ocean is that it will have a slightly higher concentration of salt.

Sabina would like to highlight that this discharge is of a very different nature than what was recently permitted at TMAC’s Doris North Project, which will direct compliant discharge to Robert’s Bay from the Tailings Impoundment Area and saline groundwater from mining. The discharge volume at the Back River Project is much lower than the anticipated volume at the Doris North Project. Sabina would like to reiterate that, as stated in the FEIS, there will be no direct discharge of treated sewage effluent, contact water or camp greywater to the marine environment (FEIS Volume 2, Chapter 4, Section 4.3.6.1).

Sabina provided detailed information on the planned desalination plant discharge and the related potential effects assessment on the marine environment. As stated in FEIS Volume 7, Chapter 2, Section 2.5.3.6, no residual effects are anticipated:

Discharge of brine water from the desalination plant will meet the CCME salinity guideline for the protection of marine life and will not cause the salinity of the receiving environment to fluctuate by more than 10% of the natural expected salinity (CCME 2015).

The desalination plant is designed with an intake flow rate of 33 m³/h and a discharge rate of 30 m³/h. Assuming the fresh water plant product has a salinity of 0, the discharge from the plant is predicted to be 10% more saline, and therefore within the CCME salinity guideline at the point of discharge. The discharged effluent is expected to mix in the receiving environment, and is not expected to be detectable beyond the outfall. Hence no effects from the concentration of

naturally present metals in the seawater influent are expected. Baseline metal concentrations are generally low but some seasonal variation has been observed in the baseline monitoring program (FEIS Volume 7, Chapter 2, Section 2.1.5.5). A 10% increase in natural metal concentrations in the desalination effluent is not expected to be detectable in the marine receiving environment once natural variation and mixing are considered. No treatment or process chemicals, such will be added at the effluent stream returning to the marine environment, and therefore no effects from those chemicals are predicted.

It is anticipated there will be no residual effects from the desalination and greywater discharges on the VEC marine water quality due to the application of the mitigation by Project design and management measures.

During the FEIS Final Hearing, Sabina and ECCC jointly submitted the following term and condition (ECCC-T-1):

The Proponent shall design and implement a marine monitoring program at the Marine Laydown Area to identify potential impacts of the project on the marine environment and inform adaptive management actions.

For the NIRB's consideration, Sabina is proposing the monitoring of intake water, discharge effluent, and the receiving environment for the Project during Construction, Operations, and Closure in MLA; this information is provided in the attached Marine Monitoring Supplemental Information (FEIS Addendum Appendix V7-2B), which will be incorporated into the next version of the Environmental Management Plan (FEIS Volume 10, Chapter 1). Sabina would like to emphasize that if the proposed monitoring results are materially different than anticipated, adaptive management will be implemented (e.g., storage of water, treatment of water).

During the FEIS Final Hearing, it was confirmed that four federal departments have interaction or oversight with marine discharge: INAC, ECCC, DFO, and TC.

- INAC administers the *Arctic Waters Pollution Prevention Act* and its regulations as well as the *Territorial Lands Act* and its regulations, which both include significant enforcement provisions. The *Arctic Waters Pollution Prevention Regulations* prohibit the deposit of "waste" into Arctic waters unless otherwise authorized under the *Territorial Lands Act*. Sabina is required under the *Territorial Lands Act* and its regulations to obtain an instrument before constructing the MLA, and INAC confirmed during the FEIS Final Hearing that it will include marine discharge criteria within its instrument, developed as follows:

*"Yesterday, during the Fisheries and Oceans presentation, the Nunavut Impact Review Board enquired about the regulation of the outfall from the desalination plant at the marine laydown area. At this time, I would like to advise the Board that the deposition of material into Arctic waters will be addressed through an authorization issued by the department under the same instrument that allows the installation of the outfall. We will work with experts at Environment and Climate Change Canada to determine appropriate water quality parameters that will be appropriated into the authorization."*²⁶

