



Nunavut Research Institute

License Holder Reporting requirements

For research undertaken in the 2024 calendar year (commencing January 01, 2024 and ending December 31, 2024)

Project Title:

Freshwater Environment Monitoring (AEMP, MDMER, SNP, MFWFH, Deposit 2/3 Baseline)

Project Leader(s): Full name, affiliation, and contact information (address, phone number, email) of each project leader (principle investigator and co-PIs)

Minnow - Katherine Kuchapski, 110-2750 Faithfull Ave, Saskatoon, SK (306) 952-3779
 North Water Environmental - Andrew Rees, 285 Ivanhoe Dr North Bay ON, 705-492-2446
 North/South Consultants (NSC) Inc. - Michael Johnson, 83 Scurfield Blvd, Winnipeg, MB (204) 284-3366
 Baffinland Iron Mines - Katie Babin, 360 Oakville Place Drive, Suite 300, Oakville, Ontario, Canada, L6H 6K8 (647) 253-0596

Project Team: Full name, affiliation, and address (name of city/community and province/territory/state) of each member of the project team

Andrew Rees, North Bay, ON
 Jordan Mazur, Winnipeg, MB
 Michael Salazar, Winnipeg, MB
 Andrew Milling, Thunder Bay, ON
 Courtney Gafka, Winnipeg, MB
 Dante Freitas, Toronto, ON
 Emmie Button, Sparwood, BC
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 Samantha Burke, Guelph, ON
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 Justin James, Lethbridge, AB
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 Tom Williamson, Saskatoon, SK
 Rachel Noddle, North Bay, ON
 Liam Guenther, Winnipeg, MB
 Kathleen Meszaros, Revelstoke, BC
 Gilliam McLean, Torbay, NL
 Jessy St. Amour, Montreal QC
 Brendan MacNeill, Wolfville, NS
 Samuel Immaritok, Igloolik, NU
 Ronnie Komangapik, Pond Inlet, NU

Abstract: A concise summary of what was done, found, and concluded to date, and how the results/information will be used. This summary must be translated into the appropriate dialect of Inuktitut. Suggested length: 250-300 words. ***This section will be published in the NRI's annual compendium of licensed research**

The Aquatic Effects Monitoring Program (AEMP) for the Mary River Project 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; and, 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 (FEIS) and Addendum for the Early Revenue Phase (ERP). The freshwater VECs include water quantity, sediment quality, and freshwater biota and fish habitat.

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.
- Hydrometric Monitoring Program assesses flow in several streams and rivers near Project sites and supports the AEMP.
- 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.
- Milne Freshwater Fish Health (MFWFH) Program, serves to satisfy Term and Condition 48(a) required under Nunavut Impact Review Board (NIRB) Project Certificate No. 008, includes gill netting in the Ikaluit, Tugaat, and Qurluktuk river systems to monitor fish tissue chemistry as well as fish age, growth, reproduction, energy storage, and condition measures.

Surface water and aquatic ecosystem monitoring program is focused on fulfilling the monitoring requirements on water quality and quantity: The monitoring of volumes and water quality of surface water runoff and storm water retained by Project infrastructure (e.g. surface water management ponds, containment areas) and discharged to the receiving environment; The monitoring of volumes and water quality of specific surface water drainage systems downstream of Project areas; The monitoring of water quality of surface water drainage downstream of active quarries and borrows sources; and, the monitoring of water volumes withdrawn from approved water sources.

Additional Baseline studies were also conducted on Deposits 2 and 3, including the collection of water quality, sediment quality and/or biota, associated with planned future expansions of mining operations to Deposits 2 and 3.

Key messages: Concise, plain language summary of key take-away messages of work to date, findings and conclusions. Preferably 3-5 points, in bullet form.

Findings and conclusions are still being analyzed. A plain language executive summary of will be available in the NWB /QIA Annual Reports that will be published in spring 2025.

Objectives: Project objectives, preferably in bullet form.

All freshwater monitoring programs were identified as a follow-up monitoring program in Baffinland's FEIS (Baffinland, 2012) and are prescribed by the Type 'A' Water Licence.

