

JAN 19 1994

Mr. Dwight E. Shelor, Associate Director for
Systems and Compliance
Office of Civilian Radioactive Waste Management
U.S. Department of Energy, RW 30
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Shelor:

SUBJECT: REVIEW OF U.S. DEPARTMENT OF ENERGY (DOE) STUDY PLAN "DIFFUSION"

On August 13, 1993, DOE transmitted the study plan, "Diffusion" (Study Plan 8.3.1.3.6.2) to the U.S. Nuclear Regulatory Commission for review and comment. NRC has completed its review of this document using the Review Plan for NRC Staff Review of DOE Study Plans, Revision 2 (March 10, 1993). The material submitted in the study plan was considered to be consistent, to the extent possible at this time, with the revised NRC-DOE "Level of Detail Agreement and Review Process for Study Plans" (Shelor to Holonich, March 22, 1993).

A major purpose of the review is to identify concerns with studies, tests, or analyses that, if started, could cause significant and irreparable adverse effects on the site, the site characterization program, or the eventual usability of the data for licensing. Such concerns would constitute objections, as that term has been used in earlier NRC staff reviews of DOE's documents related to site characterization (Consultation Draft Site Characterization Plan and the Site Characterization Plan for the Yucca Mountain site). It does not appear that the conduct of the activities described in this study plan will have adverse impacts on repository performance and the review of this study plan identified no objections with any of the activities proposed.

As part of its study plan review, the NRC staff determines whether or not detailed comments or questions are warranted. The NRC staff's review of the subject study plan has resulted in the identification of one question. The enclosed question will be tracked by the NRC staff as an open item similar to SCA comments and questions.

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Mr. Dwight E. Shelor

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If you have any questions concerning this letter or the enclosure, please contact Charlotte Abrams (301) 504-3403 of my staff.

Sincerely,

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C. William Reamer, Acting Director
Repository Licensing and Quality Assurance
Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosures: As stated

cc: R. Loux, State of Nevada
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Study Plan 8.3.1.3.6.2 Diffusion

QUESTION 1

For the kinetic studies, how will pure diffusion of rapidly sorbed radionuclides be demonstrated in a thin tuff wafer immersed in a stirred solution?

BASIS

Section 3.2.1 Test Methods describes the experimental set-up for kinetic studies for rapidly sorbed radionuclides where a thin tuff wafer is suspended from a teflon thread in a stirred radionuclide-bearing solution.

Section 3.2.4 describes the analytical solution for a solute diffusing from a liquid solution into a plane sheet of material. This method assumes that "the concentration of tracer in the solution in contact with the sheet is always uniform...."

In order to assure the concentration of the tracer in the liquid solution is uniform, the solution is stirred.

However, advection in the stirred solution may produce advective transport in the tuff wafer due to the small pressure differences of fluid impinging the solid surface.

Consequently, transport by "diffusion" would be overestimated. Likewise, radionuclide retardation of matrix diffusion in fracture flow conditions would also be overestimated.

RECOMMENDATION

Describe how the advective contribution to transport in the tuff due to stirring will be eliminated or compensated for in these diffusion experiments.