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Contract No. NRC–02–97–009
Account No. 20–01402–561

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 Materials Research Society Annual meeting, to be held November 26–29, 2001, in Boston, Massachusetts. The title of this abstract is:

> "Deliquescence Behavior of Multicomponent Salts: Effects on the Drip Shield and Waste Package Chemical Environment at the Proposed Nuclear Waste Repository at Yucca Mountain, Nevada"
> Lietai Yang, Roberto T. Pabalan, and Lauren Browning

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

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Enclosure

cc: J. Linehan, B. Meehan, E. Whitt, J. Holonich, W. Reamer, K. Stablein, J. Bradbury, J. Ciocco, B. Leslie, W Patrick, CNWRA Directors, CNWRA Element Managers, R. Pabalan

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2001 MRS Fall Meeting
Symposium JJ: Scientific Basis for Nuclear Waste Management XXV

DELIQUESCENCE BEHAVIOR OF MULTICOMPONENT SALTS: EFFECTS ON THE DRIP SHIELD AND WASTE PACKAGE CHEMICAL ENVIRONMENT AT THE PROPOSED NUCLEAR WASTE REPOSITORY AT YUCCA MOUNTAIN, NEVADA.

Lietai Yang, Roberto T. Pabalan, Lauren Browning, Center for Nuclear Waste Regulatory Analyses, San Antonio, TX.

Groundwater seeping into the proposed Yucca Mountain nuclear waste repository would be subjected to evaporation and salt formation processes that may enhance corrosion of metallic drip shield/waste package surfaces. Because corrosivity tends to increase with increasing brine concentrations, we have initiated a study to characterize the conditions associated with highly concentrated brine solutions at Yucca Mountain. In a hot repository setting, flash evaporation may lead to the accumulation of dry, multicomponent salt deposits on drip shield/waste package surfaces. This accumulation may also result from deposition of salts entrained in ventilation air. Hygroscopic salts on drip shield/waste package surfaces will absorb moisture from the atmosphere, generating small volumes of highly corrosive brines. This rewetting is expected to occur after the repository temperature falls below the boiling point for the salt mixture and the equilibrium humidity, or deliquescence point, has been reached. The U.S. Department of Energy (DOE) performance assessment abstraction of in-drift chemical environment assumes that deliquescence begins at a relative humidity of 50 percent and corrosion of the drip shield or waste package does not occur until this value is reached. The threshold relative humidity is based on the deliquescence behavior of pure $NaNO_3$ salt. In this study, thermodynamic modeling of multicomponent salt mixtures is used to demonstrate that the deliquescence point of Yucca Mountain waters is lower than that of pure $NaNO_3$, implying that initiation of drip shield or waste package corrosion can occur at lower relative humidities and at earlier times than predicted by the DOE.

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