

# 2022 ANNUAL REPORT







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# The Giant Mine Oversight Board at a Glance

## Purpose

The 2015 Giant Mine Remediation Project Environmental Agreement established the Giant Mine Oversight Board (GMOB). GMOB has two primary purposes:

1. Independently monitor, promote, advise, and support the responsible management of the remediation of the Giant Mine site; and
2. Manage a research program to seek a permanent solution to the arsenic trioxide dust stored underground at the Giant Mine.

## Mandate

To achieve its purposes, GMOB's mandate is to:

- Monitor and report on the Giant Mine Remediation Project;
- Review, comment, and make recommendations on programs, research, and reports about the Project;
- Support research into a permanent solution for the arsenic trioxide dust stored underground at the Giant Mine site; and,
- Communicate to the public and Parties to the Environmental Agreement about GMOB's activities.

## Vision

GMOB envisions that the remediation of the Giant Mine site, including the sub-surface, will be carried out in an environmentally sound, socially responsible, and culturally appropriate manner.

## Governance

GMOB is governed by a six-member Board of Directors. The six Parties to the Giant Mine Remediation Project Environmental Agreement each appoint one member to the Board. Each Director acts independently from the Party making the appointment. The Parties are:

3. Government of Canada, Crown-Indigenous Relations and Northern Affairs Canada
4. Government of the Northwest Territories, Environment and Natural Resources
5. Yellowknives Dene First Nation
6. North Slave Métis Alliance
7. Alternatives North
8. City of Yellowknife

The Government of Canada and the Government of the Northwest Territories are co-proponents of the Giant Mine Remediation Project. They work together as the Giant Mine Remediation Project Team. The co-proponents are referred to as the 'Project Team' throughout this report.

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## Message from the Giant Mine Oversight Board

The Giant Mine Oversight Board (GMOB) was created pursuant to the 2015 Giant Mine Environmental Agreement. It is an independent Board composed of individuals appointed by the six signatory parties (the governments of Canada and the Northwest Territories (the co-proponents of the Giant Mine Remediation Project), Yellowknives Dene First Nation, North Slave Metis Alliance, Alternatives North and the City of Yellowknife). It is supported by an Executive Director and consultants with expertise in areas not represented by Board members. Once appointed, the members are independent of their appointing organizations. GMOB monitors and supports the responsible remediation of the Giant Mine site. It is also tasked with seeking a permanent solution to the arsenic trioxide dust temporarily stored underground at the mine.

This report (the seventh issued by GMOB since its establishment) sets out GMOB's expectations for each of seven key aspects of the remediation project, its observations as to the actions taken in 2022 and its conclusions and recommendations for future work. It also summarizes GMOB's activities in 2022 including its engagement activities and its research program, and provides a status report on past recommendations.

GMOB has not identified any major environmental concerns arising from remediation activities in 2022 and overall is satisfied with the site remediation activities undertaken throughout the year. Engagement by the Giant Mine Remediation Project Team with the Parties to the Agreement on engineering and environmental issues through the various working groups remained strong and effective. However, GMOB is frustrated with the continued delay in developing the Perpetual Care Plan.

Progress on the reporting and analysis of economic aspects of the project by the co-proponents is disappointing and led to GMOB stepping in and taking the initiative in this area. Among other things, GMOB built a preliminary economic model of the Project based on an in-depth review of Project work activities and a high-level accounting of planned expenditures. GMOB continues to strongly support better reporting on economic aspects of the remediation project, better analyses to determine where improvements can be made, improved strategic planning, and better application of lessons learned from other remediation projects. GMOB continues to urge the co-proponents to implement improved access to remediation work for local small businesses, and to create more employment and training opportunities for residents.

This report summarizes the work GMOB, and its research partners undertook in 2022 in working toward finding a permanent management solution for the arsenic trioxide dust currently stored underground at the site. Future generations should not be saddled with this liability. Studies include characterizing the arsenic trioxide dust, converting it into a more stable and less toxic compound, vitrification, mixing it with cement, and biogenic stabilization.

This report also updates the status of GMOB's past recommendations and identifies those that were accepted, rejected, or rejected and no longer relevant. Many recommendations have been repeated over the years, including those related to the Perpetual Care Plan and reconciliation.

*2022 recommendations set out in this report include those related to:*

- Reporting on greenhouse gas emissions and efforts to reduce emissions;
- Retaining the Aquatic Affects Committee;
- Improved economic reporting and working group effectiveness;
- Greater public engagement with respect to planned changes to the public boat launch area at the site;
- Reconciliation with affected Indigenous peoples;
- Contingency planning;
- Follow-up steps to address the cancellation of the *Hoèla Weteèts'eèdeè Understanding Community Well-being around Giant Mine Study*; and,
- Completion of the Perpetual Care Plan and initiation of land use planning for the site.

2022 was a very busy year for the Project Team, the Main Contract Manager, the Parties to the Agreement, contractors working at the site, and for GMOB. The Board, its Executive Director and GMOB's partners recognize and appreciate the efforts that all parties have made in working toward a successful remediation of the site. We all understand that much has been accomplished but much more needs to be done. We strongly encourage all involved to remain fully engaged in implementing their respective responsibilities in a cooperative and effective manner. Only by doing so can we achieve remediation and closure of the site in a manner that is environmentally sound, socially responsible, and culturally appropriate.

David Livingstone  
Chair, GMOB

## Project Oversight in 2022

For the Giant Mine Oversight Board (GMOB), project oversight involves monitoring, reviewing, and commenting on documents and presentations relevant to the Giant Mine Remediation Project. It also includes attending meetings, seeking expert advice, making recommendations, and promoting public awareness and engagement. GMOB's project oversight activities fall into seven interrelated areas of responsibility:

- 1. ENVIRONMENT**
- 2. ECONOMY**
- 3. ENGAGEMENT**
- 4. RECONCILIATION**
- 5. PROJECT MANAGEMENT AND PLANNING**
- 6. COMMUNITY HEALTH AND WELLNESS**
- 7. LONG TERM PLANNING**

**Each project oversight responsibility is briefly discussed in terms of:**

- **WHY IS THIS IMPORTANT?**
- **WHAT DID GMOB EXPECT?**
- **WHAT ACTIONS WERE TAKEN?**
- **WHAT WERE THE OUTCOMES OF THE ACTIONS?**
- **WHAT ARE THE NEXT STEPS?**
- **RECOMMENDATIONS**



## Acronyms

<b>AAC</b>	Aquatics Advisory Committee
<b>AEMP</b>	Aquatic Effects Monitoring Program
<b>CIRNAC</b>	Department of Crown-Indigenous Relations and Northern Affairs Canada
<b>DFO</b>	Department of Fisheries and Oceans
<b>GHG</b>	Greenhouse Gas
<b>GMOB</b>	Giant Mine Oversight Board
<b>GMRP</b>	Giant Mine Remediation Project
<b>GMWG</b>	Giant Mine Working Group
<b>GNWT</b>	Government of the Northwest Territories
<b>IOC</b>	Indigenous Opportunities Considerations
<b>MCM</b>	Main Contract Manager, Parsons Corporation
<b>MVEIRB</b>	Mackenzie Valley Environmental Impact Review Board
<b>MVLWB</b>	Mackenzie Valley Land and Water Board
<b>NSMA</b>	North Slave Métis Alliance
<b>NWT</b>	Northwest Territories
<b>OCAP</b>	Ownership, Control, Access and Possession
<b>PCP</b>	Perpetual Care Plan
<b>PSIB</b>	Procurement Strategy for Indigenous Business
<b>TERRE-NET</b>	Toward Environmentally Responsible Resource Extraction Network
<b>TRC</b>	Truth and Reconciliation Commission of Canada
<b>UNDRIP</b>	United Nations Declaration on the Rights of Indigenous Peoples
<b>WLU</b>	Wilfrid Laurier University
<b>YKHEMP</b>	Yellowknife Health Effects Monitoring Program
<b>YKDFN</b>	Yellowknives Dene First Nation
<b>AEMP</b>	Aquatic Effects Monitoring Program
<b>RFP</b>	Request for Proposals
<b>PIP</b>	Project Implementation Plan

## ENVIRONMENT

### WHY IS THIS IMPORTANT?

Reducing and eliminating environmental risks associated with the Giant Mine is a fundamental priority for Yellowknife, Ndilo, and Dettah residents. A healthy environment contributes to the overall health and wellbeing of the community. This priority aligns with the Giant Mine Remediation Project's (GMRP or the Project) primary goal to protect human health and safety and the environment.

Section 2.2 of the Giant Mine Remediation Environmental Agreement states that the Parties intend that the Agreement will achieve or support the following objectives:

- h. the remediation of the Giant Mine site in a manner that protects
  - i. the land, air, water, aquatic life, and other wildlife in the area of or potentially affected by the Project;
- b. the remediation of the Giant Mine site in a manner that eliminates or substantially mitigates the environmental risks posed by the site;
- c. comprehensive, integrated ecosystem-based approaches for the monitoring, management and regulation of the Project; and,
- d. the minimization of the Perpetual Care requirements at the Giant Mine site."

Section 3.1 (b) (v) of the Agreement enables GMOB to compile and analyze available and relevant environmental quality data to review, report, or make recommendations about, "environmental or engineering studies conducted by the Co-proponents in relation to the Project."

### WHAT DID GMOB EXPECT?

GMOB expects the Project Team to develop and implement effective management and monitoring, design and construction plans in all phases of the Remediation Project. These plans should minimize the negative environmental effects of the mine site and remediation activities.

GMOB expects the Project Team to modify plans based on monitoring results, changing management practices, and new information from external researchers, community members, and others.

GMOB expects the Project Team's designs to consider GMOB's research toward a permanent solution for the arsenic trioxide roaster waste (dust) stored in the mine's underground chambers. The Project Team's communication about the site should include the temporary nature of freezing the arsenic trioxide dust stored underground and the search for a permanent solution. Remediation designs and work must not compromise the development and implementation of a permanent solution.

GMOB expects the Project Team and GMOB to work closely together so the Project Team is aware of research developments and their implications for site remediation, and GMOB is aware of Project Team plans that may affect the research program and potential

permanent solutions, including access to the chambers and extraction of the arsenic trioxide dust.

### **WHAT ACTIONS WERE TAKEN?**

The Type A Water License issued by the Mackenzie Valley Land and Water Board (MVLWB) in 2020 requires the Project Team to develop and submit a variety of management and monitoring, design and construction plans and reports. During 2022, the Project Team provided the required reports and implemented measures to minimize environmental impacts during active remediation.

GMOB's review of monitoring and inspection reports in 2022 raised no significant environmental issues. The Project Team continued to prioritize environmental management and safety throughout the year.

The Project is now entering a more active phase, and the Project Team submitted management, monitoring, design, construction plans and reports to the MVLWB.

These plans and reports are required to maintain compliance with the Type A Water License. Interested parties, including GMOB, reviewed and provided comments on these plans and reports which were then approved with or without revision by the MVLWB. Proposed changes to the current management and monitoring plans were discussed by the Parties, GMOB and the Project Team before those plans entered the MVLWB process.

