HLWYM HEmails

From: Jude Mcmurry
Sent: Friday, September 16, 2005 5:29 PM
To: John Bradbury; Randall Fedors
Subject: potential RTUZ topics for 2006

John/Randy,

I'm writing this on Friday afternoon, but I hope by now you're headed into the weekend instead of still at your desk. Here are some items that are on my list as useful topics for further study in terms of radionuclide transport in the unsaturated zone, which I'd like to discuss with you sometime on Monday.

A. Matrix diffusion in the UZ.

Two perspectives on this issue: (1) Is it as effective a process as DOE claims? (a practical/geological kind of question), and (2) In the DOE performance assessment, why is matrix diffusion more effective in the UZ than it is in the SZ? (a compare-the-abstractions kind of question).

Seems to me that question (2) fits in the 'pre-licensing review' part of the ops plan, and I'll include it there.

Question (1) is harder to deal with. If there were easy answers, I guess we wouldn't still be talking about matrix diffusion in the UZ after all this time. Even on the scale of a single fracture in the UZ, is matrix diffusion as effective as DOE claims? Maybe, maybe not. DOE has a bit of field test data to support it, though most data comes from SZ studies. Questions still, though, about how important matrix diffusion is in an environment where groundwater is moving relatively rapidly downwards through an open fracture. And even if matrix diffusion is represented realistically on a local scale, has DOE overestimated its effect by overestimating the number of water-bearing fractures present in the UZ. This ties into other questions about the active fracture model. And how can we answer these questions? An experiment, with tracers, in unsaturated rock? A natural analogue (e.g., unsaturated fractured volcanic rock overlain by a chemical anomaly -- an orebody, or contaminated water -- that would serve as a subsurface tracer)? How can we evaluate/test DOE's assumptions about the proportion of water-bearing fractures in the active fracture model? All suggestions welcome. I have a couple of pages, mostly question marks, in my notes for this item.

B. Sorption coefficients in UZ rocks.

Main idea here is that we have been doing sorption experiments for the past year or two using natural materials to gain confidence in our estimates of sorption coefficients for Np in alluvium, which is the layer that has the greatest sorption potential in the saturated zone. An obvious corollary would be to do a similar set of sorption measurements using the Calico Hills nonwelded vitric unit, which has the greatest sorption potential in the unsaturated zone (at least according to TPA), to improve confidence in that range of sorption coefficients, too.

C. Evaluation of DOE sorption coefficients.

DOE replaced many of the data in its original set of sorption coefficients, which were based on a pre-QA expert elicitation that was not well constrained, with data from batch sorption experiments using Yucca Mountain materials. Not all of the Kds got revised, however. And some of the revised ranges are narrow, because they were based on a limited number of experiments. Potentially a contentious issue, which could be addressed in part by an evaluation of the sorption coefficients and comparison with Kd values used in the performance assessments of other repository programs? (This is another topic that could fit into pre-licensing review and prep, rather than 'new work').

D. Colloids and the near-field/far-field interface.

In terms of the unsaturated zone, the question to be investigated is whether or not near-field colloids would become destabilized after they leave the waste package. What conditions in the far-field (e.g., ionic strength) could affect the physical stability of colloids? What conditions could affect the chemical stability (e.g. solubility controls) of colloids?

There are many topics related to colloids where we can do pro-active work if the opportunity presents. This example is a fairly minor one, likely to be folded into some broader "Colloids" project that may or may not be part of the UZ3 ISI.

What else? Do you have other questions or suggestions for work?

When is a good time on Monday to catch you (individually or together) for a chat?

Thanks!
Jude

J. McMurry, Ph.D.
Senior Research Scientist
Center for Nuclear Waste Regulatory Analyses
Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78228 USA
Ph. (210) 522-6935
jude.mcmurry@swri.org

Hearing Identifier: HLW_YuccaMountain_Hold_EX
Email Number: 530

Mail Envelope Properties (jmcmurry@cnwra.swri.edu20050916172800)

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Created By: jmcmurry@cnwra.swri.edu

Recipients:
"John Bradbury" <John.Bradbury@nrc.gov>
Tracking Status: None
"Randall Fedors" <Randall.Fedors@nrc.gov>
Tracking Status: None

Post Office:

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