Annual activities: A description of activities and methods carried out during the current reporting period. This section should answer the questions: What? Where? When? Who? How? Include dates team members conducted research at remote field sites or collected data (including interviews) in communities; append a map with locations and/or coordinates of remote field sites, if applicable.

Baffinland continued to implement a freshwater monitoring program to assess potential mine related effects on water quality, phytoplankton, sediment quality, benthic invertebrate communities, and fish populations. A summary of the activities conducted includes:

1. Water quality was monitored at several stream and lake stations including several reference areas, the Camp Lake tributaries, Camp Lake, Sheardown tributaries, Sheardown lakes, the Mary River, and the north and south basins of Mary Lake. Water quality monitoring was conducted in the freshwater receiving environment proximal to the discharge locations to determine whether there were any potential effluent discharge effects. Water quality indicators included metals, total suspended solids, nutrients, and hydrocarbons. Particle size distribution, as well as concentrations of organic and inorganic carbon, total petroleum hydrocarbons, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and trace metals were monitored.
2. Sediment quality sampling was conducted at each study lake (Camp, Sheardown NW, Sheardown SE, and Mary lakes) for physical and chemical characterization, with supplementary characterization of physical sediment properties to support the benthic invertebrate community analysis. Benthic communities were sampled to assess against the following performance indicators: density, richness, Simpson's diversity, and evenness to assess the accuracy of FEIS impact predictions that Project-related changes in benthic infauna.
3. Sediment traps were deployed in Sheardown Lake NW to monitor annual sediment deposition rates and characterize sediment density.
4. Reconnaissance of hydrometric stations began in June 2024 to monitor snowmelt and freshet flow at seven locations. The Hydrometric Monitoring Program measures water level and temperature every 15 minutes using a Seametrics PT2X pressure transducer and data logger. A Hach FH950 wading current meter is used for stream velocity where flows allow safe access; otherwise, dilution gauging with Rhodamine WT estimates discharge.
5. Non-lethal fish surveys of Arctic char were conducted at nearshore lake habitats and from littoral/profundal habitat at each of Camp, Sheardown NW, Sheardown SE, Mary, and Reference lakes, as well as at water bodies along the future South Railway alignment from Mary River to Steensby Port. Fish sampling was conducted using both active and passive capture methods. Total catch, relative abundance, and catch per unit effort were used to characterize the freshwater fish community. Fish health was evaluated through the assessment of established endpoints, length frequency distributions, length-weight relationships, visual assessment of internal and external abnormalities, and tissue chemistry analysis for contaminants of concern. Changes in concentrations of polycyclic aromatic hydrocarbons (PAHs) and metal concentrations in fish tissue, as well as overall changes in body condition.
6. Fish sampling was conducted by the Minnow Environmental field team during the Milne Freshwater Fish Health Study in the Ikaluit, Tugaat, and Qurluktuk river systems in August 2024. Large-mesh gill nets were used to capture Arctic Char during sampling activities.

Additionally, monitoring of the volumes and water quality of surface water runoff and storm water retained by Project infrastructure (e.g. surface water management ponds, containment areas) and discharged to the receiving environment is conducted.

The program is focused on the period with an open water (April-October) with some components conducted all year round.

Results and Achievements: Findings and results to date of the above activities, highlighting any key research achievements (see guide below for formatting tips regarding tables and figures).

The results of the 2024 monitoring programs is currently being analyzed. Preliminary results will be available in the spring of 2025 and will be published in Baffinland's 2024 NWB/QIA Annual Report for Operations.

The results of Deposits 2/3 baseline data collection will be presented to the NIRB and NWB in future submissions associated with permitting of that activity.

Challenges/Obstacles: In this section, please comment on any challenges/obstacles (if any) that you experienced during this project year. If there were any actions to mitigate or resolve these challenges, please list them here. Were any concerns raised regarding the conduct of research team members or the impacts of the project?

No challenges or obstacles.

Expected Project Completion Date: Provide month and year of expected completion date of the project.

The field work was conducted from April to October 2024.

Project website (if applicable): If your project has a presence on the internet, including a website and/or social media page, please provide the link and/or account handle.

URL: <https://www.baffinland.com/media-centre/document-portal/>

Citations: Please append a complete reference list if citations are used anywhere in the document.