The Project Team continued care and maintenance activities, including the management of:

- waste storage areas;
- wastewater discharge;
- dust control on roads;
- dust control on tailings containment areas;
- monitoring and reporting on air and water quality; and,
- responses to inspections.

In addition, the Project Team continued the paste backfill program, construction of Phase 1 of the non-hazardous waste landfill, work on the AR1 Drill Pad, and started demolition of several buildings on site, including those near the planned new water treatment plant.

The Aquatic Advisory Committee (AAC) was established in 2020 to provide guidance on mitigations and monitoring decisions for Baker Creek and Back Bay. It met four times in 2022. The Project Team suggested this committee be discontinued because of the pending submission of the Fisheries Act Authorization application to the Department of Fisheries and Oceans (DFO). However, GMOB notes that this Committee is functioning well and may prove useful as an ongoing source of advice and engagement with aquatic experts and knowledge holders as the project moves from planning to operation and monitoring.

### **Reports and Plans reviewed by GMOB in 2022**

- Borrow and Explosives Management and Monitoring Plan v2.0
- Site Infrastructure Design Plan – Part 1 v1.0
- Underground Design Plan v1.3
- Water Management and Monitoring Plan v3.0
- Tailings Management and Monitoring Plan – v2.0
- 2020 AEMP Annual Report
- 2021 GMRP Annual Water Licence Report to the MVLWB
- Engagement Plan v3.0
- Waste Management and Monitoring Plan v3.0
- Tailings Design Plan v1.0
- Water Treatment Plant Design Plan
- Borrow Materials and Explosives Management and Monitoring Plan v2.0

Several parties expressed serious concerns about DFO engagement on its Fisheries Act Authorization consultation and technical review. To respond to these concerns, GMOB held a facilitated discussion with DFO and key Parties. Participants proposed specific outcomes. Subsequently GMOB requested that DFO take specific actions to increase transparency. DFO expressed reservations about these recommendations, prompting more discussions between the Project Team, DFO, GMOB, and affected Parties. The Project Team subsequently began a specific engagement process on the Fisheries Act Authorization, providing an opportunity for affected Parties to participate, understand the review process, and provide advice outside the limited scope permitted by DFO.

### **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

The Giant Mine Working Group (GMWG) provides feedback to the Project Team on remediation plans. Working Group members are:

- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC);
- Public Works and Government Services Canada;
- Government of the Northwest Territories (GNWT);
- Environment and Climate Change Canada (ECCC);
- Department of Fisheries and Oceans (DFO);
- Alternatives North (AN);
- Yellowknives Dene First Nation (YKDFN);
- North Slave Métis Alliance (NSMA);
- Health Canada; and,
- City of Yellowknife.

The Working Group met eight times in 2022. These meetings are a useful opportunity for the Project Team to update the Parties on project activities and for the Parties to review upcoming submissions to the MVLWB.

In response to a previous GMOB recommendation (2019-9), the Project Team began tracking and reporting on greenhouse gas (GHG) emissions from site activities. 2022 provides the first full year of GHG tracking data. The Project Team assessed options to reduce GHG emissions from the water treatment plant. This assessment resulted in selection of a pellet boiler heating system. It would be useful if the Project Team would develop a metric to assess Project-wide GHG performance, noting that the level of activity will vary year over year.

GMOB found no significant environmental issues associated with the mine site or remediation activities in 2022, nor did members of the public bring any to GMOB's attention. The Project Team met water license and land use permit requirements and schedules. Minor concerns related to monitoring and inspections were remedied in an appropriate and timely manner.

There were some issues in early spring 2022 with water overflowing from Baker Creek and entering underground via the C-1 Pit. This caused underground water levels to exceed the Low Action Level. The Project Team responded in consultation with the Inspector and DFO, and improved flow within Baker Creek. Water treatment began in early June, about one month earlier than typical, to address the elevated mine water level. The Project Team's response to this event is documented in notifications to the Inspector posted to the MVLWB Public Registry.

Ongoing investigation into the elevated dissolved iron concentration previously identified at the mouth of Baker Creek suggests that the Project activities are not the source of the dissolved iron. The Project Team will continue to monitor water quality trends in Baker Creek.

Monitoring reports found that air quality is consistently good at and near the mine site, and in proximity to nearby communities. Monitoring reports also showed that the effluent discharge met the standards set out in the Water Licence. Water and aquatic life monitoring results for Back Bay and Baker Creek found no marked change over previous years.

The GMRP finalized its Status of the Environment Report in 2022. The Project Team consulted GMOB as it developed this report. The resulting document uses graphics, simplified language, and a simple risk-based coloring scheme (green, yellow, red) to describe the state of the environment around the Giant Mine site. GMOB commends the Project Team's efforts.

## **WHAT ARE THE NEXT STEPS?**

GMOB will continue to:

- Review environmental management plans and monitoring reports;
- Continue to monitor engagement undertaken by the DFO about the Fisheries Act Authorization for the Baker Creek and Nearshore/Foreshore Tailings work and,
- Share concerns and issues through direct dialogue with the Project Team and Parties to the Environmental Agreement as well as in comments to the MVLWB.

GMOB notes the results of recent research (e.g. Palmer 2021) which suggests that the level of naturally occurring arsenic in the Yellowknife area may be lower than previously thought. The elevated levels measured in soil sampling programs within about 15 km of Yellowknife appear to be influenced by roaster stack emissions from Yellowknife area mines. The GNWT is currently updating its soil quality guidelines; GMOB is interested in the outcome of this work and its potential implications for the Giant Mine remediation.

The Project Team included indicators in the 2015-2021 Status of the Environment Report, and GMOB will continue to support consistent monitoring and reporting on these indicators. To improve understanding of trends, GMOB will continue to work with the Project Team to identify other environmental indicators.

The project does not appear to track its GHG emissions to allow comparisons year over year since the annual level and type of physical work changes. Tracking emissions for all onsite work will show GHG performance trends even though the type of work and its intensity changes year to year.

The Parties continue to be concerned about aquatics. GMOB expressed some concerns with the development of the Aquatic Effects Monitoring Program (AEMP) for the project and considers this program a high priority for continued discussion and improvement. The AAC is functioning well and has been a useful venue for discussing aquatics-related concerns and providing recommendations to the Project Team.

## ■ **RECOMMENDATIONS**

1. GMOB recommends that the GMRP develop and communicate the methodology it uses to track and compare annual GHG emissions.
2. GMOB recommends that the AAC continue to operate on an as-needed basis to provide a venue for updates, to share knowledge, and seek advice on all things related to aquatics management for 2023-24. The Project Team should evaluate with AAC members the need to continue or cease operations after 2024.

## ECONOMY

### WHY IS THIS IMPORTANT?

Between 1948 and 2004, the Giant Mine was a major economic driver for the Yellowknife area and the Northwest Territories. When the mine stopped operating and Canada became the site custodian, attention focussed on the environmental issues left behind. The latest estimate released by Canada suggests that remediation of the site to today's environmental standards will cost the government (i.e., taxpayers) \$4.38 billion, and ongoing work will span 30-plus years.

The GMRP will be one of the largest, if not the largest single economic project in the history of the Yellowknife area. It has the potential to become a watershed for the NWT's future prosperity and will influence other remediation activities expected over the next 10 to 20 years. Increasing participation by resident Indigenous and non-Indigenous workers and businesses will bring about greater financial prosperity and set the NWT on a path for a stronger and more integrated economy in the future.

Article 2.1 (d) of the Agreement states that one of its key purposes is to, "build public confidence in the Project and enhanced transparency and accountability in relation to the Project."

Article 2.2 (a) (ii) of the Agreement states that the Parties intend that the Agreement will achieve or support the remediation of the Giant Mine site in a manner that protects "the economy, way of life and well-being of the aboriginal peoples of Canada in the vicinity of Yellowknife, and of other residents of Yellowknife, the Northwest Territories and Canada".

GMOB has previously recommended that the economic benefits of the Project be thoroughly and effectively monitored and accounted for by Canada and the GNWT.

GMOB believes the economic opportunities flowing from the Project's \$4.38 billion expenditure require far greater attention by the Parties to the Agreement than has been shown to date.

### WHAT DID GMOB EXPECT?

The Project is expected to create significant local business, employment, and training opportunities and benefits. These opportunities and benefits are expected throughout the life of the Project during both active remediation and post-remediation care of the site.

GMOB expects the Project Team to report its economic results, including employment, purchasing, and training records, in a manner that clearly shows the participation of NWT Indigenous and non-Indigenous labour and businesses in the Project. Economic reporting should include the employment effects on the federal and territorial governments and the Main Contract Manager (MCM) in addition to the employment generated by Project contractors. GMOB expects the Project Team to also report indirect spending where possible, and to report spending within the NWT, within Canada, and on direct imports.

GMOB expects the Project Team to share detailed planned expenditures for the Project based on the Project Implementation Plan work activities and work packages. This will allow GMOB to conduct its own economic effects assessment of the Project, which it will share with the Project Team, the Parties to the Environmental Agreement, and the public.

GMOB expects an updated Economic Strategy to communicate the Project's economic opportunities and how they will be captured within the context of the current and future economic conditions in the NWT. GMOB also expects an accompanying Action Plan that aligns stakeholders with the Project's economic opportunities and outlines how these organizations will work together to achieve measurable success in increasing the economic benefits to local and NWT residents.

GMOB expects the Project Team to engage with and seek input from local and regional government agencies and the private sector, particularly businesses, and the public on increasing local benefits and mitigating any negative impacts of the Project.

GMOB is concerned that the rules being established to favour NWT participation hold the potential to have the opposite effect, which may unnecessarily raise Project costs without substantively improving employment rates.

GMOB is also concerned that these rules distort the perceived value or benefit flowing from the participation of NWT non-Indigenous businesses and NWT businesses located outside the Indigenous Opportunities Consideration (IOC) zone. GMOB recognizes there is a hierarchy with respect to the Project Team's desired economic outcomes, with Indigenous groups most affected by Giant Mine historically being at the top level. This should not be interpreted to mean participation by other NWT residents or businesses, Indigenous or otherwise, are unimportant or that their contribution offers less value to the NWT economy. It should also be noted that non-Indigenous-owned businesses commonly employ Indigenous employees.

GMOB believes that greater participation in future remediation work throughout the NWT requires the Project Team give more attention to the broader NWT business community when considering contracted work. GMOB expects the Project Team to increase its knowledge of the capacities within the NWT business community and investigate opportunities for broader participation in the Project as a direct response to the GNWT's interest in maximizing benefits from remediation projects beyond the Project. GMOB believes these actions can ultimately lower costs. At the same time they will improve the NWT's capacity to capture a higher percentage of the economic benefits expected from future remediation projects in the NWT (e.g., the Norman Wells oilfield, abandoned mines on Great Bear Lake, sumps in the Mackenzie Delta, and oil and gas wells in the Cameron Hills and Beaufort Delta).



### **Economic Benefits**

The Project identified "maximizing benefits" as one of its main objectives. This term is not well-defined. GMOB's interactions with the Project Team, Parties to the Agreement, and with the public have shown that there are different definitions in use. GMOB encourages a clear and specific definition to help improve the economic outcomes of the Project.