- ECCC administers section 36 of the *Fisheries Act* which prohibits the deposit of deleterious substances into fisheries waters, as well as the *Metal Mining Effluent Regulations*. There are numerous enforcement provisions in the *Fisheries Act*, which (among other items) provide for fines of up to \$500,000 per day (during periods where discharges are ongoing). As confirmed during the

²⁶ K. Costello, INAC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 554, Lines 18 to 26; Pg. 555, Lines 1 to 3

FEIS Final Hearing and acknowledged in the FEIS Final Hearing Report, ECCC has no concerns with respect to the assessment work completed by Sabina, the proposed discharge plan, or potential impact of the discharge on fish²⁷. ECCC also provided the Canadian Council of Ministers of the Environment (CCME) salinity guidelines to the Board for review during the FEIS Final Hearing, which details the scientific basis of the salinity guideline and supports the assessment that the effluent from the proposed MLA desalination plant is not expected to have effects on fish and other aquatic life in Bathurst Inlet.

- Sabina will also be required by DFO to comply with the *Fisheries Act* requirements respecting protection of fish habitat in regards to construction and operation of the outfall.
- Sabina will also be required to comply with the *Navigation Protection Act* in respect of the marine outfall, which is administered by Transport Canada. This will ensure the outfall will not interfere with marine navigation.

The regulatory authorities with oversight over the facility and discharge have all confirmed that they have no concerns with the potential for effects on the marine environment.

The NIRB stated that it was uncertain in relation to the effects predicted for the proposed saline water discharge at the MLA. For the NIRB's consideration, Sabina has provided additional clarity with regards to the proposed saline water discharge at the MLA, and is providing marine monitoring supplemental information for the Project (FEIS Addendum Appendix V7-2B).

Attachment:

FEIS Addendum Appendix V7-2B. Marine Monitoring Supplemental Information.

FHR-NIRB-4.13(B) - Emergency Preparedness, Spill Response Capacity and Regulatory Oversight

The NIRB identified concerns with the adequacy of emergency preparedness and response capacity for shipping of bulk fuel into Bathurst Inlet for the Project. The NIRB has also expressed concerns with regards to adequacy of proposed mitigation, management, and regulatory oversight for the proposed Project activities in and near the marine environment.

In recognition of NIRB's above concerns, Sabina has provided a response to this concern in FEIS Addendum Volume 9, Section 6.2 (FHR-NIRB-6.2 (A)).

Attachment:

Not applicable

²⁷ A. Wilson, ECCC, NIRB Final Hearing File No. 12MN036 Transcript, Pg. 497, Lines 4 to 20

7.5 MARINE FISH COMMUNITY (ADDENDA)

NIRB Section:	Section 4.14 - Marine Wildlife	Ref No.:	FHR-NIRB-4.14
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Reference to NIRB Report:
Section 4.14 - Marine Wildlife

Conclusions and Recommendations of the Board (Section 4.14.4):

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to marine wildlife could be appropriately managed through the commitments provided by the Proponent and application of key mitigation measures associated with monitoring prior to construction of the winter ice road and airstrip on Bathurst Inlet, and ensuring that shipping companies employ sufficient ship-based wildlife monitoring during annual resupply.

Issues Highlighted within the Ministers' Referral Letter:

None identified

Sabina Response:

Sabina agrees with the NIRB that the Project's potential effects to marine wildlife could be appropriately managed through the commitments provided and application of key mitigation measures associated with monitoring prior to construction of the winter ice road and airstrip on Bathurst Inlet, and ensuring that shipping companies employ sufficient ship-based wildlife monitoring during annual resupply.

For the NIRB's convenience a listing of the terms and conditions and commitments that were recommended during the FEIS Final Hearing by the DFO and agreed to by Sabina that are relevant to the topic of marine wildlife are listed in the table below.

