



Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office QA: N/A
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MAR 28 2001

OVERNIGHT MAIL

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**RESPONSE TO RADIONUCLIDE TRANSPORT KEY TECHNICAL ISSUE
TECHNICAL EXCHANGE: SUBISSUE 3, AGREEMENT 7**

The subject agreement asked, in part, the U.S. Department of Energy (DOE) to document the evaluation of techniques to test colloidal transport in Alcove 8/Niche 3. The DOE's evaluation of techniques to test colloidal transport in Alcove 8/Niche 3 is provided below.


As part of the Alcove 8/Niche 3 tests, DOE has considered introducing fluorescent polystyrene microspheres to investigate colloid transport in the unsaturated zone. Colloid transport testing has been performed at Yucca Mountain, Nevada, at the C-Wells in the saturated zone and at Busted Butte in the unsaturated zone. In both cases, the colloids used for the tests were fluorescent polystyrene microspheres having a size range of 0.3 to 1 μm . One of the more important factors identified in these tests is the chemistry, in particular the ionic strength, of the water in which the microspheres are dispersed. Results of the tests thus far indicate that performing colloid transport tests with high-ionic-strength waters depresses and possibly eliminates colloid transport resulting from flocculation of the colloidal dispersion. This fact was born out in the C-Wells tests where colloid transport tests were run with a low-ionic-strength solution and a higher-ionic-strength solution containing other aqueous tracers. The low-ionic-strength test resulted in a definitive colloid transport response between the injection and production wells; the higher-ionic-strength test indicated no colloidal transport between the wells. The colloid transport tests at Busted Butte were done for unsaturated conditions, and colloids were added only into tracer solutions having high ionic strength. The Busted Butte tests did not show any colloid transport from the injection to the collection holes over a 1.5-year testing period. Examination of the tracer solutions showed large colloidal aggregations on the order of 100 μm , supporting the flocculation hypothesis. The Busted Butte colloid transport test was further complicated by naturally fluorescing minerals that were collected on the filter pads.

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A test plan will be developed for conducting colloid transport tests in Alcove 8/Niche 3, based on previous experience and additional laboratory work, if needed. Current preliminary flow tests are being conducted on a small plot that includes a minor fault connecting Alcove 8 and Niche 3. These preliminary tests are being done to investigate testing techniques for the expected recovery in Niche 3 of water introduced at Alcove 8 and the behavior of water flow in a fault. The small plot could potentially be used for aqueous and colloid transport tests if the flow tests show a response in Niche 3. The flow and transport tests for the main testing area (large plot) in Alcove 8 are scheduled to begin in four to six months. Initial tests will be done for saturated conditions, with a two-cm positive pressure imposed on the test bed in Alcove 8. Subsequent tests will be performed for unsaturated conditions. A final determination of testing techniques has not been made. DOE will provide a test plan detailing testing techniques as soon as it is developed.

If you have any questions relative to this letter, please contact Timothy C. Gunter at (702) 794-1343 or Eric T. Smistad at (702) 794-5073.

for 
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OL&RC:TCG-0902

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