GMOB understands an economic benefit as something made possible when money is spent. The Project Team completed its Project Implementation Plan in 2022. The plan describes when and where the Project Team intends to spend money over the next 15 years. The planned remediation expenditures cover a vast array of goods and services. Every one of these purchases create demand within the NWT, Canadian, and sometimes international economies. The suppliers of labour and business goods and services are "benefiting" directly from the Project's economic activities.

There are other economic benefits, namely indirect and induced benefits. An indirect benefit occurs when a contractor supplying a good or service to the project spends its own money as part of its business operations. Those businesses create demand of their own, and the supplier of that demand could be an NWT resident, or they could be from elsewhere in Canada or the world.

An induced benefit occurs when individuals working either directly or indirectly on the Project spend their wages or salaries. Whether that consumer spending takes place within the NWT economy or elsewhere depends largely on the residency of that individual labourer.

GMOB makes a distinction between economic benefits and other financial transfers. An economic benefit is not compensation, nor is it a government grant, or a government program. It is not a transfer from the federal government to other levels of government, to persons, or to businesses of any kind.

GMOB will use these definitions throughout the life of the Project and encourages the Project Team and Parties to the Agreement to adopt them as well.

### **WHAT ACTIONS WERE TAKEN?**

The Project Team released its first Socio-Economic Strategy in 2018 but backdated it to 2016. The Project then formed the Socio-Economic Advisory Body and the Socio-Economic Working Group in 2018 delegating them the responsibility for leading, coordinating, and integrating progressive socio-economic initiatives for the Project. These two groups met throughout 2022 with a focus on:

- a. receiving updates on the Project status, including employment and procurement.
- b. discussing the updated socio-economic strategy to be released sometime in 2023; and,
- c. discussing other project-related topics such as a proposed change in the definition of Indigenous Opportunities Considerations (*ultimately rejected by the Working Group and the Advisory Board*).

GMOB noted that the Parties consistently have been concerned that the Project Team reports employment results without the context that might help explain the results.

Parsons, the MCM for the Project, hosted its annual "Industry Days" on November 1-2, 2022. The session was open to contractors wanting to learn about upcoming work packages and to learn about the rules, regulations, and procedures regarding the bidding and evaluation processes.

### **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

In response to GMOB's request, the Project Team provided to GMOB raw employment data collected by Parsons to facilitate GMOB's review of the Project's employment record. This action follows the recommendations on the need for better employment reporting in the 2021 report *Strengthening Socio-Economic Impact Reporting and Analysis for the Giant Mine Remediation Project*.

GMOB continued to raise concerns about the inadequacy of economic considerations and reporting by the Project Team and met with the Project Team on several occasions to discuss these concerns. In May, 2022 the Project Team released the Project Implementation Plan (PIP) that detailed the numerous activities required to remediate the site in its entirety. This PIP did not contain financial estimates.

The lack of attention to the economics of the Project led GMOB to conduct its own economic effects assessment of the GMRP. This work began in the summer of 2022 prior to the release of the Project's updated cost estimates. GMOB built a preliminary economic model of the Project based on an in-depth review of the work activities described in the PIP and a high-level accounting of the planned expenditures at the time. The model produced estimates of the GMRP's direct, indirect, and induced contribution to NWT's gross output, Gross Domestic Product, labour income, employment, and indirect government revenues. Greater details regarding the planned expenditures for the Project are needed to improve the precision of the model results.

GMOB held a series of sessions about the economic contributions of the Project. These sessions prepared participants to better communicate the importance of a solid economic baseline for use in the next Socio-Economic Strategy and for measuring the future economic impact of the Project.

Canada released its updated Project cost estimates in late October, and in November GMOB updated its assessment using those numbers. However, those estimates lacked details necessary for a thorough investigation into the economic contributions of the Project. GMOB formally asked the Project Team on November 26, 2022, and December 13, 2022, for details of the new Project estimated costs. GMOB's request for further details was initially denied citing that, "disclosure of this information would

compromise the fairness and integrity of future procurement processes and prevent the Crown from receiving competitive bids on future contracts that include value for money.” Following further discussions, GMOB understands that the requested detailed expenditure profile will be made available in early 2023.

GMOB attended the ‘Industry Day’ sessions to better understand the procurement opportunities for the coming years and reviewed the upcoming work packages to learn more about complexity concerns raised by local contractors.

### **WHAT ARE THE NEXT STEPS?**

GMOB will increase its communication about the economics of the Project through several initiatives, including:

1. Providing the Project Team and the Parties to the Agreement a comprehensive presentation on the economic activities associated with the Project and the results of GMOB’s economic modelling efforts;
2. Engaging in discussions about economic development and the opportunities associated with current and future remediation work; and,
3. Giving greater attention to the results of contracted work and the spending and employment record of contractors to assess the direct, indirect, and induced effects on the NWT domestic economy.

GMOB will continue to request details of the new Project expenditures plan. This economic baseline is needed to determine whether all the business and employment opportunities made available by the Project are captured. GMOB is concerned the Project Team has not conducted the needed analysis to determine the potential effects of the Project on economic growth or job creation for the North, for Canada, or for Indigenous Peoples. GMOB will use this expenditure data to refine its 2022 economic effects assessment.

GMOB intends to advocate for an economic strategy that speaks to economic issues and will advocate for increased participation of the Parties in working toward these tangible goals.

## **RECOMMENDATIONS**

1. **GMOB recommends the Socio-Economic Working Group meet no more than three or four times a year while the associated Advisory Body meet only once or twice per year. These meetings are time-consuming, expensive and not always well attended. Without metrics to determine if the meetings serve their intended purpose, GMOB questions their value.**

## ■ RECOMMENDATIONS

2. GMOB recommends that the Project Team consider changing its approach to these meetings to give more attention to the broader economics of the Project and the economic environment in which the Project is taking place. All Parties to the Agreement require better information so they can consider potential actions by their own organizations and look to the Working Group and Advisory Body meetings as opportunities to co-operate and coordinate.
3. The GNWT has a far greater role and responsibilities for the economic outcomes of the Project than does the federal government, but all Parties to the Environmental Agreement have an important role. If the Socio-Economic Working Group and Advisory Body are to meaningfully contribute to the success of the Project, all Parties must attend and fully participate in meetings.

## ENGAGEMENT

### WHY IS THIS IMPORTANT?

The Parties to the Environmental Agreement represent specific communities (Yellowknives Dene First Nation, North Slave Métis Alliance, and the City of Yellowknife). The GNWT represents the interests of NWT residents and CIRNAC those of the Canadian public. Together these communities of interest must be informed about the activities on the Giant Mine site and plans for the near and distant future.

Engagement is a hands-on activity that seeks meaningful input from specific sources. Engagement uses back and forth feedback to move an initiative forward. Communications is more a form of 'what to say' and 'who to say it to'. Together they are important to building trust among the Project Team, the Parties, affected communities and the public.

Articles 2.1 (c) and (d) of the Agreement state that the purpose of the Agreement is to "facilitate collaboration among the Parties" and "build public confidence in the Project and enhanced transparency and accountability in relation to the Project." Article 2.2 (e) also states that the Parties intend that the Agreement will achieve or support "effective communication with future generations".

### WHAT DID GMOB EXPECT?

GMOB expects the Parties and the Project Team to meaningfully communicate and engage with specific audiences and the broader public. Local communities and other northerners should be able to regularly learn about and express their thoughts on the remediation and care of the Giant Mine site. GMOB expects that relevant public input will be considered in decision-making.

### WHAT ACTIONS WERE TAKEN?

The Project Team continued to engage with the Parties. Engagement activities included meetings of the

- Giant Mine Working Group
- Aquatic Advisory Committee
- YK Health Effects Monitoring Program Technical Committee
- *Hoèla Weteèts'eèdeè: Understanding Community Well-being around Giant Mine Study*
- Socio-Economic Working Group; and,
- Socio-Economic Advisory Body

The Project Team makes resources available to assist the Parties to prepare for and meaningfully participate in meetings on engineering, environmental, health and socio-economic matters.

Due to the COVID-19 pandemic, meetings were held virtually for much of 2022. The Project team began hybrid in-person/virtual meetings near the end of 2022. The Project Team also held a virtual Annual Public Meeting.

The Project Team shared information about its remediation activities through public service announcements, electronic newsletters, and social media postings. The federal government and the GNWT maintain and update Project-related information on their respective websites.

The independent YK Health Effects Monitoring Program (YKHEMP) team communicated study results and arsenic education bulletins to the public on an ongoing basis, mainly through radio announcements and brochures.

The *Hoèla Weteèts'eèdeè: Understanding Community Well-being around Giant Mine Study* was scheduled to begin in Spring 2022. However, the study did not proceed due to concerns expressed by YKDFN Chief and Council.

The GMOB Community Survey 2022 ran between February 18, 2022, and December 31, 2022. Some additional in-person interviews were conducted with YKDFN members to address gaps in Phase 1 of the survey. The survey results are informing GMOB about community awareness, knowledge, and interest in the Project.

### **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

The Giant Mine Remediation Project Annual Report 2021-22 lists stakeholder concerns that the Project Team heard through its public engagement activities. The Annual Report also lists the Project Team's responses to these concerns, and the decisions taken or altered because of public input. For example, the Project heard several questions about post-closure land use. In response the Project developed a "constraints map" with specific land categories.

GMOB notes the Project Team's undertakings to improve understanding of technical information to improve the quality of participation and decisions at meetings. These efforts include plain language materials, advance meetings with individual Parties, and access to independent experts. Meeting participants are more confident in asking questions, voicing concerns, and offering advice. A renewed approach is required to better prepare and educate the Socio-Economic Working Group to support similar productive outcomes.

In 2022, the Project Team met several times with the Yellowknife Historical Society and the Great Slave Sailing Club. The Project continues to address issues identified by both groups.

GMOB notes that there is no advocate for the greater boating community in Yellowknife. The Project Team should reach out to general users of the community boat launch in the near future as its plans for the community boat launch and covering of the offshore tailings develop further.

GMOB is concerned with the lack of active coordination among the Great Slave Sailing Club, the Great Slave Cruising Club, the Yellowknife Historical Society and the City of Yellowknife for the management of the Giant boat launch and Sailing Club area during remediation. Failure to proactively consider congestion at the site and to develop appropriate mitigation measures brings significant risks, in GMOB's view. The current ad-hoc approach is inadequate.

The results of the GMOB 2022 Community Survey will be compiled into a final report to be shared widely. The results are informing GMOB's approach to future communications and public outreach. GMOB hopes the survey results will also inform the Parties and the Project Team with regard to their respective communication and engagement efforts.

Based on its own observations and preliminary survey results, GMOB cannot state with confidence that information shared by the Project Team is improving the general public's understanding of the remediation project or the Project outcomes. For example, GMOB is unclear if residents understand that the current Closure and Reclamation Plan does not remediate certain areas of the mine site even in places where there are high levels of arsenic. More specifically, it is unclear if residents understand that after remediation, certain areas will be permanently fenced off and completely unavailable to residents.

GMOB's review of the websites of the Parties to the Agreement suggests that all Parties need to update their online information about the status of the Project and their respective involvement.