POLICY RELEVANCE

Does this research support policy development or decision-making in Nunavut? If yes, please describe.

In accordance with existing Terms and conditions of the Nunavut Water Board Water Licence 2AM-MRY- 1325 Amendment 1, Baffinland is responsible for the establishment and implementation of a AEMP and SNP, which includes detailed information on Baffinland's project effects monitoring programs that are conducted over a sufficient time to meet the following objectives:

- a. Measure the relevant effects of the Project on the aquatic environment
- b. Confirm that the project is being carried out within the terms and conditions relating to the protection of the aquatic environment.
- c. Assess the accuracy of the predictions contained in the Final Environmental Impact Statement (FEIS) for the project.

It is required by the following Project authorizations:

- a. Type A Water Licence No. 2AM-MRY1325 issued by the Nunavut Water Board (NWB or the Board, 2015)
- b. Commercial Lease - Q13C301 (Commercial Lease) with the Qikiqtani Inuit Association (QIA, 2013)

RESEARCH OUTCOMES: BENEFITS

Community engagement: Briefly list and describe any community consultation, engagement, collaboration and outreach activities that you have undertaken for the project; describe the role(s) that community members and/or specific organizations have played in research co-design and activities.

All work was completed as part of regulatory commitments already reviewed with and agreed to by communities during the licencing process.

Community support letters were obtained from the Mitamitalik Hunters and Trappers Organization (MHTO) for obtaining a License to Fish for Scientific Purposes from the DFO relating to the Deposit 2/3 Baseline data collection.

Youth engagement: Briefly list and describe any outreach, school or classroom activities that you have undertaken for the project; describe the role(s) that youth have played in your research activities.

N/A

Training and Employment:

How many Nunavummiut received training from team members? Please describe training and/or compensation provided.

Nunavummiut participants received training from team members on health and safety while on site and the expected Field Level Risk Assessment (FLRA) before the start of each activity/task. Nunavummiut participants were also trained in routine sampling tasks; including grab sampling, gill netting, use and calibration of a water quality parameter multimeter, and many other tasks related to water sampling at a remote mine site.

How many team members received training from Nunavummiut? Please describe training received and/or what knowledge sharing and/or skills exchange took place.

Nunavummiut participants shared information and knowledge with team members in an informal capacity over the duration of the field program.

How many Nunavummiut received employment? Please describe employment type and length, role(s) and responsibilities, and compensation provided.

The eight Nunavummiut participants were Baffinland and QIA employees.

How many Nunavummiut received honoraria as research participants? Please describe method of participation (interview, observation, sample, survey, etc.), including compensation provided.

Same as above

Please explain how the project directly benefited Nunavut organizations and/or businesses (e.g., through contract services, local purchases, equipment donations, etc.)

Any Inuit firm registered with Nunavut Tunngavik incorporated (NTI) with 100% Inuit ownership operating in Qikiqtani region is designated as a preferred Inuit Firm (PIF) with Baffinland and gains advance notice on contracting opportunities at the Mary River Project.

OPTIONAL: Nunavut Team Members, hires, and/or trainees (excluding research participants e.g., interviewees)

The NRI is creating an inventory of Nunavummiut who are skilled and/or interested in research. The information provided below will not be shared publicly but will support long-term capacity sharing by connecting local and visiting researchers with research talent in each community.

Name	Expertise/skills	Training/interest areas	Contact Info	Community

Academic Mobility

If you are affiliated with an academic institution, please answer the following question: For which Level of Project(s) will the data be used? (Check all that may apply)

- ☒ Research
- ☐ Post-Doctoral Research
- ☐ PhD Thesis
- ☐ Masters (Major Research Paper)
- ☐ Masters (Thesis)
- ☐ Graduate Course Project
- ☐ Staff/Administration Research
- ☐ Undergraduate Honours Thesis

Other

BUDGET

Please complete the table below to detail your projected and actual research expenditures during the reporting period.

