INFORMATION REQUEST RESPONSE

EA No: 0809-001 **Information Request No: Review Board #01**

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Linkage to Other IRs

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Request

Preamble:
The DAR makes much reference to the ongoing Freeze Optimization Study (FOS), which was initiated in June 2009 to investigate and optimize the active / passive / hybrid freezing options. Objectives of the study are presented in DAR s. 6.2.9.1. However, in order to address various points listed in the ToR, the DAR states:

- "Advantages and disadvantages of the two approaches are being further investigated in the FOS that commenced in June 2009". (DAR s.6.2.3, p. 6-12)
- "A program to test methods for creating backfill plugs forms part of the FOS". (DAR s. 6.2.5.2, p.6-17)
- "The FOS is expected to result in improvements to the parameter estimates, which could lead to changes in pipe spacing, drillhole numbers and total lengths". (DAR s.6.2.5.3, p.6-22)
- "Surface drilling methods under investigation in the FOS include mud rotary, downhole hammer and coring". (DAR s.6.2.5.3. p 6-23)
- "An alternative hybrid system that is being tested in the FOS involves the delivery of primary coolant directly to the point of heat exchange with the carbon dioxide". (DAR s.6.2.5.5., p. 6-26)
- "Several instrument types are being tested in the FOS. […] Methods for handling the expected large volumes of monitoring data are also being tested in the FOS". (DAR s. 6.2.5.6., p 6-27)
- "The most effective methods to accomplish each step remain under investigation, principally through the ongoing FOS. […] However, results of the FOS are required before those estimates can be confirmed or improved. […] Results of the FOS will allow improved modelling of the freezing process. The target criterion of -5°C is not expected to change, but revisions to the modelling may indicate slower freezing rates". (DAR s.6.2.6, p 6-29 – 6-30)
- "As noted above, results of the FOS will be assessed to confirm or improve the parameters used in the 2006 modelling". (DAR s.6.2.7.2, p 6-31)
- "The ability to overcome these limitations is being tested in the FOS". (DAR s.6.2.8.3, p 6-39)

The freeze technology is extremely important to the success of the remediation program. One and a half years of data should now be available from the study.

Question:
Please present the initial results, findings and conclusions of the Freeze Optimization Study to date. It is understood that this is an ongoing study and not all questions may be answered at this point. However, the study is expected to provide important information relevant to many of the predictions in the DAR. Please apply the most recent data from the FOS in answering ToR s 3.3 (Arsenic Containment), points 1, 2 and 8.

Reference to DAR (relevant DAR Sections):

S. 6.2. Arsenic Trioxide Dust Storage Areas

Reference to the EA Terms of Reference

S.3.3 Arsenic Containment

Summary

Although construction of the Freeze Optimization Study (FOS) started in June, 2009, the freezing system was completed and turned on only in March, 2011. Due to the very limited duration of freezing so far, no conclusions can be drawn about the design or expected performance of the full-scale system. Interim data reports will be issued periodically with the first report expected in June, 2011.

Response

Points 1, 2 and 8 in ToR Section 3.3 deal with implementation of the frozen block method, saturation of the arsenic trioxide dust and the longevity of the cooling system, respectively. The results of the FOS are expected to inform design and implementation of the frozen block method. The current study plan does not include any testing of saturation, nor any investigations specifically targeted at system longevity.

Construction of the FOS began in June, 2009. The work completed in 2009 included surface preparation, drilling and installation of freeze pipes and thermosyphons from surface, development of access to the underground freeze pipe locations, and drift plugging trials.

Above-ground infrastructure and underground freeze pipes were installed in 2010 and early 2011. This work included the installation of freeze plants for the active and hybrid freezing systems, power supply, piping distribution systems to surface and underground freeze pipes, and a data collection and management system.

Installation and commissioning of the thermosyphons was completed at the end of February, 2011. Active freezing began following commissioning of the freeze plants in early March, 2011. Attached to this response are a selection of as-built drawings that detail the general layout and location of the freeze

pipes and monitoring points. The following bullets list the key features that can be found in each drawing:

- Drawing C04 provides the layout of all of the surface drillholes, including locations of the freeze pipes and instrumentation drillholes.
- Drawing C05 indicates the freezing technology being tested in each group of drillholes. Groups B, F, and G consists of hybrid thermosyphons, each with a different pipe diameter ranging from 2.5 inches to 4 inches. All other groups consist of active freezing pipes, but with different connection arrangements in parallel or serial.
- Drawing U02 provides the layout of the horizontal freeze pipes and instrumentation installed in horizontal drillholes beneath the chamber.

The experience with system construction will assist the engineering team in scheduling and estimating costs for full scale implementation. For example, three drilling methods were tested and the results give a clear indication of the accuracy and advance rates that can be expected for each method.

No conclusions about the performance of the active or hybrid freezing systems are yet available. Passive ground cooling began only with the charging of the thermosyphons in February, 2011, and active and hybrid freezing only in March, 2011. Results from the study will be released on an ongoing basis. However, conclusions will only be possible once the study is complete. The current expectation is that the FOS will run until 2012 to provide a full year of data. Complete analysis of these data would take at least another couple of months.