### **WHAT ARE THE NEXT STEPS?**

GMOB is committed to improving the effectiveness of communication and engagement on Project environmental, engineering, health, safety, and economic matters. GMOB remains committed to enhancing its capacity to oversee engagement activities and detect trends. GMOB urges the Project Team to continue identifying key engagement indicators and report on them semi-annually.

GMOB will continue to monitor the engagement activities with the Yellowknife Historical Society and Great Slave Sailing Club, advocating for mutually acceptable outcomes. GMOB will continue to raise the need for a champion for the greater boating community.

GMOB will compile the results of the GMOB 2022 Community Survey into a final report in early 2023 and share it publicly. The results will continue to inform GMOB's approach to its communications and public outreach.

GMOB encourages all Parties to the Environmental Agreement to regularly update their websites and the extent of their involvement in the Project.

## **RECOMMENDATION**

1. GMOB recommends that the Project Team call a general meeting of the boating community in Yellowknife, Ndilq and Dettah as a first step in more fully and effectively engaging with boat launch users on the Project Team's plans for public access to the waterfront at the site, and its plans and schedules for the public boat launch.

## RECONCILIATION

### WHY IS THIS IMPORTANT?

Long before the first explorers, fur traders, or prospectors ventured into the north, the Tsetsot'inè people ("metal people") occupied a vast area around Tinde'e (Great Slave Lake). These people were the ancestors of today's Yellowknives Dene. Numerous traditional camps, the largest being T'è ɾehdaà (Dettah), were located along the east shore of Willicheè (Yellowknife Bay). The west shore, and in particular the valley of Ehnda Deh (Baker Creek), was reserved for moose hunting, berry picking, and medicinal plant harvesting.

Gold was found on the Giant Mine site in 1935 but it was not until 1944 that a commercial ore body was confirmed when a massive gold-bearing zone was uncovered beneath the Baker Creek Valley. The Burwash Mine, Con Mine, and Negus Mine were all operating in the area before the Giant claims entered production. Giant Yellowknife Gold Mines Limited poured its first gold brick on June 3, 1948, and remained in operation until 2004.

The development of the mines in the area displaced traditional pathways forcing Dene to move to other locations to hunt, fish and gather from the land. The influx of mining operations both contaminated the land and in turn drew a growing population that irrevocably altered the landscape, both environmental and cultural.

Reconciliation is an integral part of the Giant Mine remediation process.

In 2015, the Truth and Reconciliation Commission of Canada (TRC) defined reconciliation as "an ongoing process of establishing and maintaining respectful relationships." 2022 marked the seventh year since the Commission released its 94 'Calls to Action'. These calls to action form a roadmap for national reconciliation and address a variety of aspects of life in Canada including business, education health, youth, women, and justice.

Article 2.2 (a) (ii) of the Agreement states that the Parties intend that the Agreement will achieve or support the remediation of the Giant Mine site in a manner that protects "the economy, way of life and well-being of the aboriginal peoples of Canada in the vicinity of Yellowknife, and of other residents of Yellowknife, the Northwest Territories and Canada".

Section 3.1 (b) (ii) of the Agreement says GMOB may compile and analyze available and environmental quality data in order to review, report, or make recommendations concerning "the Project's integration of Traditional Knowledge into its Environmental Program and Plans."

### WHAT DID GMOB EXPECT?

GMOB expects the Project Team and the Parties to the Agreement to view remediation and care of Giant Mine as an opportunity for reconciliation and to act on those opportunities in meaningful and constructive ways.

GMOB expects the remediation and care of Giant Mine to promote and act on the relevant actions set out by the Truth and Reconciliation Commission. The Project Team should consider the principles of reconciliation in all decisions. GMOB also



expects the Government of Canada to formally respond to the repeated requests and recommendations for an apology and compensation to the YKDFN.

### **WHAT ACTIONS WERE TAKEN?**

Reconciliation with the Indigenous communities negatively affected by the historic operations at Giant Mine is an ongoing process. In 2022, the Government of Canada and the YKDFN made progress toward an apology and compensation for the harms caused by Giant Mine.

In 2022 Canada and the YKDFN reached four agreements:

- The *Collaborative Process Protocol Agreement* has two phases.
  1. Canada and the YKDFN will develop a shared understanding of the compensation claim so Canada can seek a mandate to negotiate a settlement.
  2. If Canada successfully obtains a mandate, the parties intend to negotiate a mutually agreeable resolution of the claim.

CIRNAC allocated funds to the YKDFN to undertake historical research and community engagement on the impacts of the Giant Mine. The Regional Office is funding YKDFN through a contribution agreement. Work will take place over two years ending in 2024/2025.

- *Memorandum of Cooperation to advance key socio-economic priorities.*

A working group made up of YKDFN representatives and CIRNAC NWT Region employees meets regularly to review priorities outlined by YKDFN Chiefs and Councils. Through this working group, YKDFN has submitted to various federal departments numerous funding applications that target YKDFN priorities.

- *Community Benefits Agreement to ensure that the Yellowknives Dene First Nation obtains socio-economic benefits from the Giant Mine Remediation Project.*

YKDFN and the Project Team signed a Community Benefits Agreement in August 2021. It will continue through the implementation phase of the project. The agreement includes funding for a Socio-Economic Development Officer and a Socio-Economic Development Division to ensure benefits for the YKDFN. In addition to a strong focus on socio economics, the agreement includes funding for training, scholarships, community-based monitoring, and a community liaison.

- *A Framework Agreement to maximize the number of work packages under the Giant Mine Remediation Project that are awarded to Indigenous businesses and formalize the Yellowknives Dene First Nation's role in the Project as the Indigenous group most impacted by Giant Mine.*

The Procurement Framework Agreement formalizes Canada's commitment to provide socio-economic advantages to YKDFN. It confirms the purchasing approaches that Canada and the Main Contract Manager will use for the Giant Mine Remediation Project. This includes the use of the Procurement Strategy for Indigenous Business (PSIB) and Indigenous Opportunities Considerations. This agreement gives the Yellowknives Dene a role in deciding the Project's purchasing approach. YKDFN will review and comment on planned procurement methods before the Main Construction Manager implements them.

The Government of Canada is currently negotiating Community Benefits Agreements with the Tłıchǫ Government and the North Slave Métis Alliance.

Health studies (i.e., YKHEMP and Stress Study) used principles of reconciliation throughout their development and, in the case of YKHEMP, in its data collection and interpretation. Those principles include partnership, ownership, and shared control in developing and implementing the studies. YKHEMP initial sampling in 2017-18 provided valuable baseline information on arsenic in Yellowknife residents and among NSMA and YKDFN members. YKHEMP plans the second phase of sampling, for children and youth, in spring 2023. Regrettably, the Stress Study did not proceed.

### **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

GMOB finds that understanding and recognition of reconciliation has improved during the Giant Mine Remediation Project. While slow, progress toward a formal apology and compensation to the YKDFN is being made.

The cancellation of the Stress Study presents a challenge for GMOB as a body with a broad duty of Project oversight and engagement with all Parties, not solely the Project Team. The Stress Study team, supported fully by the GMRP and a highly qualified technical advisory committee, collaborated with the YKDFN Wellness division in planning, developing, testing, and refining the Stress Study. The study was first and foremost a partnership between Wilfred Laurier University (WLU) and YKDFN and was guided by Ownership, Control, Access and Possession (OCAP) principles. These principles assert that First Nations have control over data collection processes, and that they own and control how collected information can be used.

As with YKHEMP, the Stress Study used fundamental United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)-based reconciliation principles. Following data collection, YKDFN was to retain ownership, control, access, and possession of data collected from their members. The study was designed to be relevant, culturally appropriate, strengthen community ties, and lead to improvements in overall community wellbeing. Despite these efforts, the study did not proceed. This leaves a significant challenge as to how to engage and partner in reconciliation-based initiatives in the future.

### **WHAT ARE THE NEXT STEPS?**

GMOB will continue to promote an understanding of reconciliation and apply the TRC calls to action in its work. To this end, GMOB will urge the Project Team to identify key reconciliation indicators and implement a process to monitor and regularly report on them.

## PROJECT MANAGEMENT AND PLANNING

### WHY IS THIS IMPORTANT?

The Giant Mine Remediation is a multi-year, multi-billion-dollar project. Its primary goal is to protect human health and safety and the environment. Planning the work and activity on the site must account for varying levels of arsenic contamination. Effective project management and planning is critical to keeping a project of this size and complexity under control, with respect to both schedule and cost.

Section 2.2 of the Agreement states that the Parties intend that the Agreement achieve or support the following objectives:

- a. the remediation of the Giant Mine site in a manner that protects the land, air, water, aquatic life, and other wildlife in the area of, or potentially affected by the Project;
- b. the remediation of the Giant Mine site in a manner that eliminates or substantially mitigates the environmental risks posed by the site;
- c. comprehensive, integrated ecosystem-based approaches for the monitoring, management and regulation of the Project; and,
- d. the minimization of the Perpetual Care requirements at the Giant Mine site.

Section Article 3.1 (b) (v) ("Mandate of the Oversight Body") states that the Oversight Body may compile and analyze available and relevant environmental quality data in order to review, report, or make recommendation concerning, "environmental or engineering studies conducted by the Co-proponents in relation to the Project."

### WHAT DID GMOB EXPECT?

While the GNWT and the Government of Canada are the co-proponents of the Project, external stakeholders are also involved. GMOB expects that the Project Team will take an integrated approach to project management to ensure that economic and social elements are considered in addition to engineering, and that all interested parties are aware of remediation plans and opportunities.

GMOB expects the Project Team to modify work plans based on monitoring results, adaptive management practices, and new information brought forth by external researchers, community members, and others.

GMOB expects the Project Team's designs to consider GMOB's research toward a permanent solution for the arsenic trioxide dust stored in the underground chambers. The temporary nature of freezing the arsenic trioxide dust in underground chambers and the search for a permanent solution needs to be incorporated into designs so remediation work does not compromise a permanent solution. GMOB expects that the Project Team and GMOB will work closely so the Project Team is aware of research developments and their implications for site remediation, and GMOB is aware of any Project plans or work that may interfere with the development and implementation of a permanent solution.

## **WHAT ACTIONS WERE TAKEN?**

In 2022, the Project Team extended the project timelines to complete active remediation in 2038 instead of 2035. The projected Project total expenditure increased from a little over \$1 billion to \$4.38 billion.

The Project has moved into the active remediation phase. This requires the submission of various management and monitoring plans to the Mackenzie Valley Land and Water Board. Construction of the AR1 freeze pad and the non-hazardous waste landfill continued in 2022, and work began to tear down the townsite buildings. Additional demolition work focused on an area where the new Water Treatment Plant will be located.

The Project Team continues to finalize several management, monitoring, and design plans. In areas where plans are not yet finalized, the Project Team continued care and maintenance activities. The Project Team ensured that the site remained stable and posed no significant environmental or safety risks in 2022.

The Project Implementation Plan (PIP) was released in April 2022. It describes how the elements of the project will be delivered.

The Project now maintains a back-up pump on the site, following the 2021 failure of a main pump that controls underground water levels. It took approximately seven months to replace the broken pump.

