Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

GIANT MINE REMEDIATION PROJECT

Status of the Environment from June 2021 to June 2024

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

Canada

Land *Acknowledgement*

We acknowledge that the Giant Mine site is located in Chief Drygeese Territory. From time immemorial, it has been and is the traditional land of the Yellowknives Dene First Nation. The Giant Mine site is also within MǪwhì Gogha Dè Nɻ̨tłèè (Boundary from the Tłı̨chǫ Agreement) of the Tłı̨chǫ government and on the traditional homelands of the North Slave Métis Alliance. The Giant Mine Remediation Project respects the histories, languages, and cultures of First Nations, Métis, Inuit, and all First Peoples of Canada.

Message from *CIRNAC Project Leader*

Assistant Deputy Minister, Georgina Lloyd
NORTHERN AFFAIRS ORGANIZATION

I am pleased to present the second Status of Environment Report for the Giant Mine Remediation Project to the Giant Mine Oversight Board, in accordance with our commitments under the Giant Mine Remediation Project Environmental Agreement (2015). This report reflects our continued focus on safeguarding the environment, protecting human health, and working in partnership with Indigenous and northern communities to address the legacy of contamination at the Giant Mine site.

During this reporting period (mid-June 2021- mid-June 2024), the Giant Mine Remediation Project began the full-scale remediation of the site, which marked a significant milestone. Key accomplishments included the construction of the first freeze pads and the non-hazardous waste land fill, the demolition of the town site, and the beginning of the construction of the new water treatment plant. At the same time, the Project continued to address long-term environmental pressures through robust monitoring programs and risk mitigation measures, as well as working to ensure the site remains safe and stable for generations to come.

Over the past three years, the Project team has demonstrated remarkable resilience and adaptability in the face of significant environmental challenges, including an unprecedented wildfire season. The 2023 wildfire season in the Northwest Territories tested emergency preparedness across the region, and the Giant Mine Remediation Project team rose to the challenge. Through careful planning, swift coordination with emergency management authorities, and close collaboration with local partners, the team was able to respond effectively to ensure the safety of people, infrastructure, and the environment. These events underscore the importance of building and maintaining strong emergency response capabilities in a changing climate.

Central to this work is our commitment to meaningful partnerships and reconciliation with Indigenous communities. The active involvement of the Yellowknives Dene First Nation, the North Slave Métis Alliance, the Tłı̨chǫ and other stakeholders strengthens the Project by ensuring that Indigenous knowledge, values, and priorities are embedded in the remediation process. These partnerships are essential to advancing reconciliation, fostering trust, and supporting long-term environmental and community well-being.

I want to thank all those who contributed to this report and continue to guide the Project forward. Your dedication and collaborative spirit are helping to ensure that the Giant Mine Remediation Project remains resilient, responsive, and grounded in respect—for the land, for people, and for future generations.

Summary

Welcome to the 2025 **Status of the Environment Report** for the Giant Mine Remediation Project. The report is a requirement of the Environmental Agreement, signed in June 2015. The first report was due 7 years after the agreement was signed, and then a report is due every 3 years afterwards for 15 years.

After that 15-year period, a report is due every 5 years. This report is the second Status of the Environment Report and provides a high-level overview of the Giant Mine Remediation Project's key activities and the status of the environment on the Giant Mine site (the site) for mid-June 2021 to mid-June 2024. The report's purpose is to summarize:

- key operational activities
- methods and results from environmental monitoring
- actions taken if conditions on the site were not going as planned (adaptive management)
- whether the actions taken were effective
- effects of the remediation plus effects of other human activities (cumulative effects)
- planned key operational activities for the upcoming reporting period (mid-2024 to mid-2027)

The Giant Mine site was in care and maintenance from 2005 to 2021, with remediation activities officially starting in July 2021, at the start of this reporting period. Remediation activities during the mid-June 2021 to mid-June 2024 reporting period included various construction and demolition works and continued work on underground stabilization (Figure 1).

ENVIRONMENTAL COMPONENTS

The environment on the site is considered in the following components: climate change, air, water, fish, land, and wildlife. The components are all connected in Figure 2.

Before mining activity, the land on which the site is now found was a valuable area for hunting, trapping, and collecting plants for food and medicine. The Giant Mine Remediation Project has worked with Indigenous Rights holders to document historical land use in the site area through archaeological and Traditional Knowledge studies. During mining operations, the land on site was changed. It now has extensive mining infrastructure like open pits and Tailings Containment Areas. The Giant Mine Remediation Project has included information about the features that remain from previous mining activities and how they are related to the environment in this report.

Figure 1: Giant Mine Remediation Project Key Activities in this reporting period (2021 - 2024)

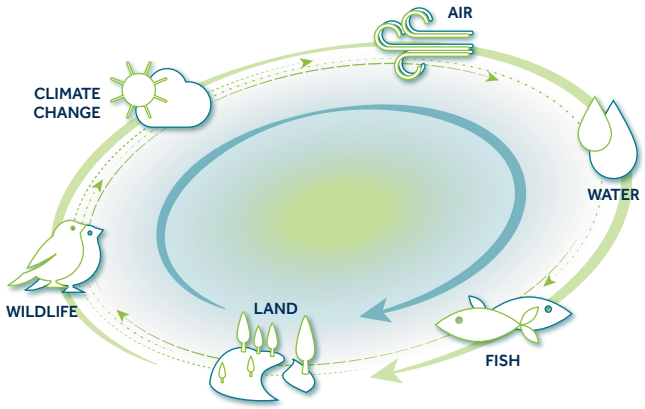

Figure 2: Environmental Components

Did you know?

Before mining, Elders report the Giant Mine area was an abundant source for moose, caribou, bear, wolf, wolverine, beaver, lynx, fox, coyote, porcupine, otter, muskrat, fisher, marten, mink, and rabbit. Rabbit were so plentiful in an area near the Yellowknife River that it became known as "rabbit place."

Aside from hunting and trapping, the area was preferred for harvesting berries, medicinal plants, and wood.

(YKDFN and Trailmark Systems 2019)

ENVIRONMENTAL MONITORING

The Giant Mine Remediation Project has many environment-related monitoring plans and programs on site (Table 1).

Many of these monitoring programs occur regularly. For some, the Giant Mine Remediation Project collected information, also called data, for many years in a row to understand environmental components and how they might change over time. For other programs, information was recorded during a short-term investigation only.

The key results from the monitoring and investigations are summarized in this report.

SUMMARY OF MONITORING OF THE ENVIRONMENT

The Giant Mine Remediation Project has continued to collect information about the environment on site since 2021. The team summarized most of this information in documents submitted to the Mackenzie Valley Land and Water Board or the Giant Mine Oversight Board. These documents are available to the public. They include reports like the Closure and Reclamation Plan (Chapter 1-4, 5.0-5.4, 5.5, 5.6, 5.7-7), and the Water Licence and Aquatic Effects Monitoring Program annual reports. A summary of the monitoring programs and results is provided in this report. A brief summary of the key results is provided below:

Table 1: Environmental Monitoring and Investigations

SYMBOL	COMPONENT	MONITORING/INVESTIGATIONS
	Climate Change	■ Weather station on site ■ Amount and flow rate of water (hydrology) in Baker Creek on site and off
	Air	■ Dust on site ■ Dust near communities ■ Wind on site
	Water	■ Mine water elevation ■ Mine water quality ■ Effluent quality ■ Water quality in Baker Creek and Yellowknife Bay
	Fish	■ Fish size, age, health in Baker Creek ■ Fish tissue quality in Baker Creek and Yellowknife Bay ■ Fish food (benthic invertebrates)
	Land	■ Archaeology ■ Soil and sediment quality ■ Underground stability ■ Dams ■ Open pit stability ■ Tailings Containment Areas / dams stability and seepage
	Wildlife	■ Animal / bird observations

CLIMATE CHANGE

The weather patterns (climate) in the Yellowknife area are changing. From 2021 to 2024, the Giant Mine Remediation Project continued to see increases in air temperature. Even more changes occurred in the amount of water at site (rain, snow) and water level in lakes and streams, and 2021 to 2024 were among the driest years on record. When wildfires threatened the Yellowknife area in 2023, the Giant Mine site had to be evacuated, and all activities paused. Changes to climate affect the environment on site and the care and maintenance of the site. In 2021, the site started measuring more information about factors that could influence climate change, including greenhouse gases. The Giant Mine Remediation Project continues to make efforts to reduce greenhouse gas emissions during remediation activities and after remediation is complete. The team is also taking into consideration the updated climate projections from the Intergovernmental Panel on Climate Change Sixth Assessment Report and has checked that the design of elements, like the new water treatment plant and the freeze program, still work for the new projections.

AIR

The Giant Mine Remediation Project monitors air quality and makes efforts to control dust on the site. Overall, on site and community air quality monitoring stations, measured low dust particles and metals. In years where forest fires occurred, most notably in 2023, concentrations of dust were higher. Air quality monitoring results indicated the air quality of the local airshed was not significantly impacted by Giant Mine Remediation Project activities.

WATER

Water in Baker Creek has had generally lower arsenic concentrations over time, though concentrations in the 2021 to 2024 period were higher than in 2015 to 2020. This increase was likely due to naturally lower water levels in the creek which meant the treated water (effluent) was less diluted. Effluent still met the discharge (release) limits between 2021 and 2024. Total arsenic in Yellowknife Bay near the site was mostly less than 10 micrograms per litre, which is the current drinking water guideline, and was less than the site-specific water quality objective of 31 micrograms per litre which protects aquatic life.

FISH

Benthic invertebrates (fish food) were present at the mouth of Baker Creek in similar amounts to a reference area (mouth of Yellowknife River). Not all the same benthic invertebrate species were found on site compared to the reference area, but the differences are smaller than those observed in decades past. Many fish species are using Baker Creek downstream of the site. Body size and liver size in Slimy Sculpin in Baker Creek was not the same as in the reference area, likely related to arsenic remaining in creek sediment. Eating fish from Baker Creek does not pose a risk to humans.

LAND (INCLUDING INFRASTRUCTURE)

Some areas on site have soils with higher amounts of total arsenic than the Government of Northwest Territories industrial standard of 340 milligrams per kilogram and higher than the residential standard of 160 milligrams per kilogram. Annual dam inspections showed compliance with the Canadian Dam Association requirements; dams are stable. Documentation for pit safety required more consistency. The existing Foreshore Tailings Area cover was stable, but erosion of the tailings submerged in Yellowknife Bay continued to be seen past the cover.

WILDLIFE

The Giant Mine Remediation Project identified more than 60 types of birds and a total of 13 species of wildlife on site in the last three years. Some buildings from historical mining operations needed to be demolished as part of remediation of the site. The Giant Mine Remediation Project prevented birds from nesting in these buildings through efforts like covering up openings and removing nearby plants. Entrances to the underground have been closed, so wildlife, including bats, can no longer access the underground.

ADAPTIVE MANAGEMENT

The Giant Mine Remediation Project has been able to adapt to changing site conditions during care and maintenance and into remediation.

The Giant Mine Remediation Project Team learned numerous lessons that will apply to ongoing care and maintenance and to remediation.

These are described in this report and in Chapter 4 of the Closure and Reclamation Plan[1] . Examples of key lessons learned and adaptive management include:

- Monitor Baker Creek for ice buildup and beaver dams, removing as needed to help prevent water from overtopping the banks or entering adjacent pits (C1). Continue to review and update ice buildup and freshet management procedures.
- Vibration monitoring devices should be buried or bolted to bedrock to help them take accurate measurements.
- Communicate often about dam safety and pre-plan work activities near dams, accounting for setback distances, prior to starting any work.
- Review management and monitoring plans and update where needed, as remediation advances.

STATUS OF THE ENVIRONMENT FROM 2021 TO 2024

To provide a summary of the status of the environment, the Giant Mine Remediation Project rated the environmental components. Evidence such as data from years of monitoring and inspections (summarized above and throughout this report) were used to give a rating. Two components could not be rated: climate change and wildlife. For wildlife, observations of wildlife were made by site staff and surveys were done in various locations on site that changed over time.

Wildlife presence on site is affected by the nearby city of Yellowknife and its Solid Waste Facility (landfill), the Ingraham Trail (Highway 4) which runs through the site, and by the nearby Great Slave Lake. The type of data is not appropriate to establish a meaningful indicator for the site distinct from the surrounding area. For climate change, the Giant Mine Remediation Project is reviewing information and possible ways to rate this component in future iterations of this report.

The Giant Mine Remediation Project ratings (Table 2) were set as:

- green, meaning the condition was stable or "okay"
- yellow, meaning the condition needed attention or was a concern
- red if the condition was a hazard or risk
- a combination of green/yellow, where some conditions were okay, but others were of concern, or
- yellow/red where some areas were of concern and others were a higher risk to the environment

These ratings provide a "snapshot" of the status of the environment for the period of this report (2021 to 2024), including a comparison to the ratings from the previous reporting period (2015 to 2021).

More details on the status of the environment and monitoring programs are found in the report.

Table 2: Summary of Status of Environment

COMPONENT	2015-2021 RATING	2021 - 2024 RATING
Air		
Water		
Fish		
Land		

WHAT IS NEXT FOR THE GIANT MINE REMEDIATION PROJECT?

The main activities to occur on site in the next reporting period (mid-June 2024 to mid-June 2027) are:

- continuing care and maintenance
- ongoing site monitoring and remediation

Some of the main remediation activities will be as follows:

- Complete work to close the remaining openings to surface from the underground, and construction and operation of the new water treatment plant.
- Continue to develop on-site borrow sources and detailed designs and construction plans, to support remediation activities.
- Begin remediation of contaminated soils, the Tailings Containment Areas, including dams and the pits.

More information on the schedule for remediation is provided in the Giant Mine Remediation Project Annual Water Licence Report submitted to the Mackenzie Valley Land and Water Board.

The Status of the Environment on site is expected to change in the next three years. Improvements to the environment are not expected to occur until more of the remediation is complete, such as covering the tailings ponds or operating the new water treatment plant. It is likely that remediation activities will generate more dust than the care and maintenance activities in the past, but this will be monitored and efforts made to keep the amount of dust low as is required in the Dust Management and Monitoring Plan.

The Giant Mine Remediation Project will continue monitoring on site and will follow the approved management and monitoring plans. The Giant Mine Remediation Project reports results from monitoring to the Mackenzie Valley Land and Water Board every year through its Annual Water Licence Report. Results will also be summarized in the next Status of the Environment Report, submitted in June 2028.

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1.0

Purpose and *Overview of the Report*

Welcome to the Status of the Environment Report for the Giant Mine Remediation Project (GMRP). The report is a requirement of the Environmental Agreement (Table 3), signed in June 2015. The first report was due 7 years after the agreement was signed, and then a report is due every 3 years afterwards for 15 years. After that 15-year period, a report is due every 5 years. This report is the second Status of the Environment Report and provides a high-level overview of the GMRP's key activities and the status of the environment on the Giant Mine site (the site; Figure 3) for mid-June 2021 to mid-June 2024.

The report's purpose is to summarize:

- key operational activities
- methods and results from environmental monitoring
- actions taken if conditions on site were not improving as planned (adaptive management)
- whether the actions taken were effective
- effects of the remediation plus effects of other human activities (cumulative effects)
- planned key operational activities for the next report (mid-2024 to mid-2027)

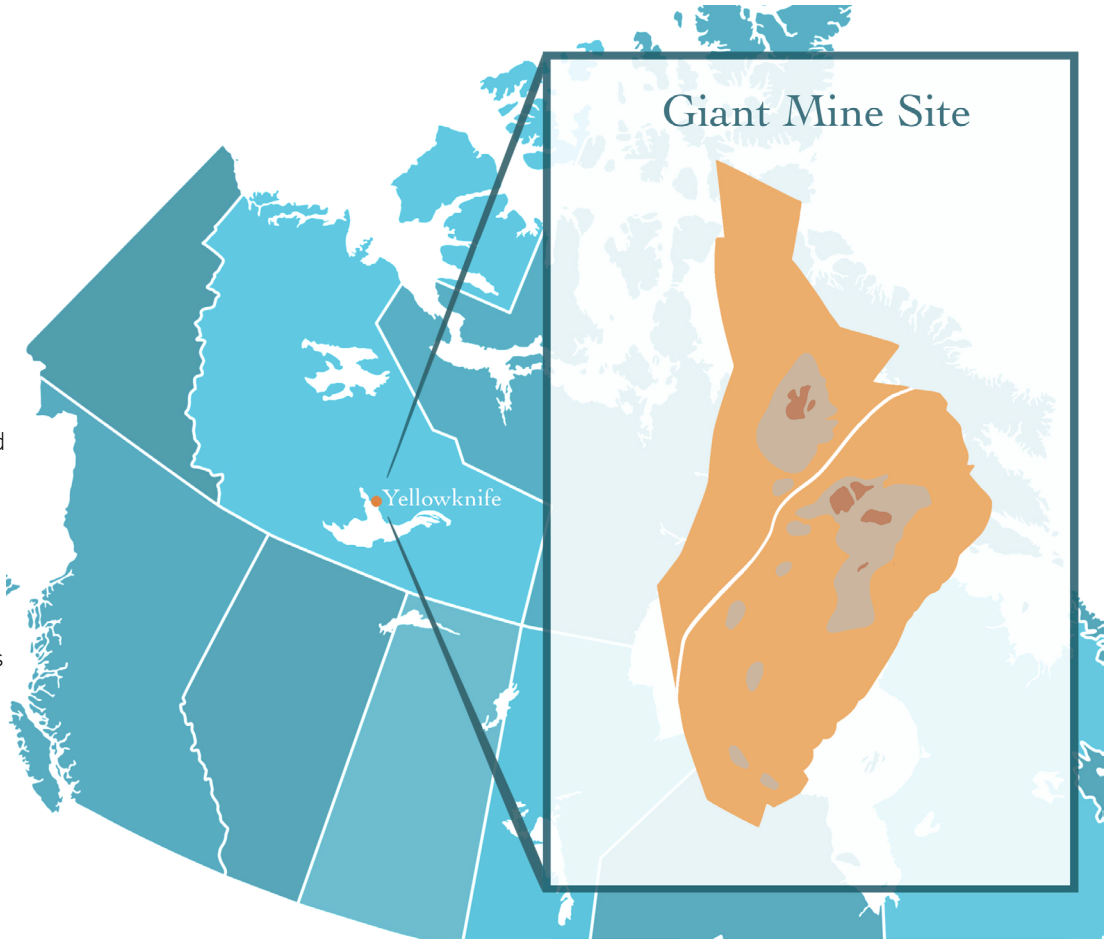


Figure 3: Location of the Giant Mine Site

The Giant Mine site was in care and maintenance from 2005 to 2021, with remediation activities officially starting in July 2021, at the start of this reporting period. Assessment of the long-term effects of remediation and changes to predictions from the environmental assessment (Article 6.1[b]) were provided in the Closure and Reclamation Plan[2] (Chapters 1-4, 5.0-5.4, 5.5, 5.6, 5.7-7.0), Effluent Quality Report[3] , and the Human Health and Ecological Risk Assessment[4] (Part 1, Part 2, Part 3, Part 4) of the Water Licence Application in 2019; the reader is referred to those documents for more information.

In general, these reports noted the following:

- Section 5.11 and 5.12 of the Closure and Reclamation Plan outlined the long-term expected effects of remediation and the monitoring programs and management of these expected effects. No updates to these identified effects are planned unless remediation activities change.
- The Effluent Quality Report provided predictions for water quality from the proposed new water treatment plant; the new water treatment plant is required to remove arsenic to amounts less than those outlined in the environmental assessment and reduce concentrations of other contaminants (for example total suspended solids and some metals); this report also provided site-specific water quality objectives for water in Yellowknife Bay near the site. Water quality in Yellowknife Bay after remediation is expected to be improved from what was expected in the environmental assessment.

The Giant Mine site had assessments examining the risks of contamination from historical mining in 2006 and 2010 that were part of the environmental assessment. In 2014, the Mackenzie Valley Environmental Impact Review Board concluded that the public still had health concerns about contamination from Giant Mine. In 2018, a new Human Health and Ecological Assessment Report was completed, and it concluded that after remediation, exposure to site would result in low risk to humans and reduced risk to wildlife and aquatic life. Since 2018, the GMRP completed an additional Acute Human Health Risk Assessment[5]. The assessment looked at arsenic exposures in un-remediated areas of the site (both non-restricted and restricted areas). A summary of results is provided in Chapter 7 (Soils and Sediment section). Appendix A outlines the requirements of the Environmental Agreement and how they are addressed in this report, in addition to how feedback from the last Status of the Environment Report wa s incorporated in this version.

1.1 COMPONENTS OF THE ENVIRONMENT

The main components of the environment at the Giant Mine site are:

- climate change
- air
- water
- fish
- land (including infrastructure like tailings dams)
- wildlife (including birds)

Weather, such as the amount of rain or snow and air temperature, affects the environment on site (climate). The wind speed and wind direction effects combine with local activities on site and activities/events off site (e.g., a forest fire) to influ-

Table 3: Environmental Agreement Requirements for Status of Environment Report

Article 6 : STATUS OF THE ENVIRONMENT REPORTING

6.1 Status of the Environment Report

At the times identified in section 6.4 the Co-Proponents shall prepare, provide to the Oversight Body, and make available to the public a comprehensive report on the Project. Each report shall include in respect of each reporting period:

a) a summary of the Project's key operational activities;

b) an assessment of the long-term effects of the Project;

c) a summary of the methodology, and the results or findings, of all monitoring done for the Environmental Programs and Plans and a description of actions taken or planned to implement Adaptive Management;

d) a summary of any changes to the environmental impact prediction models, or other conceptual models used by the Co- Proponents to guide Project management, and of the rationale for the changes;

e) the identification of any cumulative effects of the Project on the environment, meaning any effects of the Project considered in the combination with the effects of other human activities;

f) a comparison of the results or findings of all environmental monitoring programs under the Environmental Programs and Plans to the results predicted in the Developer's Assessment Report submitted as part of the MVRMA environmental assessment;

g) an evaluation of the performance of Adaptive Management;

h) a summary of the Project's planned key operational activities for the upcoming reporting period;

i) references to all sources relied on by the Co-Proponents in coming to conclusions in the report; and

l) a plain-language summary of the report

MVRMA = Mackenzie Valley Resource Management Act.

ence the air quality of the site. The site is made up of land with vegetation and rock, as well as industrial features from historical mining activities: two main Tailings Containment Areas containing a total of four tailings ponds with numerous dams, eight open pits, a foreshore of Yellowknife Bay contaminated with tailings, and the effluent treatment plant. The soil in various areas of the site is contaminated (arsenic and hydrocarbon impacts) from historical mining practices. Another main feature is the creek running though the site, called Jackfish River by the Yellowknives Dene First Nation and now known as Baker Creek (The Giant Gold Mine – Our Story: Impact of the Yellowknife Giant Gold Mine on the Yellowknives Dene – A Traditional Knowledge Report[6]). Baker Creek and local small lakes drain into Yellowknife Bay, part of Great Slave Lake. Much of the land on site is impacted because of historical mining. Figure 4 illustrates the site and how the various components interact.

Note: not to scale, for illustrative purposes only.

ETP = effluent treatment plant.

Figure 4: Conceptual Illustration of Giant Mine Site and Interaction of Environmental Components - climate change, air, water, fish, land, wildlife

1.2 ENVIRONMENTAL PLANS AND MONITORING PROGRAMS

There are many environment-related monitoring plans and programs on site. The main programs for each environmental component and where to find more information are listed in Table 4. The key results from the monitoring are summarized in this report.

Some monitoring programs occur regularly, and the GMRP has collected information (data) for many years in a row to understand the environmental component and how it acts over time: Was it stable? Was it going up or down? For others, like soils, information is recorded during an investigation and data are recorded for the year of the investigation. It is normal for a remediation project to have some long-term monitoring programs as well as some short-term investigations.

There are also data collected every day on site for operational purposes. Examples include inspections on foundations of bridges and buildings, health and safety inspections of facilities, or checks on vehicles for leaks. Operational data are not included in this report; if inspections indicate an issue, it is addressed by the main construction manager on site and reported to the relevant authorities with jurisdiction (e.g., Workers' Safety and Compensation Commission).

Table 4: Main Environment-Related Monitoring Programs at the Giant Mine Site

COMPONENT	MONITORING/INVESTIGATIONS	WHERE TO FIND MORE INFORMATION
Climate change	Weather station on site Amount and flow rate of water (hydrology) in Baker Creek on site and off site	Annual Water Licence Reports (2021, 2022, 2023 , 2024 [Part 1, Part 2])
Air	Dust on site Dust near communities Wind on site	Dust Management and Monitoring Plan NWT Air Quality Monitoring Network
Water	Minewater elevation Minewater quality Effluent quality Water quality (Baker Creek, Yellowknife Bay)	Annual Water Licence Reports (2021, 2022, 2023, 2024 [Part 1, Part 2]) Water Management and Monitoring Plan Aquatic Effects Monitoring Program Annual Reports - 2021 (Part 1, Part 2, Part 3), 2022 (Part 1, Part 2, Part 3, Part 4, Part 5, Part 6), 2023 (Part 1, Part 2, Part 3), 2024 (Part 1, Part 2, Part 3, Part 4, Part 5, Part 6)
Fish	Fish size, age, health in Baker Creek Fish tissue quality in Baker Creek and Yellowknife Bay Fish food (benthic invertebrates)	Aquatic Effects Monitoring Program Annual Reports - 2021 (Part 1, Part 2, Part 3), 2022 (Part 1, Part 2, Part 3, Part 4, Part 5, Part 6), 2023 (Part 1, Part 2, Part 3), 2024 (Part 1, Part 2, Part 3, Part 4, Part 5, Part 6) *Fisheries Act* Authorization Annual Report – 2024
Land	Archaeology Soil and sediment quality Underground stability Open pit stability Tailings Containment Areas / dams stability and seepage	Underground Design Plan & Appendices Arsenic Trioxide Frozen Shell Management and Monitoring Plan Open Pit Design Plan & Appendices Tailings Management and Monitoring Plan Closure and Reclamation Plan (Chapters 1-4, 5.0-5.4, 5.5, 5.6, 5.7-7.0) & Appendices Operations, Maintenance, and Surveillance Manual for Giant Mine Dams[7] Annual Water Licence Reports (2021, 2022, 2023, 2024 [Part 1, Part 2])
Wildlife	Animals/bird observations	Wildlife and Wildlife Habitat Management and Monitoring Plan Annual Water Licence Reports (2021, 2022, 2023, 2024 [Part 1, Part 2])
General	Applicable to many of the components listed here	Giant Mine Remediation Project Annual Reports: 2021-2022, 2022-2023, 2023-2024

1.3 ENVIRONMENTAL INDICATORS AND HOW THEY ARE RATED

Information about the environment on site collected since 2021 is summarized in annual reports to the Mackenzie Valley Land and Water Board or the Giant Mine Oversight Board. A summary of the monitoring is provided in the Chapters 3 through 8 of this report. To further simplify the large amount of information and summarize the status of the environment on site, indicators for each of the environmental components were developed (Table 5). These are provided as a "snapshot" of the status of the environment for the period of this report (2021 to 2024).

Table 5: List of Environmental Indicators for the Giant Mine Site for 2021 to 2024

ENVIRONMENTAL COMPONENT	INDICATOR	INFORMATION USED TO RATE STATUS OF ENVIRONMENT
Climate change	No indicator for this report, but under review to determine if one can be developed in future years	
Air	Dust on site [a]	Was there visual dust observed on site and/or due to activities on site? Was the total suspended particulate measured at or below the ambient air quality criteria[a] for site at the site perimeter air quality monitoring stations?
	Dust at community stations	Was visual dust observed at the community air quality monitoring stations due to site activities? Were the measurements at the community air quality monitoring stations at or below the ambient air quality criteria[a]?
Water	Water quality on site and in Baker Creek	Water in Baker Creek on site: Was arsenic on site greater than upstream? Was total arsenic less than the national regulation for metal mines (MDMER[8])? Treated effluent: Did it meet the licensed discharge criteria[b]?
	Water quality in Yellowknife Bay	Was arsenic in the water in Yellowknife Bay, near the site, below the drinking water quality standard and below the site-specific water quality objective?[b]
Fish	Fish food in Baker Creek	Were benthic invertebrates (fish food) present? Were they in similar amounts to a reference area? Did they have the same species as a reference area?
	Fish in Baker Creek	Were fish species present? Did they have high concentrations of metals in their bodies? Was the fish size the same as in a reference area?
Land	Soil quality in developed areas	Did soils have total arsenic above the approved closure plan standard of 340 mg/kg for the site?
	Soil quality in bedrock, forest, wetland areas	Did soils have total arsenic above the approved closure plan standard of 340 mg/kg for the site?
	Soil quality in Townsite	Did soils have total arsenic above the approved closure plan standard of 160 mg/kg for the Townsite?
	Substrate quality in Baker Creek	What was quality of Baker Creek substrates at bottom of creek? Were they above the aquatic life guideline for total arsenic?
	Dam stability and maintenance	Did the annual dam inspection show compliance with Canadian Dam Association requirements? Were dams stable? Were maintenance/repairs completed when required?
	Pit safety	Was maintenance/monitoring required? Were access controls in place?
	Foreshore Tailings Area in Yellowknife Bay	Was the existing foreshore cover stable? Were there local signs of erosion outside of the cover?
Wildlife	No indicator for wildlife was identified due to two concerns: 1) wildlife on site is influenced by the nearby developments (e.g., highway, City of Yellowknife and its Waste Transfer Area) and 2) data (e.g., observations of wildlife by workers on site) were intermittent and not collected in the same locations over time. It was not possible to develop a meaningful indicator of the status of wildlife on site independent of other influences and with the type of data available. However, a summary of the wildlife data is provided (Chapter 8).	

a) Refer to the Air Quality Monitoring appendix of the Dust Management and Monitoring Plan;

b) See Appendix B for more information.

MDMER = Metal and Diamond Mining Effluent Regulations; mg/L = milligrams per litre; mg/kg = milligrams per kilogram.

For each indicator, information about the type and amount of monitoring data was reviewed (Table 5). For example, for the fish component, information on fish size, health, and what fish eat (fish food called benthic invertebrates) was available and could be used as evidence to provide a rating on the status of the environment. Each component was qualitatively rated based on the evidence from monitoring. Ratings were set as green, yellow, or red, as well as a combination of green/yellow or yellow/red (Table 5).

Appendix B describes the indicators in more detail, explaining how they were chosen and what data were used to support the rating for each component.

Appendix C provides a summary of rating for each component for 2021 to 2024.

1.4 REPORT ORGANIZATION

The report is organized to provide information on the key operational activities from mid-June 2021 to mid-June 2024 (Chapter 2), a summary of monitoring for each environmental component (Chapters 3 through 8), and an overview of cumulative effects (Chapter 9), as well as lessons learned during this period (Chapter 10). Chapter 11 gives a summary of the next steps for the GMRP until the next Status of the Environment Report is submitted in 2028.

2.0

Key Operational *Activities*

The GMRP had numerous activities ongoing from 2021 to 2024. These fit in three general categories: care and maintenance of site, remediation, and engagement and Traditional Knowledge.

2.1 CARE AND MAINTENANCE ACTIVITIES

Key activities for the care and maintenance of the site from 2021 to 2024 included:

- repairs to the old Ingraham Trail highway on site in 2024
- water (effluent) treatment plant operations and inspections
- addition of a support (buttress) to B2 Dam in 2022 for stabilization until the dam is decommissioned
- maintenance and improvement of site roads
- dust suppression on roads and Tailings Containment Areas
- management of existing dams on site, following recommendations from annual geotechnical inspections
- monitoring for movement of highwalls and rock faces in pits
- removal of hazardous waste from the underground prior to closure
- management of surface water and underground water

2.2 REMEDIATION ACTIVITIES

Key activities for the remediation of the site from 2021 to 2024 are summarized [7]in this section[8]. For detailed information on the approved plan for remediation, refer to Sections 5.1 through 5.10 of the Closure and Reclamation Plan (Chapter 5.0-5.4, 5.5, 5.6, 5.7-7.0)[9].

- **Area 1 Freeze Pad construction**: removed contaminated soil and blasted a bedrock outcrop; passive heat pumps called thermosyphons will be installed in this area to facilitate the freezing of arsenic chambers.
- **Non-hazardous waste landfill construction** (Photo 1): stripped contaminated soil, sourced off-site material (aggregate) to build structure, and used a bituminous geomembrane and on-site clay to produce a barrier, preventing liquids from getting through. This was done to contain non-hazardous legacy waste found on site, which includes but is not limited to materials from the deconstruction of the Townsite and material from debris piles found throughout the site. A dedicated cell was constructed to contain the biproducts of the new water treatment plant.
- **Building demolition** (Photo 2): took down and removed the Townsite and several other buildings in the main por-

Did you know?

Retaining walls for the freeze pad are made of rock covered in wire mesh (called gabion baskets) rather than concrete blocks.

This gives the pad a more "natural" appearance in the surrounding environment.

tion of the site, including the main office and planner building. Non-hazardous and hazardous materials were sorted and put in the landfill or removed from site (following the Waste Management and Monitoring Plan[10]).

- **Debris pile removal** (Photo 3): sorted non-hazardous and hazardous debris from piles scattered across the site and put in the landfill or removed material from site (following the Waste Management and Monitoring Plan[10]).
- **Start of new water treatment plant construction** (Photo 4): cleared area, removed contaminated soils, blasted corridor for pipeline to carry treated effluent down to Yellowknife Bay, drilled the new intake wells (pump installation to be completed in 2025), started the building foundation, and monitored that construction water was not released to the environment.
- **Underground stabilization:** placed paste backfill in underground voids located near the surface to help stabilize the underground.

General activities to support remediation:

- installed instruments to monitor minewater and underground stability
- began work to close openings from the underground that connect to surface
- rerouted pipes in the underground high test line, which directs contaminated water to the mine pool

Did you know?

Solid ice plugs naturally formed within the mine access and ramp in the A1 and A2 areas.

These ice plugs were melted in 2024 by redirecting warm air into the area, to allow underground backfilling.

It is reasonable to expect ice to develop throughout the shallow portions of the mine once the underground mine is closed (end of 2024).

Did you know?

A liner was installed when building the non-hazardous waste landfill. It is called a bituminous geomembrane (BGM) liner.

It holds up in poor weather, does not get punctured by waste put in the landfill, and does not wrinkle when weather is hot.

It is a good choice to last into the long term and help protect the environment.

- raised Dam 1 by adding material and installed thermosyphons to limit future settlement
- removed decant structures for Dam 2
- collected contaminated soils samples during construction of the water treatment plant, non-hazardous waste landfill, and Area 1 Freeze Pad
- continued various investigations and monitoring activities to support engineering design
- set up plots for revegetation trials to determine best type of material to use to grow plants in some areas after construction

More details on the care and maintenance and remediation activities can be found in Chapters 3 and 4 of the Closure and Reclamation Plan, as well as the annual reports submitted to the Giant Mine Oversight Board (2021-2022[11] , 2022-2023[12], 2023-2024[13]).