Category	Planned/Approved Expenditure	Actual Expenditure
Travel and Accommodation		
Equipment, Materials and Supplies		
Salaries/Wages for Nunavut residents		
Salaries/Wages for non-Nunavut resident researchers		
Professional Fees and services in Nunavut		
Professional Fees and Services outside of Nunavut		
TOTAL EXPENDITURES		

List the total \$ amount of funding from each funding source for your full research program, including in-kind support

N/A

RESEARCH OUTPUTS / REPORTING TOOLS

What research outputs were generated? Please list below and append copies of each. Specify which outputs (if any) may be made public on the NRI research licensing database.

The 2024 Baffinland NWB/QIA Annual Report for Operations. Will be available in spring of 2025.

Have peer-reviewed manuscripts been published as a result of your project? If Yes,
complete the following table:

Full citation	Publicly accessible/ free to access (Y/N)	Link (if available) and DOI (if available)

If No, do you intend to submit a manuscript (or manuscripts) for peer reviewed publication?

The 2024 Baffinland NWB/QIA Annual Report for Operations. Will be available in spring 2025.

Were non-peer reviewed materials produced to either communicate or synthesize results to the public? Examples of these materials include (but are not limited to): websites, reports, brochures, podcasts, webinars, presentations, non-peer reviewed publications, etc.

If Yes, complete the following table:

Title	Description of Materials	Link (if available)	DOI (if available)
NWB/QIA Annual Report for Operations	Detail of all programs conducted by Baffinland under the NWB T	Yes	https://www.baffinland.com/media-centre/document-portal/

Did your project develop a communications plan? Please describe communications/reporting tools used, and list the target audience for each and/or who requested which.

Established communication protocols for the NWB Water Licence reporting process.

How were Nunavummiut credited and/or acknowledged in all project outputs, such as co-authorship, participant biographies, article acknowledgements, etc.

DATA AND INTELLECTUAL PROPERTY

Did you enter into a research agreement, data-sharing agreement and/or intellectual property rights agreement with a community and/or designated Inuit organization (DIO)? If yes, please explain.

Do intellectual property rights apply to your research? If yes, please explain.

Minnow, North Water Environmental, North/South Consultants (NSC) Inc. own all copyright including all text, data, tables, figures, drawings.

Who owns the data? Has the raw data been shared with the appropriate community and/or DIO? If yes, how? How is data security and storage handled by community-based co-owners?

The data from Baffinland research is owned by Baffinland and its Consultants. Summary reports are made publicly available, but raw data is not shared.

Where is the data stored and will the data be destroyed within a set timeframe?

Baffinland and its consultants store the data, and there is no schedule to destroy the data.

Is the data trackable and/or available in a public data repository? If yes, please provide the appropriate information and/or link to ensure the findability and accessibility of the data.

Results are available at <https://www.baffinland.com/media-centre/document-portal/> but raw data is not available publicly.

Please append a copy of your data management plan.

CLIMATE CHANGE

Is your research about climate change (causes, impacts, mitigation, adaptation, etc.)? If yes, explain.

No, this program is not focused on Climate Change.

PHOTOGRAPHS

If possible, please provide high-resolution photos of licensed research activities that NRI may use in communication materials, organizational reporting, and other promotional purposes. The photographer and all recognizable people in each photo must sign the attached Photo and Video Release form. Please also complete the table below for each photo provided and submit to NRI along with all required NRI photo release forms. The photographer/owner will be credited in all uses of the photograph(s).

File Name	Location	Description	Subjects	Photographer/Owner	Date

Would you like your project to be considered for a research profile and promotion by the NRI? **Yes**

FORMATTING TIPS

Main text:

Please supply report in a standard manuscript format (**Microsoft Word format is required**).

Tables:

Any number of tables can appear in one file (as long as they are clearly marked). Tables prepared using simple table formats as provided in word processing programs such as WordPerfect are preferred. Each table should be numbered according to its appearance in the text (e.g., Table 1, Table 2) and each should have a brief descriptive heading.

Figures:

Each figure or graphic element should be submitted as a separate file. Black & white and colour graphics are both acceptable. We can accommodate most standard graphic file formats, however, please indicate in which format the graphic was prepared.

References:

Please use the APA or MLA Citation Style while referencing throughout the report.

Size:

The size of the electronic document must not exceed 4MB (if larger than 4MB, please send attachments separately and number the emails).