## **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

Construction of Phase 1 of the Non-hazardous Waste Landfill is now complete as is the construction of the AR1 Freeze Pad. Work has begun to remove buildings from the old townsite and the core area of the mine.

The Project Team's care and maintenance activities continued in areas where active remediation has yet to begin. The Project Team improved core care and maintenance tasks necessary for the stability and safety of the mine site. There have been some delays to the planned schedule, as presented in the 2021-2022 GMRP Annual Report, but these delays did not materially affect the overall project schedule.

GMOB is pleased that the Project has a back-up pump on site, should this contingency be needed because of another pump failure. However, it took over seven months to address the failure of the original pump. GMOB recognizes that the COVID 19 epidemic introduced delays with procurement and obtaining equipment. In GMOB's view, on-site management should have the authority to immediately purchase all equipment necessary to respond to an emergency.

## **WHAT ARE THE NEXT STEPS?**

GMOB has requested additional information about the increase in the Project's budget. This is more fully discussed in the Economy section of this report. From an integrated project management viewpoint, GMOB expects that this information will also inform future Project management and planning efforts.

Condition B.20 of the Project's Type A Water Licence requires that the Project Team submit an annual report to the Mackenzie Valley Land and Water Board by April 30 annually. The report must summarize previous year site activities including reclamation work. The report must also provide a schedule of anticipated activities and planned submissions to the Board for the upcoming year. In conjunction with the PIP, the Water Licence Annual Report will inform GMOB's project management and planning oversight activities. The report is helpful in tracking progress, identifying deviations in schedules, and understanding trends.

GMOB will continue to review and comment on plans and reports required by the Mackenzie Valley Land and Water Board.

GMOB will continue to evaluate Project Team contingency planning efforts.

## **RECOMMENDATIONS**

1. GMOB recommends that a summary of all contingency planning exercises and reviews be included as a separate section of the GMRP Annual Report.
2. GMOB recommends that local management be provided with the appropriate purchasing authority to enable them to respond to any on-site emergency situations without delay.

## COMMUNITY HEALTH AND WELLNESS

### WHY IS THIS IMPORTANT?

The Giant Mine site has 237,000 tonnes of arsenic trioxide dust temporarily stored underground. There is widespread surface contamination on and off the site. Residents' concerns about arsenic and other unsafe elements in soil, tailings, dust, surface water and groundwater, and flora and fauna in the area are a central aspect of the Project.

Article 2.2 (a) (ii) of the Giant Mine Remediation Project Environmental Agreement, states that the Parties intend that the Agreement will achieve or support the remediation of the Giant Mine site in a manner that protects "the economy, way of life and well-being of the aboriginal peoples of Canada in the vicinity of Yellowknife, and of other residents of Yellowknife, the Northwest Territories and Canada".

### WHAT DID GMOB EXPECT?

GMOB expects that residents will have ready access to all information related to community health and wellness. Residents' access to timely information depends on ready access to GMOB, the Project Team, and the Parties to the Environmental Agreement. Ready access to information should give residents a reasonable understanding of:

- The Closure and Reclamation Plan and its implications for future land use;
- Current and future public health risks related to dust, runoff, construction, and contaminated soils associated with the Giant Mine area;
- Current and future risks related to activities such as hiking, eating fish and using the boat launch in the area during and after remediation, and,
- Studies on arsenic exposure and related health outcomes.

GMOB expects the Project to bring maximum economic benefits and minimal negative effects to residents and their ways of life. GMOB expects that risks to community health and wellness are minimized, and always clearly understood by residents.

### WHAT ACTIONS WERE TAKEN?

The Yellowknife Health Effects Monitoring Program (YKHEMP)<sup>1</sup> is studying the human health effects of arsenic and other contaminants resulting from the Giant Mine Remediation Project. The Program started in 2017. The focus in 2022 was interpreting baseline data from 2017-2018 collection of hair and toenail samples from residents in and around Yellowknife. The YKHEMP team communicated study results and arsenic education bulletins to the public on an ongoing basis, mainly through radio announcements and brochures. The second phase (Year 5 of the program) of sampling is planned for Spring 2023 and will focus on children and teens ages 3 – 19. In the third phase (Year 10 of the program: 2027-2028), the study will again sample all age groups.

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1 <https://ykhemp.ca>

In 2022 the authors of the *Hoèla Weteèts'eèdè: Understanding Community Well-being around Giant Mine Study* (also known as 'the Stress Study') finalized the study plan, a survey and protocols, and obtained research ethics approval through Wilfrid Laurier University. The study, scheduled to begin in spring 2022, did not proceed due to concerns expressed by YKDFN Chief and Council.

From 2020 through 2022, the Aurora Research Institute and Queen's University conducted the *Yellowknife Garden Metals Study: Arsenic and Mining Associated Metals in Local Garden Produce in the Yellowknife Area*.<sup>2</sup> The study analyzed the amount of arsenic and other mining-related contaminants (antimony, cadmium, lead, manganese, copper, zinc, and vanadium) in backyard garden soils and produce in Yellowknife, Ndilo, Dettah, and surrounding area. The study was completed in 2022, and the final report is pending.

In 2022, the Project Team engaged the engineering consulting firm WSP to evaluate hazards and risks associated with acute arsenic exposure from soil in areas that will not be remediated. WSP provided a preliminary report to the Giant Mine Working Group in October 2022. GMOB will review the final report, expected in early 2023.

Also in 2022, the Project Team shared its digital model of the Giant site with GMOB. The model is used as an additional resource to help residents visualize the mine site and to inform the public about the remediation efforts.

## **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

Key findings of the initial phase of the YKHEMP showed that most children and adults tested have total urinary arsenic levels similar to the average Canadian. Children (ages 2-12 months) have higher exposure than adults, likely due to more external contact with dust or soil. There is no evidence that people's health is at risk at the levels observed in the Yellowknife area.

GMOB is disappointed that the *Hoèla weteèts'eèdè: Understanding Community Wellbeing Around Giant Mine* is not going ahead. This study was intended to address Measure #10 from the "Report of Environmental Assessment and Reasons for Decision, Giant Mine Remediation Project" (Mackenzie Valley Environmental Impact Review Board (MVEIRB), June 2013), which specifies that there must be an evaluation of "the indirect effects of potential exposures to arsenic on wellness, including stress effects". This study is also discussed in the Reconciliation section above.

The study was, from the outset, a partnership between Wilfrid Laurier University (WLU) and YKDFN and was guided by the principles of Ownership, Control, Access and Possession (OCAP, <http://fnigc.ca/ocap>), and Data Sharing Agreements between WLU and YKDFN, as well as between WLU and NSMA. The study was designed to be relevant to and culturally appropriate for Yellowknives Dene, with a goal to strengthen community well-being, pride and dignity, Dene values, and sense of connection. More generally, a key

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2 <https://nwtresearch.com/yellowknife-garden-metals-study>

goal of the study was to facilitate improvements in stress and mental health in all affected populations in the study area through targeted mitigation and healing activities. GMOB regrets that despite these efforts, the Chief and Council decided to withdraw from the study.

GMOB acknowledges the substantial work and exemplary community research and ethics standards used in the study design, protocols, and ethics considerations by Dr. Ketan Shankardass (Wilfrid Laurier University), Dr. Sue Moodie, the YKDFN Wellness team, and the study advisory and technical committee members.

The Project Team and GMOB have websites that contain information about all phases of the Project. These websites give the public and participating agencies and governments access to information at any time. In addition, research studies, signage, and plain language information materials,<sup>3,4</sup> are widely available. These materials inform residents and other members of the public, the Project Team, and the Parties to the Agreement about remediation activities, especially the risks of historic arsenic contamination.

The public has raised concerns about the toxicity of dust from tailings at the Giant Mine site. The Project Team continues to refine its dust management procedures. In 2022 the Project Team began a multi-media comprehensive dust communications approach to keep residents of Ndilo, Yellowknife, and Dettah informed.

## ■ RECOMMENDATION

1. In light of the discontinuation of the *Hoèla Weteèts'èèdè Understanding Community Well-being around Giant Mine Study*, GMOB recommends that the Project request direction from MVEIRB, the responsible Ministers, and the Parties to the Agreement regarding Measure #10 and the evaluation of broader health impacts such as stress effects.

3 <https://www.lightsource.ca/public/news/2021-22-q4-jan-march/blowing-in-the-wind.php>

4 [https://www.enr.gov.nt.ca/sites/enr/files/resources/remediation\\_arsenic\\_brochure\\_english\\_web\\_0.pdf](https://www.enr.gov.nt.ca/sites/enr/files/resources/remediation_arsenic_brochure_english_web_0.pdf)



## LONG TERM PLANNING

### WHY IS THIS IMPORTANT?

Work on the Giant Mine site will continue for the indefinite future. While the planned remediation will reduce most of the hazards on the site, some residual risks will need to be managed. A robust plan is needed to account for all the elements of the site that will require regular monitoring and maintenance. After remediation, some areas of the site may be available for commercial, recreational, or residential use; other areas will be permanently off limits. Future land uses need to be better communicated so that remediation decisions do not inadvertently reduce options for possible future activities.

Section 4.1 of the Agreement states that the co-proponents must include provisions for perpetual care of the site, including management and monitoring, in their environmental programs and plans.

More specifically, section 4.2 (a) of the Agreement states that, 'the Co-Proponents shall develop a comprehensive Perpetual Care Plan that must address improvements in records management, communication with future generations, long term access to funds for the Project and analysis of different possible future scenarios that might affect the Perpetual Care of the Project'.

Section 4.2 (b) states that, "the Co-Proponents shall provide the Oversight Board with a first draft Perpetual Care Plan no later than five years after the Effective Date of this agreement. (June 09, 2015)

### WHAT DID GMOB EXPECT?

GMOB expected the first draft of the Perpetual Care Plan (PCP) to be completed in 2020 as required by the Environmental Agreement. GMOB has expressed its concern about the manner and pace of the first draft in Annual Reports since then and is again expressing its concern about the continued delay.

GMOB expects that public governments will guarantee adequate funds over the long-term to implement the approved PCP, and to guarantee funds to address any future issues as they arise.

GMOB expects the Project Team's plans and designs to take into consideration GMOB's research toward a permanent solution for the arsenic trioxide dust temporarily stored in the underground chambers. The Project Team's planning and communications about the site should include information as to the temporary nature of the frozen shell and the search for a permanent solution. Advance planning and design must ensure that remediation work does not compromise the development and implementation of a permanent solution.

GMOB expects that future land use planning of the site will be led by the City of Yellowknife with the support and involvement of the Government of the NWT.

GMOB expects that the lessons learned in the remediation of the Giant Mine site will inform effective long term management of the Giant site and the management of economic opportunities at other NWT remediation projects.

## **WHAT ACTIONS WERE TAKEN?**

Progress to date on long term planning has been slow. The first draft of the PCP was scheduled for June 2020 but this and subsequent target dates have not been met. In 2022, a Task Force made up of the Parties to the Agreement and the Project Team completed the guiding requirements for a PCP. The plan requirements were given to Public Services and Procurement Canada which is preparing a Request for Proposals (RFP) based on the guidance document. It is expected that this RFP will be released in mid-2023.