Photo 1: Non-hazardous Waste Landfill Construction
Upper photo: clearing and site preparation
Lower photo: completed main cell of the non-hazardous waste landfill

Photo 2: Building Demolition
Upper photo: site preparation near main office building
Lower photo: deconstruction of main office building and clearing of debris

Photo 3: Debris Pile Removal
Left photo: example of larger debris pile on site
Right photo: area after the debris pile was removed

Photo 4: Construction of the New Water Treatment Plant
Upper photo: clearing and site preparation
Lower photo: aerial photo of construction progress

2.3 ENGAGEMENT AND TRADITIONAL KNOWLEDGE

The GMRP continued to prioritize engagement in 2021 to 2024, following the Engagement Plan[14]. An overall summary is provided in Table 6. Information on topics and outcomes relevant to remediation are outlined in the Annual Water Licence reports (2021[15] , 2022[16] , 2023[17] , and 2024 [Part 1], [Part 2[18]]). During this period, the GMRP Team engaged with the following groups and committees:

- Yellowknives Dene First Nation
- Giant Mine Advisory Committee
- North Slave Métis Alliance
- Giant Mine Oversight Board
- Giant Mine Working Group
- Aquatic Advisory Committee
- Socio-economics Working Group and Advisory Body
- Health Effects Monitoring Advisory Committee
- Great Slave Sailing Club
- Yellowknife Historical Society
- City of Yellowknife
- Tłı̨chǫ Government

Table 6: 2021 to 2024 Key Engagement Activities

ACTIVITY	GROUP	DATE RANGE[(a)]	COMMENTS	OUTCOME
Community Benefits Agreements	**YKDFN, NSMA**	August 2021, March 2023	Support members and businesses to maximize their participation in the Project through training, capacity building and socio-economic development.	Responded to community concerns by supporting ongoing health studies, annual healing ceremonies, and community-based monitoring and perpetual care planning.
Annual Public Forum	**Public**	March 2021	Community update on work completed to date, work expected in coming season, socio-economic achievements and open discussion. Presentation sent to all attendees and DFO on 27 April.	A total of 18 questions were posed by community members about a variety of topics, documented in the forum's Q&A.
Closure Criteria	**GMWG**	2021	Engaged on closure criteria in development and updates to the Closure and Reclamation Plan Closure Criteria Table for Baker Creek, tailings, soils, borrow, and underground.	Closure criteria updated and approved in the Tailings, Borrow, and Underground design plans. Criteria developed will be included in the Baker Creek and contaminated soils and sediments design plans (forthcoming submissions).00
Borrow and Blasting	**AAC, NSMA, YKDFN, GMWG**	2021	Various meetings on Area 1 Freeze Pad and borrow designs, site-wide blasting, surface water runoff criteria, and the geochemical characterization program for on-site borrow. All parties provided comments on the surface water runoff criteria development.	Discussions and input helped inform designs, criteria, and programs.
WTP and Foreshore/ Nearshore Cover Designs	**AAC**	2021	Engaged and provided updates on WTP outfall and freshwater intake designs, as well as cover design updates for the Nearshore and Foreshore tailings areas.	Feedback incorporated into the approved WTP and tailings design plans.
Outstanding Closure Criteria	**GMWG**	2022	Workshop held to review outstanding closure criteria; including, the underground mine workings, open pits, contaminated soils and sediments, Baker Creek, borrow, and the WTP.	Feedback on remaining closure criteria incorporated into design plans (some plans have been approved, while others are forthcoming).
Annual Public Forum	**Public**	March 2022	Community update on work completed to date, work expected in coming season, socio-economic achievements and open discussion with attendees.	A formal letter was written by one virtual attendee, outlining 25 questions and sent to the GMRP on 25 March. A formal letter in response, addressing questions was provided in June 2025.

ACTIVITY	GROUP	DATE RANGE[a]	COMMENTS	OUTCOME
Spring Trade Show	**Public**	May 2022	An opportunity for the team to share details of the new active remediation work on site with the local public.	Yellowknife Historical Society had a discussion with the GMRP Team regarding funding details (four questions in total).
Borrow and Blasting	**YKDFN**	2023	Workshop to update and engage on borrow locations and blasting. Concerns with blasting and possible release of arsenic trioxide.	The GMRP Team took YKDFN members on a tour of the borrow locations. Requested that tree cover be used at these locations to minimize visibility – no further concerns with the overall plan.
Blasting near Water and *Fisheries Act* Authorization	**YKDFN**	2023	Community meetings to discuss water quality, treatment and testing, fish health, and blasting near water.	The GMRP Team updated the community on monitoring programs and fish. Community members expressed concern about water quality and fish quality in Yellowknife Bay. Discussion about the GRMP supporting community-based monitoring to gather more data in the bay where the community would like to focus.
***Fisheries Act* Authorization**	**YKDFN, NSMA, DFO**	2023	Various meeting to discuss and provide updates on the *Fisheries Act* Authorization application.	No further action required after these engagement meetings.
Annual Public Forum	**Public**	March 2023	Community update on work completed to date, work expected in coming season, socio-economic achievements and open discussion with attendees.	Community members in attendance asked 12 questions about a variety of topics, captured in the record of discussion (Q&A). The GMRP received 25 completed participant feedback forms, including one follow up question via email.
Spring Trade Show	**Public**	May 2023	Aimed to inform the local community about the new active remediation work being carried out on site.	Spoke to over 300 members of the public about a variety of topics. A total of 45 questions were posed to the GMRP Team and documented.
***Fisheries Act* Authorization**	**GMAC**	February 2024	The GMRP provided an update to the GMAC with the completed and upcoming work at site, and a presentation on the *Fisheries Act* Authorization that explained the Aquatic Advisory Committee (AAC).	The GMAC provided feedback and comments on its concerns, requested additional information, and follow-ups.
Annual Public Forum	**Public**	March 2024	Community update on work completed to date, work expected in coming season, socio-economic achievements and open discussion with attendees.	Hosted approximately 40 attendees in person locally in Yellowknife, and an additional 50 virtual attendees from across Canada on Zoom. About eight questions were posed by attendees on a variety of topics, documented in Q&A.
Spring Trade Show	**Public**	May 2024	An opportunity for the team to share details of the new active remediation work on site with the local public.	Approximately 140 visitors. There were six reoccurring questions along with eight unique questions posed on a variety of topics recorded in discussion notes from show.
Geoscience Forum	**Public**	November 2024	Engaged with geoscience attendees and public completed and upcoming work happening at the Giant Mine site and answered questions regarding remediation methods and employment opportunities.	The GMRP booth had 50–60 visitors and four follow-up questions from the event.

ACTIVITY	GROUP	DATE RANGE[a]	COMMENTS	OUTCOME
Management and Monitoring Plans	**GMWG**	2021–2023	Pre-engagement process and reviews of updates to the Arsenic Trioxide Frozen Shell, Water, Waste, Dust, Borrow Materials and Explosives, Erosion and Sediment Management and Monitoring Plans (MMPs), and the Chloride and Sulphate MMP Report. Meetings to review updates to the Tailings, Dust, and Borrow Materials and Explosives MMPs.	The GMRP Team provided responses to GMWG review comments, with updates made to address review comments in the plan.
Design Updates	**GMWG**	2021–2024	Engaged on underground minewater elevations, greenhouse gas emissions study for designing the WTP, and updates on open pits designs.	Input incorporated where appropriate into the design plans: WTP, open pits, and underground.
Baker Creek	**AAC, NSMA, YKDFN**	2021–2024	Meetings held to engage on the engineering design and fisheries topics for Baker Creek. All parties had comments and recommendations for improvement of the *Fisheries Act* Authorization application and monitoring.	Input from engagement incorporated into the *Fisheries Act* Authorization application. Feedback will be incorporated into the Baker Creek Design Plan (forthcoming submission).
Aquatic Effects Monitoring Program and *Fisheries Act* Authorization	**AAC**	2021–2024	Workshops held throughout 2021 to 2024 relating to a number of aquatic components including the Aquatic Effects Monitoring Program and the DFO *Fisheries Act* Authorization.	Discussions and input from Rights holders and stakeholders helped inform the decisions around aquatic-related GMRP components (e.g., monitoring of fish, water, sediment). Members of the YKDFN shared thoughts about fish locations in Yellowknife Bay; this information was shared in confidence and was used to support the Aquatic Effects Monitoring Program.
Revegetation Update	**YKDFN, NSMA, GMWG**	2022, 2024	Meeting with YKDFN and NSMA separately to discuss revegetation needs for Baker Creek and for erosion protection in other areas of site, solicit feedback on types of plants and how revegetation success would be measured. In 2024, met with NSMA for site tour for updates on revegetation on site.	YKDFN advised not to plant medicine plants; NSMA and YKDFN advised to focus on native plants. This feedback was incorporated into the design plans and *Fisheries Act* Authorization.
Climate Change	**GMWG**	2023–2024	Workshops held in 2023 and 2024 relating to how climate change is incorporated into design, including updates to the climate projections.	Discussion and input from Rights holders and stakeholders helped inform the decisions around the update of the climate projections and the use projections in design (e.g., how often projections are updated, how previous and new projections are considered in design).

The date ranges provided are intended to show the engagement activities within the timeframe of this report (mid-June 2021 to mid-June 2024); however, engagement for many of the listed activities may be ongoing.

AAC = Aquatic Advisory Committee; DFO = Fisheries and Oceans Canada; GMAC = Giant Mine Advisory Committee; GMRP = Giant Mine Remediation Project; GMWG = Giant Mine Working Group; GNWT = Government of Northwest Territories; MMP = management and monitoring plan; NSMA = North Slave Métis Alliance; Q&A = question and answer; YKDFN = Yellowknives Dene First Nation.

The GMRP incorporates Indigenous Traditional and Local Knowledge to guide decisions and be sure the work reflects community values. This knowledge has shaped project designs and monitoring plans and continues to inform planning through direct community input. The GMRP remains committed to including Indigenous perspectives throughout the remediation.

The GMRP has funded the following studies:

- **Yellowknives Dene First Nation:** A 2018 Traditional Knowledge study helped incorporate Yellowknives Dene First Nation values, risk perceptions, and land use impacts into project planning and future reclamation.
- **North Slave Métis Alliance:** A 2020 preliminary study documented North Slave Métis Alliance land use and history in the area to support more meaningful engagement.
- **Tłı̨chǫ:** The site falls within Tłı̨chǫ territory; a Traditional Knowledge study was funded in 2021 to 2022 to guide socio-economic and other engagement aspects.

2.4 SOCIO-ECONOMIC ACTIVITIES

The GMRP strives to deliver social and economic benefits to Indigenous and Northern communities while protecting the environment and people's health.

The focus of this report is about the status of the environment, but additional information about the GMRP's approach to socio-economics is available in the GMRP Socio-Economic Strategy 2023-2028 (links for additional information below). In general, the GMRP strives to provide socio-economic benefits through contracting mechanisms with its main construction manager, such as Indigenous Opportunity Considerations (incentives to employ and train Indigenous persons and do business with Indigenous businesses) and setting aside contracts for regional Indigenous businesses.

Additional benefits, such as funding for training and scholarships, are provided via Contribution Agreements to Indigenous Groups in the region. In January 2023 a Procurement Framework Agreement was negotiated with the YKDFN to solidify such funding and to maximize opportunities and support for Indigenous Businesses.

Specific to the general business community, the main construction manager hosts an annual "Industry Day" that lets companies who want to bid on work at site learn about upcoming opportunities and to hear what activities will be happening at the site in the coming years.

There are two dedicated socio-economics committees. The first is a Socio-Economic Working Group that coordinates and integrates socio-economic activities for the GMRP.

This working group shares information and seeks opportunities to improve collaboration, as well as reports to and seeks advice from a Socio-Economic Advisory Body.

The Advisory Body is a senior-level committee that provides high-level recommendations to the GMRP team by building on suggestions coming from the Socio-Economic Working Group. Working Group meets every other month, and the Advisory Body meet a couple of times per year.

Membership for both committees is similar and consists of the following representatives: Crown-Indigenous Relations and Northern Affairs Canada, City of Yellowknife, GNWT (Environment and Climate Change; Industry, Tourism and Investment; and Education, Culture and Employment), the main construction manager, Public Services and Procurement Canada, North Slave Métis Alliance, Tłı̨chǫ Government, Yellowknives Dene First Nation, and Giant Mine Oversight Board (as an observer).

Did you know?

The GMRP has a socio-economic strategy that was updated for 2023 to 2028?

The GMRP is committed to deliver socio-economic benefits to Indigenous Peoples and Northerners.

Every year, results on how many contracts were issued, and demographics of people who were trained or hired, are reported to the public.

More information about socio-economics and the GMRP may be found here:

Socio-economic Strategy

Plain Language: (https://www.rcaanc-cirnac.gc.ca/eng/1566487546150/1618357081011)

Details: (https://gmob.ca/wp-content/uploads/2024/04/GIANT-2023-Socio-Economic-Strategy-2023-2028-Low-Res-1.pdf)

Socio-Economic Report

The latest socio-economic report summarizes up to April 2024: https://gmob.ca/wp-content/uploads/2025/01/2024-12-18-GMRP-Annual-Report-2023-2024.pdf.

3.0 Climate *Change*

The climate is changing, with the North experiencing changes faster than other areas. Climate can affect the management of the site. Too little rain or snow can cause a drought with reduced water to use for remediation and for fish spawning and survival. Too much rain or snow can cause a flood and prevent remediation or be a risk to infrastructure. Air temperature can affect the rate of melting of snow or can affect the water temperature in Baker Creek, making it too warm for fish survival or too cool for fish growth. Both too much and too little water require extra management or inspections on site. The GMRP monitors water coming onto the site from rain and snow and tracks local streams very closely to prevent flooding on the site.

The GMRP (plus other activities) can also affect the climate by putting out gases, known as "greenhouse gases," into the air that can trap heat on Earth and make the weather different. In 2021 the GMRP began to calculate how much greenhouse gas it puts out.

This chapter provides a description of changing conditions in the region that affected the site from 2021 to 2024, including water flows/water level and air temperature, wildfires, and an overview of the greenhouse gases from the site. In addition, this chapter also has a summary of the actions the GMRP has taken in response to climate change. Information on wind speed and direction is provided in Chapter 4.

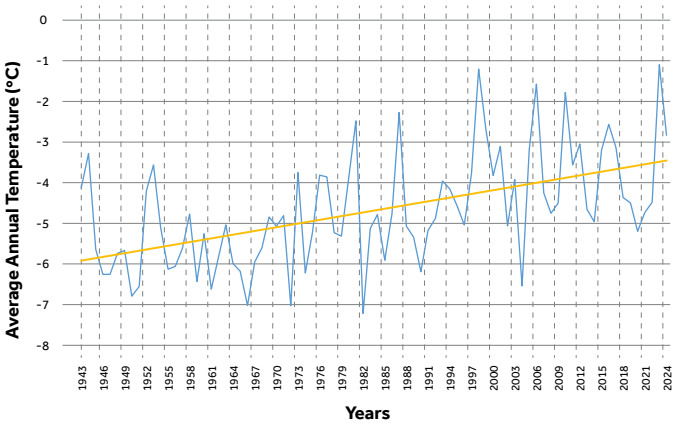
3.1 CLIMATE

Air Temperature

As outlined in the Closure and Reclamation Plan[19], the annual average air temperatures in Yellowknife are going up (Figure 5). This shortens winters and lengthens summers. Warmer air temperature can mean warmer ground temperature. Some of the buildings and dams on site are settling, and this is thought to be in part due to the warmer ground. Frequent inspections and maintenance are carried out on site to manage settling until remediation when the buildings are demolished, and new infrastructure is built.

The change in air temperature can change the timing of spring melt. Figure 6 shows the date of peak spring flows at Baker Creek above the site at the outlet of Lower Martin Lake.

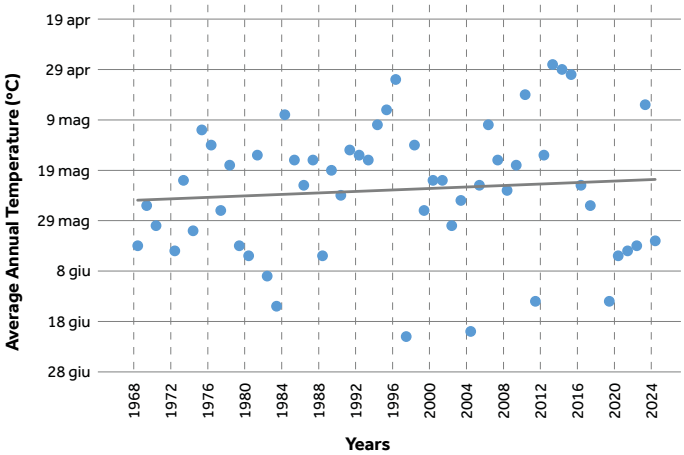
In general, the spring melt of Baker Creek is happening earlier than in the past. The GMRP must monitor for ice jams and water levels in the creek to prevent flooding.



Source: Environment and Climate Change Canada Yellowknife A Station.

°C = degree Celsius

Figure 5: Annual Average Temperature at Yellowknife, 1943 to 2024



Source: Water Survey of Canada Baker Creek at Lower Martin Lake station.

Figure 6: Date of Spring Peak Flow at Baker Creek, 1968 to 2024

Precipitation (rainfall and snowfall)

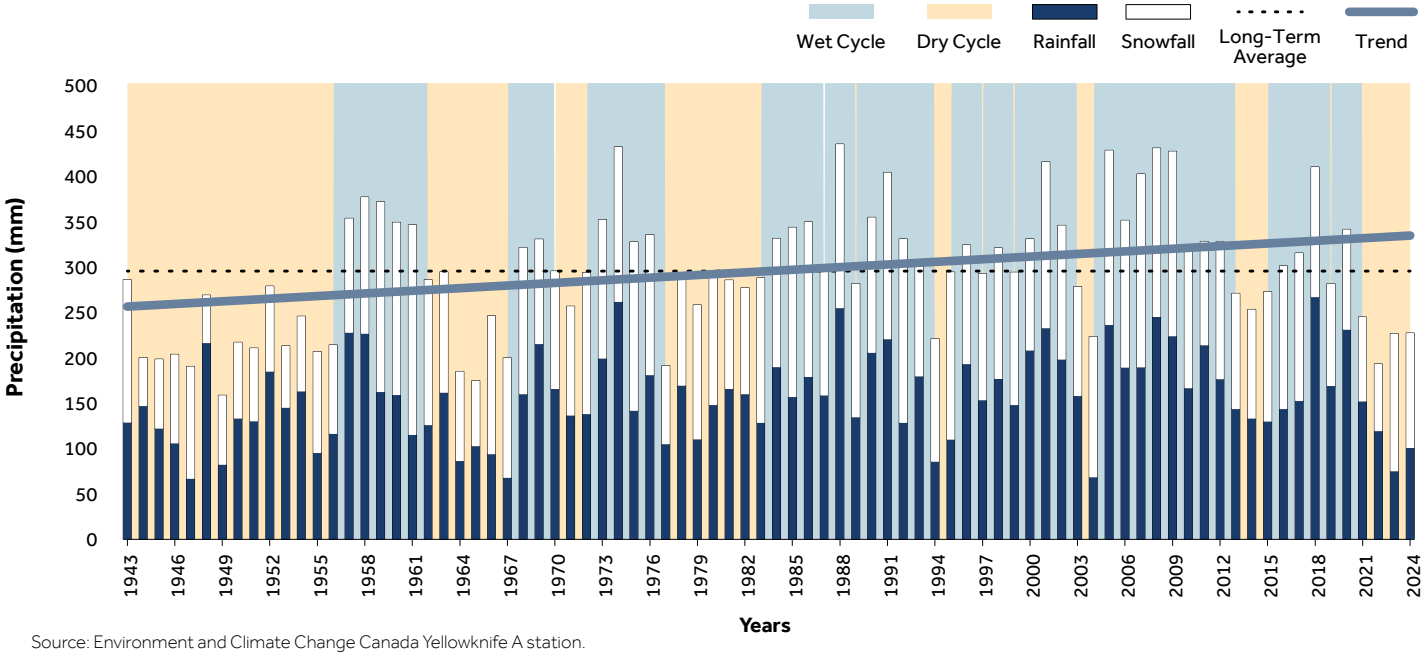
Figure 7 shows information on snowfall and rainfall since 1943. It also indicates dry periods, which are years with precipitation below average, and wet periods, which are years with precipitation above average. Typically, dry and wet periods occur in cycles that alternate between dry and wet every few years. Overall, the amount of annual precipitation (snow and rain) in Yellowknife is increasing over time and more extreme wet or dry periods are observed.

The years 2021 to 2024 were amongst the driest on record (see Figure 7). Drought conditions resulted in low flows in rivers and creeks, and low water levels in lakes and ponds.

Flow and Water Levels

The years 2021 to 2024 were dry, with less snow or rain than previous years. Flow rates at Baker Creek were above average in 2021 because there was water in the system from wet conditions in 2020 and then flows dropped after that (Figure 8). With so little snow and rain, flow rates became zero in the summers of 2022, 2023, and 2024 at Baker Creek, upstream of the site, and the creek was sometimes completely dry (Photo 5, Figure 8). Low to no flow rates have happened in the past, most recently in 2017.

Treated effluent was discharged to Baker Pond as approved and was sometimes the only water in the creek (see Chapter 5 for more details).

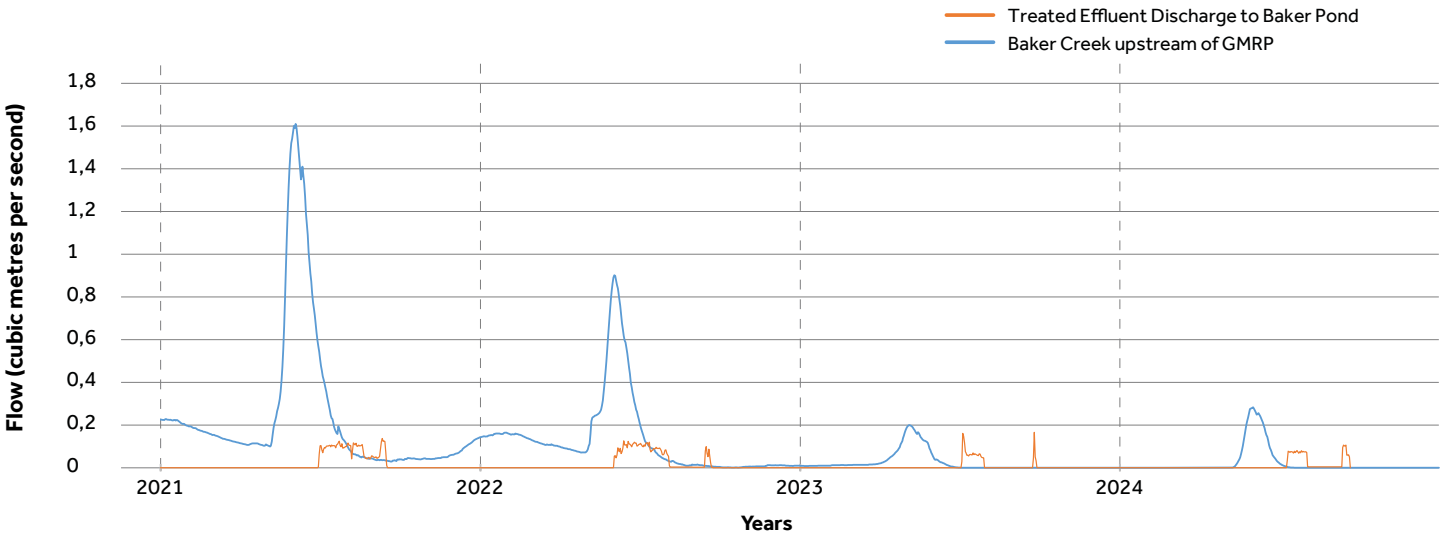


Source: Environment and Climate Change Canada Yellowknife A station.

Note: This figure presents hydrological years. "Hydrological year" means the 12-month period of precipitation which turns into flow during open-water months; precipitation during the months of October to December of the previous year, and January to September of the current year, turn into flow during the current year.

mm = millimetre.

Figure 7: Annual Precipitation at Yellowknife, 1943 to 2024



Source: Water Survey of Canada Baker Creek at Lower Martin Lake station

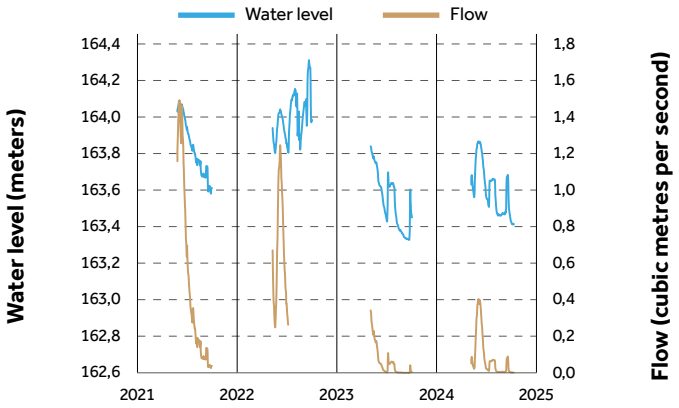
Figure 8: Flow Rates of Baker Creek Upstream of Site Compared to Discharged Effluent to Baker Pond

Photo 5: Conditions in Baker Creek, Upstream of the Site in 2023

Photo 6: Dry Stream Bed at Pocket Lake in Spring 2024

Less water was also seen at Baker Pond on site, as well as nearby Trapper Lake and Pocket Lake (Photo 6). The GMRP monitors water level and flows in these waterbodies; the information from the monitoring is shown in Figure 9, Figure 10, and Figure 11. When the drought conditions end and wet conditions are experienced, it may take a while for the waterbodies to fill up and for the streams to flow again.

Climate change can affect the timing of precipitation. As noted in the Closure and Reclamation Plan[20] (Chapters 1-4, 5.0-5.4, 5.5, 5.6, 5.7-7.0), there has been a shift in the regional streamflow pattern. An increasing trend in September rainfall is occurring. Peak flows historically occurred during spring freshet, with 78% of the Baker Creek annual streamflow in May and June compared to 6% between October and March. Since 1998, the proportion of annual streamflow has decreased in spring and increased in fall/winter[21,22]. This shift in streamflow pattern is shown in Figure 12. The remediation plan for Baker Creek includes realignment to accommodate a probable maximum flood and ice buildup. This was done to account for expected changes in climate in the future, including changes to precipitation and flows.



Note: After 8 July 2022 until the end of 2022, a beaver dam was present, which increased the level of Baker Pond and decreased the flow out of Baker Pond.

Figure 9: Water Level and Flow at Baker Pond during Open-Water Conditions

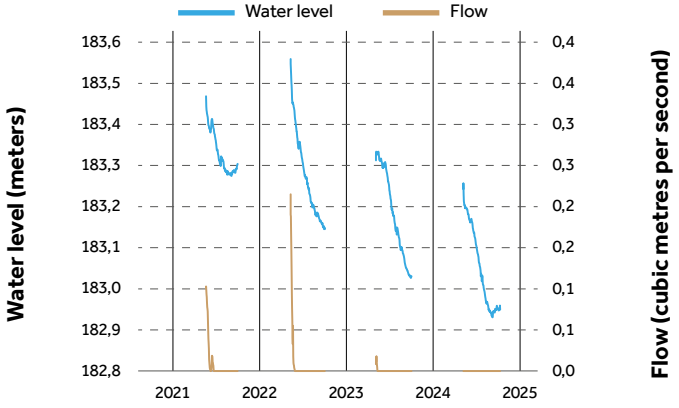


Figure 10: Water Level and Flow at Trapper Lake during Open-Water Conditions

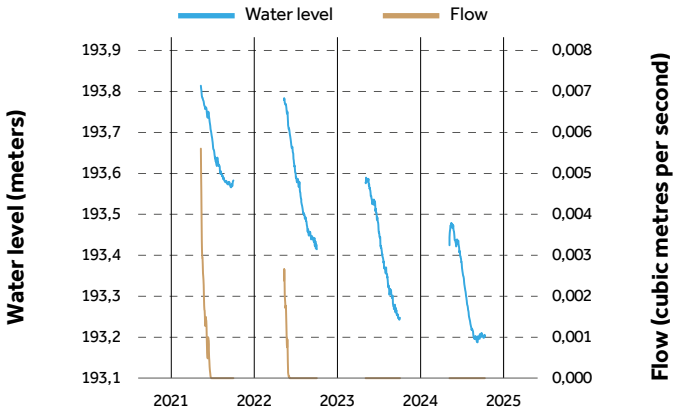


Figure 11: Water Level and Flow at Pocket Lake during Open-Water Conditions

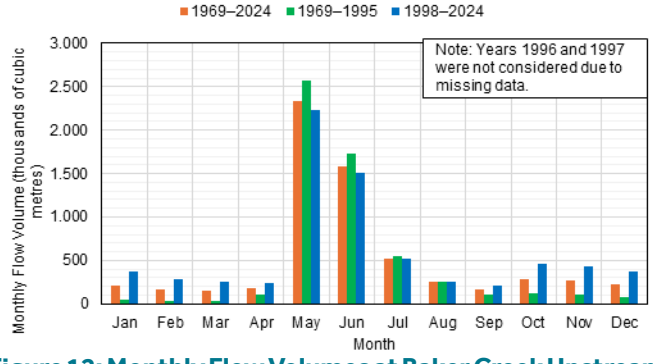


Figure 12: Monthly Flow Volumes at Baker Creek Upstream of the Site

Summary

The consideration of climate change and monitoring for climate-related items like water flow are essential to the safe and successful completion of the GMRP. Wet and dry cycles are natural occurrences that result in different water levels and flows; however, climate change may mean that the cycles are more severe or frequent. Although some trends over time have been identified, projecting the changes to precipitation in the future is uncertain, as the timing and intensity of precipitation can vary. The realignment of Baker Creek is designed to account for future uncertainty of precipitation.

3.2 WILDFIRES

When wildfires occur near the Yellowknife area, the City and the Giant Mine site can experience smoke and poor air quality[23]. In 2023, there were a number of local and regional wildfires which were closer to the site than had been experienced since 1998 and 2014. The City of Yellowknife ordered an evacuation on 18 August which was in place through 6 September 2023[24]. In compliance with City directives, all activities on site were suspended for this duration. Before leaving site, GMRP crews collected brush, cleared materials, and disconnected power, save for a connection for three underground pumps. Access points to the site were secured; contractors occasionally checked the site when safe to do so. There were no reported security breaches during the evacuation. In general, the wildfire posed a low risk to the toxic arsenic trioxide dust because it is stored underground at the site and contaminated materials from the deconstructed roaster are stored in shipping containers within tailing ponds. The wildfires (May to late October 2023) did impact air quality; see Chapter 4 for further details.

Since that time, the GMRP has made improvements to its emergency management process to better prepare for potential future wildfires. Additional information can be found in the wildfire incident action plan as part of the Emergency Management and Spill Response Plan[25] .

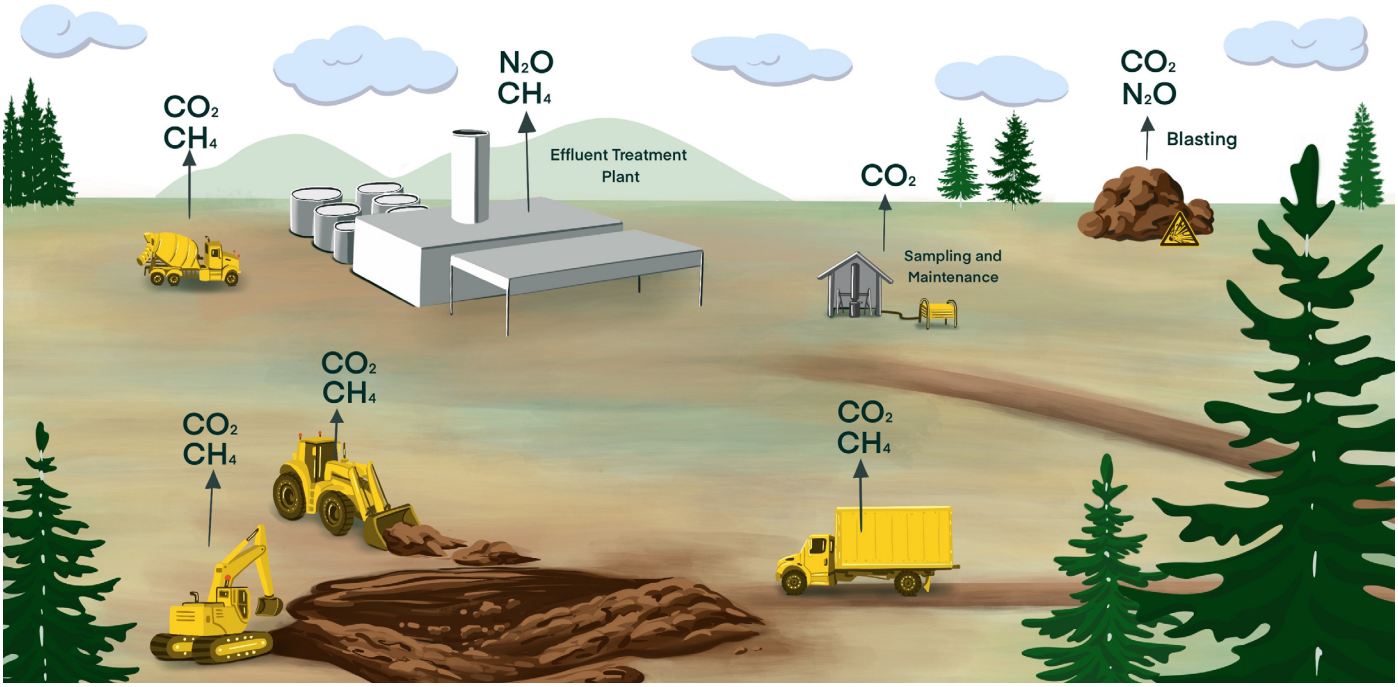
3.3 GREENHOUSE GASES

What were the total emissions from 2021 to 2024?

The GMRP contributes greenhouse gas emissions through different remediation activities (Figure 13) and documents the amount of these greenhouse gases:

1. **Carbon dioxide gas**, abbreviated as CO2: Carbon dioxide gas is naturally in the air, but it can also be emitted by cars, trucks, and buildings.
2. **Methane gas**, abbreviated as CH4: Methane gas can be emitted by industrial activities including water treatment.
3. **Nitrous oxide gas**, abbreviated as N2O: Nitrous oxide gas can be emitted by burning fuel and treatment of water.

The total amount of the estimated greenhouse gas emissions is shown in Table 7. In the table, the greenhouse gas emissions are shown in units of kilotonnes of carbon dioxide equivalent (kt CO2e). Carbon dioxide equivalent is a way to convert different greenhouse gases into the amount of carbon dioxide that would have the same effect. For example, methane (CH4) is much more powerful than carbon dioxide (CO2) at trapping heat. This means a small amount of methane is equivalent to a larger amount of carbon dioxide.



CH_4 = methane gas; CO_2 = carbon dioxide; N_2O = nitrous oxide gas.

Figure 13: Sources of Greenhouse Gas Emissions from the Giant Mine Remediation Project

This allows the overall effect of different greenhouse gas emissions to be represented in a straightforward way. More details on the emissions can be found in the Giant Mine Remediation Project annual reports (2021-2022, 2022-2023, 2023-2024).

As shown in Table 7, the total estimated greenhouse gas emissions from the Giant Mine site from 2023 to 2024 was 6.29 kilotonnes CO_2 equivalents. For comparison, the total amount released by the Northwest Territories from 2023 to 2024 was approximately 1,224 kilotonnes CO_2 equivalents (Northwest Territories Carbon Tax Report 2023/2024[26]). The Northwest Territories has a Climate Change Strategic Framework[27] and a 2030 Energy Strategy[28] to help address climate change in the North.

Table 7: Total Estimated Emissions of Greenhouse Gases from the Giant Mine Site in 2021 to 2024

YEAR	CARBON DIOXIDE (kt CO_2e)	METHANE [a] (kt CO_2e)	NITROUS OXIDE (kt CO_2e)	TOTAL (kt CO_2e)
2021-2022	2.59	0	0.02	2.62
2022-2023	2.91	0	0.02	2.94
2023-2024	6.23	0	0.05	6.29

a) Values below 0.01 kt CO_2e.

kt CO_2e = kilotonnes carbon dioxide equivalents.

