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U.S. Nuclear Regulatory Commission
ATTN: Mrs. Deborah A. DeMarco
Two White Flint North
11545 Rockville Pike
Mail Stop T8A23
Washington, DC 20555

Subject: Programmatic Review of Abstract

Dear Mrs. DeMarco:

The enclosed abstract is being submitted for programmatic review. This abstract will be submitted for presentation at the American Geophysical Union Fall Meeting to be held December 15–19, 2000, in San Francisco, California. The title of the abstract is:

> "Heat and Mass Transfer through Partially Saturated Fractured Rock at the Drift-Scale Heater Test at Yucca Mountain" by R. Green and S. Painter

This abstract presents results of work conducted by CNWRA as part of the Thermal Effects on Flow Key Technical Issue. This abstract is a product of the CNWRA and does not necessarily reflect the view(s) or regulatory position of the NRC.

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

Sincerely,

Budhi Sagar
Technical Director

/ph
Enclosures

cc: J. Linehan, E. Whitt, B. Meehan, J. Greeves, J. Holonich, W. Reamer, T. Essig, K. Stablein, J. Pohle, D. Brooks, W. Patrick, CNWRA Directors, CNWRA Element Mgrs, T. Nagy (SwRI Contracts), P. Maldonado

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Heat and Mass Transfer Through Partially Saturated Fractured Rock at the Drift-Scale Heater Test at Yucca Mountain

By Ronald Green and Scott Painter

The Drift-Scale Heater Test (DST) being conducted at the Experimental Facilities Site at Yucca Mountain, Nevada is unique in providing a reasonably large field-scale heat and mass transfer analog for the proposed high-level nuclear waste geologic repository at that site. The DST is to have a four-year heating phase followed by a monitored cooling phase of similar duration. Thermal flux input and temperature are directly measured and other physical properties of the rock, such as saturation of the rock, are monitored using a variety of techniques including air permeability testing, gamma ray logs, electrical resistivity tomography, and ground penetrating radar.

The multiphase, nonisothermal numerical simulator MULTIFLO was used to simulate the first year of the heating phase of the DST. The rock mass at the DST was conceptualized as a dual continuum consisting of fractures and matrix. Comparison of simulation results with measured temperatures and inferred saturations provided a basis to evaluate the conceptual model, initial and boundary conditions, and property values. In addition, the potential effect of unmeasured mass loss through the thermal bulkhead at the end of the heater drift was investigated. In particular, the simulations assessed the effect of thermal bulkhead mass loss on the formation of a heat pipe above the heater drift. The simulations proved to be most sensitive to infiltration rate, fracture permeability, and thermal conductivity. Adjustment of these input and property values significantly reduced the differences between the simulations and observed test outcome. A mass loss of 80 mL/hr through the thermal bulkhead had no appreciable impact on predicted temperature and a small effect on predicted saturation.

ACKNOWLEDGMENTS
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