GMOB reviews GMRP submissions to the MVLWB with the view that freezing the arsenic trioxide dust is a temporary measure. Remediation actions taken on the site should not prevent implementation of a permanent solution. The Research section of this Annual Report discusses progress towards identifying an effective permanent stabilization method for the arsenic trioxide roaster waste.

In 2019 GMOB recommended the development of a land use plan for the Giant Mine site (2019-8). In March 2021, in response to further enquiries by GMOB, the GNWT indicated that the City of Yellowknife had authority to undertake land use planning at the site, and that the GNWT Department of Lands would be the lead for the GNWT. No progress was reported on this in 2022.

## **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

The GMRP used a committee-based approach to develop the PCP RFP, now expected to be released in early 2023. GMOB is disappointed with the delays and remains concerned that PCP development is more than three years behind the schedule set out in the Agreement. GMOB expects that the Project Team will prioritize the development of this important document.

Closure Objectives include keeping the option open to permanently solve the arsenic storage problem. The Underground Design Plan submitted by the Project Team in 2022 included plans to construct a long-term access portal as part of the underground remediation program. The status of the GMOB research program toward a permanent solution is described more completely in Section 12 of this document.

No progress has been reported on a land use plan for the Giant Mine site. On the contrary, it appears that the City of Yellowknife will not conduct significant planning until active remediation of the site is complete, despite the Project Team's ongoing communications regarding the likely characteristics of the site post-remediation.

## WHAT ARE THE NEXT STEPS?

GMOB expects that the RFP to develop a PCP will be issued in early 2023. GMOB once again strongly recommends that the Project Team not delay this work further and complete the PCP by March 31, 2024.

GMOB will continue to review MVLWB submissions in the context of implementation of permanent solutions. GMOB is regularly updated by its research partners as to the status of the research program; to date this has occurred either virtually (due to COVID 19) or at one of the universities where the work is being conducted. GMOB intends to hold a public meeting in Yellowknife in 2023 to raise the profile of its research program and better communicate progress.

GMOB does not agree with delaying onsite land use planning until after remediation is complete. GMOB remains concerned that proceeding with remediation without a clear land use plan may limit or close off options for future uses of the site. GMOB recommends that on-site land use planning occur in tandem with active remediation given that:

1. The Project Team has provided information about the post-remediation landscape (i.e., what areas will be accessible or not for residents' use); and,
2. The City of Yellowknife has the authority to develop a land use plan for the site.

Parallel land use planning and remediation processes provide greater opportunities to make adjustments that may be impossible or impractical after remediation is completed.

## RECOMMENDATIONS

1. **GMOB recommends that the PCP be completed and submitted to GMOB for review no later than March 31, 2024.**
2. **GMOB recommends that onsite land use planning for the Giant Mine site occur in tandem with active remediation and be led by the City of Yellowknife.**

## GMOB RESEARCH PROGRAM

### WHY IS THIS IMPORTANT?

A total of 237,000 tonnes of arsenic trioxide dust is stored in 14 underground chambers at the Giant Mine site. In 2002, the Government of Canada had an independent peer review panel with a wide range of technical expertise examine 56 options to deal with the underground contaminant. After several public sessions, the “frozen block” method was selected as the best choice.

However, the 2008 public Environmental Assessment of the Giant Mine Remediation Project<sup>5</sup> concluded that the frozen block method “will proceed only as an interim solution for a maximum of one hundred years. A permanent alternative is necessary beyond that point.”

As a result, Article 7 of the Agreement tasks GMOB with managing a formal research program focussed on finding a permanent management solution for the arsenic trioxide dust currently stored underground at the site. It is important to arrive at a safe and permanent solution so future generations are not saddled with this liability.

The GMOB research program has three parts:

3. GMOB-funded research with the TERRE-NET (“Toward Environmentally Responsible Resource Extraction Network”) partnership;
4. Other research with TERRE-NET partners made possible by accessing funds from external sources; and,
5. Research proposals from other researchers.

### What Actions were Taken?

Throughout 2022, GMOB worked on each part of its research program.

1. GMOB-funded Research with TERRE-NET

GMOB continued to fund multiple arsenic trioxide stabilization research projects through its TERRE-NET partners. The research projects include:

- i. Assessing the chemical and physical properties of the arsenic dust.
- ii. Chemically changing the arsenic dust into a less toxic and more stable sulphide mineral.
- iii. Mixing the arsenic dust into a cement paste backfill.
- iv. Assessing the stability of arsenic glass.

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5 [https://reviewboard.ca/upload/project\\_document/EA0809-001\\_Giant\\_Report\\_of\\_Environmental\\_Assessment\\_June\\_20\\_2013.PDF](https://reviewboard.ca/upload/project_document/EA0809-001_Giant_Report_of_Environmental_Assessment_June_20_2013.PDF), (page 71)

2. Three other research streams were added to the program through funding provided by the Alliance program of the Natural Sciences and Engineering Research Council of Canada. These research projects are:
  - v. Stability of iron arsenate phases – chemically changing arsenic dust into a less toxic and more stable arsenic iron mineral.
  - vi. Biogenic sulfide precipitation – using microbes to change arsenic dust into a less toxic and more stable arsenic sulphide mineral.
  - vii. Implementation and application of Sb isotope systems – using antimony as a substitute for arsenic to identify geochemical processes related to the weathering of arsenic dust.

Details of progress on the four TERRE-NET research projects and three Alliance-funded projects are described in Appendix B.

### 3. Consideration of Proposals from Independent Researchers

GMOB's independent expert panel reviewed an unsolicited research proposal. A meeting with the proponent resulted in new information being provided which was then shared with the panel. The expert panel made a final recommendation to GMOB and posed questions of the proponent that are to be answered prior to GMOB making a final decision. A later meeting was held with the proponent and further information is forthcoming.

## **WHAT WERE THE OUTCOMES OF THE ACTIONS?**

- The four GMOB-funded TERRE-NET research projects have progressed. The formal results are expected to be published in the coming year.
- The three additional research projects funded through the Alliance program have started and progress on them will be shared in the coming year.
- Over the past year, GMOB used the independent expert panel for two formal reviews of an unsolicited proposal.
- GMOB saw the need for a formal research strategy to guide its research program for the short and long term. GMOB contracted the Institut national de la recherche scientifique to develop the strategy. GMOB anticipates that the strategy will be completed in late 2023 and will make it publicly available.
- GMOB worked closely with CIRNAC to extract arsenic trioxide dust samples from the Giant Mine site for future research use. The sample extraction is planned for the spring of 2023.
- GMOB continues to work with an independent contractor to develop plain-language infographic sheets to explain the research program and describe the current research initiatives.

### **WHAT ARE THE NEXT STEPS?**

- GMOB will continue to share the formal progress reports of its research program on its website and at its public meetings.
- GMOB will update the plain language infographics materials and is working toward plain language summaries of its formal progress reports.
- GMOB and TERRE-NET members will continue to look for more research funding from external sources.
- GMOB will continue to invite independent research proposals and investigate potential linkages with other expert groups.
- The independent expert panel will evaluate proposals as they are submitted and make its recommendations to GMOB.
- GMOB will complete the GMOB Research Strategy to guide its research program for the short and long term.
- GMOB will continue to work with CIRNAC on the GMOB research program and on the sample extraction project. GMOB will ensure safe transport and storage of the samples to the SGS facility in Lakefield, Ontario.
- GMOB will work with the Parties to ensure that the PCP will incorporate the eventual treatment of the arsenic trioxide dust currently stored underground.

# APPENDICES

## APPENDIX A

### The Status of Previous Recommendations

The status of previous GMOB recommendations is assessed as follows:

- **ADDRESSED:** Actions were taken to implement the recommendation. Actions may be completed or showing evidence of progress toward completion in the foreseeable future. Even though a recommendation may be assessed as 'addressed', GMOB will continue to monitor the matter in question with the view to understanding the outcomes of actions taken.
- **IN PROGRESS:** Actions were taken to implement the recommendation, but progress is insufficient to determine if completion can be anticipated in the future.
- **NOT ADDRESSED:** The party to whom the recommendation was directed either did not accept and/or did not act on the recommendation.
- **NOT ADDRESSED AND NO LONGER RELEVANT:** GMOB has concluded that the recommendation is no longer relevant in current circumstances.

YEAR and RECOMMENDATION #	TOPIC	STATUS
<b>Environment</b>		
2016-7A/B 2017-10 2018-9	Improve integration, monitoring, and reporting on environmental activities.	<b>IN PROGRESS:</b> Management and monitoring plans have been completed and approved or are being prepared. With the Remediation Project now in the active remediation phase, continual monitoring of plan development and implementation will be required.
2019-9	Reduce greenhouse gas emissions where feasible, consider offsets, and report annually.	<b>IN PROGRESS:</b> The Project Team has committed to annual reporting and reductions where feasible. However, commitments fall short of current federal government policies.
2020-1	Develop a short and long-term strategy that sets targets and commits to action to proactively reduce greenhouse gas emissions.	<b>IN PROGRESS:</b> The Project Team has committed to a greenhouse gas assessment for the water treatment plant design; limiting fuel use; reducing haul distances for borrow; tracking greenhouse gas emissions on a monthly basis; and annual reporting on emissions. GMOB will monitor these commitments and assess them within the context of current federal government policies.
2021-1	To enhance project oversight activities, GMOB recommends that the Project Team undertake more active reporting on key indicators of trends in each of the seven areas: 1) Environment, 2) Economy, 3) Engagement, 4) Reconciliation, 5) Project Management and Planning, 6) Community Health and Wellness, and 7) Long Term Planning.	<b>NOT ADDRESSED:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." GMOB encourages the Project Team to continue to identify key indicators and actively report on them.



YEAR and RECOMMENDATION #	TOPIC	STATUS
<b>Economy</b>		
2016-11	Apply a structured framework from a community health and well-being perspective to evaluating social, economic, and cultural aspects of the Remediation Project.	<b>ADDRESSED:</b> Improvements in public engagement and communications especially for various studies and plans indicate that this framework isn't needed.
2017-1 2018-1	Develop and implement a socio-economic strategy to ensure northerners, particularly local Indigenous people are positively impacted by the Project.	<b>ADDRESSED:</b> The strategy developed has an implementation plan to guide monitoring. However, the effectiveness of this response is unclear. GMOB will continue its monitoring of the responses to this recommendation.
2019-1	Appoint a special envoy to work with the various interests to develop and implement an integrated economic strategy.	<b>NOT ADDRESSED:</b> The Project Team has not provided a qualified independent or internal lead for socio-economic reporting. The process of updating the <i>Socio-Economic Strategy, 2016-2021</i> is an opportunity to engage this expertise.
2020-2	Use the findings of GMOB's independent review to improve outcomes and reporting on its <i>Socio-Economic Strategy, 2016-2021</i> as well as strategy renewals and updates.	<b>NOT ADDRESSED:</b> The Project Team responded to GMOB's independent review and recommendations but offered no commitments. The proposed update of the <i>Socio-Economic Strategy, 2016-2021</i> provides an opportunity to make progressive change.
2020-3	Bring forth socio-economic considerations identified in the Perpetual Care Plan framework into the goals of the Perpetual Care Plan.	<b>NOT ADDRESSED:</b> The Socio-Economic Working Group has not addressed any perpetual care planning considerations. The development of a perpetual care plan continues to be delayed.
2020-4	Ensure northerners have central roles in the care, maintenance, and management of the Giant Mine site into the future.	<b>NOT ADDRESSED:</b> The development of a perpetual care plan continues to be delayed.
2021-1	To enhance project oversight activities, GMOB recommends that the Project Team undertake more active reporting on key indicators of trends in each of the seven areas: 1) Environment, 2) Economy, 3) Engagement, 4) Reconciliation, 5) Project Management and Planning, 6) Community Health and Wellness, and 7) Long Term Planning.	<b>NOT ADDRESSED:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." GMOB encourages the Project Team to continue to identify key indicators and actively report on them.
2021-2	GMOB will continue to bring concerns about contracting processes to the Project Team and advocate for new tools and approaches to address these issues. GMOB recommends that the Project Team meet with local contractors to discuss opportunities for improving contracting processes.	<b>NOT ADDRESSED:</b> The Project Team identified Parsons, the Main Construction Manager, as responsible for engaging with the business community and gathering lessons learned on contracting tools used to procure work on the site. This is valid but does not address the concern that GMOB highlighted, which was to actively listen to and consider the input of local contractors who are affected by the federal policies on how contracts are set up, awarded and managed.

