INFORMATION REQUEST RESPONSE

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Linkage to Other IRs

Review Board #08
Alternatives North IR #09

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Request

Preamble: Instrumentation is proposed to monitor the freezing system used to contain arsenic trioxide dust in underground storage areas. Monitoring activities are proposed to: include a ground monitoring system; monitoring of the freezing fluid characteristics during the active or hybrid phase of freezing; and, monitoring of gas pressure and heat loss during the passive phase of freezing.

It was indicated that the proper functioning of the ground freezing system would imply the absence of arsenic trioxide leaks from the containing chambers. For the first step of the freezing process an initial objective was outlined to maintain ground temperature colder than -10°C over a distance of at least 10 m around and below each chamber stope. An overall long term performance target to maintain the water and arsenic dust to at least -5°C was outlined for the active freezing phase. Modelling results indicated that active freezing would be required for the first five years of operation and it was estimated that it would take up to ten years for all the dust in the mining stopes to reach - 5°C.

A set of contingency measures were outlined for the freezing system during both the initial freezing process and the long term passive phase; however, the contingency measures were not tied to specific performance criteria. It is noted that in Section 14: Environmental Monitoring of the DAR no specific performance criteria or monitoring schedule for the freezing system are provided.

Question:

a. It is requested that specific performance criteria for the temperature of the freezing system are defined to correspond to the contingency measures that are outlined for the freezing system during the initial freezing, active, and passive phase of operation.
b. It is requested that a schedule for monitoring all characteristics to understand the freezing system performance be provided.

Reference to DAR (relevant DAR Sections):

S. 14

Summary

During the long-term passive operations, there will be adequate time to investigate any irregularities in the monitoring data and choose appropriate mitigation measures. An example is presented to illustrate the general steps.

Instrumentation will produce real-time data, which will be forwarded to a data management system and will be available for operators to view at any time. An annual report will present a summary of the data trends.

Response a

During the initial active freezing or hybrid freezing, a failure to meet performance criteria would simply result in an extension of the active/hybrid freezing process, and a delay in the conversion to fully passive operation.

During the long-term passive operations, there will be adequate time to investigate any irregularities in the monitoring data and choose appropriate mitigation measures. The thermal modeling reported in the Developer's Assessment Report (DAR) indicates that, once the frozen blocks are established, it would take many years for thawing to penetrate to the arsenic dust even in the case of a complete failure of the freezing system. Given that time frame, it is more appropriate to allow future operators the flexibility to investigate problems and design contingency actions to specifically address the location and severity of any deficiency.

It is, however, possible to provide an example to illustrate the general steps. If we assume that the first indication of a possible performance problem is a reading of lower than expected temperatures at some point in the frozen block, the hierarchy of response measures would be:

- Conformity checks to determine whether the readings are erroneous;
- If the readings are questionable, removal and re-calibration of instruments and/or installation of additional temperature monitoring devices;
- Infrared examination and pressure testing of thermosyphons in the problem area, and replacement of any defective components;
- Once the monitoring readings are proven to be reliable and the hardware checked, more active interventions would be considered, including:
  - Changes to thermosyphon radiator sizes to increase cooling power;
  - Installation of additional thermosyphons to provide additional cooling power in a localized area of deficiency;

- Re-conversion of some of the thermosyphons to hybrid operation to allow year-round cooling;
- Conversion of some of the thermosyphons to active freezing to allow intensive short-term cooling.

The first step above would be taken in all cases of questionable readings. The second and third steps would take in most cases where the readings are proven to be correct and the cause of the problem is not immediately clear. The more active interventions would be subject to analysis and probably thermal modeling prior to implementation. Once implemented, the effects would be monitored with a higher level of intervention taken only if necessary.

Response b

As detailed in the DAR section 6.2.5.6, temperature monitoring devices will be installed in drillholes located around the freeze pipes to monitor the progress of the cooling front into the surrounding dust and ensure that the 10 m wide, -10°C freeze wall is achieved. Water pressure sensors will also be included in monitoring strings inserted into the arsenic chambers. The water pressure sensors will be used to track water levels during wetting of the dust and for any loss of water.

The temperature and water pressure sensors will produce real-time data, which will be forwarded to a data management system and will be available for operators to view at any time. An annual report will present a summary of the data trends.

Further details such as the number, locations and types of instruments, the methods of data storage, and the schedule of data review are currently being evaluated as part of the Freeze Optimization Study (FOS).