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August 5, 2002
Contract No. NRC–02–97–009
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U.S. Nuclear Regulatory Commission
ATTN: Mrs. Deborah A. DeMarco
Office of Nuclear Material Safety and Safeguards
Program Management, Policy Development, and Staff
Office of the Director
Mail Stop 8D–37
Washington, DC 20555

Subject: Programmatic Review of Abstracts

Dear Mrs. DeMarco:

The enclosed abstracts are being submitted for programmatic review. These abstracts will be submitted for presentation at the American Geophysical Union 2002 Fall Meeting to be held December 6–10, 2002, in San Francisco, California. The title of the abstracts are:

"Potential for Lateral Flow Associated with Fractured, Nonwelded, Layered Tuffs in the Unsaturated Zone" by R. Fedors and D. Ferrill

"*In Situ* Measurement of Permeability in the Vicinity of Faulted Nonwelded Bishop Tuff" by C. Dinwiddie

Please advise me of the results of your programmatic review. Your cooperation in this matter is appreciated.

Sincerely,

for Budhi Sagar
Technical Director

/ph
Enclosures: Abstracts (2)
NRC Forms 390A (2)

cc:					
	J. Linehan	J. Bradbury	B. Leslie	W. Patrick	Letter only:
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Potential for Lateral Flow Associated with Fractured, Nonwelded, Layered Tuffs in the Unsaturated Zone

Randall W. Fedors and David A. Ferrill (CNWRA, 6220 Culebra Road, San Antonio, TX 78238; 210-522-6818; e-mail: rfedors@swri.org)

The magnitude of lateral flow caused by permeability and capillary barriers associated with dipping, layered, nonwelded tuffs above the proposed repository horizon is an important issue for evaluating the amount and distribution of water potentially contacting high-level radioactive waste proposed for emplacement at Yucca Mountain, Nevada. Predictions of the distance over which lateral flow occurs vary from the meter scale to the kilometer scale. Numerical models using homogeneous properties and sharp stratigraphic boundaries overpredict the amount of lateral flow along stratigraphic contacts. Primary heterogeneity or secondary discontinuities (e.g., fractures and faults), however, could lead to preferential flow paths through the Paintbrush nonwelded tuff (PTn) and into the Topopah Spring welded tuff below. Heterogeneity of matrix properties, including primary depositional textures and vapor-phase alteration combined with later structural overprinting and mineralization, will affect the ability of permeability and capillary barriers to produce lateral flow.

The potential for lateral flow to occur is evaluated using observations of field hydrogeologic characteristics, laboratory measurements, and results of numerical models that simulate fluid flow in the unsaturated zone. These include (i) observations of field water content profiles; (ii) observations on the nature of stratigraphic contacts (e.g., unconformity or gradational); (iii) analysis of laboratory measurements of matrix permeability; (iv) analysis of unsaturated zone constitutive relations to assess potential for permeability and capillary barriers occurrence in dual permeability models; (v) analysis of fault and fracture sizes, orientations, and spacings; and (vi) expected matrix deformation in small and large faults. An evaluation of the available geologic and hydrologic information, in conjunction with intuitive knowledge of geologic and hydrologic factors, suggests that lateral flow is likely limited to distances less than tens of meters along stratigraphic contacts in and near the PTn.

This abstract is an independent product of the CNWRA and does not necessarily reflect the views or regulatory position of the NRC.

AGU Fall 2002 Meeting, H06 Recent Advances in Groundwater Hydrology.

In Situ Measurement of Permeability in the Vicinity of Faulted Nonwelded Bishop Tuff

AGU Fall Meeting 2002, Tectonophysics Session T04: Fluids and Faulting: Cause and Effect

Cynthia L. Dinwiddie, Randall W. Fedors, David A. Ferrill (Center for Nuclear Waste Regulatory Analyses (CNWRA), 6220 Culebra Road, San Antonio, TX 78238; 210-522-6085; e-mail: cdinwiddie@swri.org); Kelly K. Bradbury (Utah State University).

The nonwelded Bishop Tuff includes matrix-supported massive ignimbrites and clast-supported bedded deposits. Fluid flow through such faulted nonwelded tuff is likely to be influenced by a combination of host rock properties and the presence of deformation features, such as open fractures, mineralized fractures and fault zones that exhibit comminuted fault rock and clays. Lithologic contacts between fine- and coarse-grained sub-units of nonwelded tuff may induce formation of capillary and/or permeability barriers within the unsaturated zone, potentially leading to down-dip lateral diversion of otherwise vertically flowing fluid. However, discontinuities (e.g., fractures and faults) may lead to preferential sub-vertical fast flow paths in the event of episodic infiltration rates, thus disrupting the potential for (1) large-scale capillary and/or permeability barriers to form and (2) redirection of water flow over great lateral distances. This study focuses on an innovative technique for measuring changes in matrix permeability near faults *in situ*—changes that may lead to enhancement of vertical fluid flow and disruption of lateral fluid flow.

A small-drillhole minipermeameter probe provides a means to eliminate extraction of fragile nonwelded tuffs as a necessity for permeability measurement. Advantages of this approach include (1) a reduction of weathering-effects on measured permeability, and (2) provision of a superior sealing mechanism around the gas injection zone. In order to evaluate the effect of faults and fault zone deformation on nonwelded tuff matrix permeability and to address the potential for disruption of lithologic barrier-induced lateral diversion of flow, data were collected from two fault systems and from unfaulted host rock. Two hundred and sixty-seven gas-permeability measurements were made at 89 locations; i.e. permeability measurements were made in triplicate at each location using three different flow rates. Data were collected at the first fault and perpendicularly away from it within the hanging wall to a distance of 6 meters along one transect, and perpendicular to the fault from the foot wall to the hanging wall for a distance of 6 meters along a second transect. Additionally, eight water-permeameter tests were conducted in order to augment this gas-permeability data. Data were collected along two transects at the main fault of the second fault system and perpendicularly away from it within the hanging wall to a distance of 10.5 meters, crossing several secondary faults in the process. Data were also collected within the fault gouge of the main fault, and were found to vary by an order of magnitude. Preliminary results indicate an increase in gas permeability from that of the host rock within the hanging wall of fault zones.

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Potential for Lateral Flow Associated with Fractured, Nonwelded, Layered Tuffs in the Unsaturated Zone

2. AUTHOR(s)

R. Fedors and D. Ferrill

3. NAME OF CONFERENCE, LOCATION, AND DATE(s)

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San Francisco, CA; December 6-10, 1001

4. NAME OF PUBLICATION

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C. Dinwiddie

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