YEAR and RECOMMENDATION #	TOPIC	STATUS
<b>Engagement</b>		
2016-3A 2017-2 2018-3	Give priority to engagement and communications with the public and the Parties to the Giant Mine Remediation Project Environmental Agreement.	<b>IN PROGRESS:</b> Public engagement and communications continue to improve although it is unclear the degree to which the general public is aware of and supports Project activities and planned outcomes.
2016-9 2017-3 2018-2 2019-2	Ensure all Parties to the Giant Mine Remediation Project Environmental Agreement have adequate resources to fully participate in all aspects of the Project.	<b>ADDRESSED:</b> Proposal-based funding is addressing resource needs of the various Parties.
2018-4 2019-3	More information and engagement from the City of Yellowknife that ensures citizens know about social and economic benefits.	<b>ADDRESSED:</b> The City of Yellowknife developed and regularly updates a Giant Mine information webpage.
2020-6	The City of Yellowknife make the website interactive to enable Yellowknife residents to provide their input to the Project.	<b>ADDRESSED:</b> The City of Yellowknife's webpage includes a contact email.
2020-5	Identify indicators to enable the measurement of the effectiveness of engagement and communications activities.	<b>NOT ADDRESSED:</b> The Project Team has not responded to this recommendation.
2021-1	To enhance project oversight activities, GMOB recommends that the Project Team undertake more active reporting on key indicators of trends in each of the seven areas: 1) Environment, 2) Economy, 3) Engagement, 4) Reconciliation, 5) Project Management and Planning, 6) Community Health and Wellness, and 7) Long Term Planning.	<b>NOT ADDRESSED:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." GMOB encourages the Project to continue to identify key indicators and actively report on them.

<b>Reconciliation</b>		
2016-3B 2017-4 2018-5 2019-4	Respond to the requests from the Yellowknives Dene First Nation for an apology and compensation.	<b>IN PROGRESS:</b> There has been reported progress in the negotiations between the Government of Canada and the Yellowknives Dene First Nation regarding an apology and compensation.
2021 – 1	To enhance project oversight activities, GMOB recommends that the Project Team undertake more active reporting on key indicators of trends in each of the seven areas: 1) Environment, 2) Economy, 3) Engagement, 4) Reconciliation, 5) Project Management and Planning, 6) Community Health and Wellness, and 7) Long Term Planning.	<b>NOT ADDRESSED:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." GMOB encourages the Project to continue to identify key indicators and actively report on them.

YEAR and RECOMMENDATION #	TOPIC	STATUS
<b>Project Management and Planning</b>		
2016-2	Develop performance measures to enable monitoring of the Remediation Project.	<b>IN PROGRESS:</b> The Type A Water Licence granted by the Minister of Northern Affairs on September 18, 2020, in accordance with the <i>Mackenzie Valley Resource Management Act</i> , partially addressed the need for indicators. Additional work on indicators for the <i>Status of the Environment Report</i> is underway.
2016-4	Develop a Traditional Knowledge Strategy.	<b>NOT ADDRESSED:</b> The Government of the NWT funded the <i>Yellowknives Dene First Nation Traditional Knowledge Study</i> in 2017/18 but no formal traditional knowledge strategy for the Remediation Project has been released.
2016-5A	Identify foreseeable additional advanced remedial work required prior to full remediation.	<b>ADDRESSED:</b> Achieved through ongoing monitoring, application of lessons learned and responsiveness to change.
2016-5B	Develop, monitor, and report on a risk profile of the site.	<b>ADDRESSED:</b> Achieved through ongoing monitoring and communication of trends in the risk profile.
2016-6	Identify and mitigate delays in remediation planning.	<b>ADDRESSED:</b> Due to regulatory approvals, active remediation began in 2021.
2016-10	Consider options to a government-driven and controlled approach to the Project.	<b>NOT ADDRESSED:</b> No action was taken aside from contracting the Main Project Manager.
2017-5 2018-6 2019-5	Provide a five-year project plan and critical path to link and integrate aspects of the Project.	<b>NOT ADDRESSED AND NO LONGER RELEVANT:</b> No explicit action was taken although the Project now has regulatory authority to proceed with full reclamation within specific parameters and timelines. As such, this is no longer relevant.
2017-6 2018-7	Describe the Main Construction Manager's responsibilities.	<b>ADDRESSED:</b> Responsibilities are articulated.
2017-7	Provide results of Independent Peer Review Panel on remediation and stabilization of arsenic dust.	<b>ADDRESSED:</b> The Panel provided results on one occasion.
2017-8 2018-8	Complete measures five and six in the Mackenzie Valley's Environmental Impact Review Board's Report of Environmental Assessment.	<b>IN PROGRESS:</b> The Quantitative Risk Assessment is being conducted and results will be integrated on an ongoing basis into plans for the Remediation Project.
2017-9	Mackenzie Valley Land and Water Board to consider an interim water license.	<b>NOT ADDRESSED AND NO LONGER RELEVANT:</b> Rejected by the Mackenzie Valley Land and Water Board and the Project Team. This recommendation is no longer relevant.

YEAR and RECOMMENDATION #	TOPIC	STATUS
<b>Project Management and Planning CONTINUED</b>		
2021-1	To enhance project oversight activities, GMOB recommends that the Project Team undertake more active reporting on key indicators of trends in each of the seven areas: 1) Environment, 2) Economy, 3) Engagement, 4) Reconciliation, 5) Project Management and Planning, 6) Community Health and Wellness, and 7) Long Term Planning.	<b>NOT ADDRESSED:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." GMOB encourages the Project to continue to identify key indicators and actively report on them.
2021 - 3	The Project Team's annual water Licence Report will inform GMOB's project management and planning oversight activities. This report will be helpful in tracking progress, identifying deviations in schedules, and discerning trends. GMOB recommends that the Project Team identify key project management and planning indicators that can be consistently monitored and reported in the annual report and the Project Team's upcoming Status of the Environment Report.	<b>IN PROGRESS:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." However, the GMRP did respond positively to this recommendation with the State of Environment Report and marked changes in their Annual Report to GMOB. GMOB encourages the Project to continue to identify key indicators and actively report on them.

<b>Health and Wellness</b>		
2016-8 2017-12 2018-11 2019-7	Deal with offsite contamination issues including land use, safety, public health, and environmental concerns.	<b>IN PROGRESS:</b> Risk assessment work and improved public engagement and communications are progressing to address these issues.
2016-12 2017-11 2018-10	Communicate effectively on studies that address arsenic contamination and risk and health studies.	<b>IN PROGRESS:</b> Improved public engagement and communications are progressing to address these issues.
2018-4 2019-3	Improve the City of Yellowknife's engagement of local residents in all aspects of the Remediation Project.	<b>ADDRESSED:</b> The City of Yellowknife has developed and regularly updates its Giant Mine information webpage which includes a contact information webpage which includes a contact email.
2020-7	Continue to improve engagement and communications activities to ensure that local people: a) are not experiencing unnecessary stress or fear due to dust coming off the Giant Mine site, and b) understand the three main types of site remediation standards - residential, industrial, undisturbed – and how they apply to the site.	<b>IN PROGRESS:</b> Improved public engagement and communications are progressing to address these issues.
2021-1	To enhance project oversight activities, GMOB recommends that the Project Team undertake more active reporting on key indicators of trends in each of the seven areas: 1) Environment, 2) Economy, 3) Engagement, 4) Reconciliation, 5) Project Management and Planning, 6) Community Health and Wellness, and 7) Long Term Planning.	<b>NOT ADDRESSED:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." GMOB encourages the Project to continue to identify key indicators and actively report on them.

YEAR and RECOMMENDATION #	TOPIC	STATUS
<b>Long Term Planning</b>		
2017-8	Complete measure six in the Mackenzie Valley's Environmental Impact Review Board's Report of Environmental Assessment.	<b>ADDRESSED:</b> While this measure was addressed, GMOB considers the outcome unsatisfactory.
2019-6	Use legislation to guarantee long-term funding.	<b>NOT ADDRESSED:</b> No progress has been made on long-term funding.
2019-8	Develop a land-use plan for the site.	<b>NOT ADDRESSED:</b> No progress has been made to develop an onsite land-use plan.
2020-4	Ensure northerners have central roles in the care, maintenance, and management of the Giant Mine site into the future.	<b>NOT ADDRESSED:</b> The development of a perpetual care plan continues to be delayed.
2021-1	To enhance project oversight activities, GMOB recommends that the Project Team undertake more active reporting on key indicators of trends in each of the seven areas: 1) Environment, 2) Economy, 3) Engagement, 4) Reconciliation, 5) Project Management and Planning, 6) Community Health and Wellness, and 7) Long Term Planning.	<b>NOT ADDRESSED:</b> The Project Team stated in its response to the GMOB 2021 Annual Report recommendation that, "The Project team does not support the development of additional indicators to those that have already been developed." GMOB encourages the Project Team to continue to identify key indicators and actively report on them.
2021-4	It is expected that a request for proposals to develop a perpetual care plan will be issued by May 2022. GMOB is hopeful that inefficiencies associated with a committee-based approach to drafting the request for proposals will not create further delays. GMOB strongly recommends that the Project Team permit no further delays in the preparation of an appropriate perpetual care plan.	<b>NOT ADDRESSED:</b> The Project Team stated that, the RFP for the perpetual care plan was intended to be tendered in the fall of 2022, and it is expected that a consultant will be retained towards the end of 2022 to begin drafting the first official version of the PCP. GMOB has not seen this progress to date.