3.4 ACTIONS IN RESPONSE TO CLIMATE CHANGE

What efforts are being undertaken to reduce greenhouse gas emissions?

The remediation of the Giant Mine site will take approximately 15 years to complete. While the GMRP will result in improvements to many of the components of the environment, the "earthworks" activities on site using heavy equipment will create greenhouse gases. The GMRP is taking steps to proactively reduce emissions and implement relevant federal and GNWT climate action plans and policies.

The GMRP completed a greenhouse gas assessment (federal requirement for new buildings) of the design of the new water treatment plant. This included a life cycle analysis of the heating system and all supporting equipment, as well as looking at the current proposed fuel oil heating design and a 100% electric heating system using electric boilers. Greenhouse gas emissions were calculated for each option over the 40-year lifespan of the facility to demonstrate the reduction in emissions. The option for biomass (pellets) and electric and propane and photovoltaic cells was chosen, which is estimated to reduce emissions by almost 90% over 40 years. Additional information is available in the last Status of the Environment Report.

The Closure and Reclamation Plan[29] and the last Status of the Environment Report, outlined many design improvements and decisions that have been made to decrease greenhouse gas emissions. The GMRP is committed to looking for other opportunities to reduce emissions during the remediation work (GMRP Annual Report 2021-2022, 2022-2023, 2023-2024). Further details on future initiatives and work on greenhouse gas reductions can be found in Chapter 11.

Incorporating climate change into designs

Climate projections evolve over time through advances in observations, research, and modelling. The engineering designed in the Closure and Reclamation Plan was based on climate projections from the Intergovernmental Panel on Climate Change Fifth Assessment Report[30]. Newer climate projections are now available based on the Intergovernmental Panel on Climate Change Sixth Assessment Report[31]. The new projections estimate that future precipitation near the site will be more variable and likely increase from current conditions; however, the projections are not estimating much more precipitation than already projected in the Fifth Assessment Report. The new projections did, however, suggest the future air temperatures would be warmer than previously estimated.

- The engineering designs for the GMRP were checked against the new climate projections to see if they could still work. The GMRP confirmed that the designs for the new water treatment plant, drainage structures from the covers of the open pits and tailings ponds, and Baker Creek can manage the updated precipitation projections.
- The design of the stability of the dams in the tailings containment pond was also considered and still work. After remediation, future dams may experience warmer conditions and are still predicted to be stable.
- The design of the freeze containment system is also considered appropriate. Should future air temperatures be warmer, the GMRP has actions it can take to address this.

One additional consideration related to climate and design is the presence of permafrost on site. As earthworks proceed, more permafrost may be found. Efforts will be made to building infrastructure in areas to avoid permafrost where possible.

3.5 CLIMATE STATUS OF ENVIRONMENT INDICATOR

The appropriateness of an indicator for climate change: greenhouse gases is under review. The GMRP is doing additional work to better understand opportunities to reduce greenhouse gases during remediation.

4.0 Air

4.1 BACKGROUND

The GMRP could affect air quality during remediation. This could occur primarily through release of dust and vehicle emissions on site.

To monitor air quality, an Air Quality Monitoring Plan was developed in 2013 for the GMRP. It was revised in 2021. The Air Quality Monitoring Plan describes the air monitoring for the GMRP and outlines methods for measuring, documenting, and responding to potential airborne contaminants on the site and in the community. The Air Quality Monitoring Plan was developed in consultation with Rights holders and stakeholders, including discussions on the locations of the community monitoring stations. This chapter describes the air quality monitoring that occurred from 2021 to 2024 (the period covered by this report) and compares this period to air quality since 2015.

Dust is small particles in the air that settle on the land and water or can be breathed in (inhaled) by humans. Dust can come from forest fires, pollen from plants, or human activities such as blasting or construction. The amount and size of particles (particulate matter) in air is linked to potential impacts to human health. This is because dust that is very small can be inhaled by people.

Total suspended particulate (TSP) is the amount of airborne dust with particles measuring 100 microns or less in diameter. A micron measures one-millionth of a metre. Some TSP in the air is normal. By determining the amount of airborne dust, TSP indicates overall air quality. TSP includes both dust particles a person can inhale and larger dust particles that the body's protective systems can easily remove. Depending on its contents, TSP may not cause negative (adverse) health effects.

If the TSP mostly contains larger particles, it is not considered a significant health risk. This is because the body's protective systems can remove the particles or keep them from getting into the lungs. For example, large particles can be trapped in the nose, preventing these from entering the lungs. However, if the TSP contains a large amount of small or fine particles that can be inhaled (called PM_{10} and $PM_{2.5}$, see below), it could cause adverse health effects. Particulates of concern include:

- fine particulate matter, such as that found in wood smoke or vehicle exhaust, that is smaller than 2.5 microns in diameter ($PM_{2.5}$)
- fine particulate matter smaller than 10 microns in diameter (PM_{10}) from landfills or construction or wildfires
- coarser particulate matter (larger than 10 microns), such as that found near unpaved roads and earth handling activities

In summary, TSP provides an indication of overall air quality, and PM_{10} or $PM_{2.5}$ indicate the presence of particles that could cause adverse health effects. Monitoring of these is important to protect people and the land.

4.2 MONITORING

How is air and dust monitored for the Giant Mine Remediation Project?

The GMRP has a large monitoring program for dust that includes ambient air quality monitoring to protect the land and people (Dust Management and Monitoring Plan). If one of the air monitors detects an increase in airborne dust levels, site workers take action. They may water the area to keep the dust down (dust suppression) or even stop the work. While dust from the site may not contain harmful levels of contaminants, the GMRP still wants to make sure that dust does not reach communities near the site. Air quality monitoring for the GMRP is conducted using two networks to track the effects of site activities, including remediation activities (Figure 14). The two networks measure different aspects of air quality:

1. **On-site**: network measures the air quality around the site to identify if dust and contaminants are released from the site. It provides information to site workers about activities that might be generating dust so site workers can manage these to reduce or prevent dust. There are fixed air monitor stations around the site (i.e., site perimeter monitoring stations), as well as monitoring around specific site activities as warranted.
2. **Community**: network provides information on dust levels in communities, whether generated on site or within the nearby communities (Yellowknife, Ndilǫ). If the on-site monitors are within acceptable levels when the community monitors show spikes, the GMRP Team knows the source of dust is not the site and could be from regional forest fires or local roads.

Figure 14: Air Quality Monitoring Stations

Where are the on-site stations and what do they monitor?

Dust is captured on filters at the nine site perimeter air quality monitoring stations (Figure 14). Continuous real-time monitoring of TSP and PM_{10} is done May to November, 24 hours a day (i.e., during non-snow covered months). Filters from the air monitors are analyzed in a laboratory on a schedule partially determined by season and site activities. The amount of TSP and of fine particles at size PM_{10} is measured. This is reported as a value indicating how much dust is in a volume of air (micrograms per cubic metre of air). Filters are also analyzed for metals (i.e., antimony, arsenic, lead, nickel, and iron). These are reported as a value indicating how much of each metal is in a kilogram of dust (milligrams of metal per kilogram).

Air quality may also be monitored during some remediation activities with activity-specific monitors. This monitoring is not part of a network but provides a means for the GMRP to better understand and control dust near its source.

Routine monitoring for signs of dust in the air (visible dust) is also done by all site workers. To help support dust monitoring, weather data such as wind speed and direction are collected at the on-site meteorological station (Photo 7) and data from the Yellowknife airport. Table 8 summarizes the dust monitoring. More details on the monitoring can be found in the Dust Management and Monitoring Plan[32].

Photo 7: Meteorological Station on Site

Table 8: Summary of Dust Monitoring for the Giant Mine Site

NETWORK	TYPE OF MONITORING	WHERE?	WHAT STATIONS?	WHAT IS MONITORED?	HOW OFTEN?
On-site	Air quality: site-wide dust	9 stations	Stations A through I	Particulate (TSP, PM_{10}), arsenic, antimony, iron, lead, nickel	Continuous real-time data collection between May and November, and when site activities warrant during the winter, 24 hours a day; integrated 24-hour average filters for each of TSP and PM_{10} are collected daily between May and November and when site activities warrant during the winter. Filters from the air quality monitors are sent for gravimetric and inorganic trace element (metals) analysis on a schedule dependent on season and site activities, and whenever exceedances are found on site due to site activities (i.e., not the result of fog or inclement weather)
	Activity-specific dust	Near a specific site activity as needed	As needed	Particulate (PM_{10})	As needed
	Visible dust	Anywhere on site		Dust that is visible to the eye	Every day, multiple times per day, continuous
	Weather	Meteorological station	Located west of the mobile equipment garage	Horizontal wind speed, horizontal wind direction, temperature, precipitation, relative humidity, barometric pressure, solar radiation	Continuous real-time data
Community	Air quality: dust	3 stations	Yellowknife Bay Ndilǫ Niven Lake, subdivision near downtown Yellowknife	Particulate (TSP, PM_{10}, $PM_{2.5}$), arsenic, antimony, iron, lead, nickel, asbestos (as warranted by site activities), nitrogen dioxide (NO_2) (Niven Lake only)	Continuously monitor hourly average; collection will operate year-round, 24 hours a day

$PM_{2.5}$ = particulate matter with a mean diameter of 2.5 microns or smaller; PM_{10} = particulate matter with a mean diameter of 10 microns or smaller; TSP = total suspended particulate.

Where are the community stations and what do they monitor?

Three air quality monitoring stations, at locations selected with input from Rights holders and stakeholders, make up the community network. The stations are:

- Near Yellowknife Bay (station YKB)
- in Ndilǫ (station NDL)
- in Niven Lake subdivision near downtown Yellowknife (station NVN).

The community network (Figure 14) monitors fine particles ($PM_{2.5}$ and PM_{10}); fine particles measured in communities mostly result from combustion (from vehicles and heating), but it is also possible fine particulate matter from dust generation on the site can travel to communities and be captured by these monitoring stations. On a fixed schedule dependent on season and site activities, filters are analyzed in a laboratory, as with the site samples (Photo 8). Each filter provides two types of data: weighed for the TSP and PM_{10} and then analyzed for metals (e.g., arsenic) (Table 8). One station (NVN) also continuously monitors nitrogen dioxide (NO2) that is emitted from vehicle exhaust, power generation, and building heating.

Photo 8: Air Monitor Filter and Station

What do we do with the data?

1. The amount of PM_{10} and TSP at site perimeter monitoring stations is compared to air quality criteria limits set for the site in the Air Quality Monitoring Plan, which is an appendix to the Dust Management and Monitoring Plan[33]. These limits were set to be protective of human health. If there are any exceedances, they are investigated to determine if the site is the cause. If the site is found to be the cause of the dust, then action is taken on site to reduce or stop the dust (e.g., watering roads).
2. Metals in dust are compared to the established air quality monitoring criteria (as outlined in the Air Quality Monitoring Plan) as results are received from the laboratory (typically three weeks after submitting the filters). The amount of nitrogen dioxide at the Niven Lake station is compared to the Northwest Territories Ambient Air Quality Guideline[34].
3. The amount of $PM_{2.5}$ and PM_{10} at the community monitoring stations is reviewed to determine if there are any patterns over time or if it exceeds the established air quality monitoring criteria (as outlined in the Air Quality Monitoring Plan). These data are used to help improve the types and duration of dust mitigation strategies.
4. The GMRP uses information on wind speed and direction to guide the timing of activities on site, as well as the need for additional dust control.

Should the results show a concern about dust generation, site workers investigate the cause. They determine if something on site caused an issue by doing the following:

- doing visual checks for dust
- reviewing activities happening on site
- looking at how strong the wind is blowing
  looking at what the direction the wind is blowing
- checking other environmental factors like forest fires that could impact air quality
- if work on site causes the dust readings, taking action to address it right away

4.3 KEY RESULTS

What are the results of the monitoring program from 2021 to 2024?

Results of dust and air quality monitoring are available to the public. Weekly air quality monitoring reports are sent via email to Rights holders and stakeholders through the GMRP Distribution List; weekly reports are also uploaded to the Mackenzie Valley Land and Water Board Public Registry[35] and Government of Northwest Territories Ambient Air Quality Network Website[36,37] (CIRNAC 2023). A summary of three key results (PM_{10}, $PM_{2.5}$, and wind) is provided below.

Dust (PM_{10} and $PM_{2.5}$)

Dust measured at the site perimeter (PM_{10}) and community stations (PM_{10} and $PM_{2.5}$) has had steady, low concentrations

except for 2023 (and 2017 and 2024 to a lesser extent) when regional forest fires occurred (Figure 15). When the data are refined to exclude days that reported heavy fog or smoke from forest fires, overall PM_{10} concentrations were lower (Figure 16). For example, removing fire days in 2023 reduced average PM_{10} dust significantly.

Dust in the community stations also showed higher dust concentrations in years with more forest fires (Figure 17). Spring road cleaning, vehicles parked near the stations, and/or forest fires are often responsible for elevated values at community monitoring stations.

On occasion, dust was visible on site. For example, on 27 May 2024, dust was observed, mostly likely because of work happening on the North and Central tailings ponds. On the same day, dust concentrations measured in filters were above the GMRP air quality criteria for PM_{10} and arsenic. As another example, on 5 July 2024, dust was observed and elevated concentrations were recorded due to work activities at the south end of the Northwest Pond.

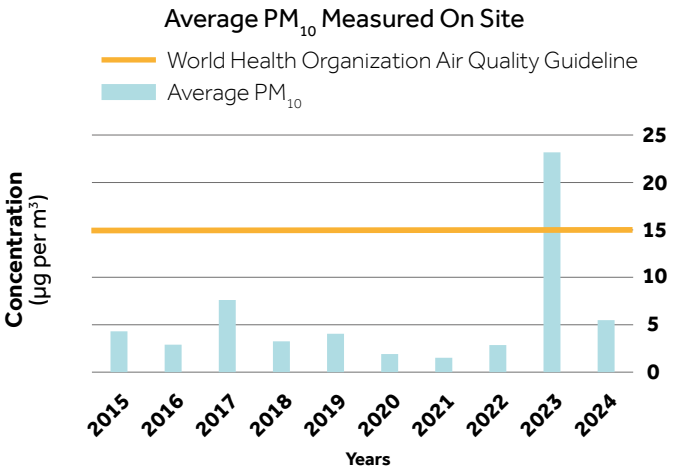
The GMRP watered these areas and placed dust suppressant on the tailings ponds to stop the dust. Water and approved dust suppressant are applied to the tailings ponds and other areas of the site as needed to help reduce the chance of blowing dust. The GMRP recognizes that the potential for dust generation remains until remediation activities are complete and the tailings ponds are covered.

Wind

Wind forecasts and real-time wind measurements are important as they help site workers plan site activities and have extra protection measures in place where needed (e.g., water trucks on stand-by). Wind direction is also an important aspect of wind measurements on site. Winds from the north have the potential to blow dust from the site toward communities.

Figure 17 is a "wind rose" and is used to get an overall picture of wind speed and direction in the reporting period. The length of the "arms" shows how often the winds blew from specific directions. The wind rose on the left shows the pattern during May to November when remediation occurs. The wind rose on the right show's winds in winter. During the remediation period, winds are most often from the southeast and blow toward the communities from the site about 10% of the time. The same pattern is expected to continue in future.

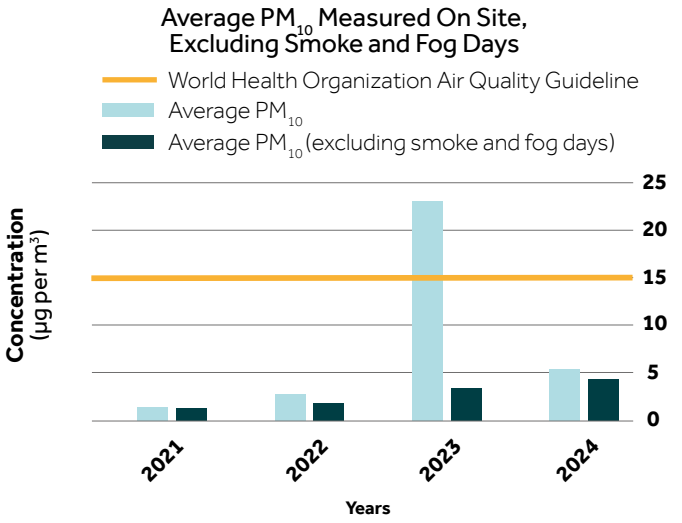
When dust is expected, extra monitoring is planned, as well as extra mitigation to reduce dust, such as watering a road before vehicles drive on it. If dust is seen, dust control can be started right away.



Note: the 15 minute average air quality criteria for on site stations is 159 micrograms per cubic metre..

PM_{10} = particulate matter with an average diameter 10 microns or smaller; µg/m3 = micrograms per cubic metre

Figure 15: Dust (PM_{10}) at On-Site Stations



Note: the air quality criteria for community stations is 50 micrograms per cubic metre for a 24-hour period.

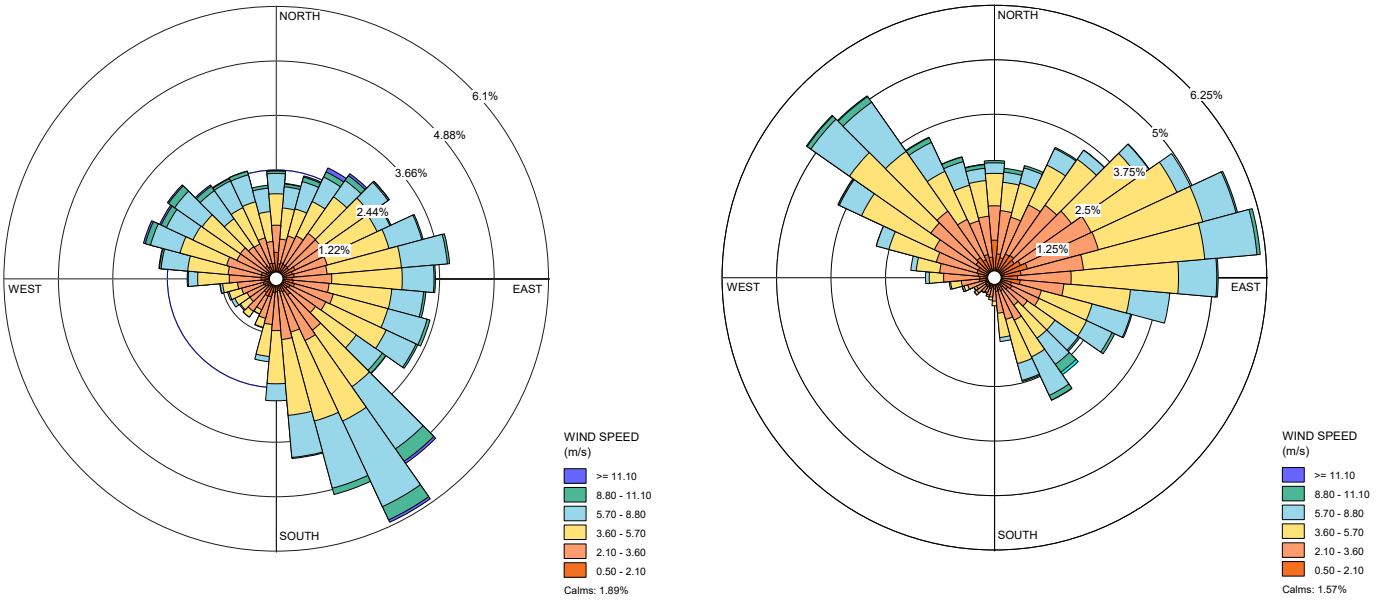
PM_{10} = particulate matter with an average diameter 10 microns or smaller; µg/m^3 = micrograms per cubic metre; YKB = station near Yellowknife Bay; NVN = station in Moyle Park, Niven Lake subdivision; NDL = station in Ndilǫ.

Figure 16: Dust (PM_{10}) at On-Site Stations from 2021 to 2024, with and without Smoke and Fog Days

Did you know?

The World Health Organization has established a guideline for annual PM_{10} based on scientific data. It is set at 15 micrograms per cubic metre. It is meant to help achieve air quality that protects public health. PM_{10} represents the particle mass that enters the respiratory tract. In high concentrations, it can affect breathing and the heart.

Based on many studies, an annual mean concentration of 15 micrograms per cubic metre is below the mean for most likely effects. Monitoring results in Figure 15 show that, apart from the 2023 fire season, annual average PM_{10} concentrations in the site perimeter and community networks are well below the World Health Organization guideline.



Left: During the May to November remediation season. Right: December to April.

m/s = metre per second; % = percent.

Figure 17: Windrose Plot – Meteorology Data Taken from Yellowknife A Station (Station ID – 51058) from 2021 to 2024

4.4 AIR STATUS OF THE ENVIRONMENT INDICATOR

The status of air was rated as "green." This is because the dust concentrations due to operations on site during the reporting period remained low despite having a few occasions where dust was visible on site or over the air quality criteria (Table 9).

The current rating may not stay the same in the next three years. In future, more dust (PM_{10} emissions and larger dust particles) is expected on site with expanded remediation activities. Forest fires will occur, and some days will be windy and generate additional dust in the air. The Dust Management and Monitoring Plan[38] will be followed. Dust control measures in place are expected to be effective and continue to safeguard the communities in future years.

Table 9: Air Status of the Environment Indicator

Air

INDICATOR	EVIDENCE	STATUS FOR 2021–2024
Dust on site	Visible dust was observed on site in a few cases and action needed to be taken; overall dust was limited to site and rare exceedances of the air quality criteria occurred[(a)]. Measured dust was overall low on site except in 2023 during regional forest fires.	
Dust at community stations	Measured dust particles were low at community stations except in 2023 during regional forest fires. Measurements at community air quality monitoring stations were below the ambient air quality criteria[(a)]	

a) Refer to the Air Quality Monitoring appendix of the Dust Management and Monitoring Plan.

5.0 Water

5.1 BACKGROUND

The GMRP could affect water quality due to historical mining contamination on the land and in sediments entering the water, the current operation of an aging effluent treatment plant, site stabilization, and remediation activities.

Water monitoring has occurred on site for decades, with data from the 1970s and 1980s showing that water underground and in Baker Creek was highly contaminated from the mining and roasting processes. The primary contaminant was arsenic, but concentrations of other metals (e.g., copper, lead, nickel, zinc) and ammonia were also high. In the 1980s and 1990s, environmental controls and effluent treatment were implemented, and water quality began to improve. Currently, the water quality at the site continues to be impacted by historical mining operations, but concentrations in the treated effluent have consistently met federal and territorial requirements.

The site has followed the Government of Canada Metal Mining and Effluent Regulations (established in 2002), which became the Metal and Diamond Mining Effluent Regulations in 2018. These regulations provide limits on the quality of the effluent being released from mines across Canada. In 2020, the GMRP received its Water Licence from the Mackenzie Valley Land and Water Board, which outlines specific monitoring and effluent quality requirements for the site. In October 2024, the GMRP became a Recognized Closed Mine under the Metal and Diamond Mining Effluent Regulations. Therefore, starting in 2025, the GMRP will no longer monitor and report under the Metal and Diamond Mining Effluent Regulations; monitoring and reporting in compliance with the GMRP Water Licence will continue.

5.2 MONITORING PROGRAMS

How was water monitored?

The types of water monitoring completed each year include (Table 10):

- collecting water below the ground surface using shallow wells and deep wells (groundwater; Photo 9)
- testing water that comes from the old underground workings (called the mine pool), and measuring how high the water level is in the underground (minewater)
- sampling water that has undergone treatment by the effluent treatment plant and is discharged to Baker Creek (treated effluent)
- collecting water from various locations on site: runoff, water in sumps and ponds (surface water; Photo 10)
- sampling Baker Creek at several locations from near where it enters the site down to where it leaves the site and enters Yellowknife Bay (Photo 11)
- testing water quality in Yellowknife Bay at stations in Back Bay and in north and south Yellowknife Bay (Section 5.1.2)

Groundwater, minewater, treated effluent, and surface water quality are all monitored by collecting field measurements and samples for laboratory analysis. Sampling locations span a wide range of areas of the site and in Baker Creek and Yellowknife Bay as outlined below.

Groundwater monitoring evaluates groundwater elevation, flow, and quality across the site. Groundwater wells (shallow and deep multiport) are installed in areas that will help the GMRP understand water levels under the ground surface and the quality of the water that is flowing near the mine workings. The wells are grouped mainly based on their purpose and location (i.e., near areas of potential source of contamination, near the major environmental receptors, or near the site boundary to evaluate if impacted groundwater is migrating off site). An example of an area that is monitored using groundwater wells is near the Foreshore Tailings Area.

Photo 9: Groundwater Well Sampling at Station

Did you know?

Shallow wells are installed at depths of up to 33 metres below the ground surface and monitor groundwater moving through shallow surface layers and bedrock.

The deep multiport wells, which can collect samples at multiple depths, are installed at depths of up to 156 metres below the ground surface and are designed to monitor groundwater in deeper bedrock aquifers.

Minewater samples are collected by pumping water to the surface (Figure 18), sending equipment down through a shaft and collecting minewater samples at different levels underground, or by directly accessing the underground mine pool or near the sealed chambers that store arsenic trioxide dust. Access to the underground was closed in late 2024; minewater sampling will continue, but samples will only be collected from minewater pumped or drawn to surface rather than collected underground. The underground minewater level (i.e., how high the water is underground, also called the mine pool elevation) is measured using sensors that are attached to the pumps.

After water is treated at the effluent treatment plant, it is sampled to make sure concentrations are within allowable discharge limits before it is seasonally discharged to Baker Creek. Treated water is also tested to see if it is toxic to aquatic life such as fish, bugs (insects), algae, and aquatic plants.

Water quality across the site is also sampled to better develop the predictive models, support remediation design, and help the GMRP Team make water management decisions. These programs include sampling runoff from spring snowmelt and rainfall as it flows across the surface of the site (Photo 12), seepage from the dams around the Tailings Containment Areas, and water in the small feeder creeks that drain into Baker Creek.

These all help to understand the sources of metals and other parameters that could be linked to off-site inputs or site activities such as construction.

Baker Creek and Yellowknife Bay monitoring provides information on how water quality changes over time, with distance downstream (mixing), and potential aquatic effects, including conditions for fish and insect communities that live in the water.

Photo 10: View of Surface Runoff on Site

Photo 11: Water Quality Sampling at Baker Creek

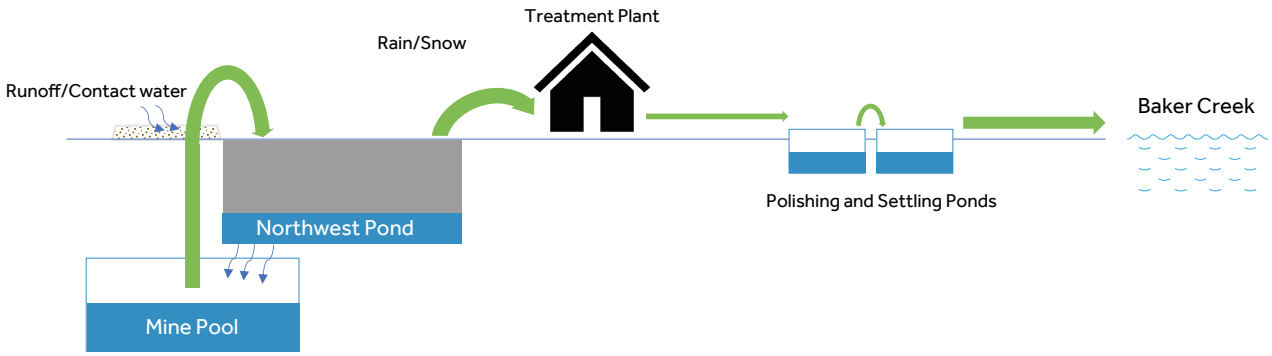


Figure 18: Pumping of Minewater to Effluent Treatment Plant on Site

Most of the water sampling at the site happens from spring break-up each year (May) until freeze-up in fall (October) (Table 10), although some such as minewater sampling occurs year-round. The water monitoring program is one of the most extensive monitoring programs at the site.

To help understand the program, results are organized below by two main questions: How did the water quality compare on site, in Baker Creek, and in Yellowknife Bay? What have we learned so far about studying water quality in Yellowknife Bay?

Table 10: Water Monitoring Summary on Site, in Baker Creek, and in Yellowknife Bay

TYPE OF MONITORING	WHERE?	WHAT?	WHEN?
Groundwater	Under the ground surface, on site	Groundwater quality	Spring and fall
		Water levels	
Minewater	From surface either through a shaft or from minewater pumped to surface; underground sensors for elevation	Minewater quality	Year-round
		Minewater elevation	
Surface water	On site: ponds, sumps, runoff	Water quality	Open-water; freshet
		Pump volumes	
	Treated effluent	Water quality	During discharge
		Discharge volume	
	Baker Creek	Water quality	Open-water
	Yellowknife Bay	Water quality	Winter, spring, summer, fall

5.3 KEY RESULTS

Key results from each of these monitoring programs are outlined below, along with some discussion of what the results mean. The results are summarized in reports sent to Environment and Climate Change Canada (for the Metal and Diamond Mining Effluent Regulations) and the Mackenzie Valley Land and Water Board (for the Water Licence).

5.3.1 How did the water quality compare on site, in Baker Creek, and in Yellowknife Bay?

Groundwater: Contaminants may migrate through groundwater from where mine tailings were placed (e.g., Central Pond and South Pond, Foreshore Tailings Area) during mining operations or from where contact water is stored (e.g., North Pond, Northwest Pond). Key results for groundwater quality are:

- Groundwater quality measurements near these sources typically show elevated arsenic, other metals, and dissolved anion (often refers to how "salty" the water is) concentrations.
- Arsenic concentrations in the shallow wells (Photo 12) were generally highest when measured in tailings and lowest in the overburden or the bedrock.
- Arsenic concentrations in groundwater samples were typically the highest near the Tailings Containment Areas and the Calcine Pond and Mill Pond: Roaster Complex areas.
- Parameter concentrations in the wells remained approximately the same throughout the reporting period, except for at Calcine Pond where concentrations of dissolved arsenic, sulphate, and ammonia have increased in the last several years.
- The lowest arsenic concentrations were measured in the deep well samples collected in the eastern and western areas of the site, farthest from developed areas of the site and arsenic sources.
- The groundwater elevations measured in the shallow wells and the shallowest ports of the deep multiport wells (Photo 13) suggest that the water table is typically within 20 metres of ground surface.

Since mining and following the partial refilling of the underground workings in the early 2000s, minewater pumping has allowed the GMRP to have significant hydraulic control over groundwater flow conditions. The underground continues to act as a "sink" that collects infiltration, groundwater, and contaminated water. For more information on groundwater monitoring methods and results, please refer to the 2021, 2022, 2023, and 2024 (Part 1, Part 2) Annual Water Licence reports for the GMRP.[39,40,41,42]

Minewater: The minewater is contaminated and must be treated before it can be discharged. It is pumped out of the underground workings year-round so that water levels remain below the arsenic storage

Photo 12: Shallow Well for Monitoring Groundwater

Photo 13: Deep Multiport Well for Monitoring Groundwater

chambers. During the reporting period, the water level was very closely managed; pumps were turned on and off to keep the water level at approximately the same elevation. The water level was kept close to the current level, which is 239 metres below ground surface (-77 average metres above sea level or in mining terms, approximately the 750 Level). Water was pumped to the surface using mostly the Northwest Pumping System, and once pumped to the surface, it was stored in the Northwest Pond so that it could be seasonally treated and discharged to Baker Creek. Water from other parts of the site, such as seepage from the Tailings Containment Areas or construction runoff, is also stored in the North Pond or Northwest Pond until treatment.

Did you know?

A new water treatment plant is being built to replace the aging existing plant.

The new plant will discharge directly to Yellowknife Bay, and arsenic concentrations in effluent discharge will be reduced to much lower than existing levels (from 0.3 to 0.01 milligrams per litre on average).

Once the new water treatment plant is commissioned, minewater will be pumped from a different area of the underground mine (C Shaft area) to the surface for treatment. For this reason, monitoring at C Shaft is relevant to understanding future influent quality at the water treatment plant. Two main patterns have been observed in the data at C Shaft void: chloride and sulphate concentrations were lowest in the upper levels of C Shaft and increased with depth, while the reverse occurred for total arsenic and antimony. In 2023, arsenic and antimony concentrations in the upper portion of the C Shaft void were higher than in previous years, possibly related to temporary increases in minewater levels due to wet conditions across the site in 2021 and 2022. When the minewater level increases, contaminants like arsenic and antimony can be flushed from the walls of the underground into the mine pool.

Treated effluent: Operation of the existing effluent treatment plant (Photo 14) is required to allow remediation work to occur and site water to be managed until the new water treatment plant is in operation (Photo 15) and to maintain the minewater elevation underground. In spring each year, the site starts to operate the effluent treatment plant. The release of treated water (known as effluent) generally occurs between July and September but has occurred as early as June and as late as October. Treated effluent is released through a pipe into Baker Pond, where it mixes with upstream water flowing in from Baker and Trapper creeks, then flows directly into the lower part of Baker Creek and into Yellowknife Bay.

How much effluent is released? The amount of effluent released to Baker Pond has varied over time. The highest yearly release of effluent over the past decade was in 2020 (approximately 700,000 cubic metres or about 280 Olympic swimming pool volumes). Since 2020, the yearly volume of effluent release has generally decreased each year likely due to dry

Photo 14: Giant Mine Old Effluent Treatment Plant

Photo 15: Giant Mine New Water Treatment Plant Construction – June 2024

conditions (i.e., less water at the site to manage and treat). The total discharge volumes in 2023 and 2024 were lower than total annual discharge volumes between 2017 and 2022. In 2024, a total volume of approximately 220,000 cubic metres (or about 88 Olympic swimming pool volumes) of effluent was released to Baker Pond.

