INFORMATION REQUEST RESPONSE

EA No: 0809-001 **Information Request No: Review Board #14**

Date Received

February 28, 2011

Linkage to Other IRs

Review Board IR #01, 02, 05, 07, 12, 13, 15, 16, 20

Date of this Response

June 17, 2011

Request

Preamble:
In evaluating risks or accidents and malfunctions, the Review Board must consider any stability issues arising from the proposed arsenic saturation and freezing method. The DAR raises the possibility of moving or agitating the water and arsenic dust during saturation while the perimeters of the chambers and stopes are already frozen, and may be swollen by the freezing.

Question:

1. Please provide a stability analysis to prove that cavities will remain stable during perimeter freezing, saturation of dusts, freezing of dust.

2. Please describe drainage scenarios and any other potential releases or arsenic in the event of a collapse or bulkhead failure.

Reference to DAR (relevant DAR Sections)

S. 6.2.6 Initial Freeze
S. 5.1.4 Stability of Arsenic Trioxide Dust Storage Area Crown Pillars
Dec 13, 2010 Deficiency Statement #1, 2.

Reference to the EA Terms of Reference

ToR 3.2.5

Response 1

Stability of the arsenic stopes/chambers cannot be 'proven' given the uncertainties in rock characterization and loading conditions. However, an evaluation of the existing stability analyses previously carried out is in progress. These analyses have assessed the likelihood of failure of the arsenic stopes and chambers, and adjacent non-arsenic stopes prior to freezing and saturation.

Preliminary results of the design evaluation suggest that the likelihood of failure of various arsenic stopes is similar to that outlined in Section 5.1.4 of the Developer's Assessment Report (DAR).

The current phase of design work will also include recommendations for future geotechnical investigations, stability analyses, and possible short-term performance monitoring requirements for specific arsenic stopes and chambers and nearby stopes. The need for mitigation of the risk of instability of nearby stopes will be considered where this has the potential to affect the implementation of the remedial design.

The design evaluations will consider the potential for the implementation of perimeter freezing, saturation of dusts, and freezing of dust to cause arsenic stopes and chamber failure. Preliminary comments on these issues follow.

Perimeter freezing

- Unsupported or under-supported rock wedges subjected to freezing may become detached from the rock mass but the effects are anticipated to be local and no major instabilities are expected. Freeze/thaw cycles would increase the potential for wedge stability issues and their magnitude but these are not anticipated under the proposed design.

- The lower bulkheads will be reinforced with drift plugs and drift backfilling prior to freezing and wetting. The impact of slabs falling off the arsenic stope or chamber walls and into the arsenic dust will be minimal.

Saturation of dust

- Saturation of the dust could result in settlement of the dust that would increase open stope hanging-wall, foot-wall, and end-wall spans. The potential impact of dust consolidation will be addressed in the final design, as required.

- During the wetting or flooding process some local rock wedges may be impacted by the changing groundwater pressures but the effects are anticipated to be local and no major instabilities are expected.

- The potential impact on pillars separating adjacent stopes of ground loads caused by saturation of the dust will be the subject of a future geotechnical assessment. The impacts are anticipated to be minimal as non-arsenic stopes separated by thin pillars from arsenic stopes will be backfilled and the pillars frozen prior to saturation.

Freezing of dust

- The final design will assess the optimum approach to freeze the added water in the dust to prevent significant increase in pressure that may impact the stability of the arsenic stopes and chambers or the lower arsenic drift plug / bulkhead combinations.

Response 2

The preliminary remediation design approach includes measures to reduce the probability of pillar collapse or bulkhead failure which could lead to drainage of contained arsenic contaminated water, saturated arsenic dust, or dry arsenic dust.

The closure/remediation design includes new drift plugs that will be installed in all drifts and raises connected to or adjacent to arsenic stopes or chambers to isolate them from the "clean" and/or non-frozen areas of the mine. New drifts will be excavated to gain access to currently inaccessible bulkheads for plug construction. The drift plugs will be built within the zone of rock to be frozen. Many of these new drift plugs will be built directly adjacent to the existing bulkheads and will be designed to withstand the pressure from the maximum possible column of saturated arsenic dust. The combined existing bulkhead /new plug structure will be designed to resist structural failure. In the few cases where the new lower arsenic drift plugs will be built away from existing bulkheads, the intervening drifts will be backfilled and frozen prior to saturation of the dust. Potential seismicity will be included in the designs.

The impact of frost pressure due to freezing on the combined bulkhead / drift plug structure is outlined in response to IR #14, Question 1, but information gained during the Freeze Optimisation Study (FOS) will be incorporated into the final designs.

However, any resulting leaks will be captured in the general mine pool and treated in the water treatment plant.