October 1, 2004

MEMORANDUM TO: Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

FROM: Lawrence E. Kokajko, Deputy Director /RA/
Technical Review Directorate
Division of High-Level Waste Repository Safety
Office of Nuclear Material Safety
and Safeguards

SUBJECT: TECHNICAL ASSISTANCE REQUEST RESPONSE - REVIEW THE DRAFT REPORT: CONSIDERATION OF GEOCHEMICAL ISSUES IN GROUNDWATER RESTORATION AT URANIUM *IN-SITU* LEACH MINING FACILITIES

The draft report, "Consideration of Geochemical Issues in Groundwater Restoration at Uranium In-Situ Leach Mining Facilities" dated July 2004, has been reviewed by John Bradbury, as requested (TAC No. A10525, UR Program Publications). The report addresses important issues pertaining to groundwater restoration at uranium in-situ leach mining facilities: namely, what are the effects of the various methods currently used at these sites in terms of contaminant release, and how much water must be pumped through the perturbed aquifer to reasonably ensure restoration, and what can happen after the pumps are turned off? This revision of the draft report is much improved over the previous draft. Furthermore, the authors have been responsive to earlier suggestions (Memo from J. Schlueter to G. Janosko, September 15, 2003).

Technical Review

The report appears comprehensive in terms of simulating the range of possible scenarios expected at uranium in-situ leaching facilities. No additional scenarios need be simulated.

Including appendices that contained a PHREEQC input file and the database is appreciated. This detail improves the report's potential usefulness as guidance for the staff and licensees who might apply this method for addressing groundwater restoration issues.

CONTACT: John Bradbury, NMSS/HLWRS
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On page 26, it is stated that “stability constants were not determined for selenate and sulfate adsorption because adsorption of these solutes was assumed to be negligible for the chemical conditions that were modeled.” Although the stability constant for selenate is not present in the database in Appendix B, the stability constant for sulfate adsorption is. This could alter the results if sulfate competes with the other sorbed species. It is recommended that this discrepancy be corrected.

Figure 12 shows groundwater chemical data collected during the groundwater sweep and reverse osmosis treatment phases of groundwater restoration at the Ruth (Wyoming) ISL pilot plant. Concentrations of contaminants are plotted versus pore volumes extracted. Since the report compares breakthrough curves from PHREEQC simulations with the breakthrough curves at the Ruth site, it is recommended that the report include a description of the actual volume (e.g. gallons) of a pore volume at Ruth and how it is determined. This information could be useful if the method is applied to other sites. Additionally, the groundwater stabilization section of the report states that the simulations are carried out for 96 pore volumes under natural gradient conditions. It is recommended that the authors estimate the time for this amount of water to flow through the impacted aquifer, and compare it to the regulatory time limit.

There are a number of occurrences in the report (e.g. p. 37, 41, 45, 59), where the authors describe unique chemical conditions at different parts of the column. There are no corresponding figures illustrating concentrations versus position in the column. The authors may want to consider including some figures plotting concentration versus column position, if they would help clarify the text.

On page 45, there is a statement that U(VI) concentration decreases as a “...result of U(VI) desorption...” This seems backwards.

Finally, the conclusions reached in the report seem appropriate based on the supporting simulations. Overall the report provides important insights into the issues concerned with groundwater restoration of uranium in-situ leach facilities.

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