Recommended Terms & Conditions and Commitments:

Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	DFO-T-5	The Proponent commits to developing and implementing a pre-construction monitoring plan for seal lairs to ensure potential lair locations are not impacted by the ice road or airstrip construction. If construction is scheduled during the seal pupping period, then the identified potential lair locations - such as ice ridges or large snow drifts, will be avoided and monitoring for ringed seal presence will be triggered prior to construction. The Proponent will update the text in the WMMP Plan (Section 7.2.8.3) to include working with Fisheries and Oceans Canada and interested parties to determine the most appropriate methodology should construction be proposed during the seal pupping period and structures that may support lairs (ice ridges and snow banks) be unavoidable. Prior to construction of the project, a detailed Standard Operating Procedure (SOP) will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.	DFO

(continued)

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Type	Identifier	Suggested text from Final Hearing	Anticipated Party Involvement
Term and Condition	DFO-T-6	The Proponent commits to produce a simplified SOP and ensure that Marine mammal surveys are conducted following the basic methods provided in the protocol outlined in Recommended Seabird and Marine Mammal Observational Protocols for Atlantic Canada (Moulton & Mactavish 2004). The Proponent has also committed to avoiding any groups of marine mammals observed on the ocean surface except where the safety of the ship is in concern (FEIS Volume 10, Chapter 20, Section 6.11.3). The Proponent also commits to continue to work with Fisheries and Oceans Canada and interested parties in the development of the ship based marine mammal monitoring program that utilizes bridge crew. The Proponent will update the text in the WMMP Plan (FEIS Volume 10, Chapter 20, Section 7.2.8.5) to this effect.	DFO, KIA

Since the FEIS Final Hearing, Sabina has updated the text of the Pre-Construction Survey for Seal Lairs Section (14.2.1) of the WMMP Plan:

Sabina will work with relevant parties, including Fisheries and Oceans Canada (DFO) to determine the most effective methodology should construction be proposed during the seal pupping period and structures that may support lairs (ice ridges and snow banks) be unavoidable. Prior to construction of the Project, a detailed SOP will be produced. The SOP will include training requirements for staff, methods for monitoring, and data sheets.

Sabina has also updated the text of the Marine Mammal Monitoring during Project Shipping Section (14.2.2) of the WMMP Plan:

Sabina will work with Fisheries and Oceans Canada and interested parties in the development of the ship based marine mammal monitoring program that utilizes bridge crew. Sabina will produce a simplified SOP and ensure that Marine mammal surveys are conducted following the basic methods provided in the protocol outlined in Recommended Seabird and Marine Mammal Observational Protocols for Atlantic Canada (Moulton & Mactavish 2004).

Since the FEIS Final Hearing, Sabina has worked to progress the WMMP Plan and held a WMMP 2-day workshop with the KIA and the GN on October 25-26, 2016. Specific to marine wildlife, the KIA requested that the following text be included in the WMMP Plan; this text has been added to Section 14.1.4:

If a ringed seal is found on land in the MLA infrastructure area, the KIA will be contacted prior to any action being carried out.

All WMMP Plan monitoring programs, and the Project phases in which they occur, were reviewed and increased as a result of the 2-day workshop; these updates can be found in Tables 6.2-1 and 6.2-2 of the WMMP Plan. Specific to marine mammals, the WMMP Plan text was updated to read:

