



GIANT MINE Oversight Board

Box 1602 . 5014-50th Avenue . Yellowknife, NT X1A 2P2
Phone 867.675.0788 . **Fax** 867.675.0789 . **Web** www.gmob.ca

Ms. Natalie Plato

Deputy Director

Giant Mine Remediation Project

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)

June 18, 2019

Freeze Program

Thank you for your letter of May 14, 2019 wherein you refer to the Giant Mine Oversight Board public meeting held May 1, 2019 and in particular, to a discussion about alternatives to the “frozen block” method, or the “Freeze Program”.

During that discussion, Mr. Livingstone mused about alternatives to the Freeze Program and his personal optimism that a method to permanently address the risks posed by the arsenic trioxide currently stored underground could be found within two decades. He also questioned the value of proceeding with the very expensive Freeze Program at this time given the considerations already raised by GMOB in our comments on the GMRP Closure and Reclamation Plan (CRP).

In GMOB’s comments on the CRP last fall (see attached), we asked questions about whether the Freeze Program was justified given that 1) it is only meant to be in interim solution, and 2) that the primary failure modes that could lead to arsenic release appear to have been addressed by other mechanisms (e.g., mine dewatering and underground stabilization). As stated in our most recent set of comments submitted to the Mackenzie Valley Land and Water Board on May 30, 2019, we do not feel that the GMRP has adequately addressed our concerns and have suggested that the topic continue to be discussed at the Technical Sessions in July 2019.

With regard to GMOB’s research program, and as we discussed at the public meeting, the program is in the very early stage. Based on our discussions with the Terre-NET group of experts, we plan to move forward with a series of studies that will further characterize the arsenic trioxide dust stored underground and examine several options for rendering the arsenic trioxide dust much less toxic and/or less mobile in the environment. The latter options include vitrification, encapsulation in a cement slurry and converting the arsenic trioxide to the low-solubility sulphide mineral orpiment. While GMOB acknowledges there are many technical challenges and uncertainties associated

with developing a permanent solution for arsenic trioxide, we are of the view that it will take significantly less than 100 years to find and implement that solution. It should be emphasized that while studies have shown that the frozen block method is currently the best available method to isolate the arsenic trioxide stored underground, that statement is based on current knowledge. It does not take into account the likelihood that research will identify new technologies or prove out currently unproven technologies – research the Project Team has not undertaken in the intervening 16 years since the original assessments.

Given these and other considerations, GMOB has been discussing internally for some time now whether it makes sense to undertake the very expensive Freeze Program at this time, or indeed for the foreseeable future. To our knowledge, the Project Team has not re-examined its decision to implement the freeze option in light of the changes to the Project (e.g., freeze as an interim solution only) and advances in mine remediation science in the intervening 16 years. This strikes us as unusual in that most undertakings of this magnitude would warrant such a re-examination if for no other reason than to confirm the original assumptions.

In summary, GMOB continues to recommend that the Project Team provide additional information to justify the implementation of the Freeze Program as a temporary management approach for the arsenic trioxide dust. This information is needed to ensure regulators and stakeholders understand the failure modes and risks the frozen block method is intended to mitigate. We suggest this discussion should take place as part of the water licensing process since our questions are already on the MVLWB record.

Sincerely,

A handwritten signature in black ink, appearing to read "Kathleen Racher".

Dr. Kathleen Racher
Chair, Giant Mine Oversight Board

cc Parties to the EA

Attachment: Excerpt from GMOB Comments on June 2018 Version of the GMRP's Closure and Reclamation Plan

- Original comments were submitted to the GMRP on October 28, 2018
- GMRP responses to those comments were submitted to the MVLWB as part of the water licence package
- GMOB reviewed all of the responses and assessed whether we felt the issues had been addressed or not – this assessment was uploaded to the MVLWB online review system, see: http://wbors.yk.com/LWB_IMS/ReviewComment.aspx?appid=12703