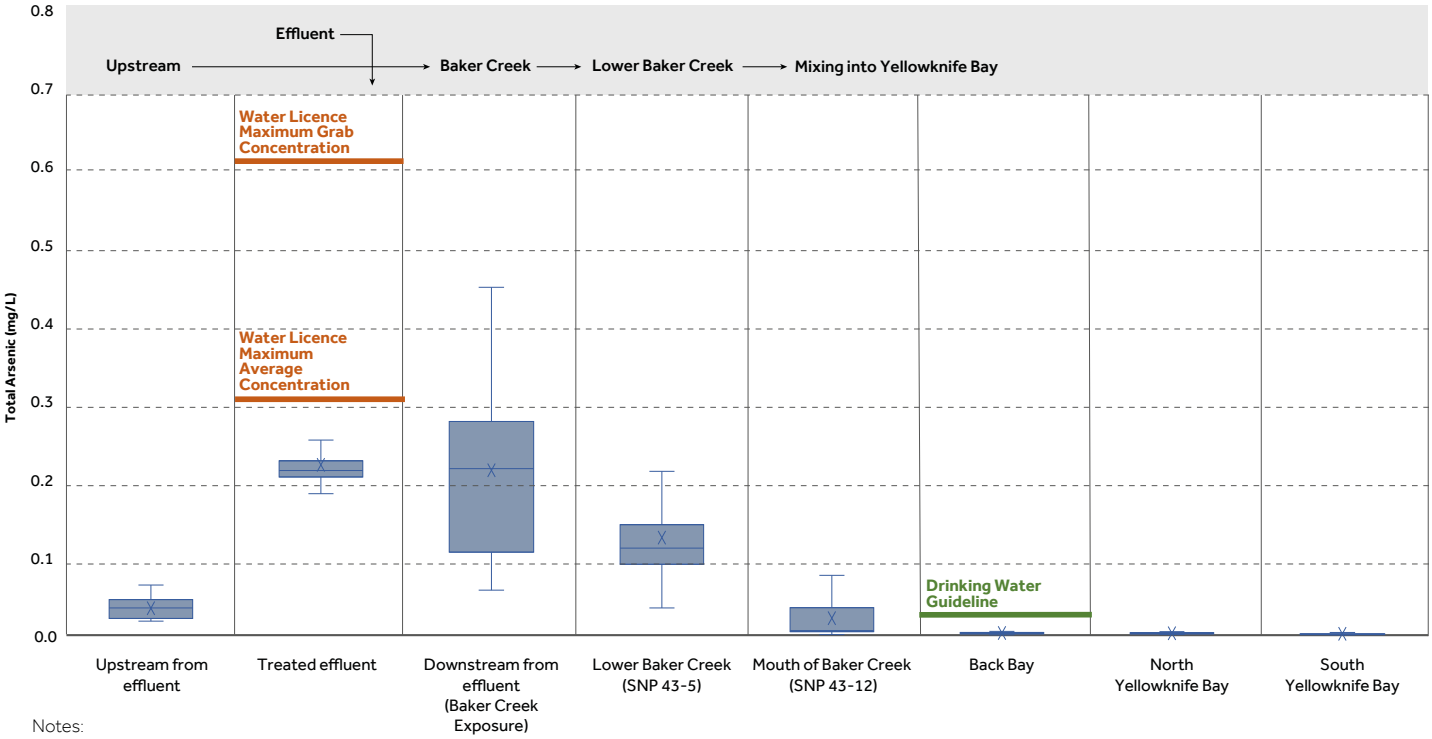
Quality of effluent? Minewater is treated using a chemical called ferric sulphate to remove a lot of the arsenic in the water. Once water has been treated at the plant, it is tested to confirm that it meets discharge requirements before it is released to Baker Creek. The quality of treated water from the site has been studied over many years of monitoring. Metals, such as arsenic, copper, lead, and zinc, are higher in treated effluent than in upstream Baker Creek. Concentrations of dissolved solids and anions (e.g., chloride, sulphate) are higher in the treated effluent than in upstream Baker Creek due to the treatment processes used to remove arsenic and other contaminants.

Baker Creek: In spring, Baker Creek is generally clear (low in suspended sediments), and concentrations of most parameters are low, similar to water coming from above the site from Lower Martin Lake. Once effluent discharge begins in spring/summer, water quality in Baker Creek (from Baker Pond to where it enters Yellowknife Bay; Figure 19) is characterized by concentrations of metals and anions elevated above those observed in Baker Creek upstream of the site, and above aquatic life guidelines for the receiving environment. However, arsenic concentrations in effluent have decreased in recent

years as treatment processes have improved and have been below allowable limits from the Water Licence. Arsenic is the main metal of concern on site. Although treatment removes much of the arsenic, there is still an increase downstream from Baker Pond after the treated effluent is released. This pattern is shown in Figure 19 by comparing arsenic concentrations over the past four years at the upstream Baker Creek sampling location (Station SNP 43 11) and at the sampling location downstream of the effluent treatment plant (Station "Baker Creek Exposure Point" in Baker Pond). The average concentration is about 7 times higher downstream of Baker Pond (0.21 milligrams per litre) compared to upstream of the pond (0.03 milligrams per litre).

Farther downstream, inputs from runoff over the land surface and small feeder creeks enter Baker Creek. This water leads to lower average arsenic concentrations farther downstream (0.12 milligrams per litre at station SNP 43-5 in Figure 19). Once the water starts mixing farther into Yellowknife Bay (past the breakwater), arsenic concentrations decrease rapidly. The same pattern between upper and lower Baker Creek is seen for many other metals, total dissolved solids, chloride, and sulphate.

Arsenic concentrations in Baker Creek have generally decreased over time with better environmental controls, improved treatment, and stricter regulations. For example, arsenic concentrations were around 12 milligrams per litre in the 1970s before the effluent treatment plant was built and have now decreased to below 0.3 milligrams per litre. As shown in Figure 20, the yearly mean arsenic concentrations in lower Baker Creek (at SNP 43-5) decreased from 2015 to 2020. An increase in arsenic was observed from 2021 to 2024, likely due to naturally lower water levels in Baker Creek, especially in the fall when there is less rainfall. Lower water levels mean that the effluent is less diluted in the water of Baker Creek, leading to increased arsenic concentrations (see Photos 16 to 19). Inputs from contaminated sediments or other local factors (e.g., changes in flows, climate, air patterns) may cause some parameter concentrations to increase slightly or remain relatively consistent over time. With construction of the new water treatment plant later in remediation, it is expected that there will be a further lowering in arsenic concentrations near the mouth of Baker Creek, which is currently affected by discharge from the existing plant.

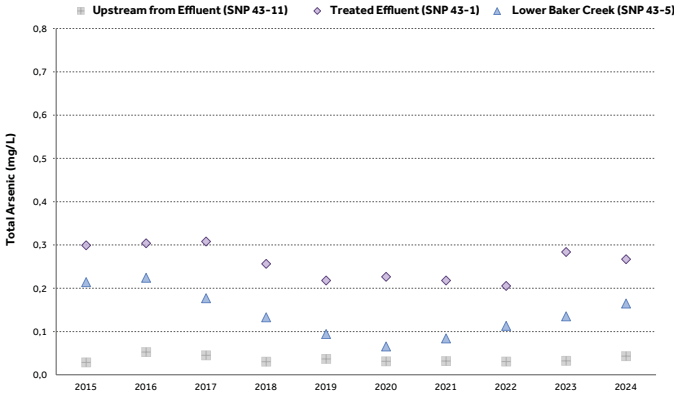


Notes:

Data from 2021 to 2024 are used for statistical calculations. The bottom of the box indicates the first quartile (Q1), the top of the box indicates the third quartile (Q3) and the middle line within the box represents the median. The X indicates the average, the horizontal line above the box indicates the statistical maximum (i.e., Q3 + 1.5*IQR) and the horizontal line below the box indicates the statistical minimum (i.e., Q1 – 1.5*IQR).

SNP = Surveillance Network Program; IQR = interquartile range; mg/L = milligrams per litre.

Figure 19: Pattern of Arsenic Concentrations in Treated Effluent and Baker Creek from Upstream to Downstream, 2021 to 2024



mg/L = milligrams per litre; SNP = Surveillance Network Program.

Figure 20: Yearly Average Arsenic Concentrations over Time in Treated Effluent and Baker Creek

Photo 16: Baker Creek near SNP 43-5, May 2023

Photo 17: Baker Creek near SNP 43-5, June 2023

Photo 18: Baker Creek near SNP 43-5, July 2023

Photo 19: Baker Creek near SNP 43-5, September 2023

Yellowknife Bay: Sampling locations in Yellowknife Bay are grouped into three main areas (Figure 21): Back Bay, North Yellowknife Bay, and South Yellowknife Bay. Based on recent samples collected in these areas, arsenic concentrations in Yellowknife Bay are close to, or below, the Health Canada drinking water guideline of 0.01 milligrams per litre (Figures 19 and 21).

For more information on water monitoring methods and results, please refer to the Annual Water Licence Reports (2021, 2022, 2023, 2024 [Part 1, Part 2])[43,44,45,46] for the GMRP, as well as the annual Aquatic Effects Monitoring Program reports (2021 [Part 1, Part 2, Part 3], 2022 [Part 1, Part 2, Part 3, Part 4, Part 5, Part 6], 2023 [Part 1, Part 2, Part 3], 2024 [Part 1, Part 2, Part 3, Part 4, Part 5, Part 6]).[47,48,49,50]

Did you know?

That arsenic concentrations in Yellowknife Bay near the mouth of Baker Creek have gone down since mining stopped and water treatment improved. Arsenic concentrations are close to or below the drinking water guideline for Canada.

Notes:

Data from 2021 to 2024 were used to calculate the ranges shown.

For comparison, the average arsenic concentration upstream of the site is 0.03 mg/L and the drinking water quality guideline for arsenic is 0.01 mg/L (Health Canada, 2024).

mg/L = milligrams per litre; < = less than.

Figure 21: Pattern of Arsenic Concentrations in Baker Creek and Yellowknife Bay

5.3.2 What Has the GMRP Learned So Far about Studying Water Quality in Yellowknife Bay?

The GMRP collected background information in Yellowknife Bay from 2018 to 2023 as part of the Aquatic Effects Baseline for Yellowknife Bay (appendix to the Aquatic Effect Monitoring Program Re-Evaluation Report [Part 1, Part 2, Part 3, Part 4, Part 5, Part 6, Part 7, Part 8, Part 9, Part 10])[51] (Photos 20 and 21) in preparation for the construction and operation of the water treatment plant. The GMRP will continue to collect water quality samples in the bay in the future as part of the Aquatic Effects Monitoring Program during discharge from the water

treatment plant. Many other researchers are also studying the impacts of historical mining on sediment and water quality in Yellowknife Bay. The studies found that the sediments at the lake bottom continue to be a source of contaminants. However, because of high flows coming in from the Yellowknife River and other areas of Great Slave Lake, concentrations of contaminants in the water column are low.

Information collected as part of the Aquatic Effects Baseline for Yellowknife Bay is used in two ways: 1) it shows whether there is an effect from treated effluent from the existing treatment plant after the water leaves the mouth of Baker Creek and mixes into the bay, and 2) it establishes conditions before the new water treatment plant becomes operational.

Photo 20: Filling Water Bottles for Water Quality Sampling of Yellowknife Bay

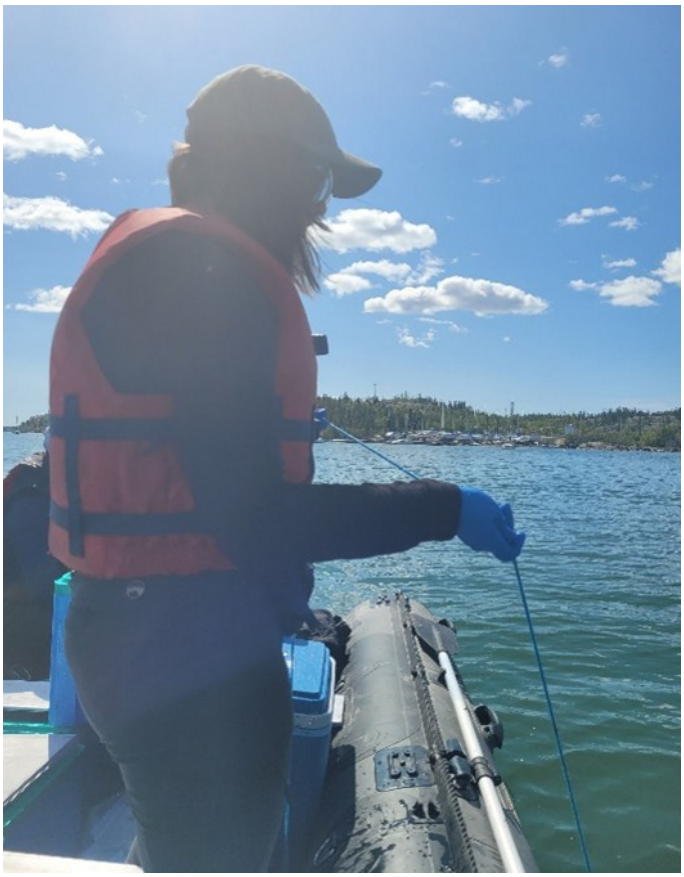


Photo 21: Water Quality Sampling in Yellowknife Bay Off Side of Boat

An example of the way that the baseline monitoring has helped the GMRP understand conditions in Yellowknife Bay is illustrated in Figure 22. In summer (left of diagram), there is surface warming from the sun and there are cooler layers at deeper levels of the lake (shown in darker colours). By fall (right of diagram), these layers start to mix until lake turnover occurs, bringing nutrients up to the surface from deeper layers. At this stage, there is very little change in temperature with depth because the cooler layers have been mixed with the warmer surface layers. The different temperature layers affect fish food (benthic invertebrates), fish growth, and type of organisms that can live in the bay.

Toxicity testing (a laboratory test that looks for negative [adverse] effect of a substance on animal health or the environment) was completed as part of the Aquatic Effects Baseline for Yellowknife Bay for fish, bugs, algae, and aquatic plants using water from an area close to the site, as well as an area farther offshore in North Yellowknife Bay. In both cases, there have been effects on the organisms being tested, but results indicate that the water discharge from the site has not had a major effect on the aquatic organisms: they can still reproduce, feed, and grow.

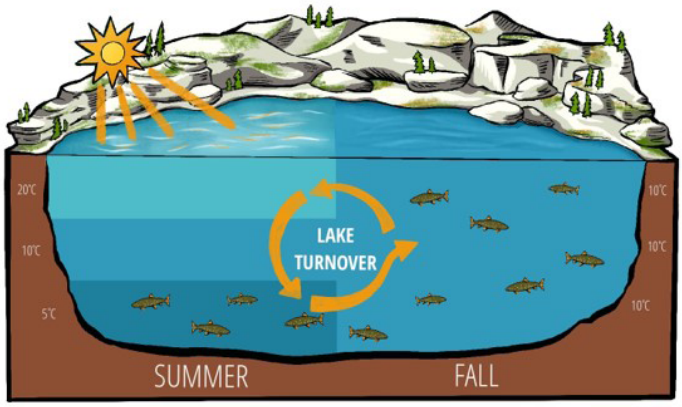


Figure 22: Lake Turnover in Yellowknife Bay between Summer and Fall

5.4 WATER STATUS OF ENVIRONMENT INDICATOR

The status of water was rated as shown below:

On-site: Baker Creek: The status of water was rated as "yellow" for water quality on site and in Baker Creek (Table 11). This is because Baker Creek had increased arsenic in the water when treated effluent was discharged but also had arsenic at amounts similar to upstream when effluent was not discharged to the stream. With effluent present in the creek, arsenic concentrations remained below the federal regulations for metal mines (Metal and Diamond Mining Effluent Regulations). The quality of treated effluent from the site has improved over time and also meets licensed discharge criteria.

Yellowknife Bay: Yellowknife Bay water was rated as "green" (Table 11). This is because the arsenic concentrations were often less than current drinking water quality standard and always less than the site-specific water quality objective (Effluent Quality Criteria Report[52]).

These ratings are expected to stay the same as remediation progresses. Until there is a new water treatment plant for the site, water quality improvements are not expected.

Table 11: Water Status of Environment Indicator

Water

INDICATOR	EVIDENCE	STATUS FOR 2021–2024
Water quality on site and in Baker Creek	*Water in Baker Creek on site*: had arsenic that was higher than upstream of the site when effluent was being discharged, but remained within the national regulation for metal mines (MDMER). *Treated effluent*: met licensed discharge criteria	
Water quality in Yellowknife Bay	Arsenic was often less than current drinking water quality standard and always less than the site-specific water quality objective in Yellowknife Bay.	

Note: From September 2020 onward, the GMRP has operated under a new Water Licence with updated effluent quality criteria (#MV2007L8-0031).

MDMER = Metal and Diamond Mining Effluent Regulations.

6.0 Fish

6.1 BACKGROUND

Baker Creek is a stream that flows through the Giant Mine site. Well before mining, Baker Creek provided a place for fish to lay eggs (spawning habitat), as well as live and grow (rearing habitat). The Yellowknives Dene First Nation used to fish for trout and whitefish in Baker Creek, as well as near the Giant Mine site in Yellowknife Bay, and at the mouth of the Yellowknife River. A drawing of the aquatic environment, showing the relationship between the water and the species that live in it, is provided in Figure 23.

During mining, data from the 1970s showed that the health of Baker Creek was severely damaged; no fish and few benthic invertebrates (small animals living at the bottom of water bodies that are important food for fish), were found downstream of the Giant Mine site (Closure and Reclamation Plan[53] Chapter 2). During the 1990s, wastewater (treated effluent) quality and the timing of wastewater release to Baker Creek were improved to reduce the impact on fish in Baker Creek.

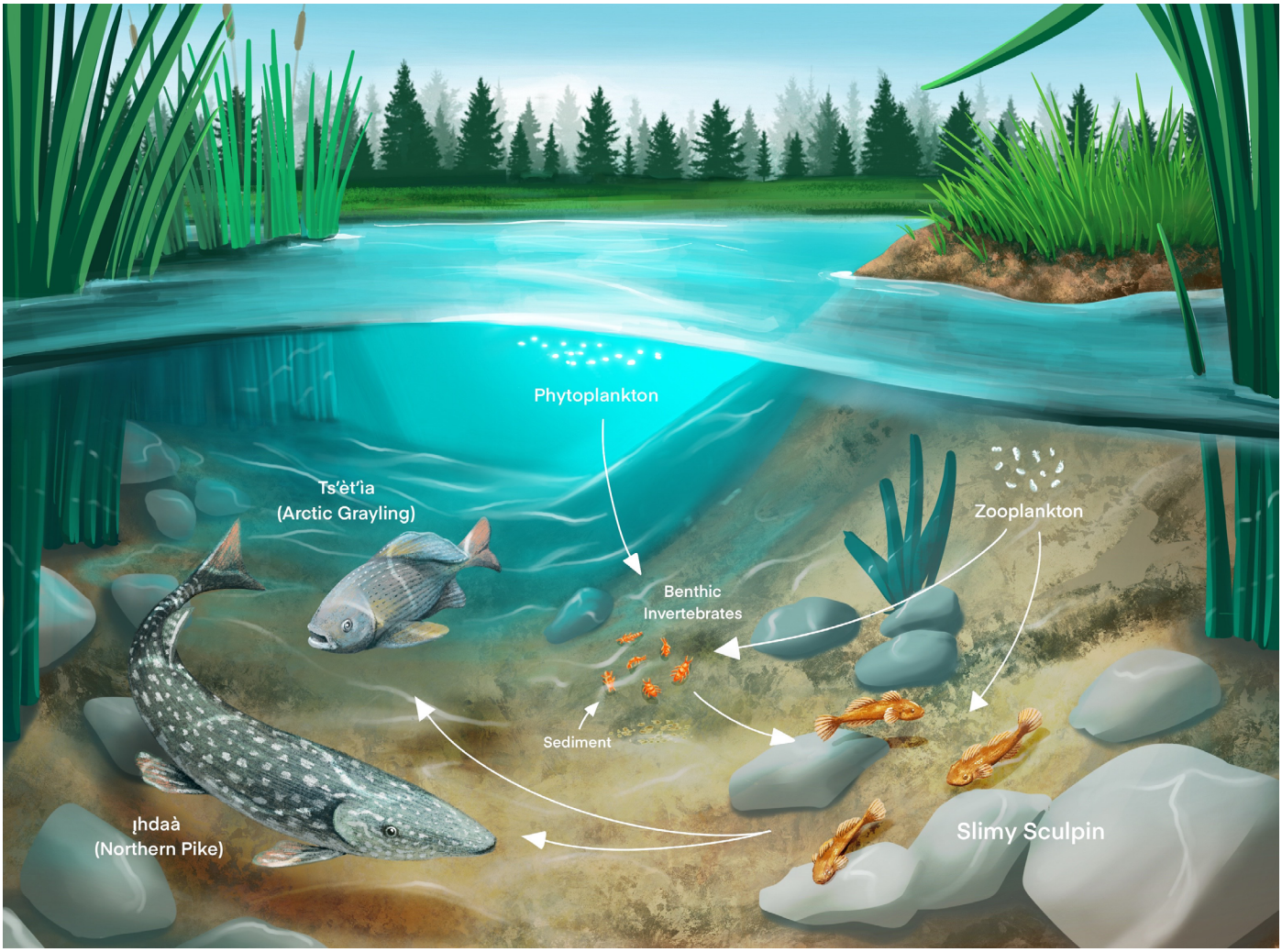


Figure 23: Conceptual Model of the Aquatic Environment

Following these improvements, species of fish and benthic invertebrates began to come back to Baker Creek.

After the site began adopting better controls, and more recently began remediation, improvements in aquatic life were seen in Baker Creek. Currently, Baker Creek is described as contaminated and altered but showing signs of a system in recovery.

In 2002, Canada introduced the Metal Mining Effluent Regulations to control the quality of wastewater from metal mines. The name of these regulations was changed in 2018 and they are now called the Metal and Diamond Mining Effluent Regulations. From 2004, the water, fish and benthic invertebrates in Baker Creek were regularly checked to confirm effluent quality met the requirements of these regulations. Monitoring under the Metal and Diamond Mining Effluent Regulations continued until the Giant Mine became a "Recognized Closed Mine" through Environment and Climate Change Canada in 2024. Monitoring of Baker Creek water will continue under the GMRP's Water Licence.

In 2020, the GMRP began monitoring the potential effects of treated effluent and remediation activities under an Aquatic Effects Monitoring Program. This program was created to meet the monitoring requirements of the Water Licence (MV2007L8 0031) issued by the Mackenzie Valley Land and Water Board. From 2020 to 2024, water quality and toxicity were monitored in Baker Creek each year and included monitoring of benthic invertebrates, fish health, and fish tissue in 2022.

While there have been improvements in Baker Creek since the 1990s, the results of monitoring show that historical contamination in the creek continues to affect fish and benthic invertebrates. To address this, the GMRP plans to move the release of treated effluent from Baker Creek to Yellowknife Bay, as well as to remediate Baker Creek by removing the historical contaminants in the creek bottom (the sediments) and realign the creek on site to restore a more natural flow and prepare for possible flood events.

Some facts about fish and fish food in Baker Creek:

- Many different species of fish have been found in Baker Creek since the 1990s, including Northern Pike (ı̨hdaà, *Esox lucius*), Arctic Grayling (Ts'èt'ìa, *Thymallus arcticus*), Lake Chub (*Couesius plumbeus*), Ninespine Stickleback (Dahts'a; *Pungitius pungitius*), Emerald Shiner (*Notropis atherinoides*), Spottail Shiner (*Notropis hudsonius*), Trout Perch (*Percopsis omiscomaycus*), White Sucker (*Catostomus commersonii*), Burbot (*Lota lota*), Longnose Sucker (*Catostomus catostomus*), Slimy Sculpin (*Cottus cognatus*), Lake Whitefish (łì; *Coregonus clupeaformis*), and Walleye (*Sander vitreus*).
- The mouth of Baker Creek, which has been the focus of biological monitoring, is a marsh habitat with many aquatic plants, including cattails and reeds. It is the richest area of the creek in terms of fish species and is an important area for fish to gather before they migrate upstream. Young fish live at the mouth in summer to eat food and grow, hiding in the vegetation; thousands of fish of different types spend their summers there, including Northern Pike, Slimy Sculpin, Arctic Grayling, and Longnose Sucker, as well as many small-bodied fish.
- Large-bodied fish, such as Arctic Grayling[54], can travel through the Baker Creek culvert under the highway and go upstream to the part of the creek that flows through the site. Here, some fish lay eggs (spawn), and the eggs will hatch and young fish will feed and grow until the creek warms up and they return to Yellowknife Bay.
- Over 40 species of benthic invertebrates have been found in Baker Creek. Changes in the number and types of benthic invertebrates can affect the fish that feed on them. The main groups of invertebrates are the flies/bloodworms (dipterans), as well as mayflies, caddisflies, shrimps/scud (amphipods), and snails. For all, or at least part of their lives, benthic invertebrates in Baker Creek live either in the bottom sediment of the creek, on top of the creek bottom, or on wood debris. The numerous aquatic plants in Baker Creek in the summer also provide habitat for benthic invertebrates. Many of the young benthic invertebrates will hatch into adult flies/beetles. Both the young and the adults are food for fish and so are often referred to as "fish food."
- Local residents fish at the mouth of Baker Creek during the summer, including catch-and-release fishing for Arctic Grayling . The creek is closed to fishing in spring from 15 April to 15 June.

6.2 MONITORING PROGRAMS

What monitoring programs and investigations were done from 2021 to 2024?

Over the last three years, monitoring in Baker Creek has focused on examining how treated effluent released into the creek affects fish and benthic invertebrates, as well as gathering information needed to support future remediation activities in Baker Creek. This included finding out how fish are using Baker Creek during the spring, summer, and fall, as well as collecting information about fish and benthic invertebrates in Yellowknife Bay, to help prepare for the release of treated effluent from the new water treatment plant.

6.2.1 Biological Monitoring

Baker Creek

Biological monitoring related to Baker Creek included sampling fish and benthic invertebrates in two types of areas:

- **Exposure area:** where benthic invertebrate communities: fish live in or near the treated effluent. The exposure area in Baker Creek is near the mouth of the creek, where treated effluent and creek water are mixed. This water also mixes with water from Yellowknife Bay at the mouth of the creek.

- **Reference area:** where benthic invertebrate communities or fish live in water that does not currently and did not historically contain treated effluent. There are multiple reference areas for the Giant Mine Environmental Effects Monitoring Program. The reference areas used for fish were the Yellowknife River and Horseshoe Island Bay, and the reference area used for benthic invertebrates was close to the mouth of the Yellowknife River (Figure 24).

The biological data collected from the exposure and reference areas were then compared to each other to determine how the benthic invertebrate communities and fish from the exposure area were performing (i.e., how healthy they were) when compared to the reference areas (Table 12).

Yellowknife Bay

As part of remediation activities at the Giant Mine site, treated effluent will be released from a new water treatment plant to Yellowknife Bay. Because of this, future biological monitoring will need to focus on a new exposure area in Yellowknife Bay to assess how treated effluent affects fish and benthic invertebrates. To prepare for this change in exposure area, biological monitoring data for fish and benthic invertebrates were collected from the area where in the future treated effluent will be discharged into Yellowknife Bay[55]. This information is being collected now to better understand this new area before discharge begins. Several other areas close to Yellowknife Bay and the Giant Mine site were also surveyed to help identify potential future reference areas to support the biological monitoring program[3].

Did you know?

Scientists use electricity to collect fish from Baker Creek!

Electrofishing uses a special device called an electrofisher to send electricity through the water. A person trained in the use of electrofishing will wear a backpack unit with a battery and will use a special wand to temporarily stun the fish without harming them, making them easier to catch. This makes electrofishing a safe and effective way to capture and identify fish.

Table 12: Types of Biological Monitoring in Baker Creek, the Yellowknife River, and Yellowknife Bay, 2021 to 2024

MONITORING	FISH SPECIES/ ENTHIC INVERTEBRATES	EXPOSURE AREA	REFERENCE AREA	HOW ARE THEY MONITORED?	WHAT IS MONITORED?	WHEN WAS IT MONITORED?
Effects of treated effluent on fish	**Ninespine Stickleback**	Weedy areas near the mouth of Baker Creek	Weedy areas of Horseshoe Island Bay and Tartan Rapids in the Yellowknife River	Fish collected using small nets	Length, weight, plumpness	2022
	Slimy Sculpin	Rocky, shallow areas near the mouth of Baker Creek	Rocky, shallow areas in the Yellowknife River	Fish collected by electrofishing	Length, weight, condition, sex, age, parasites, liver size, organ health, concentrations of metals in carcass tissue	2022
Effects of treated effluent on fish food sources	**Benthic invertebrate communities**	Weedy area near the mouth of Baker Creek	Area near the mouth of Yellowknife River	Benthic invertebrates collected from artificial substrates and from the sediment	Type and number of benthic invertebrates	2022
Yellowknife Bay	**Fish and benthic invertebrate communities**	Future area where treated effluent will be discharged into Yellowknife Bay	Four potential future reference areas: Nearshore Cover Area, North Yellowknife Bay, Mosher Island, Prosperous Lake	Fish collected by electrofishing and benthic invertebrates collected from the sediment	Exposure area: fish length, weight, plumpness, sex, age, liver size, organ health, concentrations of metals in their tissue, and the type and number of benthic invertebrates Reference areas: fish length, weight, plumpness, and the type and number of benthic invertebrates	Exposure area sampled in 2023 Reference areas sampled in 2022 and 2023

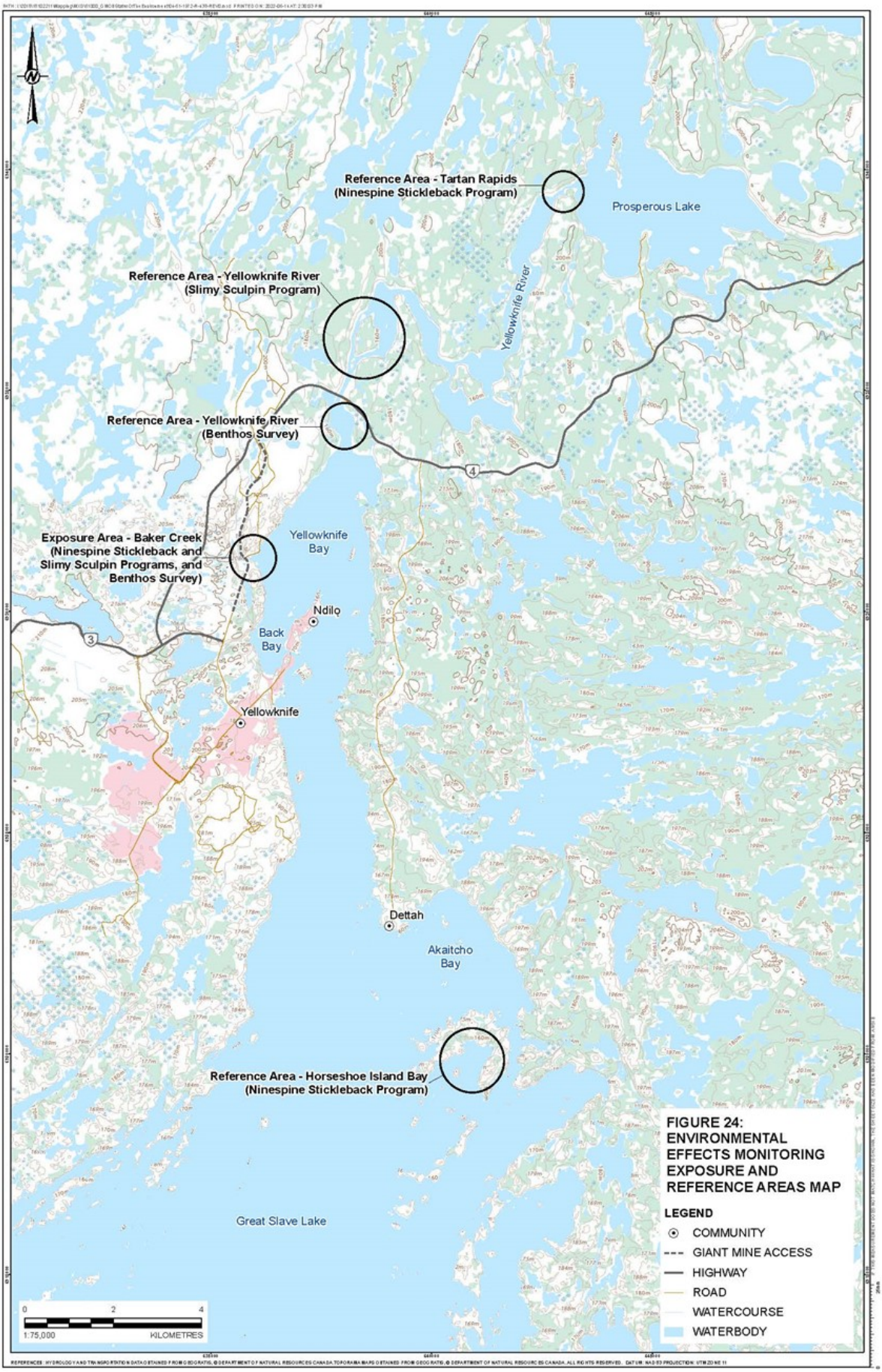


Figure 24: Environmental Effects Monitoring Exposure and Reference Areas Map

6.2.2 Fish Use

The remediation of Baker Creek will begin in 2027 and is expected to last until 2036. During remediation, sections of Baker Creek will be dug up to remove the historically contaminated creek bottom (sediments), while other sections will be realigned so that the water can flow through naturally. Baker Creek will then be rebuilt, and fish habitat will be improved by adding features that fish like, such as rocks, aquatic plants, and trees.

While the remediation of Baker Creek will improve fish habitat over the long term, the removal of contaminated sediments and realignment of the creek will disrupt fish habitat while this work is being done. The GMRP submitted an application in 2023 for a *Fisheries Act* Authorization to Fisheries and Oceans Canada to approve the destruction and disruption of fish habitat in Baker Creek that will need to occur while the creek is being remediated. The application included a detailed description of the proposed work, how the GMRP will protect fish during the remediation, and an "Offsetting Plan" describing how the GMRP will compensate for the loss of aquatic habitat. Authorization to complete the remediation from Fisheries and Oceans Canada was issued to the GMRP in April 2024 (22-HCAA-03009). A meeting with Rights holders and stakeholders was held in 2021 to gather feedback on the *Fisheries Act* Authorization and remediation activities planned in Yellowknife Bay as part of the remediation.

To meet requirements of the *Fisheries Act* Authorization, fish surveys began in 2024 to see how fish were using Baker Creek right now. These included surveys to record the types of fish present in Baker Creek, as well as a survey to count and identify young fish moving out of Baker Creek to Yellowknife Bay. Data will be collected over two years before remediation work begins and for two years after remediation is complete so that fish use of Baker Creek before and after remediation can be compared to understand how the new fish habitat is working.

6.3 KEY RESULTS

6.3.1 Biological Monitoring

Benthic Invertebrate Communities

The benthic invertebrates were collected two different ways (see Photo 22):

- A grab sampler was used to sample bottom substrates to collect the benthic invertebrates living in the sediment.
- Artificial substrates called Hester-Dendy plate samplers were used to collect benthic invertebrates living above the sediment (such as on the sediment surface, rocks, or vegetation).

In 2022[56], both sampling methods showed some differences in benthic invertebrate communities between Baker Creek and the Yellowknife River reference area. The 2022 biological study found:

- There was no effect of the treated effluent on the total number of benthic invertebrates living in Baker Creek.
- There were more types of benthic invertebrates (measured by a scientific index called "richness") in Baker Creek compared to the Yellowknife River. The Baker Creek invertebrate community was more balanced, with a wider range of invertebrate types.
- Although there was overlap in the type of benthic invertebrates between Baker Creek and the Yellowknife River, a scientific index called Bray-Curtis found some differences. Baker Creek communities had a lot of mayflies, midge larvae, shrimps/scuds, worms, and snails, while Yellowknife River communities had a lot of mayflies, caddisflies, shrimps/scuds, and midge larvae.
- In 2022, mayfly numbers were more similar in Baker Creek and the Yellowknife River compared to 2019 and previous monitoring years. There were, however, fewer caddisflies in Baker Creek compared to the Yellowknife River. Both mayflies and caddisflies are well-known "biomonitors" of water quality.
- Both Baker Creek and the Yellowknife River reference area continue to provide a stable and varied food source for fish.

The historical contamination in Baker Creek has changed the benthic invertebrates found in the creek. Differences between Baker Creek and Yellowknife River benthic invertebrates were also suggested by the abundance of underwater plants found in Baker Creek in 2022. As shown in Photo 22, the plants that live underwater in Baker Creek were very thick. This abundance can release carbon and nutrients into the sediment when these plants start to decompose in the fall, which can change the number and types of benthic invertebrates living in the creek.

Photo 22: Baker Creek
Upper photo: sampling station
Lower photo: benthic grab sample

Did you know?

Hester-Dendy Plates Sampler: "Bug Houses" in Baker Creek!

For this kind of sampling, plates attached to a wood base are anchored in shallow water. Benthic invertebrates colonize each sampler, and after several weeks the samplers are retrieved.

