INFORMATION REQUEST RESPONSE

EA No: 0809-001 **Information Request No: Review Board # 15**

Date Received:

February 14, 2011

Linkage to Other IRs:

Review Board IR # 8, 12, 13

Date of this Response:

May 31, 2011

Request

Preamble:
The proposed project involves saturating and freezing chambers with water, despite the possible presence of many unidentified holes and open voids. The project description in the DAR suggests that although detected and pluggable holes will be filled with fine-granular material, pre-existing undetected or unpluggable holes will remain open until the caverns are saturated with water. It is unclear how this may affect the freezing process, and whether it may cause other potential impacts.

Question 1:
With respect to holes and voids in chambers during freezing:

- Please define scenarios which include the presence of variable number/section of undetected/unpluggable holes

Question 2:
With respect to holes and voids in chambers during freezing:

- Please verify that freezing will be possible under flow

Question 3:
With respect to holes and voids in chambers during freezing:

- Please describe potential impacts and implications, such as possible losses of contaminants, over-costs of pumping/treatment, etc.

Reference to DAR (relevant DAR Sections):

S. 6.2.8.1 Influence of Groundwater
S. 6.2.5.2 Underground Preparation
S. 5.2 Other Underground Mine Components
S. 5.2.6 Boreholes

Reference to the EA Terms of Reference:

S. 3.3.2 ---

Response 1 Summary

Unknown water pathways in the rock may be encountered during the execution of the freeze program. The plan is to backfill and plug known exits for water. If leaks are detected during drilling and the water flow is such that the frozen shell does not stop it, then additional measures will be considered such as grouting. A plan will be developed as part of future design phases for adding water to the chambers/stopes and will include a program for monitoring.

Response 1

Records show that attempts were made to plug drill holes into chambers prior to placing the arsenic trioxide dust. Current information indicates the rock around the arsenic chambers/stopes is generally competent with a low permeability. Known pathways for water to leave the chambers/stopes are drifts and raises. These exits will be backfilled and plugged prior to filling the chambers/stopes with water.

Undetected pathways for water to exit the chamber/stope may be identified during drilling for the freeze pipes. Possible scenarios might be old drill holes or fractures in the rock. However, the flow of water through these undetected pathways is expected to be limited; the rock within the freeze perimeter will be cooler than -10°C and water in any fracture would eventually freeze. If unexpected leakage is detected and the frozen shell does not stop the flow, additional measures such as grouting may be reviewed and evaluated as part of the response plan. Should water containing arsenic leak from a chamber/stope, it will report to the general mine water and be treated by the water treatment plant as is currently the case.

Response 2 Summary

Water is expected to freeze under flow.

Response 2

Once the frozen shell is in place, freezing is expected under flow. It is anticipated that the filling of the chambers/stopes will include a gradual increase in the head during flooding. As stated in Review Board IR #8, Response #2, if water seepage is not stopped initially by the frozen shell, the hydraulic

conductivity of the dust will limit the flow rate of water into the fracture. With the rock at a temperature cooler than -10°C the slow moving water would quickly freeze and the ice buildup would seal the fracture.

Response 3 Summary

There will be a limited impact on pumping and treatment costs of leaks from the chambers/stopes because of the relatively small flow rate from such leaks compared to the overall mine drainage and treatment system.

Response 3

Water will be added to the chambers/stopes after the frozen shell is in place and the potential impact from water leaking out of a chamber or stope is considered low. During the time when water is added to the chamber/stope, monitoring in access drifts will be conducted until the frozen block is created. Water that may leak out of the frozen shell would not progress very far unless the leak intersects a drift. Once water from a leak intersects a drift, it will flow into the mine water drainage system and be treated by the water treatment plant. Given the relatively low flow volume from the leak and the relatively larger amount of water that will be treated by the water treatment plant, the overall impact on pumping and treatment costs is considered negligible.

The existing remediation plan proposes a separate system to treat water that may have high concentrations of arsenic until the frozen blocks are all in place. After the blocks are frozen, arsenic concentrations in mine water should fall because the main source of arsenic in the mine water to be treated is seepage from the chambers/stopes that contain arsenic trioxide dust.