## APPENDIX B

### Overview of GMOB Funded Research

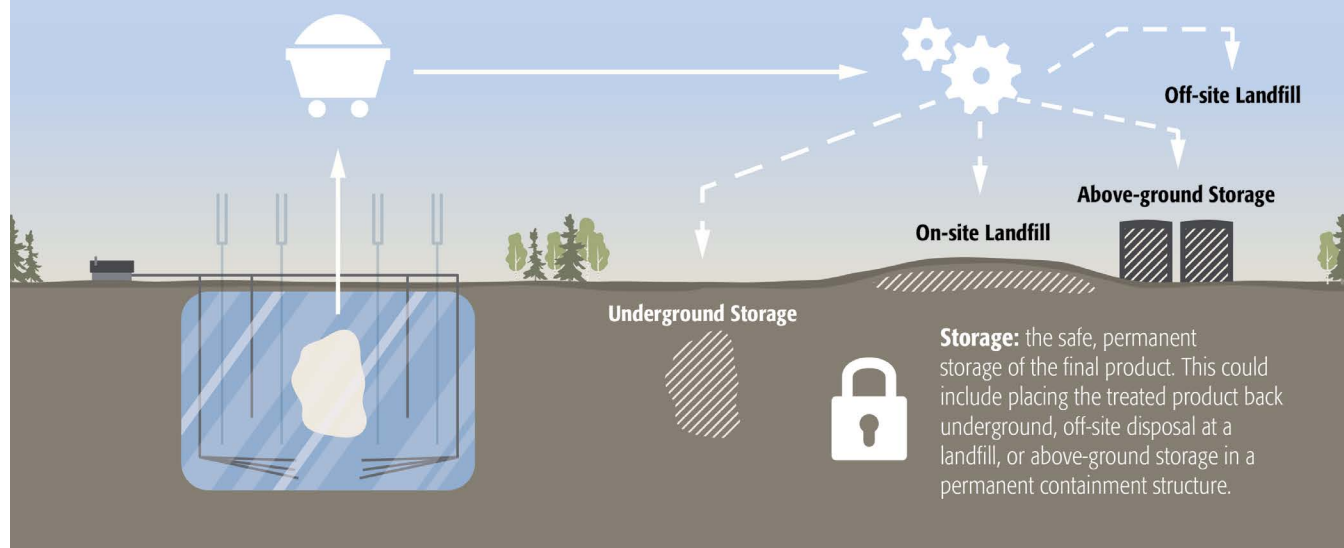
Article 7 of the Giant Mine Remediation Environmental Agreement tasks GMOB with undertaking research into technical approaches that do not require constant and forever care and maintenance of the arsenic trioxide at the mine site. As shown in the figure below, a permanent solution must tackle three key challenges: extraction of the dust, transformation to a much less toxic material, and safe storage of the final product.

#### Key Challenges to Address for a Permanent Solution to Arsenic Trioxide Dust Stored Underground at Giant Mine

A successful permanent solution will have to address three key challenges:

**Extraction:** if the dust is to be treated outside of the mine, a removal method is needed to safely extract it from the underground chambers. Its high toxicity and ability to dissolve means it is critical to prevent potential contact of the dust with liquid water.

**Transformation:** the transformation of the arsenic trioxide into something more stable. This may be achieved by transforming it into a different chemical, or by encapsulating it in another substance to stabilize it.



#### Background

In 2018, GMOB partnered with TERRE-NET, an integrated network of leading academics from universities across Canada who work toward managing mine tailings and mitigating contamination. One of TERRE-NET's goals is to find sustainable ways to deal with environmental challenges associated with the resource sector, including the management of hazardous wastes from mines. These experts work in various scientific and social science fields.

TERRE-NET is headquartered at the University of Waterloo. GMOB has asked TERRE-NET to focus on technology that will transform the arsenic trioxide into a stable, much less toxic material.

**A summary of the research projects and progress to date.**

## PROJECT 1

### Understanding the important chemical properties of the arsenic trioxide dust from Giant Mine

**Why is this Important?** There is evidence of important differences in the composition of arsenic trioxide dust created over the years that Giant Mine operated. The differences are due to differences in the rock that was mined, and the conditions used for roasting the ore. When a way to treat and stabilize the arsenic trioxide dust is found, it must work for all the dust stored across the site, regardless of these differences.

**Research Team:** University of Saskatchewan and Queen's University

**Progress to date:** The research confirms that the toxic dust contains many substances other than arsenic trioxide. Arsenic in the dust consists mostly of arsenic trioxide, however the arsenic molecules are often also associated with antimony (Sb). Both arsenic and antimony are also associated with oxides and sulfides, iron and calcium. Identification of these various substances will inform the other research projects focused on ways to stabilize arsenic trioxide. The research team reported excellent progress on all aspects of this project and expects to complete all proposed objectives during 2023.



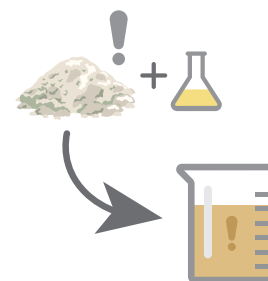
## PROJECT 2

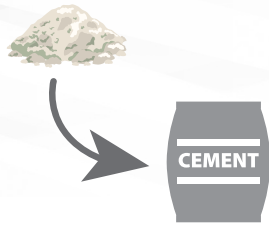
### Chemically changing the arsenic trioxide into a less toxic material that doesn't dissolve as easily in water

**Why is this Important?** While freezing the arsenic trioxide dust prevents it from entering local ground or surface water sources, it does not permanently change it into a non-toxic material. The goal of this project is to change the arsenic from arsenic trioxide to arsenic trisulphide - also called orpiment. The process of transforming arsenic waste from  $\text{AsO}_3$  to  $\text{AsS}_3$  is called sulfidation. Arsenic trisulphide or orpiment is much more stable in the environment than arsenic trioxide because it doesn't dissolve as easily in water.

**Research Team:** University of Ottawa

**Progress to date:** Researchers have confirmed that it will be necessary to dissolve the arsenic trioxide dust in very hot water (220° Celsius) for 10 minutes before chemically treating it with hydrogen sulphide gas and forming the less toxic arsenic trisulphide. Further work is underway to understand the optimal conditions for the chemical reaction and for possible ways to produce hydrogen sulphide gas onsite if this method becomes feasible.





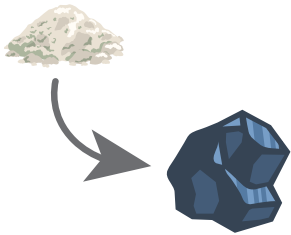
## PROJECT 3

### Stabilizing arsenic trioxide dust by mixing it with cement

**Why is this Important?** More than 20 years ago, research was completed to look at the feasibility of stabilizing arsenic trioxide dust by mixing it with cement. Results from that time were variable and further research was stopped due to the acceptance of the frozen block method of storage. This research project revisits this idea aiming to create cement-based paste backfill with the arsenic trioxide dust. If stable, the paste could be deposited underground at the mine.

**Research Team:** University of Alberta and the Université du Québec en Abitibi-Témiscamingue

**Progress to date:** Research focused on making samples of paste backfill with different ratios of arsenic trioxide dust and cement. The research team also tried different conditions for curing the cement mix to maximize stability. The different recipes of cement were tested for their ability to resist crushing and their resistance to leach arsenic when exposed to water. More detailed results will be shared in 2023.



## PROJECT 4

### Transforming arsenic trioxide dust into a type of glass

**Why is this Important?** The process of stabilizing arsenic trioxide by transforming it into a type of glass is called vitrification. This method has been used in other countries to stabilize arsenic trioxide dust produced from mining. While understanding that the exact composition of arsenic trioxide dust varies from mine site to mine site, GMOB thought it would be useful to have samples of the Giant Mine arsenic trioxide vitrified and then have researchers test the long-term stability of the product. The vitrification of the dust is being performed by a Canadian company called Dundee Sustainable Technologies.

**Research Team:** University of Waterloo

**Progress to date:** In 2020, Dundee Sustainable Technologies initiated the vitrification of three sets of arsenic trioxide samples. Researchers began to analyze the vitrified product, simulating natural conditions by crushing the glass and exposing it to acidic, basic, and neutral conditions with water similar to that present underground, as well as water similar to Great Slave Lake. Arsenic release or leaching test results show some promise but depend on environmental conditions, the glass formulation, and the arsenic dust composition. More detailed results will be shared in 2023.



**In 2021, external funding through the Natural Sciences and Engineering Research Council of Canada created three additional and complementary TERRE-NET research projects. These projects are detailed below.**

## **PROJECT 5**

### **Chemically changing arsenic trioxide dust into a less toxic and more stable arsenic iron mineral**

**Why is this Important?** As discussed in Projects 2 and 6, freezing the arsenic trioxide dust chambers prevents entry of the contaminant into ground or surface water sources. Freezing does not permanently change the dust into a non-toxic material. The goal of this project is to alter the form of arsenic from arsenic trioxide to an arsenic-bearing iron mineral including ferric arsenate and arsenical ferrihydrite that is much more stable in the environment than arsenic trioxide.

**Research Team:** University of Saskatchewan

**Progress to date:** This project is planned to start by mid 2023.

## **PROJECT 6**

### **Using microbes to change arsenic dust into a less toxic and more stable arsenic sulphide mineral**

**Why is this Important?** As discussed in Projects 2 and 5, freezing the arsenic trioxide dust chambers prevents entry of the contaminant into ground or surface water sources. It does not permanently change the dust into a non-toxic material. The goal of this project is to alter the form of arsenic from arsenic trioxide to an arsenic-bearing sulphide mineral. Arsenic-bearing sulphides can be much more stable in the environment than arsenic trioxide.

**Research Team:** University of Waterloo

**Progress to date:** This project was delayed and is due to start in mid-2023.

## PROJECT 7

### Using antimony as a substitute for arsenic to identify geochemical processes related to the weathering of arsenic dust

**Why is this Important?** Understanding the chemical transformation processes of the arsenic trioxide dust is critical to finding a permanent stabilization solution. Isotopes analysis is a common and powerful tool used to enhance understanding of chemical changes. An isotope is just another form of the same element. For example, oxygen is an element, and like all elements is made up of electrons, a nucleus, and protons. An isotope of oxygen is just oxygen with a different number of protons. Scientists can use different isotopes to help find the source of an element.

We cannot look at arsenic isotopes because arsenic has only one isotope. However, the element antimony is present in the arsenic trioxide, behaves in a similar manner to arsenic, and has isotopes that can be used to trace chemical processes associated with the stabilization experiments. This project could help find the source of arsenic and antimony across the Giant mine site and surrounding areas. It could also help us identify where and how arsenic and antimony are moving - and whether their source is natural or man-made.

**Research Team:** University of Waterloo

**Progress to date:** Research to date focused on an analytical method for using antimony as a proxy for arsenic. Once this method is established and refined, samples of Giant Mine water and from the other research projects will be analyzed to monitor progress during arsenic trioxide stabilization. The research team reported a delay during 2022 but expects progress on this research in 2023.



## GMOB Board of Directors



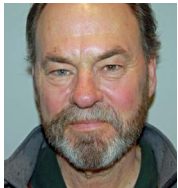
David Livingstone  
Chairperson  
Yellowknife, NT



Mark Palmer  
Director  
Edmonton, AB



Dr. Ken Froese  
Director  
Yellowknife, NT



Ken Hall  
Director  
Yellowknife, NT



Graeme Clinton  
Director  
Yellowknife, NT



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