The invertebrates are removed and preserved then counted and identified to let us know what food is available for fish as well as the stream/river health.

Versions of these samplers are widely used by everyone from high school students to research scientists

Deployment of the Hester-Dendy plates in Baker Creek (left), and retrieval of the plates and sampling of benthic invertebrates that had started living on the plates over several weeks (right).

Fish Health

In 2022[4], Slimy Sculpin in Baker Creek were smaller and had larger livers when compared to the reference areas, while Ninespine Stickleback showed the opposite, with larger adult fish and more young fish in Baker Creek compared to the reference areas. In 2022[4], concentrations of metals were also measured in the tissue from Slimy Sculpin in Baker Creek and two reference areas. Higher levels of several metals were found in fish from Baker Creek. Metals that were higher in fish from Baker Creek were arsenic, cesium, cobalt, lead, manganese, selenium, and thallium.

Based on the 2022 findings, the GMRP did a study to better understand the effects on fish in Baker Creek[57]. The study found that higher levels of several metals in Baker Creek sediment, especially arsenic, likely caused the differences in growth and the larger livers in Slimy Sculpin, rather than the treated effluent being discharged into Baker Creek. These results were similar to the previous investigation into these effects in 2015[58]. The different responses in Slimy Sculpin and Ninespine Stickleback were probably due to where they live and the amount of contact they have with contaminated sediment. Slimy Sculpin stay in small areas of Baker Creek for several years and have consistent and direct contact with the bottom of the creek and feed on benthic invertebrates within the sediment. Ninespine Stickleback tend to spend a small amount of their life in Baker Creek. They use Baker Creek as a temporary spawning and growing habitat before moving to Yellowknife Bay and do not have much contact with the sediment.

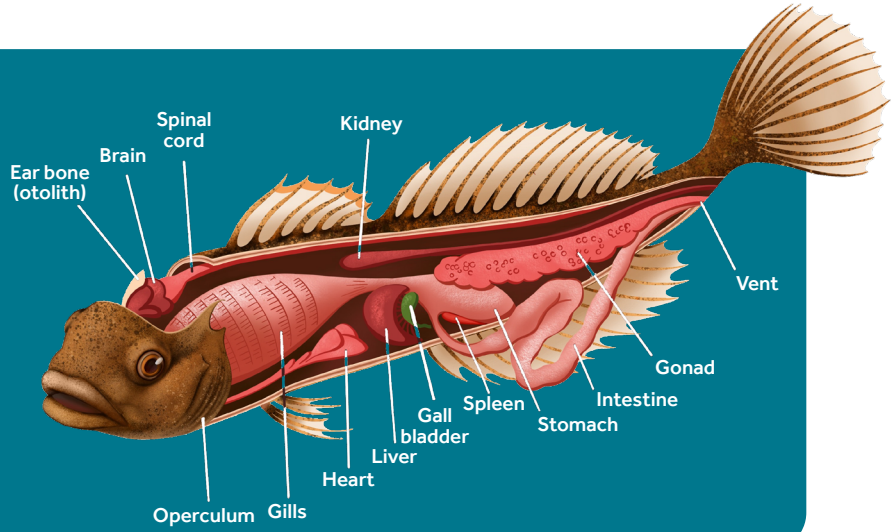
Did you know?

Biologists Look at the Insides of Fish to Better Understand the Health of Fish Populations

By examining the organs of fish like the Slimy Sculpin, biologists can understand the effects of metals and nutrients on the health of the fish.

These effects may cause changes in the size of organs such as the liver and gonads. Biologists will also check if the organs look healthy or show signs of problems like deformities, tumors, or lesions.

Although these problems can occur naturally, a higher number of fish with internal problems could suggest exposure to environmental pollutants.



Biological Monitoring in Yellowknife Bay

Two studies were completed between 2020 and 2023 to support future monitoring in Yellowknife Bay. These studies were separate from regular monitoring in Baker Creek. Instead, they focused on developing methods for monitoring the effects of discharge from a new water treatment plant into Yellowknife Bay. These special studies are called the Aquatic Effects Baseline for Yellowknife Bay and the Reference Area Reconnaissance Special Study (appendices to the Aquatic Effects Monitoring Program Re-Evaluation Report [Part 1, Part 2, Part 3, Part 4, Part 5, Part 6, Part 7, Part 8, Part 9, Part 10, Part 11).

The goal of the Aquatic Effects Baseline for Yellowknife Bay was to gather environmental data from the future area where the water treatment plant outfall will be built. This included collecting information on water quality, sediment quality, benthic invertebrates, and fish health over a six-year period, from 2018 to 2023. The findings from this will be used to help understand how to monitor this area in the future and can be used to look at changes over time once discharge from the new water treatment plant into Yellowknife Bay begins. The main findings from the study were:

- The water in Yellowknife Bay at the future water treatment plant discharge area was not toxic to aquatic life in a laboratory setting.
- The water quality in Yellowknife Bay improved farther away from the shore.
- During the baseline study, Yellowknife Bay experienced both wet years (2020, 2023) and dry years (2022, 2024).
- Samples collected from the lake bottom sediments near the shoreline in Yellowknife Bay were contaminated from historical mining.
- There were lots and different kinds of benthic invertebrates in the future water treatment plant discharge area.
- A lot of Slimy Sculpin were captured around the area where the new water treatment plant will discharge. This means that in the future, Slimy Sculpin could be used to monitor for effects from the water treatment plant discharge.

The Reference Area Reconnaissance Special Study gathered environmental data from nearby lakes to find a potential reference area that would be comparable to the future exposure area once the new water treatment plant begins to discharge into Yellowknife Bay. Eighteen different areas were looked at, and field data were collected from three areas in Yellowknife Bay, as well as Prosperous Lake. Meetings with Rights holders and stakeholders were held in 2021 and 2022 to gather feedback on the reference area search. Based on the information gathered, for at least the next few years of monitoring, it was recommended the North Yellowknife Bay be used as a reference area for Yellowknife Bay.

6.3.2 Fish Use

In 2024, fish surveys were completed in Baker Creek during the spring and summer to record the type and number of fish present. Fish surveys were done using visual surveys along the shoreline, drone surveys from the air, snorkelling surveys in the water, and a variety of fishing methods, including minnow traps, backpack electrofishing, drift nets, and fish traps called "fyke nets" that are used to catch fish in shallow waters (Photo 23).

Photo 23: Examples of Minnow Traps, Backpack Electrofishing (upper photo from left to right) **Drift Nets, and Fyke Nets** (lower photo from left to right)

During the spring and summer surveys, a total of 10 species of fish were captured in Baker Creek. These were Arctic Grayling (Photo 24), Emerald Shiner, Lake Whitefish, Longnose Sucker, Ninespine Stickleback, Northern Pike, Slimy Sculpin, Spottail Shiner, White Sucker, and Yellow Perch. Fish use in Baker Creek was greatest in the spring, with 3,351 fish counted during the spring survey. During this period, Arctic Grayling, Longnose Sucker, and White Sucker were seen migrating upstream to spawn, with large numbers of young fish hatching and migrating to Yellowknife Bay a few weeks later. In the summer, there were fewer fish in Baker Creek, with 326 fish counted.

This decrease in the numbers of fish in Baker Creek occurred as water levels dropped and water temperatures got warmer.During the outmigration survey, 1,330 fish were captured, mostly consisting of young fish. While it was difficult to identify these small fish in the field, they most likely were Longnose Sucker and White Sucker.

6.3.3 Summary

Biological monitoring in 2022 continued to show that while many and different kinds of benthic invertebrates were present at the mouth of Baker Creek, the communities were different from the Yellowknife River reference area. However, looking at the history of the Giant Mine site, the differences were relatively small compared to those observed decades ago when benthic invertebrates provided very little food for fish in Baker Creek. Benthic invertebrates in lower Baker Creek now provide different types of food for fish, which helps the creek support a variety of fish species and life-stages.

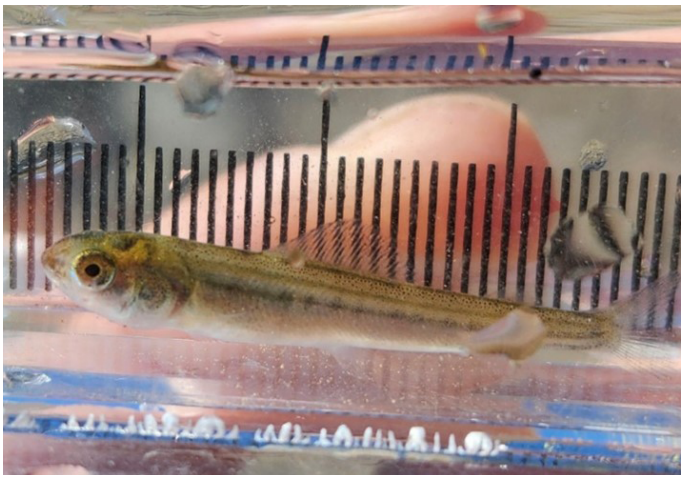


Photo 24: Arctic Grayling
Upper photo: photographed during the snorkel survey
Lower photo: juvenile Arctic Grayling captured during the outmigration survey

Fish health and fish use surveys in Baker Creek showed that many fish are using the creek downstream of the site. The creek has shown signs of recovery since the 1970s when the aquatic ecosystem of Baker Creek was severely damaged. Although this is a good sign of progress, Baker Creek is still contaminated with metals like arsenic from previous mining activities, which appear to be affecting fish. An example of this is larger livers in Slimy Sculpin.

Remediation of Baker Creek will begin in 2027 to remove historically contaminated sediments and realign the creek to restore natural flow. Once contaminated sediments have been removed, the habitat in Baker Creek will be improved for fish. Treated effluent from the site will also be released from the new water treatment plant to Yellowknife Bay. To help better understand the environment and monitor for potential effects of the water treatment plant in Yellowknife Bay, baseline data were collected for fish and benthic invertebrates from the new exposure area, as well as at a number of potential reference areas.

6.4 FISH STATUS OF ENVIRONMENT INDICATOR

The status of fish and benthic invertebrates in Baker Creek was rated as "yellow" (Table 13). This is because fish are recovering in Baker Creek since mining stopped, overall, they appear healthy, and eating the fish does not present a health concern. However, small fish in Baker Creek have larger livers than the Yellowknife River due to metals in the sediment. A variety of benthic invertebrates were present in lower Baker Creek in enough numbers to provide food for fish. There were, however, some small differences in the types of benthic invertebrates in Baker Creek compared to the reference area.

Table 13: Fish Status of Environment Indicator

Fish

INDICATOR	EVIDENCE	STATUS FOR 2021–2024
Fish food in Baker Creek	Benthic invertebrates were present in Baker Creek. There was no effect on number of invertebrates. Small differences between the types of invertebrates in Baker Creek and the reference area continued to be observed. A variety of invertebrate types were present to provide a food source for fish populations in Baker Creek.	
Fish in Baker Creek	Numerous fish species were present in the spring and summer, and were using the creek for spawning, but Slimy Sculpin fish sizes and livers were not the same as in reference area, likely due to arsenic from the sediment; eating fish from the creek did not pose a risk to humans.	

7.0 Land

7.1 OVERVIEW OF CHAPTER

While mining is a temporary use of the land, the changes mining activities make to the landscape can be permanent. Prior to mining activity, the land on which the Giant Mine site is located was a valuable area for hunting, trapping, and collecting plants for food and medicine. Archaeological and Traditional Knowledge studies have helped document the historical use and cultural significance of the land around the site.

As a result of the historical mining activities, the land on site has contaminated soils, open pits on the surface, and large Tailings Containment Areas and dams storing mine waste and contaminated water. A variety of considerations make up a discussion of land at the site, ranging from previous archaeological assessments to identifying the make-up of soils and sediments; monitoring the underground, pit safety, and dam stability; and monitoring and maintenance of the Tailings Containment and Foreshore Tailings areas. Because of this, Chapter 7 is not organized into "monitoring" and "key results" sections like the previous chapters of this report. Instead, this chapter is organized by areas of consideration with activities carried out during the reporting period (2021 to 2024), summarized by area.

7.2 ARCHAEOLOGY

Background

Archaeological sites are important for the understanding of the cultural history of the Northwest Territories and are valued by community members. As a result, they are protected by legislation and regulations. In the Northwest Territories, archaeological sites are defined as any physical evidence of human activity that is more than 50 years old and has been abandoned. This can range from Indigenous campsites that are thousands of years old to more recent prospecting camps from the early 1900s. Archaeological sites that have been identified at the site include such things as stone features (e.g., tent ring, hearth, cache), artifacts (e.g., worked stone, bone, or wood tools; historical glass, ceramics, or metal), and building/structure remains (e.g., log cabin, cellar depression)[59,60].

Archaeologists and members of the Yellowknives Dene First Nation completed the first archaeological field visit to the site conducted specifically as part of the GMRP in 2012[61]. The goal of the field visit was to identify potential heritage sensitive areas as part of a Heritage Overview Assessment. Prior to the GMRP, limited archaeological studies had been completed in the 1940s and 1960s[62,63].

Previous Assessments

Archaeological Impact Assessments were completed for the GMRP in 2018[64] and 2021[65]. Both assessments involved members of Yellowknives Dene First Nation and the North Slave Métis Alliance who provided valuable insights and interpretations. The data collected were used to develop avoidance or mitigation measures where needed to assist with future remediation planning.

A summary of key results and sites identified through these assessments is available in the Status of the Environment Report for 2015 to 2021[66].

How are the archaeological sites protected for remediation?

The combined archaeological assessments completed at the site were successful in identifying sites related to both Indigenous and Euro-Canadian history. These results were summarized in permit reports and submitted to the Government of Northwest Territories Department of Education, Culture and Employment. Results were also presented to the GMRP Working Group and to North Slave Métis Alliance members and Yellowknives Dene First Nation members. The documented sites were mapped, photographed, tested, and evaluated. Artifacts were collected and catalogued for submission to the Prince of Wales Northern Heritage Centre.

All of the archaeological sites will either be protected or mitigated, or they no longer exist. Out of the 12 identified in the reports, the GMRP has committed to avoiding two of the archaeological sites, as requested by the Government of Northwest Territories and Yellowknives Dene First Nation. Two other archaeological sites fall outside the current area of remediation, and further discussions will take place if those plans change. All other archaeological sites either no longer exist (i.e., were archaeological sites identified during mine operations and were disturbed during previous mining activities)

or have been sufficiently mitigated (i.e., documented and artifacts submitted to the Government of Northwest Territories). The GMRP will follow its land use permit conditions and management and monitoring plans should any future potential archaeological areas or artifacts be found during remediation activities. If this occurs on the site, the GMRP Team would work with the Government of Northwest Territories Department of Education, Culture and Employment, and Rights holders on next steps.

7.3 SOIL AND SEDIMENT

Background

Historical mine operations resulted in the widespread contamination of surface soils (small material like sand, silt, and clay and small rocks) and sediment (the sand and silt found at the bottom of lakes and creeks). The initial years of roaster operations had minimal emissions control, which led to the distribution of roaster emissions throughout a 25-kilometre radius. Additionally, mineralized mine rock, tailings, and buried waste were placed throughout the site, with the distribution of these materials widening as mine development progressed through to the 1980s. Environmental management practices gradually evolved over time; however, the environmental impairment resulting from the early years of mine operations is present today in regional soils and sediments.

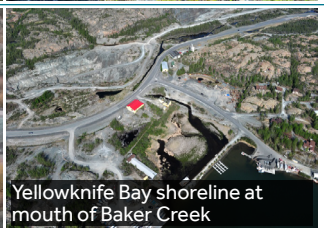
The primary contaminant of concern in soil and sediment is arsenic. In some areas, there are also concerns about elevated concentrations of petroleum hydrocarbons in soil. Elevated concentrations of other metals (e.g., antimony, copper, lead, and zinc) are also present in both sediment and soil. These metals typically occur along with elevated arsenic concentrations. Concentrations well above industrial guidelines for arsenic are seen on site and in the surrounding areas. The Government of Northwest Territories has set up a committee to review the effect of legacy mining off site. The GMRP is responsible for remediating contaminated material on site.

Contaminated soils and sediment are grouped into four categories around the site (Table 14):

- developed areas
- bedrock, forest, and wetland terrain
- Baker Creek
- Yellowknife Bay

Each of these areas has various types of soils and sediment with different concentrations of arsenic. As part of site closure, approximately 1.5 million cubic metres of contaminated soil and sediment will be removed from the developed areas, Baker Creek, and a portion of the bedrock, forest, and wetland terrain.

Table 14: Types of Areas on Site with Contaminated Soil and Sediment

Developed Areas (soil)	■ Areas the miners developed including the mill area and Townsite. ■ Mostly consists of sand and gravel fill contaminated with arsenic, petroleum hydrocarbons, and tailings.	 Developed area (road with fill)	 Developed area near B3 Pit
Bedrock, Forest, Wetland Terrain (soil)	■ Land around the site that has rock outcrops, forest, and wetlands. Includes the area downgradient of Dam 3, and shoreline lands adjacent to the Townsite. ■ Consists of fine-grained soil contaminated with arsenic from the roaster emissions as well as tailings from historical releases.	 Shoreline Lands	 Downgradient of Dam 3
Baker Creek (sediment)	■ Baker Creek includes the mouth of Baker Creek through the site to Baker Pond and the Jo-Jo tailings area. ■ Sediment in the Baker Creek has been contaminated by arsenic from historical releases from the mine and historical roaster stack emissions.	 Reach 1	 Reach 2
Yellowknife Bay (sediment)	■ Yellowknife Bay includes shoreline areas from the mouth of Baker Creek, adjacent to the Townsite and toward the Foreshore Tailings. ■ Sediment in this area has been contaminated by arsenic from historical releases from the mine and historical roaster stack emissions.	 Yellowknife Bay shoreline at the Townsite(a)	 Yellowknife Bay shoreline at mouth of Baker Creek

a) Photo source: GMOB 2024 drone footage: https://gmob.ca/resources/drone-footage-archive/giant-mine-drone-footage-2024/

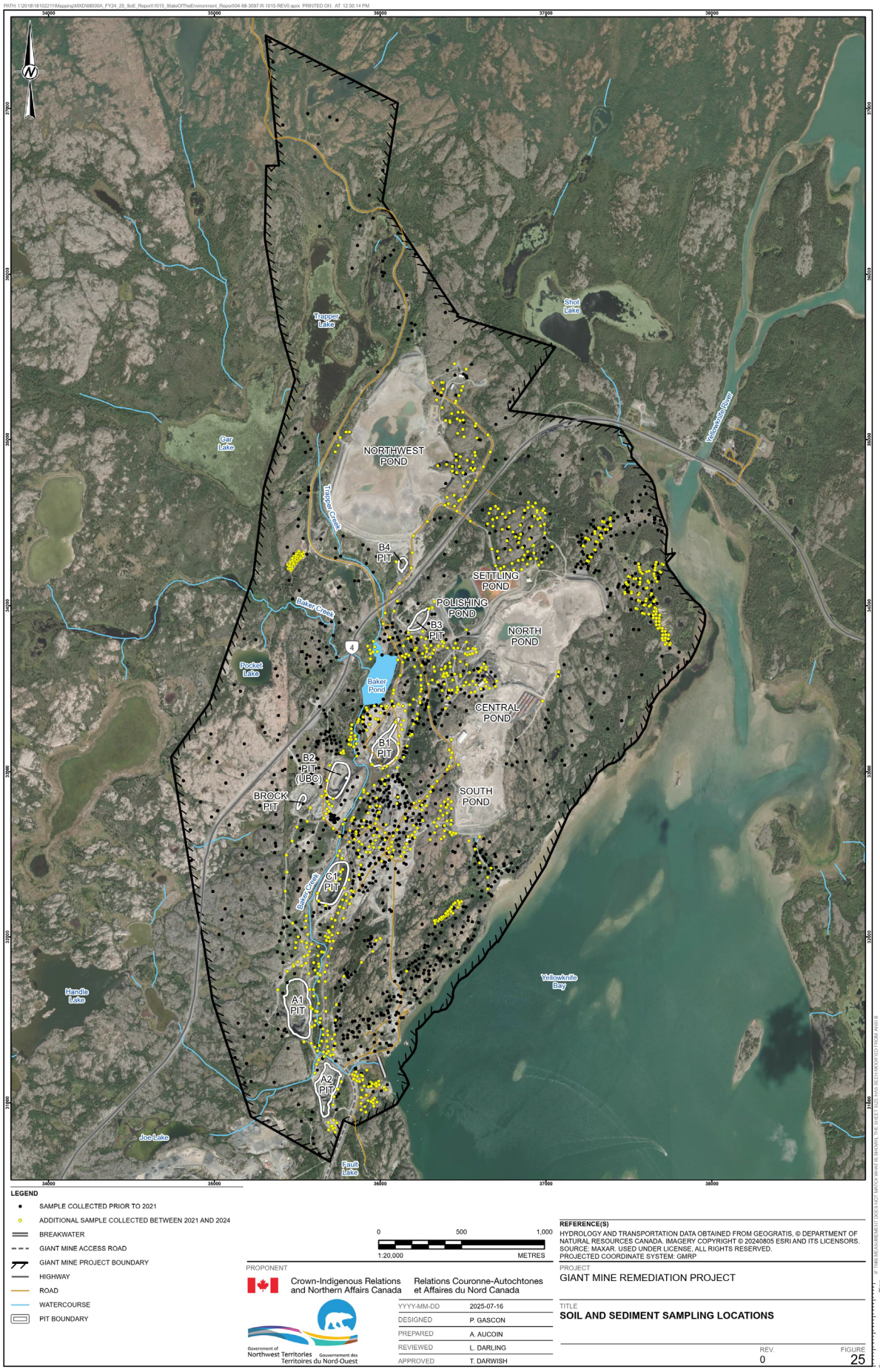


Figure 25: Soil and Sediment Sampling Locations

In addition, a fence will also be installed surrounding the core area of the site to restrict access to shallow soil within the bedrock, forest, and wetland terrain with high arsenic concentrations which will not be remediated. Contaminated sediment in Yellowknife Bay near the Foreshore Tailings Area and the nearshore will be covered, and in some areas, it will be excavated. These activities are consistent with the approach considered in the Human Health and Ecological Risk Assessments (as summarized in Chapter 1).

Soil and Sediment at the Giant Mine Site

How were soil and sediment conditions characterized in 2021 to 2024?

More than 4,000 soil and sediment samples have been collected from the site since the 1990s, over half of which were collected between 2021 and 2024 (refer to Figure 25 for sample locations). Samples were collected to further understand soil and sediment quality to plan what material needs removal or covering and how much of it there is (the volume of contaminated soil and sediment).Sediment was also sampled to help understand the potential effects of sediment contamination on fish and fish food (benthic invertebrates) (see Chapter 6).

Soil in developed areas and in bedrock, forest, and wetland terrain: Soil samples were either collected by hand tools (Photo 25) or by digging deeper with an excavator. The arsenic concentrations of samples were estimated on site using a handheld machine called an X-Ray Fluorescence Metal Analyzer. Based on these results, certain samples also underwent chemical analysis at a laboratory.

Sediment in Baker Creek: Sediment samples from Baker Creek were collected using a grab sampler. Sediment was collected from the top 5-centimetre layer of creek (as shown in Photo 26). Multiple sediment grabs were collected at each monitoring location and then mixed into a "combined sample." This was then sent to a laboratory for analysis of the sediment substrate type (e.g., sand, silt) and sediment chemistry (mainly metals and nutrients).

Photo 25: Soil Sampling Using Hand Tools

Photo 26: Sediment Sampling in 2022 in Baker Creek and Yellowknife Bay
Left and middle photo: sediment sample in "grab sampler"; **Right photo**: sediment sample made from combining multiple grab samples.

Sediment in Yellowknife Bay: Sediment in Yellowknife Bay near the site was monitored in two studies conducted between 2021 and 2023 (included in the Aquatic Effects Monitoring Program Re-evaluation Report[67]). Samples were collected with a grab sampler that is dropped into the bay and brought up to the surface. Similar to Baker Creek, multiple grabs are collected and combined and then sent to the laboratory for analysis.

What new information about soils and sediment was found from 2021 to 2024?

Soil

- Soil sampling completed on site between 2021 and 2024 showed similar soil concentrations and arsenic distribution to previous investigations. Additional information can be found in the last Status of the Environment Report.

Sediment

Baker Creek

- Sediment samples were collected from Baker Creek on site in 2022, and the results showed that concentrations of metals in sediment are above guidelines for aquatic life but that concentrations have remained stable over time. Like past monitoring, sediment concentrations of arsenic and copper were above guidelines, suggesting effects on the benthic invertebrates that live in the sediment are possible.
- In general, Baker Creek has higher concentrations of metals than the Yellowknife River because of historical mining operations. Nitrogen and organic carbon were also found to be higher in Baker Creek sediment compared to the Yellowknife River, likely due to the aquatic plants in the creek that die off at the end of the summer and the release of nutrients back to the sediments.

Yellowknife Bay

- Yellowknife Bay sediment was sampled in fall 2021 to provide information on the existing conditions of sediment near the proposed water treatment plant outfall, prior to discharge from the plant, which is expected in 2026. Arsenic, chromium, copper, lead, and zinc were above guidelines for aquatic life in these sediments. These results confirmed past studies of the area.

- Sediment was also sampled in 2022 and 2023 to understand chemistry in areas near the site and areas away from site in support of the Aquatic Effects Monitoring Program. This information will be used to design a study of fish and benthic invertebrates in the area, where the GMRP will look to understand effects from the treated effluent from the new water treatment plant knowing that there are contaminated sediment in the area.

How Soil Sampling Supported the Acute Human Health Risk Assessment

An acute human health risk assessment (acute HHRA for short) was completed between 2021 and 2024. This work focused on arsenic present in soils after remediation that could result in acute human health effects. The acute HHRA used soil quality data collected between 2021 and 2024. The acute HHRA considered three potential scenarios:

- **Scenario 1**: "Pica" Visitor. This scenario assumes a young child eats soil in areas outside of the fence on the Giant Mine site after remediation. "Pica" refers to children or adults who eat items that are not food (e.g., soil) at an amount that could be unhealthy.
- **Scenario 2**: Camping Visitor. This scenario assumes short-term camping or spending time on land in the areas outside of the fence on the Giant Mine site. This scenario includes berry picking and eating.
- **Scenario 3**: Trespassing Visitor. This scenario assumes short-term access to the areas within the fence at the Giant Mine site. This scenario also includes berry picking and eating.

The results of the acute HHRA suggested that toddlers, who are particularly prone to intentionally or accidentally ingesting unusually large amounts of soil, have the potential to have unacceptable health risks. This study highlighted the importance of verifying that risk communication measures are in place after remediation.

7.4 UNDERGROUND

Background

The underground mine at the Giant Mine site is approximately 5 kilometres long and 0.5 kilometres wide, on average. Prior to backfilling the underground (i.e., underground stabilization), there were hundreds of open tunnels and other openings called "mining voids." There were 62 "near-surface" voids, which means spaces generally less than 35 metres below ground surface. Fifteen of those are arsenic containing stopes and chambers (used for storage of arsenic trioxide dust) and 47 are non-arsenic stopes (previously mined and emptied or partially filled with rock fill). Figure 24 shows a general concept of the underground mine (cross-section).

These voids were of concern for two reasons: 1) If the overlaying rock mass, called a crown pillar, were to collapse, it could result in settlement on surface which could pose a risk to people and wildlife, as well as potential damage to structures or impacts to Baker Creek; 2) In addition, some of the non-arsenic voids were underneath the arsenic stopes and chambers, and the collapse of the rock between them, known as a sill pillar, could result in the release of arsenic trioxide dust into the underground minewater.

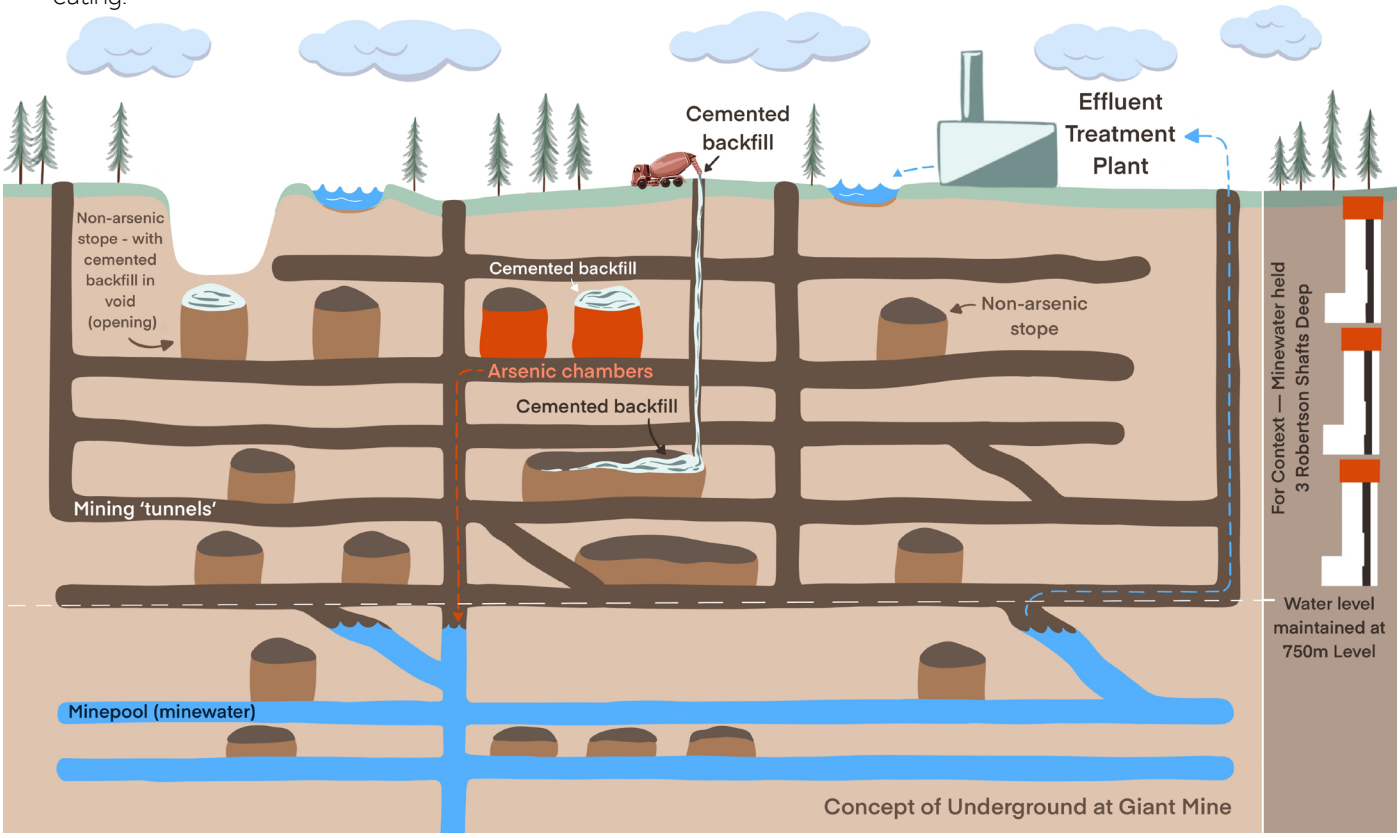


Figure 26: Schematic Example – Underground at the Giant Mine Site

The remediation plan for the underground included putting mine tailings combined with cement into near -surface voids of concern to improve underground long-term stability (see concept in Figure 26). This is known as cemented tailings "backfill" because material from underground is "put back." The tailings and cement mixture were combined with water and cement additives to form a "paste," following a "recipe" developed to achieve specific strength requirements. Once placed in an underground void, the backfill mixture cured and solidified into a hardened material. The backfill reduces the impacts of a failure (i.e., settlement of the surface or overlying areas) and potential impacts to buildings or arsenic storage areas. Use of tailings as a main ingredient of backfill reduced the volume of tailings that remain on surface, which was an objective of the remediation.

What activities related to the underground were done from 2021 to 2024?

Three main activities occurred from 2021 to 2024: stabilizing and monitoring areas of the underground mine, drilling new holes (wells) into the underground to pump water, and advancing work to exit the underground.

Underground stabilization: In 2021, the underground stabilization program was advanced, and drilling was completed to prepare to place backfill into the underground (Photo 27).

Between 2022 and 2024, the underground was stabilized by backfilling the areas surrounding the arsenic chambers, both non-arsenic and arsenic stopes (Table 15).

Table 15: Areas of the Underground Stabilized in this Report Period

YEAR	AREA OF THE UNDERGROUND THAT WAS STABILIZED
2022	■ B1: 1-18EA, 2-05, 2-06, 2-07, 2-15, 3-06N, and 3-02 stopes. This completed backfilling in the B1 area that was started in 2015 ■ B3: 1-31 and 1-33 ■ C1: 2-35 development ■ Arsenic bulkhead support in AR2, AR3 and AR4
2023	■ A1: 2-69 ■ C1: 3-11 ■ AR1 CH12 ■ AR2 more ABS ■ AR3 B234, B235
2024	■ A1: 2-69W, 2-67W ■ A2: 3-01, 3-02, 3-58, 3-61, 2-06, 3-60, 2-01NHW ■ B2 – UBC ■ B4 – 1-26, 1-35, 1-37, 1-38, 1-43 ■ C1 – 2-18 ■ AR1 – CH11, CH14, ABS ■ AR2 – CH212, CH09, ABS ■ AR3 – B230, B233, B236 ■ AR4 – Last bulkhead support

Drill boreholes from surface into underground voids. Install underground monitoring cameras and barricades to hold backfill until cured

Excavate and process tailings to be used in backfill

Mix tailings with cement, water and additives to make paste backfill

Complete quality control to check for paste consistency and collect samples for laboratory strength testing

Place backfill in underground void though the borehole

Use camera to show paste backfill flowing into void

Confirm area is full of paste tailings using borehole camera

Photo 27: Steps to Make Paste Backfill and Put It in the Underground

One area could not be backfilled using the GMRP's usual recipe because the tailings paste would have flowed through the bottom of the void before it had time to cure and solidify. To resolve this, a different paste backfill recipe was developed and tested called "paste enhanced rock fill"; it was made up of tailings, gravel-sized rock, and cement. It was poured first to seal the bottom of the void, and once it solidified, the rest of the stope was filled with conventional tailings paste (Photo 28).

After the paste backfill was delivered, the long-term stability of the rock and backfill is monitored with extensometers and vibrating wire piezometers, and borehole cameras inserted into monitoring holes (Table 16).

Minewater wells: Two new wells were installed from the surface down to the minewater in the underground, in the core industrial area of site. Water will be pumped up from the underground through these wells and it will be piped directly to the water treatment plant for treatment (Photo 29). Eventually, the wells at the north end of the mine that pump to the Northwest Pond and to the existing effluent treatment plant will be decommissioned.

Underground access: In addition to stabilizing the underground, access to most areas of the underground mine was being closed off in 2024. Eventually, monitoring of the underground will be done from surface and staff will no longer need

Photo 28: Paste Backfill Batch Plant and Mixing

Table 16: Equipment to Monitor Different Aspects of the Underground

UNDERGROUND MONITORING EQUIPMENT	WHAT DOES IT MEASURE?
Extensometer	Distance moved in millimetres; checks if movement in the backfill or crown pillar
Vibrating wire piezometer	Minewater level
Borehole camera	Photos/video of conditions of underground rock and backfill

Photo 29: Drilling and Well into the Underground
Left photo: drill rig on site for the new water intake for the water treatment plant
Right photo: completed well

to go underground. This will reduce health and safety risks to GMRP workers. Since work will cease in the underground, the power supply (e.g., lights, heat, and ventilation) and some pumps will be decommissioned, conserving costs and energy.