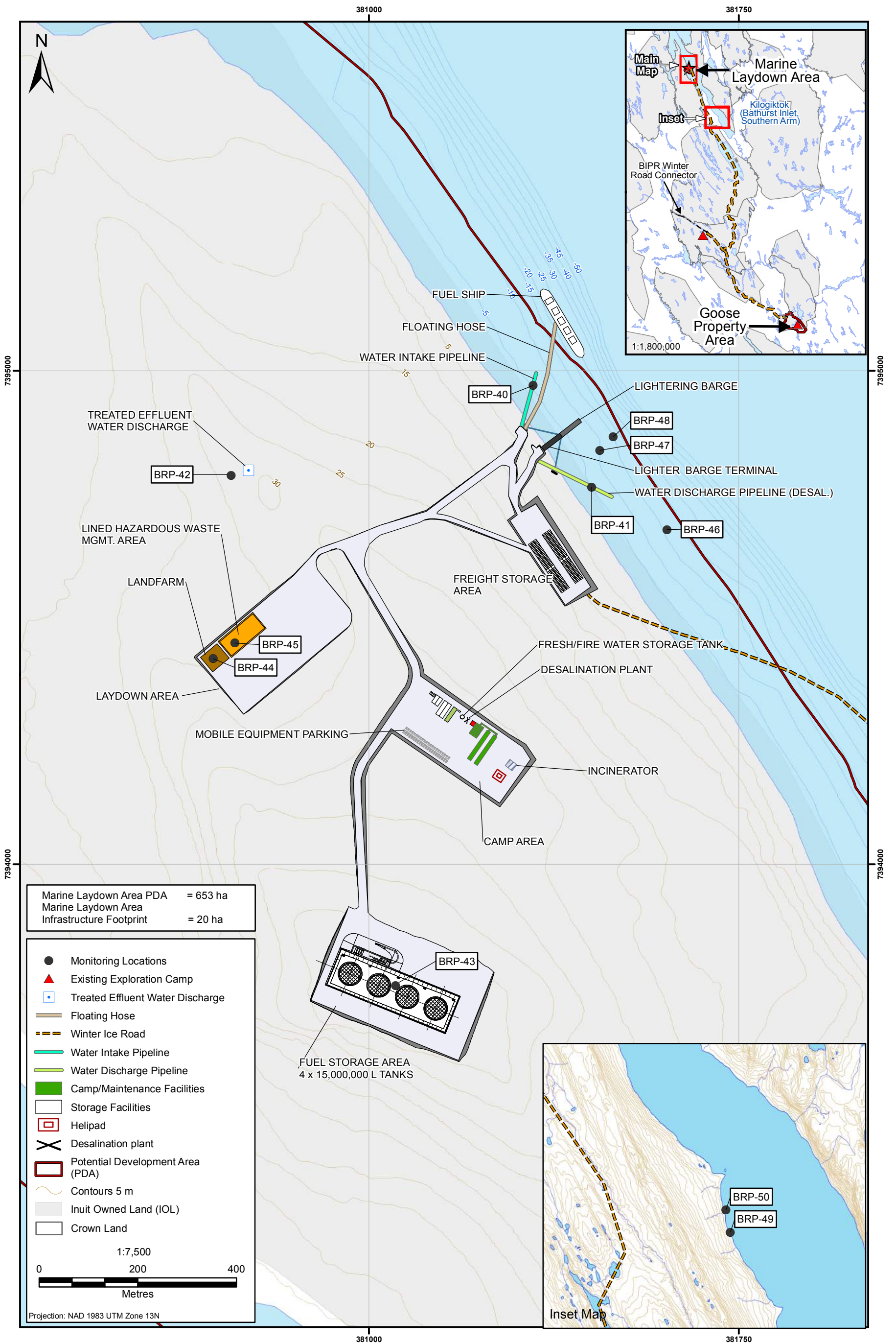
Pre-construction surveys will be conducted for seal lairs if on-ice construction is planned during the seal pupping season, February 15-April 15, during Construction, Operations, Care and Maintenance, and Reclamation/Closure.

For the NIRB's convenience, the updated WMMP Plan can be found in FEIS Addendum Volume 10, Chapter 20.

Attachment:

FEIS Addendum Volume 10, Chapter 20. Wildlife Mitigation and Monitoring Program Plan

ADDENDUM APPENDIX V7-2B: MARINE MONITORING SUPPLEMENTAL INFORMATION
(NEW)



NOTE: All roads at the MLA are service roads

Addendum Appendix V7-2B. Marine Monitoring Supplemental Information

Table 1. Proposed Water Quality Monitoring for the Project during Construction, Operations, and Closure in Marine Laydown Area