Comment #	Reviewer	Topic	Comment (submitted October 28, 2019)	Proponent Response	GMOB Assessment of Proponent Response (submitted May 30, 2019)
34	GMOB	Temporal Scope	<p>In its EA decision, MVEIRB authorized the remediation project to proceed, subject to a number of conditions. Of particular importance to the Freeze Program, MVEIRB restricted the temporal scope of the project as follows:</p> <p>Measure 1: To prevent the significant adverse impacts on the environment and the significant public concern from the proposed perpetual timeframe, the Project will proceed only as an interim solution, for a maximum of 100 years.</p> <p>The measure was issued primarily to address technical and public concerns related to the permanence of freezing arsenic trioxide in situ. Further, the EA decision made it clear that an alternate, more permanent solution needed to be identified, assessed and implemented within the 100-year time frame.</p> <p>The CRP does not address this temporal limitation and there is no evidence to suggest the freeze program has been designed as an interim solution. Previous documentation (e.g., the DAR) presented detailed information supporting the Project Team's conclusion that the Freeze Program was the best alternative for permanent management of arsenic trioxide. However, the CRP does not provide a similar rationale for why the Freeze Program is the best interim solution for the same material. We suggest that the such a rationale be incorporated into the CRP. The document could also identify any design changes that were made in response to the change of temporal scope.</p>	The GMRP has provided further clarity on this in the CRP, and has concluded that the freeze program is suitable for the 100 year timeframe.	<p>GMOB has reviewed the revised material and did not identify any new information that addresses our request. In particular, we have not seen evidence verifying that the proposed freeze program is the most appropriate solution for a project that is limited to a maximum duration of 100 years.</p> <p>Status: Unresolved</p> <p>Next Steps: Discussion during the technical sessions</p>
35	GMOB	Freeze Justification as an Interim Solution	<p>As indicated in Table 5.2-2, the primary Closure Objective for arsenic trioxide management is to ensure the waste "is not and will not become a source of contamination to the environment." There are two fundamental mechanisms by which arsenic trioxide stored underground could be a source of environmental contamination: 1) through a physical release of arsenic dust; and/or 2) arsenic dissolution into water that subsequently leaves the site.</p> <p>With regard to a physical release, the Project Team has undertaken and plans to undertake actions intended to address such risks. In particular, the Site Stabilization Program (SSP) is reinforcing structures in the mine that are vulnerable to physical failure. It is our understanding that these actions are intended to significantly reduce the probability that major physical failures will occur, thereby reducing</p>	Evaluation of alternative remedial options for the arsenic trioxide dust are summarized in Section 6.2 in the DAR, and it is noted that the freeze program had the lowest risk of arsenic release and worker safety.	GMOB understands the Project Team's rationale for selecting the freeze program as a remedial solution that would exist indefinitely. However, by limiting the temporal scope of the project to 100 years, the justification for the freeze is less clear. Specifically, the primary failure modes

Comment #	Reviewer	Topic	Comment (submitted October 28, 2019)	Proponent Response	GMOB Assessment of Proponent Response (submitted May 30, 2019)
			<p>the chances that arsenic will be released on surface or migrate deeper into the mine.</p> <p>In terms of arsenic solubilization, the Project Team asserts that realignment of Baker Creek will effectively eliminate the risk that the arsenic trioxide vaults/chambers will be exposed to large quantities of water, reducing the potential for arsenic solubilization. In addition, any arsenic that is released to the groundwater system will be contained within the drawdown cone and treated to drinking water standards prior to discharge to the environment.</p> <p>Once fully implemented, the actions noted above should make a major contribution in efforts to achieve the primary Closure Objective. If the site continues to be under institutional control (e.g., the water management system continues to function), we are unaware of any mechanisms by which the arsenic trioxide stored underground could become a significant source of environmental contamination. This is aside from the proposed Freeze Program which, as we understand it, is intended as an additional layer of defense against potential arsenic discharges. If that is the case, it should be explicitly stated in the CRP. Alternatively, if there are other justifications for implementing the Freeze Program, they should be described in detail.</p> <p>With respect to site stabilization, the Project Team has stated that the Freeze Program will physically stabilize the area surrounding the arsenic trioxide, thereby limiting the potential for structural failures and arsenic releases. Based on our current understanding of the problem, we fail to understand how freezing the rock, bulkheads and dry dust will mitigate potential physical failures.</p> <p>In summary, additional information on the justification of the Freeze Program should be incorporated into the CRP. This information is needed to ensure regulators and stakeholders understand the failure modes and risks the Freeze Program is intended to mitigate.</p>		<p>that could lead to arsenic release appear to have been addressed by other mechanisms (e.g., mine dewatering and underground stabilization). Additional information on the justification of the Freeze Program should therefore be incorporated into the CRP. As stated in the original comment, this information is needed to ensure regulators and stakeholders understand the failure modes and risks the Freeze Program is intended to mitigate.</p> <p>Status: Unresolved</p> <p>Next Steps: Discussion during the technical sessions</p>