How was the stability of underground backfill monitored?

Monitoring and inspection of the underground backfill was done by:

- Visual checks with cameras and inspection to confirm backfill did not settle.
- Use of equipment (extensometers) to document if instability occurred: Equipment was cemented in place in the ground, and distance between its two ends was measured. This measures displacement and detects instability.

Data collected to date have indicated good performance with no stability concerns. Voids backfilled between 2013 and 2018 (C509) have now been monitored for 5 years. The extensometer data shows very little movement, indicating the area is stable.

What is the status of the underground?

The underground near surface voids and voids near the arsenic chambers are stable. Monitoring related to underground is reviewed quarterly and annually. For the reporting period, monitoring indicated that backfill was performing acceptably and the underground and rock surrounding the arsenic chambers were stable. Work up to spring 2024 also involved the GMRP exiting from the underground. Many areas were closed and are no longer accessible.

The Closure and Reclamation Plan[68] and Underground Design Plan provide more information on how the underground remediation will be finalized, including the closure of openings to surface.

7.5 TAILINGS CONTAINMENT AREAS

Background

Tailings are small rock particles left over after grinding rock to remove the gold from the ore. They contain arsenic, other metals, and silica. Tailings were initially deposited into Yellowknife Bay in 1948. Beginning in 1951, tailings were deposited into what became the Tailings Containment Areas. This started with tailings deposition into lakes and low elevation areas. Over time, storage requirements necessitated the construction of dams in these areas (a total of 16 discrete dams by end of mining operations). Tailings on site are now retained by a combination of rockfill dams and higher areas of surrounding topography.

There are two main Tailings Containment Areas on the site: the Original Tailings Containment Area, which consists of the North, Central, South, Settling, and Polishing ponds, and the Northwest Tailings Containment Area, which consists of the Northwest Pond. In addition to storing tailings, these facilities are also used as part of water management on the site, providing temporary water storage. The Settling and Polishing ponds are used for treated effluent management. Some tailings were released to Yellowknife Bay and formed an area called the Foreshore Tailings Area. The Tailings Containment Areas are summarized in Table 17.

Table 17: Summary of Tailings Containment Areas and Foreshore Tailings Area at the Giant Mine Site

Northwest TCA	Surface area of roughly 44 ha Estimated to contain 5 million m3 of tailings Contains Northwest Pond Constructed in 1987 Perimeter dams constructed of rockfill located at the north and south extents Bedrock outcrops along a portion of the western perimeter and along almost the entire eastern perimeter. Perimeter dams have maximum vertical heights of between 8 and 20 m.	
Original TCA	Footprint of approximately 5 million m3 of tailings. Made up of five separate ponds that are divided by dams or dykes: • South Pond (9 ha) • Central Pond (13 ha) • North Pond (29 ha) • Settling Pond (4 ha) • Polishing Pond (5 ha) Has several external dams that vary in height up to a maximum of 18 m.	
Foreshore Tailings Area	Prior to the early 1950s, 300,000 and 375,000 tonnes of tailings were deposited in the area, Approximately 35% of the tailings located above water level in Yellowknife Bay In 2001, rock cover with geotextile placed over shoreline area to reduce further erosion of tailings into the Bay.	

TCA = Tailings Containment Area; ha = hectare; m3 = cubic metre; m = metre; % = percent.

Activities at the Tailings Containment Areas included monitoring, investigation, and maintenance. Each of these is described in more detail below.

What was done on the Tailings Containment Areas from 2021 to 2024?

From June 2021 and June 2024, the major activities related to Tailings Containment Areas were:

- Approximately 210,000 cubic metres of tailings in the North Pond were excavated and used to make paste for backfilling underground workings.
- Approximately 10,000 cubic metres of sludge in the Settling Pond was excavated and placed in the North Pond; sludge removal increased water storage capacity for the pond.
- Stockpiles of sludge or contaminated soils were constructed in the North Pond, Central Pond, and South Pond. Material will be temporarily stored here until remediation advances.
- The Tailings Containment Areas will need to be emptied of surface water (dewatered) so they can be remediated, and construction equipment can work in the area to cover the ponds. In fall 2022, a dewatering test on the saturated tailings was conducted in the South Pond (Photo 30). The test involved using digging holes in the tailings, installing wells in the holes, and then applying suction from a vacuum to remove water (called "an enhanced vacuum wellpoint system"). This method worked and can be used on site as part of remediation to improve tailings strength to allow South Pond tailings to be relocated and shaped for closure.

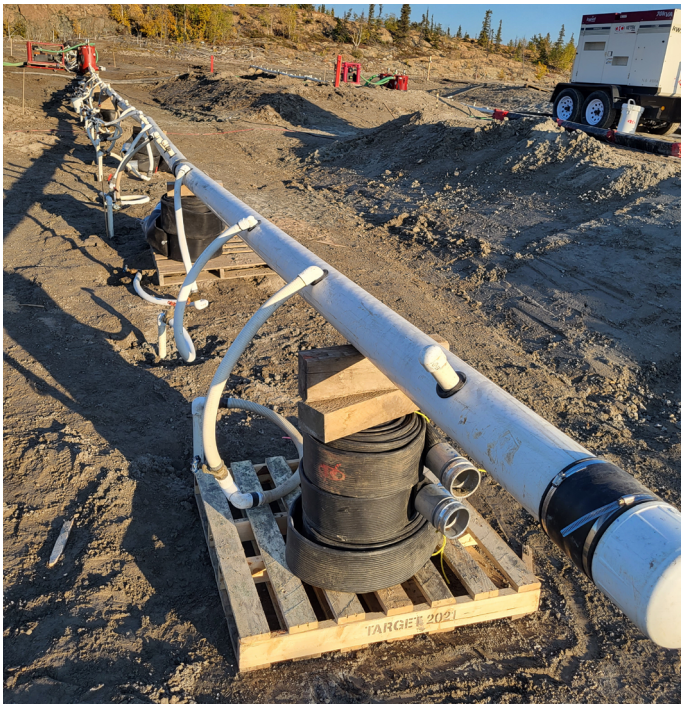


Photo 30: Equipment on South Pond Used to Remove Water from within the Tailings to Make the Area Stable for Equipment to Work

7.6 DAMS

Background

There are 26 dams at the Giant Mine site. Each must be monitored and inspected. Dams fit into three categories according to the major functions of the dams:

Mine water management: Dams are used to hold (retain) minewater.

Tailings solid retention: Dams are used to retain tailings solids (small rock particles left over after grinding rock to remove the gold from the ore, as part of the original mining process).

Surface water management: Dams are used to manage naturally occurring surface water (i.e., not mine water).

The GMRP has very specific monitoring requirements for dams, particularly for those that hold mine waste that should not be released to the environment. The GMRP follows its Operation, Maintenance, and Surveillance (OMS) Manual[69]. Dam operation, inspection and monitoring, maintenance, emergency preparation, and response are defined in the OMS Manual. The OMS Manual is reviewed and updated annually.

What was done in 2021 to 2024?

From June 2021 to June 2024, the following activities were performed in relation to the dams:

- Annual updates to the OMS Manual were made.
- Annual freshet inspection and geotechnical inspection was conducted.
- A dam safety review was conducted in 2024 (this occurs every five years or as required based on the Canadian Dam Association guidelines).
- The Canadian Dam Association guidelines for dams were evaluated to determine if any updates or legal changes need to be considered.
- In 2022, the embankment around the Mill Pond, called the Mill Pond structure, was assessed and classified as a dam because it holds minewater. This structure was added to the OMS Manual and inspected as part of the annual geotechnical inspections since 2022 (Part 1, Part 2, Part 3, Part 4, Part 5, Part 6, Part 7)(2023 [Part 1], [Part 2], [Part 3], [Part 4], [Part 5], [Part 6], and 2024 [Part 1], [Part 2], [Part 3], [Part 4], [Part 5], [Part 6], [Part 7]).
- Drilling was carried out at the Mill Pond structure and at Dams 8, 9, 10, and 12 to provide information for final remediation design of these dams that form part of the remediation of the Original Tailings Containment Area.
- Repairs were made to two dams. This was necessary prior to their full remediation for water management purposes and increased stability:
    - B2 Dam:
        - Slope reconstruction on B2 Dam, adjacent to B2 Pit, was completed in summer 2022 to improve stability (Photo 31).

Photo 31: B2 Dam Slope Remediation (before and after construction)

Photo 32: Dam 1 Crest Raise (before and after construction)

- Dam 1:
  - Dam 1, which forms part of the Polishing Pond, has been sinking for many years because frozen material under the dam was thawing. Repairs were conducted over the years but did not fully resolve the issue.
  - As noted in the last Status of the Environment Report, the dam was raised in 2020 and thermosyphons were installed to freeze the area underneath to limit further sinking. Monitoring of the dam since 2020 shows that this repair was successful in reducing the rate of settlement, as reported in the 2024 Annual Geotechnical Inspection of Dams Report. In 2022, new work was done to raise the crest of the dam (Photo 32). This was done so the Polishing Pond could store more water behind the dam (called increased storage capacity).

How is dam safety monitored?

Regular inspections and monitoring of the dams on site are important to manage and track dam safety, and include the following activities:

- daily, weekly, and monthly inspections and instrumentation monitoring
- annual freshet and geotechnical inspections

From 2021 to 2024, many new instruments were installed to collect more information on the dams on site:

- Standpipe piezometers were installed at the Mill Pond in 2021 and are used to measure groundwater table.
- Shape array accelerometers were installed at the Northwest Tailings Containment Area dams in 2023 and are used to measure deep ground deformation.
- Thermistors and vibrating wire piezometers were installed at the Northwest Tailings Containment Area dams (i.e., Dam 21 and 22) in 2023 and are used to measure soil temperatures and pore-water pressures.
- Survey monuments were installed at Dam 1 and the splitter dyke in 2022 and are used to measure surface ground deformation.
- Survey monuments were installed at B2 Dam in 2024 and are used to monitor surface ground deformation.
- Thermistors and vibrating wire piezometers at Dam 1 were installed between 2018 and 2022; these are used to measure soil temperatures and pore-water pressures. The data show that the deeper soils (below 5 metres in depth) remain frozen throughout the year (Figure 27) and that the dam is currently stable.

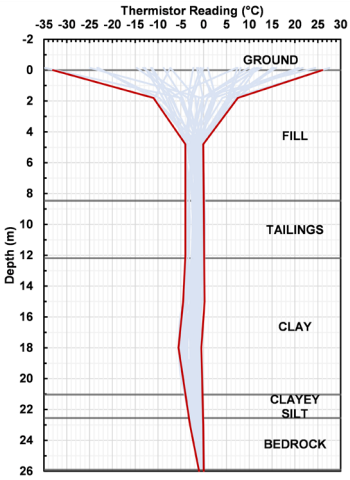


Figure 27: Ground Temperature Monitoring at Dam 1 (Borehole D1-SD-12)

Results of the geotechnical monitoring and dam classifications for each dam on site are provided in the Annual Water

Did you know?

Dam design, operation, and inspection are based on the dam consequence classification.

Canadian Dam Association guidelines on dam safety include five dam consequence classifications: Low, Significant, High, Very High, and Extreme. A dam's consequence classification considers incremental losses of life, environmental and cultural values, and infrastructure and economics.

The highest incremental classification determines the dam's consequence classification. A dam's consequence classification also defines how frequently the dam safety review is required.

Of the 26 dams at site, only four dams have the consequence classification of Very High (Dams 21A, 21B, and 21C and B2 Dam).

Northwest Pond (looking north), which includes dams with Very High consequence classification

Licence reports (2021, 2022, 2023, 2024 [Part 1, Part 2]). A dam safety review is required every five years for any dams that have a consequence classification of High or above.

The last dam safety review was conducted in the Fall of 2024. Information on the 2024 review will be provided in the next Status of the Environment Report.

Dam Maintenance

Routine care and maintenance of the dams was undertaken as required. This included the annual survey of dam crests, monitoring and management of water level of the ponds that are retained by the dams, removal of heavy vegetation at dam slopes and toes, filling and grading of dam crest to avoid water ponding, and management of traffic on dams/dam roads.

7.7 PITS

Background

Eight open pits were mined at Giant Mine; one of these pits was used as a rock quarry (Brock Pit). The open pits are a visible feature on the land. The pits contain contaminated material in the base. Some of the pits have direct interactions with the underground mine below them. This includes near-surface underground voids, with thin crown pillars or direct breakthroughs into the pit floor. There are also underground raises and mine accesses that daylight into the open pits. Some of the openings are backfilled and others are still open to the surface (A2, B1, C1 pits). Access to the underground through these openings could occur. Until these are closed through remediation, the GMRP must restrict access to these areas to prevent anyone from getting into the underground. This is done using fences, gates, warning signs, and berms (small embankments made of gravel and rock). C1 Pit has a buttress on its side (compacted rock fill material placed for stability) to limit water from the nearby Baker Creek from entering the pit (called the C1 buttress; see the last Status of the Environment Report[70] for more details).

Open pits pose other risks on site (Photo 33), including:

- steep slopes where people or wildlife may fall into a pit
- pathways for surface water to be directed into the pits
- potential for material to fall from the pit walls down towards workers ("rockfall")

Photo 33: B1 Pit Showing Material on Walls and in Base of Pit

What was done in the pits from 2021 to 2024?

1. The area underneath seven pits (A1, A2, B1, B2, B3, B4, and C1 pits) was stabilized as part of underground stabilization work.

2. Loose rocks were removed from the A2 Pit wall (called a pit catchment bench). Clearing of loose materials on pit benches helps reduce the risk that the material will tumble down onto workers (Photo 34). The loose rocks were removed using an excavator, and a large rock berm was installed to help contain future rockfalls within that area.

3. The A2 ramp was slightly shifted and a new embankment along the A2 Pit ramp (called a ramp catchment berm) was constructed in response to rock fall event in 2024 on the southwest A2 pit wall.

4. A surface drilling program started in the open pits areas in 2023. Boreholes were drilled in support of long-term geotechnical monitoring of underground backfilled voids. The drilling and installation of monitoring equipment will be completed in 2025.

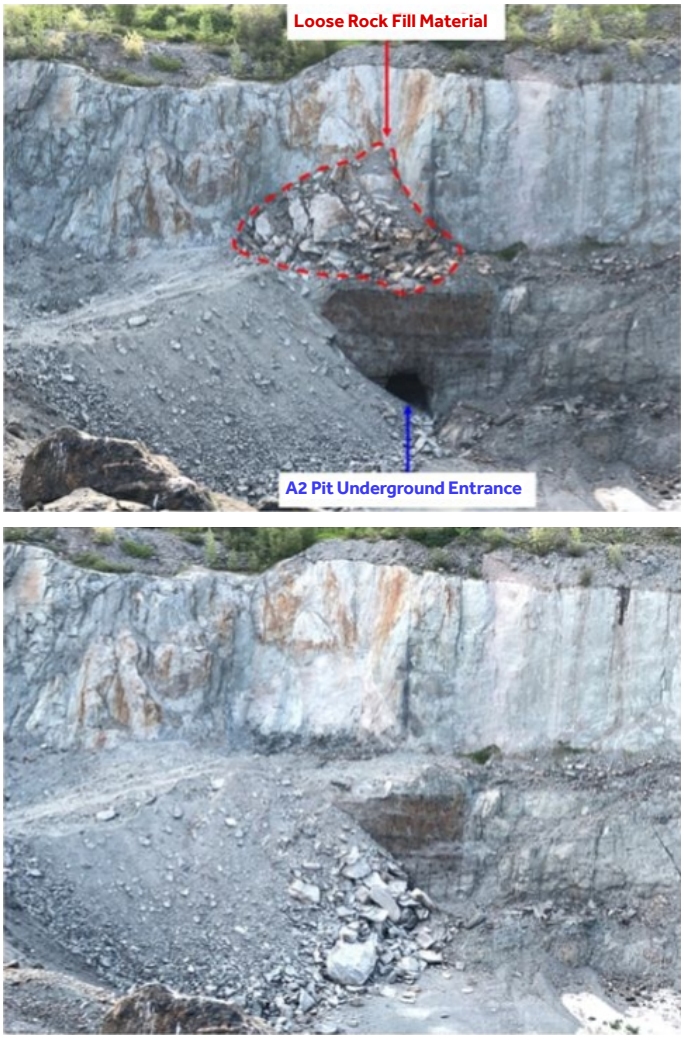


Photo 34: Clearing of Unstable Material in A2 Pit
Upper photo: clearing of catchment bench above A2 Pit underground entrance
Lower photo: after removal

5. Routine visual monitoring and inspections were conducted.

6. Water entering C1 Pit and draining into the underground was investigated to better understand the flow path.

How were the pits monitored?

Monitoring of pits was done by the following methods:

- inspected for safe access/conditions for workers when access was needed
- inspected portals to the underground daily, when access required, and placed physical barricades (i.e., wooden saw horse barricade) to prevent unauthorized access into the underground
- visually inspected and monitored pits daily, when the pit is being accessed, for signs of subsidence, rockfall, and seepage

In addition, routine monitoring for stability was carried out at two pits: B1 Pit walls and C1 buttress, which has been conducted since 2013 and 2018, respectively. This monitoring is done using reflectors (called prisms) that are installed on metal rods positioned at key locations where signs of instability, such as tension cracks, have been identified. To determine if there have been any changes in location from the previous measurements, these fixed prism locations are surveyed from established stations (Photo 35) in B1 Pit (two times per year) and at the C1 buttress (monthly). By measuring the location of the prisms, it is possible to track and assess movements within millimetres of change. Frequency of sampling is increased if results showed movement of the prisms.

Photo 35: C1 Buttress Monitoring location

What were the results of pit stability monitoring?

General pit inspections: Overall, the pits were stable from 2021 to 2024. If local instabilities were found that could pose a risk to workers, they were dealt with by scaling (removal of loose rock from pit walls) or installation of berms.

B1 Pit: Monitoring indicated that gradual settlement in each of the north, east, and west pit walls is occurring. Generally, the prisms recorded up to 350 millimetres of displacement between 2021 and 2024 (about 90 millimetres per year). This occurred at a steady pace, and no sign of larger instabilities within the pit wall were noted. One prism on the south end of the east wall recorded up to 270 millimetres of displacement to the southwest (away from the pit), indicating that it may be slowly leaning backwards. Overall, the movement recorded in the B1 Pit prisms indicates long-term, slow, and consistent settlement, which is expected in pit slopes.

C1 buttress: The prisms on the C1 buttress are placed along the crest of the buttress and are located near tension cracks observed to the north and south of the pit. The prisms indicate that the buttress is stable, with less than 100 millimetres (about 20 millimetres per year) of movement recorded between 2021 to 2024. One exception was at the north end of the buttress, which recorded 165 millimetres of movement (about 40 millimetres per year). Overall, the prisms indicate long-term, gradual, and consistent settlement of the buttress, which is expected in fill slopes.

Investigation of Water Entering C1 Pit

Early in the winter of 2022, water from Baker Creek was observed flowing over top of ice near C1 Pit, and an increase of water was observed in the base of C1 Pit. It was assumed that water entered the underground through the base of the pit because pumping of water from the underground to Northwest Pond had to be increased to keep minewater elevation stable. No damage was observed to the underground as the mine's pumping capacity was adequate to manage the increase inflows. The mine water levels were maintained below the target thresholds and underground workers were not impacted by the additional water inflows.

The GMRP conducted investigations to further understand how water was entering the pit to help decide if construction work (mitigation) should be done to reduce further water inflow. The GMRP Team estimated that in addition to rain/snow, seepage through rock (either fractured bedrock or rockfill) and overland flow from Baker Creek were other ways water could enter C1 Pit.

C1 Pit will be remediated approximately five years from now (2030 to 2032), and Baker Creek will be rerouted starting in 2030. The GMRP will continue to observe the area; however, no further work on flow paths is planned because of the anticipated remediation activities.

How was the connection between Baker Creek and C1 Pit investigated?

Field studies were carried out in 2023 to investigate the possible areas that water could leave Baker Creek and enter C1 Pit. The study included three parts:

- A visual survey and a survey using remote sensing (LiDAR) was conducted at the south end of C1 Pit, where some cracking of the ground, possibly due to permafrost degradation, was observed. Surveys were done to determine if the area was sinking, which could allow Baker Creek to flow overland into the pit.
- A dye study was completed over a 400-metre-long section of Baker Creek and in C1 Pit. The study was completed in October 2023 when Baker Creek water level and flows were low. A fluorescent, environmentally friendly dye called rhodamine was used (Photo 36). The dye is useful because it is visible and can be measured using a handheld instrument. The dye was released three different times into Baker Creek and measured at downstream locations as well as in C1 Pit. The measurements were to determine travel time in Baker Creek and confirm if water was leaking out of Baker Creek to C1 Pit. Streamflow was also measured at several locations along the reach of Baker Creek to document the amount of water that might be leaking.
- Drilling was conducted to assess the condition of the bedrock between Baker Creek and the west wall of C1 Pit and assess the thickness of material in the ground around the pit ("overburden"). This was done to check if water from Baker Creek could flow into the pit through cracks in the rock of the pit walls and through the overburden into the pit.

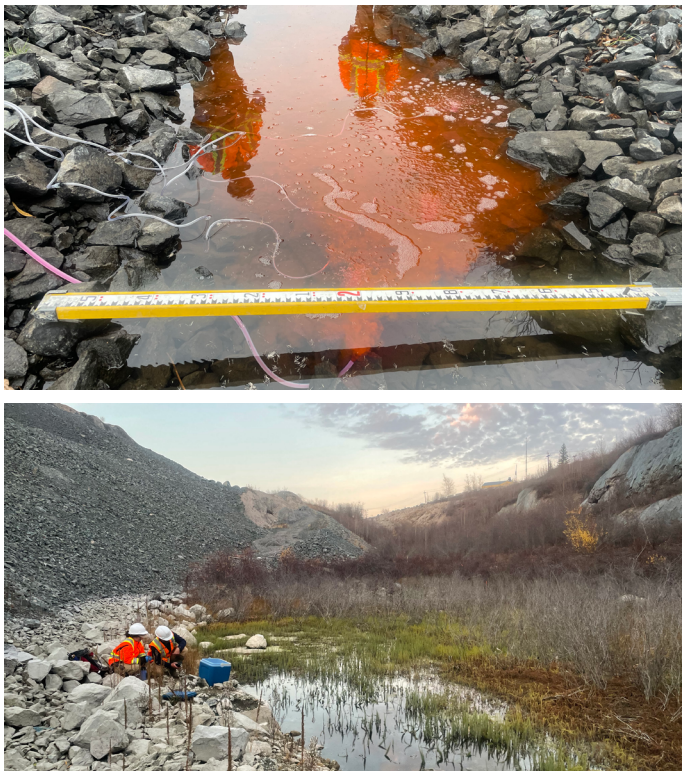


Photo 36: Study of Inflow from Baker Creek to C1 Pit, 2023
Upper photo: environmentally friendly dye used in Baker Creek in late Fall
Lower photo: monitoring at base of C1 Pit to check if dye entered the pit

What were the results of Baker Creek to C1 Pit monitoring?

The field studies confirmed that some Baker Creek water got into C1 Pit. The studies also confirmed the following:

- The ground near the south end of C1 Pit had settled. The amount of settlement, however, was not enough to regularly allow water from the creek to overtop and enter the pit directly.
- No major cracks or fractures were present in the rock of the pit walls. Material on top of the pit rock (overburden) was thick in some places and thin in other (variable thickness).
- Dye was found in water at the base of C1 Pit during the study in fall 2023. This indicated that water from Baker Creek leaked out and moved into C1 Pit even during low flow conditions in fall.
- A small amount of Baker Creek leaks continuously to C1 Pit; however, the exact pathway could not be determined due to low flow conditions.
- In winter, Baker Creek water levels could rise because of ice build-up, and then even more water from the creek could enter C1 Pit.

The GMRP Team concluded that the site can manage the small volume of flow into C1 Pit with pumping until the remediation of the pit and the creek is underway. The GMRP will use water management and monitoring including possibly digging out some ice from the creek in winter to prevent higher volumes of water entering the pit and to limit water level changes underground.

7.8 FORESHORE TAILINGS AREA

Background

In the early stages of mining, tailings were deposited in Yellowknife Bay along the shore and waves moved some material deeper into the lake. This area is called the Foreshore Tailings Area. In 2001, a rock cover was constructed on the portion of the Foreshore Tailings Area (Photo 37) that is above the waterline of Yellowknife Bay. Most of the tailings below the waterline remain uncovered.

Photo 37: Existing Foreshore Tailings Cover, Constructed in 2001

What was done on the Foreshore Tailings Area from 2021 to 2024?

The major activities carried out within the Foreshore Tailings Area between 2021 and 2024 were:

- geotechnical investigation in 2021 (March and April 2021; Photo 38)
- geotechnical inspection in 2023 (September 2023)

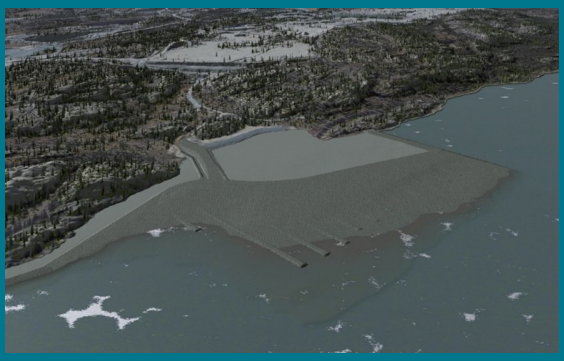
Inspections show the existing Foreshore Tailings Area cover is stable. Because water levels in Yellowknife Bay were very low in the last few years, some of the tailings were exposed to the air. Erosion of the tailings below the water line into Yellowknife Bay continues.

Photo 38: Geotechnical Investigation within Foreshore Tailings Area (drilling into the tailings underwater to check for tailings layer thickness and property using a sonic drill)

Did you know?

The plan for the Foreshore Tailings Area is to extend the existing cover and reduce erosion of the tailings into Yellowknife Bay.

This illustration shows what the cover might look like if water levels were low



7.9 LAND STATUS OF ENVIRONMENT INDICATOR

Table 18 shows the status of key indicators of the environment from 2021 to 2024. A comparison of these indicators to those included in the last Status of the Environment Report (2015 to 2021) is included in Appendix B. The status reflects the historical impacts on the land, and although remediation has started, these activities are not complete. Therefore, these ratings are expected to stay the same until the areas are fully remediated.

Remediation activities are needed to improve soil quality and pit safety, and to reduce risks to dam stability by draining and covering the Tailings Containment Areas; erosion and stability of the Foreshore Tailings Area will be improved by installation of an expanded cover in this area.

The status of land was rated as follows for the 2021 to 2024 period:

Soil quality: The status of land for soil quality within the developed area, in forest, bedrock and wetland areas, and in the Townsite was rated as "red." This is because soil concentrations are well above the approved closure plan standard.

Substrate (sediment) quality: Substrate at the bottom of Baker Creek on site was rated as "red." This is because most samples were above the aquatic life guideline for arsenic.

Dam stability and maintenance: Dam stability and maintenance was rated as "green/yellow." The annual dam safety inspections showed compliance with the Canadian Dam Association guidelines and that dams were stable. Dam monitoring and routine inspections continued; maintenance/repairs were required from time to time, focusing on removal of vegetation and management of surface drainage and traffic on dam crests. Repairs were made; however, the repairs sometimes were made later than the recommended implementation timelines.

Pit safety: Pit safety was rated as "yellow/red". Pit wall maintenance/monitoring is required; signs/ barricades/access control are in place, but hazards to workers existed. Informal processes are in place to limit access before an activity near or in a pit but not always documented consistently.

Foreshore Tailings Area: The status of land in the Foreshore Tailings Area was rated as "yellow/red" because while the cover is stable, erosion in the bay continues.

Table 18 : Land Status of Environment Indicator

Land (including Infrastructure)

INDICATOR	EVIDENCE	STATUS FOR 2021–2024
Soil quality in developed areas	On average, soils had total arsenic more than the approved closure plan standard of 340 mg/kg for the site.	
Soil quality in bedrock, forest, wetland areas	On average, soils had total arsenic more than the approved closure plan standard of 340 mg/kg for the site.	
Soil quality in Townsite	On average, soils had total arsenic more than the approved closure plan standard of 160 mg/kg for the Townsite.	
Substrate quality in Baker Creek	Baker Creek substrates at bottom of creek (sediment) were elevated in metals and were above the aquatic life guideline for total arsenic.	
Dam stability and maintenance	The annual dam safety inspections showed compliance with Canada Dam Association requirements. Dams were stable. Some maintenance/repairs were completed later than the recommended timelines. Dam monitoring and routine inspections continued.	
Pit safety	Pit wall maintenance/monitoring is required; signs/barricades/access control are in place, but hazard to workers existed. Informal processes are in place to limit access before an activity near or in a pit but not always documented consistently.	
Foreshore Tailings Area in Yellowknife Bay	The condition of the existing foreshore cover was stable. Erosion of tailings in the bay past the cover continues.	

mg/kg = milligrams per kilogram

8.0 Wildlife

8.1 BACKGROUND

Elders from the Yellowknives Dene First Nation report that before mining, the Giant Mine area was an abundant source for many species, including moose (*Alces alces*), caribou (ekwà; *Rangifer tarandus*), bear (sah; *Ursus sp.*), wolf (no̜ndi; *Canis lupus*), wolverine (no̜gha; *Gulo gulo*), beaver (tsà; *Castor canadensis*), lynx (no̜da; *Lynx canadensis*), fox (*Vulpes vulpes*), coyote (no̜nditsoa; *Canis latrans*), porcupine (ch'oh; *Erethizon dorsatum*), otter (nàmbe; *Lontra canadensis*), muskrat (dzo̜; *Ondatra zibethicus*), fisher (whacho; *Pekania pennanti*), marten (wha; *Martes americana*), mink (tehji; *Neogale vison*), and rabbit (gah; *Lepus americanus*). Rabbits were so plentiful in an area near the Yellowknife River that it became known as "rabbit place." Aside from hunting and trapping, the area on and around the site was preferred for harvesting berries, medicinal plants, and wood[71]. The area was so important that the Yellowknife Dene First Nation discouraged people from settling there to keep it undisturbed for harvesting.

Today, the Giant Mine site is still home to some of these wildlife species[72]. The types of wildlife and birds that can live on site are affected by the habitat around them. Natural habitat occurring on site includes forested areas and rocky areas and is influenced by the proximity of Great Slave Lake. Disturbance on the land from historical mining, the City of Yellowknife, the City's Solid Waste Facility (landfill), and the nearby highways, of which Highway 4 runs through a portion of the site, are some of the challenges wildlife have had to face in their natural habitat.

Wildlife could continue to be impacted until remediations is complete, due to historically contaminated soils and sediment, use and deconstruction of buildings and roads and vegetation where animals and birds may visit, and ongoing remediation activities.

8.2 MONITORING

The GMRP follows a Wildlife and Wildlife Habitat and Management and Monitoring Plan[73]. Wildlife and wildlife habitat observations, along with intermittent monitoring when warranted by site activities, were documented. This monitoring is done to support protecting wildlife during remediation activities.

What monitoring programs occurred from 2021 to 2024?

The GMRP Team reported wildlife sightings in a wildlife log. Birds were monitored on site during the spring and summer each year to determine if they were nesting near site activities and if nest protection was required. Prior to decommissioning of the Giant Mine Townsite, mitigations were applied to avoid harm to birds or wildlife, including boarding up holes and vents, deploying deterrents, and completing bird and wildlife sweeps prior to starting work.

Birds

Nest sweeps were done in spring and summer when birds were likely to be nesting, which is approximately from 9 May until 13 August annually, or until the nesting period in the North was complete[74]. The GMRP Team looked for signs of nesting birds (visual behaviours and/or nests) and identified possible risks to birds from activities on site. Different buildings and areas had nest sweeps done each year depending on the activities on site. If an area was noticed where birds could nest (e.g., on a light on an old building), the GMRP Team suggested ways to reduce risks to birds. One example is a physical buffer, which was used to keep activities at a safe distance from a nest, or if possible, limit use or avoid use of the area. The GMRP Team checked on nests that were established throughout the season until no longer active.

Wildlife

All workers on site watch for wildlife year-round and record sightings in the wildlife log. Sighted wildlife is reported to the main construction manager environment team, which tracks all wildlife sightings and observations made within the Giant Mine site.

8.3 KEY RESULTS

8.3.1 Birds

Observations

Over 60 types of birds were observed on site from 2021 to 2024 (Table 19). This included waterfowl, birds of prey, and songbirds. Some birds, such as ravens (*Corvus corax*), are "res-

ident," living near or on site all year. Other birds visit Yellowknife and the site yearly during the spring and summer months; these are referred to as "migratory" birds. Of the many types of birds, nesting was only observed for 10 different bird species. Several bird species have been detected nesting on site on multiple occasions, including horned grebe (*Podiceps auritus*), short-billed gull (*Larus branchyrhynchus*), barn swallow (*Hirundo rustica)*, common raven, and eastern phoebe (Sayornis phoebe; Photo 39). The most abundant species of bird observed during the bird nesting season is the common raven, followed by the eastern phoebe and white-crowned sparrow (*Zonotrichia leucophrys*), respectively. While the white-crowned sparrow has been observed frequently during the summer, this species has not yet been confirmed nesting on site.

Horned grebes were found to visit and nest in 2023 and 2024. In 2023, a nest was discovered on 15 June and on 17 June, and Environment and Climate Change Canada agreed with establishing a 100-metre setback (closing the nearby road) to minimize disturbance during incubation and fledgling. The setback was removed on 24 July, two weeks after the nest was found abandoned. In 2024, after the nest was observed on 23 May by a watercraft, Environment and Climate Change Canada provided several mitigations which included discontinuing use of all deterrents from the area, discontinuing use of watercraft from the area, not withdrawing any water from the pond, reducing vehicle speed to 15 kilometres per hour on adjacent roads to the pond, limiting access of humans to the area, and monitoring the nest every two weeks. Unfortunately, on 27 June, the egg was observed to be discoloured, which is an indication that it was likely not viable.

Photo 39: Eastern Phoebe Eggs and Hatched Nestlings 2022

Four species of birds that were observed on site are listed as a Species at Risk by the federal government (Table 19): horned grebe (*Podiceps auritus*), barn swallow (*Hirundo rustica*), Harris's sparrow (*Zonotrichia querula*), and rusty blackbird (*Euphagus carolinus*). The GMRP works hard to protect all birds, including Species at Risk[3].

Surveys Completed

During the reporting period, building structures including residences, pumphouses, lift station, sheds, and other buildings were surveyed. These buildings were from historical mining operations and needed to be demolished for the safety of people and the environment. The GMRP Team worked to prevent birds from nesting in these buildings before they were demolished; this is called mitigation to prevent nesting. This mitigation included removing plants from around the buildings; covering holes in buildings, pipes, and vents; boarding up of windows; and closing off chimneys, as well as deployment of deterrents throughout the Townsite (Photo 41 and 43).

Regulatory Updates and Species at Risk

In 2022, the federal Migratory Bird Regulations were updated. These updates added protection for nests of 18 species not listed in the previous regulations. This was done because these species of birds have nests that can be reused in later years by migratory birds[75]. At the Giant Mine site, only one species new to the regulations was present on site: the pileated woodpecker (*Dryocopus pileatus*). An incidental pileated woodpecker observation was confirmed on site in November 2023 near the ETP; however, no pileated woodpecker nesting cavity has been confirmed on site. Should a pileated woodpecker nesting cavity be found at site, the nest would need to be monitored for 36 months for inactivity to be designated abandoned[3].In 2022 and 2023, a foraging woodpecker tree and several power poles with nesting cavities (Photo 40) belonging to other species of woodpecker, respectively, were observed.