Monitoring Location Number	Monitoring Type	Description	Purpose	Mine Phase	Parameter Group Code(a)	Frequency
BRP-40	General Monitoring	Bathurst Inlet Intake (pretreatment)	Source intake water quality for potable and industrial use	Construction to Closure	A, D	(b)
					B	(b)
BRP-41	General Monitoring	Bathurst Inlet Discharge (post treatment)	Test quality at final point of control	Construction to Closure	D	(b)
BRP-42	General Monitoring	MLA Treated Effluent Discharge Location to land (greywater)	Confirm quality of greywater before release	Construction to Closure	E	Prior to discharge or transfer of water
BRP-43	Regulated & General Monitoring	MLA Fuel Tank Farm	Test quality of runoff water in the Fuel Tank Farm containment area	Construction to closure	E	Prior to discharge or transfer of water
BRP-44	Regulated & General Monitoring	MLA Landfarm	Test quality of runoff water in the Landfarm containment area	Construction to closure	E	Prior to discharge or transfer of water
BRP-45	General Monitoring	MLA Hazardous Waste Mgmt Area	Test quality of runoff water in the Hazardous Waste Management containment area	Construction to closure	E	Prior to discharge or transfer of water
BRP-46	General Monitoring	MLA mid-shore by the water discharge pipeline	Monitor marine area near the treated water discharge; AEMP station also sampled for sediment, benthics, and shellfish	Construction to closure	A, I	Twice per year when there is active discharge to the marine environment
BRP-47	General Monitoring	MLA near-shore by the barge	Monitor marine area in the barge area, near-shore environment; AEMP station also sampled for sediment and benthics	Construction to closure	A, I	Twice per year when there is barge activity
BRP-48	General Monitoring	MLA mid-shore by the barge	Monitor marine area in the barge area, mid-shore environment; AEMP station also sampled for sediment, benthics, and shellfish	Construction to closure	A, I	Twice per year when there is barge activity
BRP-49	General Monitoring	MLA reference near-shore	Reference for comparison to exposure near-shore sites; AEMP station, water only	Construction to closure	A, I	Twice per year in coordination with sampling in the water discharge and barge sampling areas
BRP-50	General Monitoring	MLA reference mid-shore	Reference for comparison to exposure mid-shore sites; AEMP station also sampled for sediment, benthics, and shellfish	Construction to closure	A, I	Twice per year in coordination with sampling in the water discharge and barge sampling areas

Notes BRP = Back River Project; MLA = Marine Laydown Area

a See Table 10.3-3 ("Table-Monitoring Parameters-v2") for parameters in each monitoring group

b Monitoring parameters and frequency at the discretion of Sabina as results from the verification stations are used for operational and management purposes

Table 2. List of Constituents in Each Parameter Group

Parameter Group	Parameter Group Code	Specific parameters
Field Chemistry	A	pH, specific conductivity, dissolved oxygen, and temperature.
Flow	B	Flow datalogger, calculated volume
Surface runoff	C	Total Suspended Solids (TSS)
General Chemistry on site	D	<u>Conventional</u> : turbidity, hardness, alkalinity, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, total dissolved solids (TDS), TSS, total cyanide, free cyanide, and weak acid dissociable (WAD) cyanide. <u>Nutrients</u> : ammonia, nitrate, nitrite, total phosphorus (TP), and total dissolved phosphorus (TDP). <u>Total metals</u> : aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, and zinc <u>Other</u> : radium-226 when required
Secondary Containment	E	TSS, ammonia, total arsenic, total copper, total lead, total nickel, total zinc, benzene, toluene, ethylbenzene, xylene, and total petroleum hydrocarbons (TPH), plus nitrate and ammonia when necessary
MMER deleterious substances	F	TSS, total cyanide, total arsenic, total copper, total lead, total nickel, total zinc, and radium-226
MMER toxicity	G	Acute toxicity (Rainbow Trout and Daphnia magna)
MMER sublethal toxicity	H	Sublethal toxicity (Fathead Minnow or Rainbow Trout, Ceriodaphnia dubia, Lemna minor, Pseudokirchneriella subcapitata)
Receiving Environment	I	<u>Conventional</u> : turbidity, hardness, alkalinity, calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, TDS, TSS, and total cyanide. <u>Nutrients</u> : ammonia, total Kjeldahl nitrogen, nitrate, nitrite, ortho-phosphate, TP, TDP, total organic carbon, dissolved organic carbon, and reactive silica. <u>Total and dissolved metals</u> : aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc. <u>Other</u> : radium-226 when required

Note: Detection limits for site monitoring may be higher than detection limits for downstream receiving environment monitoring