

Unsaturated Zone Testing at Yucca Mountain: Then and Now

J.S.Y. Wang* and G.S. Bodvarsson

Earth Sciences Division, Lawrence Berkeley National Laboratory, University of California, 1 Cyclotron Road, MS 90-1116, Berkeley, California 94720, USA

*Corresponding author: FAX + 1(510) 486-6115; e-mail: jswang@lbl.gov

Abstract

The evaluation of the Yucca Mountain site has evolved from intensive surface-based investigations in the early 1980s to current focus on testing in underground drifts.

Different periods of site characterization activities and prominent issues concerning the unsaturated zone are summarized. Data-collection activities have evolved from mapping of faults and fractures to estimation of percolation through tuff layers, and to quantification of seepage into drifts. Evaluation of discrete flow paths in drifts has led to fracture-matrix interaction and matrix diffusion tests over different scales. The effects of tuff interfaces and local faults are evaluated in fractured-welded and porous-nonwelded units. Mobilization of matrix water and redistribution of moisture are measured in thermal tests. Lessons learned from underground tests are used to focus on processes needed for additional quantification. Migration through the drift shadow zone and liquid flow through faults are two important issues that have evolved from current knowledge.

Keywords: seepage, fracture flow, fracture-matrix interaction, matrix diffusion, percolation, flow and transport, unsaturated zone, Yucca Mountain