Photo 40: Woodpecker Nesting Cavity on Power Pole 2023

Table 19: Birds Observed at the Giant Mine Site from 2021 to 2024

SPECIES GROUP	COMMON NAME (A)	SCIENTIFIC NAME	NESTING ON SITE	OBSERVED
Grouse (grouse, ptarmigan, quail)	spruce grouse	*Canachites canadensis*	-	Yes
	willow ptarmigan	*Lagopus lagopus*	-	Yes
	grouse species	N/A	-	Yes
	ptarmigan species	N/A	-	Yes
Waterfowl (ducks, geese, swans)	American wigeon	*Anas americana*	Yes	Yes
	bufflehead	*Bucephala albeola*	-	Yes
	Canada goose	*Branta canadensis*	-	Yes
	canvasback	*Aythya valisineria*	Yes	Yes
	common merganser	*Mergus merganser*	-	Yes
	greater scaup	*Aythya marila*	-	Yes
	green-winged teal	*Anas crecca carolinensis*	-	Yes
	lesser scaup	*Aythya affinis*	-	Yes
	mallard	*Anas platyrhynchos*	Yes	Yes
	ruddy duck	*Oxyura jamaicensis*	-	Yes
	scaup species	N/A	-	Yes
	common loon	*Gavia immer*	-	Yes
	horned grebe	*Podiceps auritus*	Yes	Yes
Loons and grebes	red-necked grebe	*Podiceps grisegena*	-	Yes
	American kestrel	*Falco sparverius*	-	Yes
	bald eagle	*Haliaeetus leucocephalus*	-	Yes
Raptors (hawks, eagles, falcons)	golden eagle	*Aquila chrysaetos*	-	Yes
	gyrfalcon	*Falco rusticolus*	-	Yes
	merlin	*Falco columbarius*	-	Yes
	osprey	*Pandion haliaetus*	-	Yes
	peregrine falcon	*Falco peregrinus*	-	Yes
	owl species	N/A	-	Yes
	sand-hill crane	*Grus canadensis*	-	Yes
	sora	*Porzana carolina*	-	Yes
	spotted sandpiper	*Actitis macularius*	-	Yes
Shorebirds	Wilson's snipe	*Gallinago delicata*	-	Yes
	arctic tern	*Sterna paradisaea*	-	Yes
Gulls and terns	herring gull	*Larus argentatus*	Yes	Yes
	ring billed gull	*Larus delawarensis*	-	Yes
	short-billed gull	*Larus branchyrhynchus*	Yes	Yes
	gull species	N/A	-	Yes
	northern flicker	*Colaptes auratus*	-	Yes
	pileated woodpecker	*Dryocopus pileatus*	-	Yes
	American robin	*Turdus migratorius*	-	Yes
Songbirds	American tree sparrow	*Spizella arborea*	-	Yes
	barn swallow	*Hirundo rustica*	Yes	Yes
	belted kingfisher	*Megaceryle alcyon*	-	Yes
	black-billed magpie	*Pica hudsonia*	-	Yes
	Canada jay	*Perisoreus canadensis*	-	Yes
	chipping sparrow	*Spizella passerina*	-	Yes
	common raven	*Corvus corax*	Yes	Yes
	dark-eyed junco	*Junco hyemalis*	Yes	Yes
	eastern phoebe	*Sayornis phoebe*	Yes	Yes
	Harris's sparrow	*Zonotrichia querula*	-	Yes

a) Bold text indicates federally listed species at Risk. Italicized text indicates NWT Species at Risk.

N/A = not applicable; - = not observed

SPECIES GROUP	COMMON NAME (A)	SCIENTIFIC NAME	NESTING ON SITE	OBSERVED
Songbirds	house sparrow	*Passer domesticus*	-	Yes
	lapland longspur	*Calcarius lapponicus*	-	Yes
	Lincoln's sparrow	*Melospiza lincolnii*	Yes	Yes
	orange-crowned warbler	*Oreothlypis celata*	-	Yes
	palm warbler	*Setophaga palmarum*	-	Yes
	red-winged blackbird	*Agelaius phoeniceus*	-	Yes
	ruby-crowned kinglet	*Corthylio calendula*	-	Yes
	rusty blackbird	*Euphagus carolinus*	-	Yes
	savannah sparrow	*Passerculus sandwichensis*	-	Yes
	Swainson's thrush	*Catharus ustulatus*	-	Yes
	Tennessee warbler	*Leiothlypis peregrina*	-	Yes
	tree swallow	*Tachycineta bicolor*	-	Yes
	white-crown sparrow	*Zonotrichia leucophrys*	-	Yes
	white-throated sparrow	*Zonotrichia albicollis*	-	Yes
	yellow warbler	*Setophaga petechia*	Yes	Yes
	yellow-rumped warbler	*Setophaga coronata*	-	Yes
	blackbird species	N/A	-	Yes
	sparrow species	N/A	-	Yes

a) Bold text indicates federally listed species at Risk. Italicized text indicates NWT Species at Risk.

N/A = not applicable; - = not observed

Photo 41: Townsite Building
Upper photo: No. 2 Main Pumphouse (Building 076) before mitigations applied
Lower photo: No. 2 Main Pumphouse after mitigation to deter nesting

Photo 42: Townsite Building
Upper photo: Guest house (Building 168) before mitigations applied
Lower photo: Guest house after mitigation to deter nesting

Did you know?

In 2021, the mew gull was split into two different species: common gull (*Larus canus*) and short-billed gull (*Larus branchyrhynchus*).

The Eurasian population, common gull, can reach North America from east and west, representing two different subspecies: Kamchatka and European. The North American population, short-billed gull, are common along the Pacific coast and into western Canada and are the most common species of gull at the Giant Mine site (see photo of a gull nesting in 2023).

These determinations are made by the North American Classification and Nomenclature Committee, which annually releases a new American Ornithological Society checklist supplement, detailing revisions to North American birds[6].

8.3.2 Wildlife

A total of 13 species of wildlife were observed on site from 2021 to 2024 (Table 20). The most abundant wildlife species observed were coyote (Canis latrans), followed by grey wolf (Canis lupus), black bear (Ursus americanus), and red fox (Vulpes vulpes; Photo 43). Most observations of coyote were in March and July, for grey wolf were January and November, and for red fox were July and November. Moose (Alces alces) and ermine (Mustela erminea) were reported only once in 2023 during September and October, respectively. Wolverine (Gulo gulo) was observed at the site each year from 2021 to 2024 between September and April; this species was reported to the Government of Northwest Territories as it is a species of concern in Canada.

Black bears were observed between April and October, with the highest reports being July, August, and September. In 2022, there were a total of 37 bear sightings in July (12 sightings), August (10 sightings), and September (15 sightings); whereas in 2023, that number nearly doubled to 73 bear sightings during the same months (44, 28, and 1 bear sightings, respectively). The increase in black bear sightings during the summer of 2023 compared to the summer of 2022 could be linked to the wildfires in the Yellowknife area in 2023. In addition, there was an increase in red fox sighting reports compared to other years at site, which may have also been due to the wildfires.

Photo 43: Red Fox (dark morph)

One bat was seen at site, the northern myotis (Myotis septentrionalis), which is also commonly referred to as the northern long-eared bat. The bat was observed in October 2023 on the ceiling of the A2 portal roughly 60 m underground in the portal (Photo 44). This is the first time this bat was detected at site. A stop work order was issued to minimize disturbance to the bat while an investigation took place.

The investigation noted that the bat appeared healthy and it was behaving normally. Site staff returned to the A2 portal the following day to inspect the area for wildlife, including bats; however, no bat nor any other wildlife was observed at that time. This observation was reported to the Government of Northwest Territories as it is a species of concern in the Northwest Territories and an endangered species in Canada. Since then, all underground portals had doors installed for winterization preventing wildlife access. No wildlife sweeps were officially completed; however, the workers did look for any wildlife prior to closing these underground entrances.

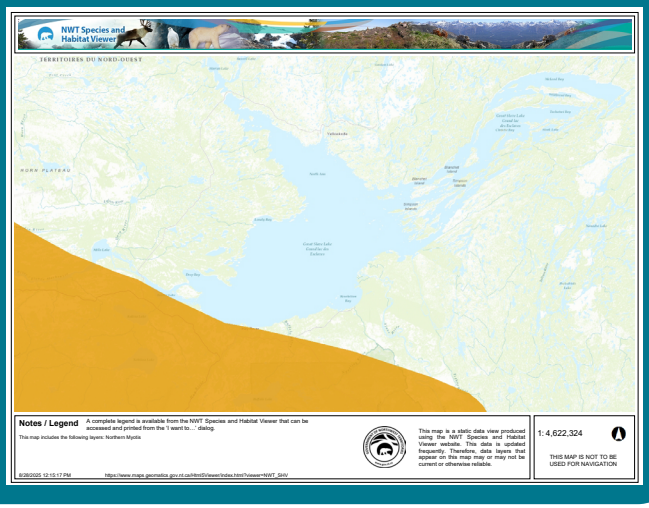
Photo 44: Northern Myotis Observed in the A2 Portal

Did you know?

A type of bat species commonly referred to as the northern long-eared bat (also called the northern myotis) was observed at the Giant Mine site.

It was spotted on the ceiling in one of the mine shafts underground on a day in October 2023, and was gone the next. The northern myotis is not only an endangered species in Canada, but is also not usually observed in the Yellowknife area.

A map of its home range is shown. The openings to the mine have been closed; bats can no longer access the underground



8.4 WILDLIFE STATUS OF ENVIRONMENT INDICATOR

No indicator for wildlife was identified. The monitoring data are not collected in a way to support identification and rating of an indicator, which relies on many observations over time. For wildlife on site, the data are mostly occasional observations by workers on site, wildlife sweeps and nest sweeps during the breeding period, and from annual surveys from various areas around site. Further, the species and amount (abundance) of wildlife on site are affected by the surrounding habitat, which includes many types of human disturbances (e.g., roads, City of Yellowknife) and natural landscape features (e.g., nearby Great Slave Lake). Because of the type of data available and the significant influence of other disturbances on wildlife, it was not possible to set a meaningful indicator that reflected the status of the wildlife on site.

Table 20: Wildlife Observed at the Giant Mine Site from 2021 to 2024

ORDER GROUP	COMMON NAME (A)	SCIENTIFIC NAME	OBSERVED
Artiodactyla	moose	*Alces alces*	Yes
Carvinora	coyote	*Canis latrans*	Yes
	gray wolf	*Canis lupus*	Yes
	red fox	*Vulpes vulpes*	Yes
	Canada Lynx	*Lynx canadensis*	Yes
	ermine	*Mustela erminea*	Yes
	wolverine	*Gulo gulo*	Yes
	black bear	*Ursus americanus*	Yes
	bear	*Species unknown*	Yes
Chiroptera	***northern myotis***	*myotis septentrionalis*	Yes
Lagomorpha	snowshoe hare	*Lepus americanus*	Yes
Rodentia	American beaver	*Castior canadensis*	Yes
	common muskrat	*Ondatra zibethicus*	Yes
	North American porcupine	*Erenthizon dorsatum*	Yes

a) ***Bold*** text indicates federally listed species at Risk. Italicized text indicates NWT Species at Risk.

9.0 Cumulative *Effects*

9.1 BACKGROUND

In 2010, potential effects of the GMRP plus those of other activities and developments in the area (cumulative effects) were assessed (Developer's Assessment Report Section 11[76]). The assessment was done to:

- Identify issues of concern for the GMRP and other projects and/or activities to see if there would be negative (adverse) effects.
- Determine how far the effects could reach out in the area (spatial extent) and how long they might last (duration).
- Identify ways to help mitigate negative effects and monitor these in the future.

Other activities that could combine with the GMRP to create cumulative effects were identified; some examples include the redevelopment of the Townsite area, City of Yellowknife airport, and other developments including City of Yellowknife Solid Waste Facility (landfill) expansion, resource harvesting, activities to remediate Con Mine, rerouting of Highway 4, and regional contamination: effects on people's health and well-being from the operations of the historical Giant Mine.

The Developer's Assessment Report concluded that there would be no significant negative effects of remediation in combination with other activities (cumulative effects; Table 21). This is because the effects of remediation are primarily positive, and extra care will be taken to protect the environment from harm during remediation (known as "mitigation"). An example of a mitigation measure is to dig a sump to collect water from areas where heavy equipment is working and moving contaminated soil; this would prevent the water from entering Baker Creek or Yellowknife Bay.

The assessment concluded that no additional mitigation measures were needed to prevent cumulative effects beyond those measures already planned.

Despite the GMRP's assessment of effects, the Mackenzie Valley Environmental Impact Assessment Review Board ruled in its Report of Environmental Assessment and Reasons for Decision[77] that the GMRP in combination with legacy effects of historical mining may have significant negative cumulative effects on:

- the well-being of people (Section 8.3.3 of the Reasons for Decision)

Table 21: Cumulative Effects of Remediation Plus Other Activities and Legacy Mining

CUMULATIVE EFFECTS ISSUES OF CONCERN	DESCRIPTION	DEVELOPERS ASSESSMENT CONCLUSION	HOW IS IT MONITORED?
Arsenic contamination of water	Contamination from old mining operations and potential release during remediation activities	Minor adverse effects; not significant	See Chapter 5 of this report
Arsenic contamination of fish	Contamination in fish (fish tissue) that humans might then eat, caused by old mining operations and potential release during remediation activities	Minor adverse effects; not significant	See Chapter 6 of this report
Arsenic contamination of wildlife	Contamination in wildlife (wildlife tissue) that humans might then eat, caused by old mining operations and potential release during remediation activities	Minor adverse effects; not significant	See the Wildlife and Wildlife Habitat Management and Monitoring Plan[94]
Traditional land uses and decreased quality of the land (degradation)	Reduced and/or restricted the land area for local Indigenous Peoples to practise traditional land use activities. In addition, there could be a loss and/or degradation of habitat	Minor adverse effects; not significant	Not appropriate for monitoring at this time, avoidance of the site occurs; Perpetual Care Working Group set up to discuss future safety of land and constraints for use/development

Source: Modified from Table 11.4.2, Chapter 11 of the Developer's Assessment Report.[95]

- the water in Yellowknife Bay (Section 9.7 of the Reasons for Decision)

Based on that determination, the Mackenzie Valley Environmental Impact Assessment Review Board set out two measures (requirements) for the GMRP Team to complete before remediation could proceed, which were accepted by the GMRP in 2014:

- **Measure 10**: conduct a Human Health and Ecological Risk Assessment of the current and future condition, and if necessary, identify additional mitigation necessary to prevent harm to people.
- **Measure 14**: add an ion exchange process to its proposed water treatment process to produce water treatment plant effluent that at least meets Health Canada's drinking water standards for arsenic (containing no more than 10 µg/L), to be released using a near shore outfall immediately offshore of the Giant Mine site.

Status to Mid-June 2024

Both Measures 10 and 14 are complete. A Human Health and Ecological Risk Assessment (Part 1, Part 2, Part 3, Part 4)[78] was completed in 2018 (per Measure 10; see also Chapters 6 and 8 for discussion). It concluded that the risk of the GMRP to people was low, if constructed as proposed in the Closure and Reclamation Plan. In 2019, the Closure and Reclamation Plan (Chapters 1-4, 5.0-5.4, 5.5, 5.6, 5.7-7.0)[79] included a water treatment plant design that can meet the low concentrations of arsenic required (per Measure 14). Requirements for the quality of treated effluent (the effluent quality criteria) are listed in the GMRP's Water Licence. Construction of the new water treatment plant started in 2023 and is ongoing. Details on final commissioning and operations of the plant will be provided in subsequent Status of the Environment reports.

Because Measures 10 and 14 are met, the GMRP assesses that the risk of negative cumulative effects to human health and water in Yellowknife Bay in combination with the GMRP is not significant.

The Legacy Arsenic Human Health Risk Assessment (HHRA) was carried out by the Government of Northwest Territories and Crown-Indigenous Relations and Northern Affairs Canada to assess health risks from historical arsenic contamination around Yellowknife[80]. Overall, the HHRA concluded that current levels of contamination do not pose a significant health risk, allowing continued land use with a few precautions.

The GMRP continues to conduct, support, and share data on health- and water-related cumulative effects monitoring, including:

- Air quality and water quality are monitored on site as well as in the surrounding area by the GMRP (see Chapters 4 and 5 of this report). This monitoring documents the quality of air and water affected by the GMRP and any other regional inputs. The data are available publicly.
- The GMRP supports and participates in the Health Effects Monitoring Program Advisory Committee.
- The GMRP shares data with other researchers who study the impacts of mining in the area. This includes groups such as Environment and Climate Change Canada, Natural Resources Canada, various universities, the Government of Northwest Territories, the Yellowknives Dene First Nation, and the North Slave Métis Alliance.
- The GMRP supports the Yellowknives Dene First Nation and the North Slave Métis Alliance in providing funding for community-based monitoring programs in the region.

Did you know?

The Northwest Territories Cumulative Impact Monitoring Program keeps track of long-term changes to the land, water, and animals?

It uses both science and Indigenous Knowledge to help leaders make good decisions. Right now, they are focusing on topics like fish, water, and caribou.

10.0

Lesson Learned *and Adaptive Management*

The Giant Mine site was in care and maintenance from 2005 to 2020. In that time, activities were carried out where practicable or urgently needed to address site health and safety or environmental issues. Since late 2021, remediation activities have commenced. The GMRP uses what has been learned over the past several years to help with remediation activities. "Adaptive management" is the term used to describe continual improvement by learning the lessons from what was previously done. Through the learnings of the past several years, the remediation will be improved and result in more protection of the environment and workers.

The GMRP's management and monitoring plans outline action levels and use an adaptive management approach to link monitoring results to actions/mitigations that would maintain management of the site as planned. If monitoring or inspections indicate that something is not performing as anticipated, a series of these approved actions/mitigations would be initiated. In some cases, updates may be needed to the management and monitoring plans based on lessons learned and adaptive management.

This chapter describes some of the main lessons learned from key activities with a focus on environmental protection. For more information on activities and lessons learned, please refer to Chapter 4 and Appendix 4A of the Closure and Reclamation Plan and the Annual Water Licence reports (2021[81], 2022[82], 2023[83], 2024 [Part 1, Part 2][84]).

10.1 ADAPTIVE MANAGEMENT DURING CARE AND MAINTENANCE

In the winter of 2022, an ice blockage in Baker Creek caused "overflow" conditions, where water was flowing over the ice, which then was able to seep into C1 Pit and eventually to the underground mine pool. The ice blockage could not be immediately removed due to a reduced number of staff due to COVID-19 and a shortage of specialized equipment. The GMRP implemented the following mitigation measures: excavating a trench in the ice to help restore flow in Baker Creek, and pumping water from C1 Pit to the underground. Additional pumping from the underground to the Northwest Pond was required to maintain minewater levels. Details of the investigations to further understand how water was getting from Baker Creek into the pit are described in Chapter 7.0 (Pits section).

THE ENVIRONMENTAL LESSONS LEARNED FOR IMPROVING WATER MANAGEMENT:

- Continue to monitor Baker Creek for ice buildup and beaver dams, removing as needed to prevent water from overtopping its banks or entering C1 Pit.
- Continue to plan for impacts of climate change and water management in the winter months.
- Review and update the Ice Buildup and Freshet Management Standard Operating Procedure as required.

From 2021 to 2024, the GMRP Team documented small spills, drips, and leaks of materials such as oil, diesel, or other fluids (e.g., engine coolant) around the site. These came from either drilling or from heavy equipment or other vehicles required for care and maintenance or remediation activities.

THE ENVIRONMENTAL LESSONS LEARNED FOR THE EQUIPMENT AND MACHINERY ON SITE:

- Inspect equipment and parts when received and again before use/installation to verify they are in good working order.
- Use the readily available spill kits, use spill trays below equipment, and complete daily inspections to prevent spills or leaks and materials from being released into the receiving environment.

10.2 ADAPTIVE MANAGEMENT DURING REMEDIATION

Working Underground

Parts of the underground mine were backfilled with a cement paste from 2021 to 2024 (see Chapter 7.0, Underground section). Some of this work was completed from surface, but other work required workers to be underground. Three issues occurred underground:

- In 2024, elevated levels of nitrogen dioxide gas were detected in the underground in B Shaft; levels were below the Mine Health and Safety Regulations[85] but higher than usual. This gas is a risk because it can sometimes cause respiratory irritation for workers. The source of this gas was investigated and found to be coming from a propane tank that was used as part of the heating system underground. A new regulator was installed in the B Shaft propane vapourizer to mitigate the risk of excess, uncombusted gas being produced. Levels returned to normal after this.
- During historical mining activities, fresh air had been pushed underground for workers and was heated at the B1 Vent Raise. As mining ceased, and areas of the mine were no longer accessed, the air into distal parts to the core area was no longer ventilated and heated. This resulted in the cooling and freezing of the rock and air in the areas away from C Shaft and B Shaft. Where water infiltrated into the underground from surface, it formed ice in the underground stopes and drifts, blocking access and filling void space. The ice buildup was observed at A1 and A2 portals and blocked access to areas where backfilling needed to occur (Photo 45). To address this, the GMRP installed local power, heating, and fans. The ice was melted through the heat and recirculation of the warm air at the "ice wall," and the area was backfilled as part of the underground stabilization program.
- As part of preparing the underground for closure, workers carried out relocation of highly contaminated sludge into Chamber 15, which will be frozen. Over the course of this work, numerous medical monitoring results for urinalysis were elevated. An investigation was carried out to determine the cause, in consultation with the Workers' Safety and Compensation Commission. Root causes included increased work in highly contaminated areas, inadequate following of proper personal protective equipment application, and inadequate cleaning in the changing area. Corrective actions were implemented to address the issue.

THE ENVIRONMENTAL-RELATED LESSONS LEARNED DURING UNDERGROUND WORK:

Use local "warm air" circulation underground to expedite ice thaw instead of relying on overall mine air heating, supporting closure and exiting the underground. This approach helped advance work, which once complete, will save power and promote worker safety.

Increase supervision, enforcement, and review of proper personal protective equipment protocols for working around highly contaminated sludge. Increase cleaning in change areas.

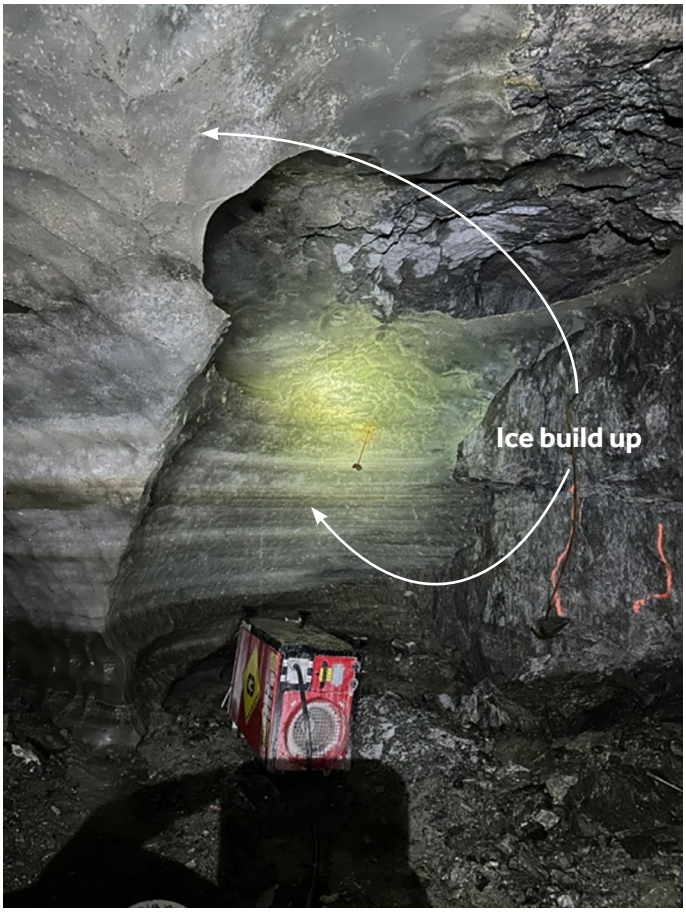


Photo 45: Ice Buildup Underground that Could Block Access to Areas for Remediation (heater was used to melt the ice)

Revegetation Plot Testing Program

Revegetation is used to prevent erosion on steep slopes or to improve habitat for fish. The GMRP will plant and/or apply seed mixes of various native species of trees, shrubs, grasses, or aquatic vegetation to some remediated areas of the Giant Mine site that need it for erosion needs or fish habitat (e.g., Baker Creek). Because there is not a lot of topsoil in the Yellowknife area for revegetation, the GMRP is looking for soil alternatives. The GMRP is testing a combination of straw, healthy soil bacteria, and minerals to use in place of soil; this mixture is called "biotic soil media." Test plots were set up on site (Photo 46) in 2024 to determine what types of biotic soil

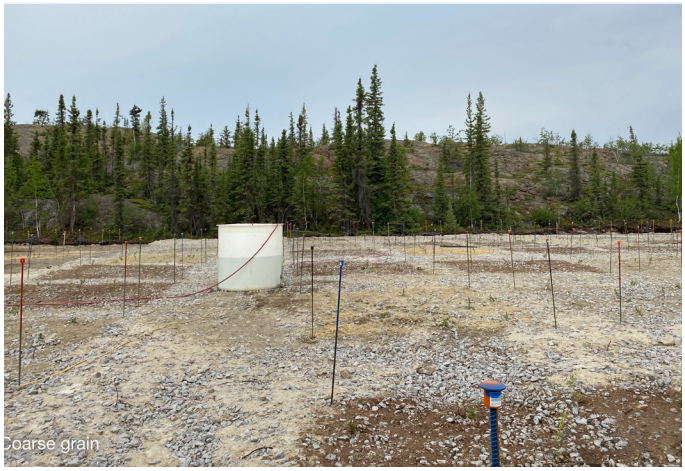


Photo 46: Revegetation Test Plot with Different Types of Biotic Soil Media

media work best at site and can grow native plant species. These plots will be maintained and monitored over the next few years to determine how well the vegetation is doing (performance of the test plots).

The plots took longer than planned to set up due to wet soil conditions. The delays led to inefficiencies with use of resources to plant and equipment, and reduced the amount of growth time available

THE ENVIRONMENTAL LESSONS LEARNED FOR **THE REVEGETATION PLOTS:**

Prepare planting area the fall prior to planned revegetation, allowing more time to plant or seed in the spring with a longer early growth season and limiting the need of additional watering program.

On-Site Blasting

The water treatment plant required use of blasting to move rock to make space for the pipeline leading down to the outfall in Yellowknife Bay. Two risks were observed that had the potential to cause environmental issues.

- Blasts are monitored using devices called seismographs that are fitted with different sensors (e.g., hydrophones, geophones, or microphones) that measure vibration and overpressure (i.e., air and water). Vibration and overpressure limits are set to protect people, wildlife and fish, and sensitive infrastructure (such as dams). All blasting on site follows the Borrow Materials and Explosives MMP[86]. On two occasions, vibration was measured above the required limit and was reported to regulators. After investigating, it was found that some equipment was not installed properly, causing the high readings.
- Sometimes more rock is blasted out of an area than is planned; this is called overbreak. Overbreak was observed in one area of the blasting on site for the new water treatment plant pipeline. This was investigated and found to be caused by rock from a previous blast that had been left against the sidewall of the next blasting event. Overbreak can create a potential hazard for workers in the area after a blast.

THE ENVIRONMENTAL LESSONS LEARNED **FROM ON-SITE BLASTING ACTIVITIES:**

Bury vibration monitoring devices or bolt them firmly to bedrock to take accurate measurements.

Dig out and remove blast rock that is up against the sidewalls of the next blast area, where possible and safe to do so.

Dam Safety

Onsite dams are monitored and inspected for stability to ensure protection of workers and the environment. More details on dam monitoring can be found in the OMS Manual[87]. In 2023, work was proposed near a dam in the Northwest Pond. Communication on how close workers could come to the dam may have been inadequate. Work was paused to better understand the nature of the activity and how close to the dam work could be done.

THE ENVIRONMENTAL LESSONS LEARNED **FOR DAM SAFETY:**

Communicate often and clearly about dam safety and necessary setback distances with contractors and monitor closely and frequently all work completed by contractors in the vicinity of dams.

Pre-plan work activities near dams, with consideration of setback distances set by the GMRP and the dam engineers, prior to starting work.

10.3 ADAPTIVE MANAGEMENT IN THE FUTURE

The GMRP continues to adapt to changing site conditions and apply lessons learned to ongoing remediation efforts. Management and monitoring plans are reviewed based on lessons learned and adaptive management and may require updates as remediation advances.

In general, the GMRP follows this process:

- Evaluate action levels based on monitoring findings.
- If an action level is exceeded, the GMRP will review the information and, if necessary, implement actions/mitigations for the action level exceedance as appropriate per the approved management and monitoring plan.
- Any exceedances will be reported per the regulatory requirements outlined in the applicable management and monitoring plan and Engagement Plan.

11.0

Where do we go *from here*

The next Status of the Environment Report will be provided in three years (2028) and will cover the time period of mid-June 2024 to mid-June 2027. The anticipated activities that will occur in the next three years are advancement of detailed design, remediation, continuing care and maintenance, and monitoring.

The remediation activities that are planned for the next three years are as follows:

Complete remediation on the following components:

- closure of the remaining openings to surface
- core industrial area infrastructure demolition
- construction completion and operation of the water treatment plant

Continue remediation of the following components:

- final detailed designs and construction plans to support remediation
- development of on-site borrow sources
- drilling of boreholes for thermosyphon installation in AR1

Start remediation of the following components:

- contaminated soils
- Original Tailings Containment Area and associated dams
- open pits

Monitoring will continue on the site including:

- estimating greenhouse gas emissions
- dust/air quality [88]
- water quality on site [89]
- water quality in Yellowknife Bay[88]
- underground water level[88]
- water level in Tailings Containment Areas on site [90]
- water flows and levels in Baker Creek[88]
- wildlife[91]
- fish[92]
- fish food (benthic invertebrates)[91]
- sediment quality[91]
- underground stability [93]
- inspections, maintenance, and monitoring of site structures such as dams and pits
- construction monitoring to confirm the environment and people are protected during construction activities related to remediation

Monitoring will follow the approved management and monitoring plans. Results from monitoring are reported every year to the Mackenzie Valley Land and Water Board through the Annual Water Licence Report and will be summarized in the next Status of the Environment Report.

If there are accidental spills to the environment, the GMRP will report to appropriate regulators and the Mackenzie Valley Land and Water Board. Should remediation activities not progress as planned, the Mackenzie Valley Land and Water Board will be notified. The project provides updates at the GMRP Working Group to Rights holders and stakeholders about any occurrences, and a summary is provided in the Annual Water Licence Report.

The Baker Creek, Contaminated Soils and Sediments, Site Infrastructure (Part 2), and updated Aquatic Effects Monitoring Program Design Plans are in progress and will be submitted to the Mackenzie Valley Land and Water Board over the next reporting period.

The GMRP will continue to evaluate and look ahead at work schedules to confirm that the sequencing of remediation activities are planned out, accommodate necessary changes through adaptive management, and coordinate between the GMRP teams working in common areas on site.

Over the next few years, engagement with Rights holders and stakeholders and regulators will continue. The GMRP plans to engage on the above-mentioned plans for different closure and remediation components, management and monitoring plans, aquatic effects monitoring, and revegetation for some areas of the site. Details on engagement activities are reported on in the Annual Water Licence Report.

Improvements to the environment are not expected to occur until more of the remediation is complete, such as covering the tailings ponds or operating the new water treatment plant.

It is likely that remediation activities will generate more dust than the care and maintenance activities in the past, but this will be monitored and efforts made to keep the amount of dust low as is required in the Dust Management and Monitoring Plan. If you are interested in receiving more information on these topics or have feedback, please contact the GMRP information line at 1 867-669-2426, or via email at giantmine@rcaanc-cirnac.gc.ca.

12.0

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Appendix A

Summary of status of environment report Environmental Agreement requirements

Articles of the Giant Mine Remediation Project Environmental Agreement (signed 15 June 2015) are summarized in the following conformity table (Table A-1) along with sections of the Status of the Environment Report where each article requirement is addressed.

Table A-1: Environmental Agreement Article Requirements and How Addressed in Report

ARTICLE 6 STATUS OF THE ENVIRONMENT REPORTING		CORRESPONDING CHAPTER IN REPORT	HOW ADDRESSED?
6.1 Status of the Environment Report - At the times identified in section 6.4 the Co-Proponents shall prepare, provide to the Oversight Body, and make available to the public a comprehensive report on the Project. Each report shall include in respect of each reporting period:		--	--
a)	A summary of the Project's key operational activities;	**Chapter 2.0**	Listed key care and maintenance activities, planning for remediation, and engagement.
b)	An assessment of the long-term effects of the Project;	**Chapter 1.0**	Estimated long-term effects are summarized in Section 5.11 and 5.12 of the Closure and Reclamation Plan. No changes to this are proposed unless remediation activities are amended. Hyperlinks to these sections provided for ease of reference.
c)	A summary of the methodology, and the results or findings, of all monitoring done for the Environmental Programs and Plans and a description of actions taken or planned to implement Adaptive Management;	**Chapters 3.0 to 8.0**	Summary of results, methods, and actions taken provided for each environmental component. Reference to original data reports provided.
d)	A summary of any changes to the environmental impact prediction models, or other conceptual models used by the Co-Proponents to guide Project management, and of the rationale for the changes;	**Chapter 1.0**	During the Water Licence process, new predictions were made for water quality (Effluent Quality Report) and human and ecological health (Human Health and Ecological Risk Assessment [Part 1, Part 2, Part 3, Part 4]). The Yellowknife Bay model was subsequently updated for the Surface Runoff Criteria (SRC) for Engineered Covers Report which included revised model assumptions to account for design changes and updated water quality, climate, and hydrologic inputs. Hyperlinks to those reports are provided.
e)	The identification of any cumulative effects of the Project on the environment, meaning any effects of the Project considered in the combination with the effects of other human activities;	**Chapter 10.0**	Review of the cumulative effects identified by MVEIRB and measures taken to mitigate these provided as well as listing of cumulative effects related monitoring.
f)	A comparison of the results or findings of all environmental monitoring programs under the Environmental Programs and Plans to the results predicted in the Developer's Assessment Report submitted as part of the MVRMA environmental assessment;	Not applicable for this reporting period	A table comparing the predicted residual effects from the Developer's Assessment Report and observations from monitoring for the first three years of reporting is included in Appendix A (Table A-2).

ARTICLE 6 STATUS OF THE ENVIRONMENT REPORTING		CORRESPONDING CHAPTER IN REPORT	HOW ADDRESSED?
g)	an evaluation of the performance of Adaptive Management;	Chapter 10.0	Adaptive management for care and maintenance and remediation summarized, including key lessons learned that are applied as remediation activities continue.
h)	a summary of the Project's planned key operational activities for the upcoming reporting period;	Chapter 11.0	Listed proposed remediation activities for mid-June 2024 to mid-June 2027
i)	references to all sources relied on by the Co-Proponents in coming to conclusions in the report; and	Chapter 12.0	Reference section provided as well as footnotes on each page with hyperlinks to digital sources of data
j)	a plain-language summary of the report.	Summary	--

MVEIRB = Mackenzie Valley Environmental Impact Review Board.

Table A-2: Comparison of Results from the Developer's Assessment Report to the Environmental Monitoring Programs

TOPIC	DAR PREDICTED RESIDUAL ADVERSE EFFECT*	UPDATED DESIGN OR PREDICTED RESIDUAL ADVERSE EFFECT	ACTIVITIES/COMMENT 2021 TO 2024	STATUS 2021-2024
Water Quality	A small quantity of drilling fluids, potentially contaminated with arsenic, may enter surface waters	No change	Localized, short-term increase in turbidity occasionally occurred; Arsenic contaminated water not released to the environment.	**Predicted residual adverse effect did not occur**
	A small quantity of wash water from the decontamination of buildings, potentially contaminated with arsenic, may enter surface waters	No change		
	A temporary increase in turbidity as a result of earthworks activities	No change		
	A temporary increase in turbidity during the construction of the water treatment outfall and Diffuser	Updated; the approved water treatment plant design includes a nearshore outfall pipe without a diffuser. Prediction applies to outfall and nearshore works.	Construction pending, not during this reporting period	Not yet applicable
	Minor mobilization of contamination (e.g., soils and sediments) as a result of earthworks	No change	Changes not detected in water quality sampling results	**Predicted residual adverse effect did not occur**
	Minor mobilization of contamination (e.g., sediments and pore water) during the construction of the outfall and diffuser	Updated; the approved water treatment plant design includes a nearshore outfall pipe without a diffuser. Prediction applies to outfall and nearshore works.	Water treatment plant under construction but outfall work did not occur in this report period	Not yet applicable
	Treated minewater discharged from the diffuser will exceed the CWQG –FAL2 guideline for arsenic within a small volume of water	Updated: The approved water treatment plant design includes a nearshore outfall pipe without a diffuser. The water discharge through the outfall is predicted to meet site specific water quality objectives once remediation is complete1. Updated site specific water quality objectives replace the use of the Canadian Water Quality Guidelines – Freshwater Aquatic Life (CWQG-FAL).	Water treatment plant under construction; no discharge in this report period	Not yet applicable
	The discharge of treated minewater will alter the thermal conditions of the water column in the vicinity of the diffuser	Updated; the approved water treatment plant design includes a nearshore outfall pipe without a diffuser. Prediction applies to outfall.		Not yet applicable

TOPIC	DAR PREDICTED RESIDUAL ADVERSE EFFECT*	UPDATED DESIGN OR PREDICTED RESIDUAL ADVERSE EFFECT	ACTIVITIES/COMMENT 2021 TO 2024	STATUS 2021-2024
Sediment Quality	Mobilization of contaminated soils, sediment and pore water during earthwork activities	No change	Changes not detected in sediment quality sampling in Baker Creek or Yellowknife Bay	**Predicted residual adverse effect did not occur**
	Mobilization of contaminants during construction of the diffuser/outfall	Updated; the approved water treatment plant design includes a nearshore outfall pipe without a diffuser. Prediction applies to outfall.	Water treatment plant under construction but outfall work did not occur in this report period	Not yet applicable
	Increased contaminant loadings in the vicinity of the diffuser in Yellowknife Bay (Great Slave Lake)	Updated; the approved water treatment plant design includes a nearshore outfall pipe without a diffuser. Prediction applies to outfall.	Water treatment plant under construction; no discharge in this report period	Not yet applicable
Aquatic Habitat	Disturbance of sediments in Baker Creek	Removed. The Closure and Reclamation Plan includes removal of sediment from Baker Creek and replacement with clean substrates. This improves conditions for aquatic and terrestrial life.2	No construction during this report period	Not yet applicable
	Disturbance of sediments during construction of the diffuser: outfall in Yellowknife Bay (Great Slave Lake)	Updated; the approved water treatment plant design includes a nearshore outfall pipe without a diffuser. Prediction applies to outfall.	Water treatment plant under construction but outfall work did not occur in this report period	Not yet applicable
	Disturbance of sediments when the cover on foreshore tailings is extended	No change.	Nearshore and foreshore tailings cover construction did not occur in this report period	
	Removal of riparian vegetation as a consequence of surface disturbances along Baker Creek's channel	No change. Note that the *Fisheries Act* Authorization includes provisions for replanting vegetation after removal.	Baker Creek construction did not occur during this report period	
Soil Quality	Minor Operational Releases of hydrocarbons and arsenic-contaminated materials associated with transportation activities	No change.	Minor spills occurred over the course of remediation activities.	All spills reported as applicable, and reports closed to the satisfaction of the Authorities Having Jurisdiction.
Permafrost	Localized loss of permafrost	No change.	Permafrost avoided where possible through design (e.g. location of the water treatment plant). Permafrost characterization studies continued in 2023 and 2024 to inform final alignment of Baker Creek. Best management practices used to limit localized loss of permafrost. Ice lensing observed during some soil excavations.	Occurred in localized area and melt water captured; **Environmental effect predicted to be minor**
Terrestrial Habitat	Earthwork activities will result in surface disturbances that will affect terrestrial habitat	No change.	Earthwork activities and blasting occurred in this report period	Did occur **Environmental effect predicted to be minor**
	The demolition of existing surface infrastructure and buildings is anticipated to eliminate existing terrestrial habitat	No change.		
	Noise emissions will discourage use of the site as terrestrial habitat, particularly during the Remediation Phase	No change.		

*As per Section 12 of the Giant Mine Developers Assessment Report ; 1 As per the approved Effluent Quality Report; 2 As per the Preliminary Screening Document prepared by the GMRP.

Table A-3: Giant Mine Oversight Board Comments on the Status of the Environment Report June 2015 to June 2021

SUBJECT	GMOB COMMENTS ON STATUS OF THE ENVIRONMENT REPORT JUNE 2015 TO JUNE 2021	GIANT MINE REMEDIATION PROJECT TEAM RESPONSE	HOW ADDRESSED IN 2021-2024 REPORT, IF RELEVANT
1. General	Overall, the report does a good job of communicating the current Status of Environment on the Site. The language is accessible to the general public, perhaps not "plain language", but understandable. The document's background and purpose is clear, and there is good use of figures and diagrams to help explain complicated information. The report offers the general public a reason to be confident that the project is being well managed from the perspective of environmental safety, and also reveals the sheer complexity of the project and the large number of environmental considerations that are at play.	The GMRP thanks GMOB for their comment.	N/A
2. General – Links and accessibility	Including the references and e-links is appreciated.	The GMRP thanks GMOB for their comment.	Throughout document
3. General – Plain Language Report	The Project was required to produce a Plain Language Report. If this is the intent of the Summary section of the current report, then it would be better as a stand-alone document.	The GMRP thanks GMOB for their comment; the Summary section was intended to be used as the plain language piece. The Project will consider developing it as a stand- alone document in future iterations, however we also believe that there is merit in having it remain as part of the report to reduce the chance for it to be disconnected from the main report (e.g., lost or not having the data that justifies the indicators nearby for interested readers).	Summary section included in the document.
4. General – Socio- Economic Considerations	The document should include a comment/ statement that information on socio-economic considerations can be found in the socio-economic Strategy and Action Plan of the GMRP. Alternately, could socio- economic impacts be considered an effect on the "human environment" and included within this document?	Key socio-economic activities and their status are reported annually via the Annual Report to the Giant Mine Oversight Board as well as the public. In addition, Rights and stakeholders, including GMOB, see this information more frequently through existing standing committees throughout each year and are involved in directly impacting these activities as they progress/evolve. The GMRP does not propose to add socioeconomics to this report. However, in the next report, the GMRP commits to directing readers to the GMRP Socio-Economic Strategy and Action Plan for information relating to socio-economics of the Project.	Chapter 2.0
5. Summary – Soil Arsenic Concentrations	The summary section mentions there are some areas on site that have higher soil arsenic levels than are outlined in the territorial industrial standard. This may understate the issue since in the main body of the report has it coded as 'red' indicating a significant issue.	Future versions of the plain language summary can make it clearer that areas of the Site are 'substantially over' the territorial standards.	Summary and Chapter 7.0
6. General – Soil Arsenic Concentration – Undeveloped Areas	The Project will not be remediating undisturbed areas of the site. However, these areas are identified as being of concern because they are well above the industrial standard. This provides mixed messaging and should be clearly explained why these areas are not being remediated.	The purpose of the Status of the Environment Report is to meet the requirements of the Environmental Agreement. The full context of the remediation, including rationale for leaving contaminated soil in some areas in-situ, is in the Closure and Reclamation Plan. Links to the Closure and Reclamation Plan are provided for interested readers.	N/A
7. General – Climate Change	Climate change is addressed less than other components of the report. Climate and weather affect the site - e.g. permafrost melt, later rainfall affecting ground freezing, etc. Lessons learned in Section 10.1 could be viewed through the lens of climate change.	As discussed previously with the SoE team, the GMRP believes it is premature to include an indicator on climate change in this iteration of the SoE report. The Project will commit to further discussions on this in the future, before the next SoE report is developed. The concept of effects of the climate on the Project (which lead to lessons learned) was discussed with GMOB prior to this report being developed. At that time GMOB felt this would add complexity to the report in terms of indicators so this was not included. As noted in the report, the GMRP intends to have more information on climate matters in the next Status of the Environment Report.	Chapter 3.0, 10.0, and 11.0
8. Section 11.0 – Climate Change – rate of change	This Section includes the statement "The status of the Environment is not expected to change significantly in the next three years." What is the basis for this statement in the context of climate change? There are examples on site of ongoing change associated with melting permafrost, changes in flow regimes, etc. that require adaptive management. This suggests that change is happening in real-time and should be accounted for.	The basis for this statement is that remediation activities are not expected to be advanced to the point that environmental improvements would change the indicator ratings. The indicators are about the effects of the Project on the environment and not about the effects of climate on the Project (see the response to Comment #7). Effects of the climate are being felt now and are outlined in the report (Section 3, Section 5 and Section 7).	Chapter 3.0

SUBJECT	GMOB COMMENTS ON STATUS OF THE ENVIRONMENT REPORT JUNE 2015 TO JUNE 2021	GIANT MINE REMEDIATION PROJECT TEAM RESPONSE	HOW ADDRESSED IN 2021-2024 REPORT, IF RELEVANT
9. General – Climate Change - Indicator	Consider using climate change response actions as the indicator for climate change - track the numbers of occasions where adaptive management was required in response to unexpected weather events or changes in permafrost conditions.	The GMRP is still considering whether it will adopt a climate change indicator. Please see response to Comment #7.	N/A
10. General – Climate Change – Vulnerabilities Assessment	The project should identify vulnerabilities associated with climate change (e.g. ice build-up, permafrost thaw). Evaluate required actions against these vulnerabilities and report on the outcomes.	The GMRP included information about changing climate in the report (Section 3) and some actions taken to address concerns (e.g., thermosyphons in Dam 1, Section 7.5). The Status of the Environment Report is backward looking, and vulnerabilities will change as the project advances (see Comment 9). The remediation plan is designed to address many of these concerns (e.g., realignment of Baker Creek for flooding, water treatment plant built on bedrock foundation). The GMRP will however explore if the climate section could include a summary of actions taken rather than the actions being described throughout the report.	Chapter 3.0 and 10.0
11. General – Climate Change – Vulnerabilities Assessment	The next report should include any actions or strategies the project has in place to mitigate against potential adverse climate-related impacts.	The Status of the Environment Report is backward looking. It describes actions taken when adverse impacts were detected over the past years (e.g., Section 7.5). The report is not intended to outline the Project's forward-looking strategies and mitigations. The CRP outlines the remediation plan which is designed to address many climate related concerns (e.g. Baker Creek will be realigned and widened to accommodate flooding should precipitation be higher or more intense in the future). Management and monitoring plans outline strategies and action levels to respond to change on site. Also see Comments 7 to 10.	Chapter 10.0
12. General – Figure 23 – Arsenic Concentrations	This figure highlights the issue where there are high arsenic concentrations on one side of the boundary, and almost certainly similar concentrations on the other side. The report is silent on where responsibility lies for managing the elevated arsenic concentrations outside the boundary; areas of responsibility could be clarified in a statement at the beginning of the report.	The GMRP will add a clarifying statement to future reports that the Project occurs within the legal boundary (as defined in the GMRP Preliminary Screening Document, submitted to Mackenzie Valley Land and Water Board as part of the EA process) and that the GNWT has other mechanisms to look at regional legacy arsenic concerns outside of this boundary.	Chapter 7.0
13. General – Pg 82 and 98 – Dam 1 maintenance	The work surrounding Dam 1 was difficult to follow; diagrams may have helped to explain what was being done and should be used wherever possible in future reports.	The GMRP thanks GMOB for their recommendation and will consider it in future reports.	Chapter 7.0
14. Table 1 –Minewater and Sediment Monitoring	Minewater monitoring should be included under the "Water" heading. Sediment monitoring should be included under the "Land" heading, however an argument could be made for including sediment monitoring under "Water".	The GMRP will consider adding a minewater quality bullet to the Water heading in Table 1 in future reports. Table 1 is meant to be a summary of the main components, and not meant to include every item. Minewater quality is already included under Water in the broader Table 4. Sediment quality is discussed in conjunction with soil quality in Chapter 7, the 'Land chapter'. Table 1 will include soil and sediment quality under Land heading in future reports.	Summary
15. Pg 7 – Lands Section – Additional Subheadings	For clarity, additional sub-headings should be included with the Lands section: soil, dams, pits and foreshore tailings as each of these sub- components has its own facts.	The GMRP thanks GMOB for their recommendation. While this is a final report and will not be updated, additional subheadings will be considered for future reports.	Chapter 7.0
16. Pg 7 – Environmental Monitoring - Fish	The effects to fish are difficult to follow – consider using a bullet list to convey this information.	The GMRP thanks GMOB for their recommendation. While this is a final report and will not be updated, a bulleted list will be considered for future reports.	Chapter 6.0
17. Pg 18 – Figure 4	This is a good visual. It could be referenced in later chapters, or be redesigned/altered to provide a similar visual for the different components.	The GMRP thanks GMOB for their recommendation. While this is a final report and will not be updated, similar visuals to figure 4 will be considered for different components in future reports.	Chapter 3.0, 6.0, and 7.0
18. Pg 23 – Missing Engagement Activities	Include NSMA meetings and GMWG in the engagement activities.	The GMRP thanks GMOB for their recommendation. While this is a final report and will not be updated, NSMA meetings and GMWG will be included in the engagement activities section of future reports.	Chapter 2.0
19. Pg 7 – Identify Commenters	Some of the entries identify which group provided the comments. This is important information and should be done for all of the engagement activities.	The GMRP thanks GMOB for their recommendation. While this is a final report and will not be updated, future reports will identify which group provided the comments for all of the engagement activities.	Chapter 2.0, where possible

SUBJECT	GMOB COMMENTS ON STATUS OF THE ENVIRONMENT REPORT JUNE 2015 TO JUNE 2021	GIANT MINE REMEDIATION PROJECT TEAM RESPONSE	HOW ADDRESSED IN 2021-2024 REPORT, IF RELEVANT
20. Table 7 – Application of TK	How the TK is applied is an important detail that should be added to the Table. Right now the Table only outlines the provision of the TK to the GMRP.	The GMRP thanks GMOB for their recommendation. While this is a final report and will not be updated, future reports will identify if/how TK has been incorporated in this section.	Chapter 2.0
21. Figure 14 – Plain Language Explanation	The wind diagram is interesting, but a plain language explanation should be provided to help the reader interpret it.	A plain language explanation of the wind diagram will be included in future reports if the wind diagram is presented again.	Chapter 4.0
22. Pg 32 - Clarity	The discussion regarding hydrologic changes is a bit difficult to follow. It should be edited to make it more clear – it is not clear whether water levels, streamflow or general climate change is being discussed.	The hydrology section format will be reviewed for clarity in future reports.	Chapter 3.0
23. Section 5 – Water Quality Data - Underground	There is some information provided regarding water quality in Baker Creek and Yellowknife Bay, but not for the underground. This information should be included as well.	Mine water level is outlined in Section 5. In future reports, additional brief text will be added regarding general measured water quality of minewater influent. Please see response to item 24 below on why additional analysis or an indicator for minewater is not proposed to be included in this report.	Chapter 5.0
24. Section 5- Water Monitoring Underground	Water monitoring does not include discussion regarding sampling in the immediate vicinity of the arsenic chambers. GMOB has previously recommended this type of sampling be conducted as a means of tracking arsenic flux. GMOB acknowledges that once the freeze is in place, there should be no water seeping from the arsenic chambers. However, tracking water quality in the vicinity of the chambers would be a useful method for communicating the improvements to the site resulting from the freeze.	The GMRP monitored water quality at various locations underground during the period covered by the report including near arsenic chambers. This is operational sampling, and it does not relate directly to the receiving environment. An indicator for water quality in select areas of the underground would not be appropriate as the current water quality is influenced by numerous complex factors (e.g., water level on surface that infiltrates to the underground under different precipitation scenarios). What is critical for current conditions is underground stability of the chambers and bulkheads. Indicators for this are found in Section 7.3. The Status of the Environment Report is not meant to report on the performance of the freeze. The GMRP has closure criteria for this as well as future reporting mechanisms on performance (e.g., Water Licence Annual Report and Performance Assessment Report).	Chapter 5.0
25. Photo 5 – Clarity	Not a great photo – it is hard to determine what is being shown.	The GMRP thanks GMOB for their comment. Photos will be reviewed for clarity and context for future reports.	N/A
26. Pg 47 – Figure Clarity	Make this figure larger so it is easier to read; there is important information here that is easily overlooked.	The GMRP thanks GMOB for their recommendation. While this is a final report and will not be updated, a larger figure will be considered for future reports.	Chapter 5.0
27. Pg 53 – Catch and Release Fishing	Confirm that the fishing happening at the mouth of Baker Creek is actually 'catch and release'.	Future reports will clarify the mouth of Baker Creek is catch and release for Arctic Grayling in summer, as per GNWT and DFO guidance.	Chapter 6.0
28. Section 7.3 – Arsenic Chambers	This section should include more information on the status of the arsenic chambers: structural integrity, conditions of water flow, and condition of the contaminant etc.	More information about the stability of the chambers can be added to the next report. Underground stabilization is on-going and updates on this will be included in the next report. This will not include condition of the contaminant or water flow near the chambers. Underground water movement and pumping is outlined in the Water MMP and reported in the Annual Water Licence Report.	Chapter 7.0
29. Pg 85 – Wildlife monitoring from 2015 to 2021	This paragraph should clarify that there is no formal wildlife monitoring program in place as a result no monitoring indicators are possible.	The GMRP thanks GMOB for their recommendation. Section 8.3 of the report outlines why an environmental indicator for wildlife was not identified.	Chapter 8.0, Appendix B

30. Section 9.0 – Cumulative Effects – Oil and Gas	The reference to Oil and Gas projects should be removed as oil and gas projects are no relevant to the Yellowknife region.	The reference to Oil and Gas projects in the report was part of a background section which outlined the assessment of cumulative effects, and what was considered within that assessment, in the 2010 Developer's Assessment Report. As such, it was included in the items noted in section 9.0. Removal will be considered in future reports.	Chapter 9.0
31. Table 21 – Wildlife Monitoring	Arsenic Contamination of Wildlife – reference is made to a Wildlife and Wildlife Habitat Management and Monitoring Plan – but this is not referenced or described in Section 8.0.	Future reports will reference the Wildlife and Wildlife Habitat Management and Monitoring Plan, where applicable and appropriate.	Chapter 8.0
32. Pg 93 – Health Effects Monitoring Programs	There is no mention of the offsite contamination initiative hosted by GNWT and the feds with the City of Yellowknife. This should also be tracked as it has a direct relationship to the cumulative effects of Giant Mine.	The Status of the Environment Report can clarify the project boundaries and the GNWT initiatives on regional areas. Should there be regional remediation activities, the Status of the Environment Report would list these as part of a review of cumulative effects. The GMRP does not intend to track off-site contamination.	Chapter 9.0
33. Pg 9 – Typo	Thorough should be throughout	While this is a final report and will not be updated, the GMRP appreciates GMOB's attention to detail in their review.	Editorial comments from past report were corrected for the 2021-2024 Report, where relevant
34. Pg 16 – Missing footnote	Footnote 1 is missing		
35. Pg 30 – Editorial	Strikethrough on "As most people know"		
36. Pg 46 - Editorial	Strikethrough on "low in suspended solids"		
37. Pg 46 – Editorial	Last sentence before Baker Creek: a comma would be more clear than the brackets.		
38. Pg 51 - Editorial	Table 12, second row: Missing a word or two? Not completely clear.		
39. Pg. 59 - Editorial	Use a more plain language word for 'pelagic'.		
40. Pg 60 – Editorial	Strikethrough on "in Dettah and Ndilǫ"		
41. Pg 63 – Editorial	First column, last paragraph: The listing of consideration is a bit awkward. A bullet list would be more clear.		
42. Pg 83 - Typo	Soil quality – remove the 'in' before 'within'		
43. Pg 92 - Typo	Just MVEIRB, not MVEIARB		
44. Pg 93 - Typo	First bullet in second column – the paragraph has a break, when it should read straight through.		

N/A = not applicable.

Appendix B

Rationale for choice of indicators and Evidence for rating the status of the environment

A large volume of information about the environment on the Giant Mine site (the site) has been collected since 2015. Much of it was summarized in the Closure and Reclamation Plan (Chapter 2) [96] and in annual reports to the Mackenzie Valley Land and Water Board or the Giant Mine Oversight Board. To simplify the large amount of information and summarize the status of the environment on the site, indicators for each of the environmental components (air, water, fish, land [including infrastructure]), were developed (see Table 1 in main document and Table B-1 below). The indicators are provided as a "snapshot" of the status of the environment for the period of this report (mid-June 2021 to mid-June 2024). This appendix outlines the methods used to identify and define the indicators and their ratings.

The indicators are meant to be "backward looking" to the period of the report. Some may improve in subsequent reports, as remediation progresses. For example, soil quality is expected to improve with remediation; other indicators like air quality may worsen slightly during remediation and then improve. The ratings are not meant to be indicative of the success of the project, only a "snapshot" in time. The Closure and Reclamation Plan closure criteria and the Performance Assessment Reports will be used to track success of remediation over time.

How were indicators chosen?

The indicators were chosen to represent the main aspect of concern about an environmental component, using the following considerations, where possible:

- directly measured in monitoring programs and tracked over time
- potential environmental concern related to water use, land use, or environmental effects
- care and maintenance activities on site or future remediation could cause effects on indicator
- valued component in the environmental assessment has data that can be compared to guideline or reference area to allow data interpretation
- linked to a closure criterion in the Closure and Reclamation Plan and expected to be monitored through active remediation and adaptive management phase

What evidence was used to review the status of each indicator?

As noted above, a large volume of data exists from the Giant Mine Remediation Project (GMRP) monitoring programs. Not all the data from each component are useful in determining the status of the component. Some of the data are collected for other purposes, such as operational decisions, design, or informing predictive models, or are collected from numerous locations on and off site. There needed to be a process to narrow down the information to that which was most representative of the status of the environment for a snapshot. The GMRP filtered the types of data down to what was thought to be the most relevant for characterizing the component and the primary environmental attributes of the component. This process is recognized to be subjective but is aligned with general feedback from engagement with the Giant Mine Oversight Board on draft indicators, general feedback from the Water Licence process, and the environmental assessment process. The indicators may be assessed based on narrative or numeric evidence, as applicable.

How were indicators rated?

Each component was rated based on the evidence from monitoring/inspections over the reporting period (see Table B-1). Ratings were set as green, yellow, or red, or as a combination of green/yellow or yellow/red (also see Table 1-3 in the main document). Green means the condition on site is stable or "ok" for the reporting period (before or during remediation); it does not mean the component is clear of contamination. Yellow means the component needs attention and the status is of concern. Red means the

status of the component is poor and a more serious hazard or risk exists. A combination colour indicates the component is monitored in various locations and they are showing different results: green/yellow indicates good/medium status with some areas stable and some that require attention; yellow/red means some of the locations are of concern and some are in worse condition and pose a hazard or risk. Ratings were assigned (Table B-1) qualitatively based on evidence (narrative and numeric) from the years of the reporting period for each indicator.

The GMRP has action levels, which are different from the indicators used in this report. The action levels in the management and monitoring plans outline specific monitoring results that trigger management responses. Rating of the indicators is "backward looking" based on the conditions in the past years and meant to show a general status of the components on the site. The indicators are therefore not the same as the action levels.

While quantitative data were gathered for each component, the many types of data/inspection results for each component were pooled into qualitative ratings as outlined in Table B-1. Many ratings included multiple comparisons that were both numeric and narrative. The sources for the data are described in Chapters 4 through 7 with hyperlinks to original data reports.

Once ratings were assigned to each indicator per component, this information was tabulated in each of Chapters 4 through 7. Appendix C lists the ratings from each individual chapter. Table 2 of the Summary of this report was then created by selecting one rating per component based on the dominant rating. For example, land ratings varied from green/yellow to red, but because red was the most frequent/dominant, the overall rating for land was assigned as red.

Table B-1: Indicators and Evidence for Each Rating Applicable from 2021 to 2024

Air

INDICATOR	INFORMATION USED TO RATE STATUS OF ENVIRONMENT	TYPE OF DATA	GREEN RATING	YELLOW RATING	RED RATING
Dust on site	Was there visual dust observed on site and/or due to activities on site? Was the total suspended particulate measured at or below the ambient air quality criteria for site at the site perimeter air quality monitoring stations?	Visual observations, laboratory analysis of filters from air quality monitors compared to ambient air quality criteria in the Air Quality Monitoring Plan	Rare to see visible dust, dust limited to site area only; none to rare exceedance of ambient air quality criteria due to site activities	Occasional visible dust, limited to the site, exceedance of ambient air quality criteria rare to occasional due to site activities	Common to see visible dust; exceeds ambient air quality criteria often (seasonally, monthly) due to site activities, dust still limited to the site and not toward communities
Dust at community stations	Was visual dust observed at the community air quality monitoring stations due to site activities? Were the measurements at the community air quality monitoring stations at or below the ambient air quality criteria?		No visible dust from the site; no exceedances of ambient air quality criteria due to site activities	Rare visible dust from the site; few exceedances of ambient air quality criteria due to site activities	Frequent dust from the site and common exceedance of ambient air quality criteria due to site activities

Water

INDICATOR	INFORMATION USED TO RATE STATUS OF ENVIRONMENT	TYPE OF DATA	GREEN RATING	YELLOW RATING	RED RATING
Water quality on site and in Baker Creek[a]	Water in Baker Creek on site: Was arsenic on site greater than upstream? Was total arsenic less than the national regulation for metal mines (MDMER[8])?Treated effluent: Did it meet the licensed discharge criteria[a]?	Water quality sample from SNP 43-5 compared to upstream reference area on site at SNP 43-11 and compared to 0.3 mg/L Water quality samples from SNP 43-1 compared to discharge criteria from Water Licence(s)[a]	Total arsenic from SNP 43-5 less than or equal to SNP 43-11 and always <0.3 mg/L. Met discharge criteria from Water Licence(s); stable treated effluent quality over time	Total arsenic from SNP 43-5 often greater than SNP 43-11 and often <0.3 mg/L Occasionally did not meet discharge criteria from Water Licence(s); stable quality over time	Total arsenic from SNP 43-5 >0.3 mg/L total arsenic Often did not meet discharge criteria; fluctuations in effluent quality
Water quality in Yellowknife Bay	Was arsenic in the water in Yellowknife Bay, near the site, below the drinking water quality standard and below the site-specific water quality objective?[b]	Water quality samples from Yellowknife Bay near the mouth of Baker Creek compared to the total arsenic drinking water quality standard of 0.01 mg/L and site-specific water quality objective of 0.031 mg/L	<0.01 mg/L in most samples and ≤0.031 mg/L all the time	Occasionally <0.010 mg/L in samples and ≤0.031 mg/L	Rarely <0.01 mg/L in samples and occasionally >0.031 mg/L

Fish

INDICATOR	INFORMATION USED TO RATE STATUS OF ENVIRONMENT	TYPE OF DATA	GREEN RATING	YELLOW RATING	RED RATING
Fish food in Baker Creek	Were benthic invertebrates (fish food) present? Were they in similar amounts to a reference area? Did they have the same species as a reference area?	Benthic invertebrate data from mouth of Baker Creek and reference area of Yellowknife River from the Environmental Effects Monitoring Program: abundance, species composition	Abundance and composition data from Baker Creek similar to reference area, most of the time less than 2 standard deviations of difference	Abundance and composition data from Baker Creek dissimilar to reference area but not often more than 2 standard deviations of difference	Abundance and composition data from Baker Creek very dissimilar to reference area, estimated as more than 2 standard deviations of difference
Fish in Baker Creek	Were fish species present? Did they have high concentrations of metals in their bodies? Was the fish size the same as in a reference area?	Fish capture data from Baker Creek and reference area of Yellowknife River and Horseshoe island Bay from the Environmental Effects Monitoring Program: presence/absences, concentration of metals in fish tissue, fish size	Data from Baker Creek similar to reference area with similar species present, metals found in fish tissue in similar concentrations to reference, most of the time <10% difference in fish condition and <25% difference in organ size relative to body size	Data from Baker Creek compared to reference area with similar species present, metals found in fish tissue in Baker Creek above concentrations to reference, but >10% difference in fish condition and >25% difference in organ size relative to body size	Data from Baker Creek not similar to reference area with not all the same species present, metals found in fish tissue at much higher concentrations than reference, often >10% difference in fish condition and >25% difference in organ size relative to body size

Land (including Infrastructure)

INDICATOR	INFORMATION USED TO RATE STATUS OF ENVIRONMENT	TYPE OF DATA	GREEN RATING	YELLOW RATING	RED RATING
Soil quality in developed areas	Did soils have total arsenic above the approved closure plan standard of 340 mg/kg for the site?[(c)]	Soil chemistry sample from developed area from any investigation compared to 340 mg/kg total arsenic	Most samples <340 mg/kg total arsenic	Most samples >340 mg/kg total arsenic	Most to all samples substantially >340 mg/kg total arsenic
Soil quality in forest, bedrock, wetland areas	Did soils have total arsenic above the approved closure plan standard of 340 mg/kg for the site?[(c)]	Soil chemistry sample from bedrock/forest wetland area from any investigation compared to 340 mg/kg			
Soil quality in Townsite	Did soils have total arsenic above the approved closure plan standard of 160 mg/kg for the Townsite?[(c)]	Soil chemistry sample from Townsite from any investigation compared to 160 mg/kg	Most samples from Townsite <160 mg/kg total arsenic	Most samples from Townsite>160 mg/kg total arsenic	Most to all samples from Townsite core area substantially >160 mg/kg total arsenic
Substrate quality in Baker Creek	What was quality of Baker Creek substrates at bottom of creek? Were they above the aquatic life guideline for total arsenic?	Sediment chemistry sample from Baker Creek on site is greater than aquatic life guideline of 17 mg/ kg dry weight total arsenic	Most samples in creek on site ≤17 mg/ kg total arsenic (dry weight)	Most samples in creek on site>17 mg/ kg total arsenic (dry weight)	Most samples in creek on site substantially >17 mg/ kg total arsenic (dry weight) and occur on more than one sampling program
Dam stability and maintenance	Did the annual dam inspection show compliance with Canada Dam Association requirements? Were dams stable? Were maintenance/repairs completed when required?	Annual dam inspection reports, records of repairs by qualified professional	Compliance with Canadian Dam Association requirements, dam stable, maintenance done as and when required	Compliance with most of Canadian Dam Association requirements, dam stable, maintenance not completed in timely manner	Out of compliance with Canadian Dam Association requirement on more than one occasion, maintenance not completed in timely manner
Pit safety	Was maintenance/ monitoring required? Were access controls in place?	Documentation of pit inspections by qualified professional and maintenance activities; review of access controls/ signage	Inspections completed consistently and documented, and access secure	Inspections completed, but not consistently and/or documented; rock fall in pit walls not addressed or access control/ signage not visible: not maintained	Inspections not completed; hazards not mitigated or not known by workers in area; access control/ signage not visible: not maintained

Foreshore Tailings Area in Yellowknife Bay	Was the existing foreshore cover stable? Were there local signs of erosion outside of the cover?	Annual geotechnical inspection by qualified professional with results on stability, erosion, and maintenance	Results listed as stable without erosion visible outside of the cover	Results listed as stable with erosion visible outside of the cover	Results listed as unstable with erosion present

Note: green/yellow and yellow/red ratings were based on evidence from various locations across site.

a) From 2015 to September 2020, the GMRP operated the effluent treatment plant to meet the discharge limits (effluent quality criteria) of expired Water Licence #N1L2-0043. From September 2020 onward, the GMRP operated under a new Water Licence with updated effluent quality criteria (#MV2007L8-0031).

b) Site-specific water quality objectives for Yellowknife Bay near site were approved in the Effluent Quality Criteria Report.

c) The Government of Northwest Territories remediation objective at the time of the development of the Giant Mine environmental assessment and final closure plan was 340 mg/kg arsenic for industrial use and 160 mg/kg for residential use. These are site-specific human health-based soil quality remediation objectives for the Yellowknife area. These are now the approved closure plan standards for the remediation.

GMRP = Giant Mine Remediation Project; SNP = Surveillance Network Program; MDMER= Metal and Diamond Mining Effluent Regulations; % = percent; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; µg/L = micrograms per litre; < = less than; ≤ = less than or equal to; > = greater than.

Appendix C

Overview of ratings of status of environment by component

The rating for each indicator for each environmental component is listed in Table C-1. Individual tables are provided in Chapters 3 through 7 but are summarized here for ease of reference.

Table C-1: Summary of Status of Environment for each component for 2021 to 2024

COMPONENT	INDICATOR	EVIDENCE	STATUS FOR 2015–2021	STATUS FOR 2021–2024[a]
Climate change	No indicator for this report, but under review to determine if one can be developed in future years. Water flows, precipitation, air temperature and greenhouse gas data are provided in Chapter 3.			
Air	Dust on site [b]		Green	Green
	Dust at community stations		Green	Green
Water	Water quality on site and in Baker Creek[c]		Yellow	Yellow
	Water quality in Yellowknife Bay		Green	Green
Fish	Fish food in Baker Creek		Yellow	Yellow
	Fish in Baker Creek		Yellow	Yellow
Land	Soil quality in developed areas		Red	Red
	Soil quality in bedrock, forest, wetland areas		Red	Red
	Soil quality in Townsite		Red	Red
	Substrate quality in Baker Creek		Red	Red
	Dam stability and maintenance		Green/Yellow	Green/Yellow
	Pit safety		Yellow/Red	Yellow/Red
	Foreshore Tailings Area in Yellowknife Bay		Yellow/Red	Yellow/Red

COMPONENT	INDICATOR	EVIDENCE	STATUS FOR 2015–2021	STATUS FOR 2021–2024[A]
	Wildlife	No indicator for wildlife was identified due to two factors 1) wildlife on site is influenced by the nearby developments (e.g., highway, City of Yellowknife and its Solid Waste Facility) and 2) data (e.g., observations of wildlife by workers on site) were intermittent and not collected in the same locations over time. It was not possible to develop a meaningful indicator of the status of wildlife on site independent of other influences and with the type of data available. However, a summary of the wildlife data is provided (Chapter 8).		

a) Status of Environment was rated as per method in Appendix B and evidence provided in each chapter.

b) Refer to the Air Quality Monitoring appendix of the Dust Management and Monitoring Plan.

c) From 2015 to September 2020, the GMRP operated the effluent treatment plant to meet the discharge limits (effluent quality criteria) of expired water licence #N1L2-0043. From September 2020 onward, the GMRP operated under a new water licence with updated effluent quality criteria (#MV2007L8-0031).

Endnote

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17 CIRNAC and GNWT (Crown-Indigenous Relations and Northern Affairs Canada and Government of Northwest Territories). Giant Mine Remediation Project 2023 Annual Water Licence Report. Version 1.1. November 2024.

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