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May 9, 1986

Dr. D. J. Brooks
Geotechnical Branch
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Room 623-SS
Washington, D.C. 20555

Dear Dave:

Please find enclosed the progress report for the month of April 1986 for B0287, "Technical Assistance in Geochemistry."

Sincerely,

Gary

Gary K. Jacobs
Manager, NRC Waste Program
1505, MS-3

GKJ/

Enclosure:

Monthly Progress Report For April 1986

cc: Office of the Director, NMSS (Attn: Program Support Branch)
Division Director, NMSS Division of Waste Management (2)
Branch Chief, Waste Management Branch, RES
P. S. Justus, Chief, Geotechnical Branch
K. C. Jackson, Geotechnical Branch
J. W. Bradbury, Geotechnical Branch
G. F. Birchard, Waste Management Branch, RES
M. Siegel, Sandia National Laboratory
A. D. Kelmers
A. P. Malinauskas
R. E. Meyer
GKJ File

WM-RES
WM ~~Record File~~ B0287
ORNL

WM Project 10, 11, 16
Docket No.
PDR ✓
LPDR ✓ (B, N, S)

Distribution:
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B-0287 PDR

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MONTHLY PROGRESS REPORT FOR APRIL 1986

PROJECT TITLE: Technical Assistance in Geochemistry

PROJECT MANAGER: G. K. Jacobs

PROJECT STAFF: J. G. Blencoe, R. M. Gove, A. D. Kelmers, R. E. Meyer, G. D. O'Kelley, and K. L. Von Damm

ACTIVITY NUMBER: ORNL #41 88 54 92 4 (FIN No. B0287)
NRC #50 19 03 01

OBJECTIVE:

The objective of this project is to provide technical assistance to the NRC in the evaluation of geochemical information pertinent to candidate HLW repository sites. The project emphasizes the collection and review of key information in order to provide input to the NRC analysis of technical issues regarding the geochemical aspects of HLW isolation.

TECHNICAL HIGHLIGHTS:

Hanford Site Geochemical Technical Assistance

J. G. Blencoe reviewed the report, A Final Report on Hydrothermal Testing of ^{99}Tc-Doped Glass Waste Form and Waste Package Components, SD-BWI-TI-229, 1984, by J. A. Schramke, L. E. Thomas, S. G. McKinley, S. A. Simonson, and D. G. Coles. By systematically testing the effects of the presence of two key candidate waste package components -- basalt and steel -- it was discovered that: (1) the apparent solubility of ^{99}Tc in GR-3 synthetic groundwater is greatly reduced when either basalt or steel is present in experimental samples, and (2) the kind(s) of secondary minerals that form during waste/barrier/groundwater tests depend on whether basalt is present or absent (specifically, it was observed that clinoptilolite crystallized in basalt-present experiments, whereas smectite clay crystallized in basalt-absent tests). A detailed letter report will be forwarded under separate cover.

Yucca Mountain Geochemical Technical Assistance

D. G. O'Kelley reviewed the report, Solubility Limits on Radionuclide Dissolution at a Yucca Mountain Repository, LA-9995-MS, 1984, by J. F. Kerrisk. The objective of this report was to predict waste-element dissolution and to assess the importance of solubility in limiting dissolution. The study used two dissolution models: (1) a "conservative," saturation-limited model and (2) a non-bounding, diffusion-limited model. The results and conclusions are presently strong functions of the assumptions concerning solubilities and model parameters. The simple models constitute a first step in the development of a comprehensive, validated model for estimating waste package source terms and serve to illustrate the

importance of solubility-limited dissolution and the need for further measurements. The detailed letter report will be forwarded under separate cover.

Salt Site Geochemical Technical Assistance

K. L. Von Damm reviewed the report, "Isotope geochemistry of fluid inclusions in Permian halite with implications for the isotopic history of seawater and the origin of saline formation waters," Geochim. Cosmochim. Acta 50, 419-433, by L. P. Knauth and M. A. Beeunas (1986). The subject report documents the isotopic composition of fluid inclusions in halite from the Palo Duro Basin and discusses the possible sources of these fluids. This study has several important implications for a repository in salt pertinent to brine abundance and composition as well as the general impermeability of the basin. The detailed review will be forwarded under separate cover.

Short-Term Technical Assistance

Plans for the workshop on sorption to be held in Silver Spring during May are complete.

PROJECT MANAGEMENT:

A subcontract to G. E. Grisak will be placed during August. Dr. Grisak will write two new sections for the topical report on matrix diffusion. These sections (see attached outline) will address two critical issues that must be resolved for matrix diffusion to be of significant value in performance assessment calculations.

MEETINGS AND TRIPS:

None.

REPORTS AND PUBLICATIONS:

LR-287-39, by G. D. O'Kelley, "Review of: Solubility Limits on Radionuclide Dissolution at a Yucca Mountain Repository, LA-9995-MS, 1984, by J. F. Kerrisk."

LR-287-40, by J. G. Blencoe, "Review and Evaluation of: A Final Report on Hydrothermal Testing of ^{99}Tc-Doped Glass Waste Form and Waste Package Components, SD-BWI-TI-229, 1984, by J. A. Schramke, L. E. Thomas, S. G. McKinley, S. A. Simonson, and D. G. Coles."

LR-287-41, by K. L. Von Damm, "Review of: "Isotope geochemistry of fluid inclusions in Permian halite with implications for the isotopic history of seawater and the origin of saline formation waters," Geochim. Cosmochim. Acta 50, 419-433, by L. P. Knauth and M. A. Beeunas (1986)."

Draft Outline of New Sections in the Topical Review

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5. THE ROLE OF FRACTURE ANALYSIS IN QUANTITATIVE MODELING OF MATRIX DIFFUSION . . . . . .
   5.1 TYPES OF FRACTURES AND FRACTURE SETS . . . . . .
   5.2 FRACTURE CHARACTERIZATION . . . . . .
      5.2.1 Goals of Fracture Characterization . . . . . .
      5.2.2 Methods of Detecting Fractures and Quantifying Fracture Characteristics . . . . . .
         5.2.2.1 Surface Methods . . . . . .
         5.2.2.2 Subsurface Methods . . . . . .
   5.3 FRACTURE MODELING . . . . . .
      5.3.1 Goals of Fracture Modeling . . . . . .
      5.3.2 Simplifying Assumptions in Fracture Modeling . . . . . .
      5.3.3 Methods of Fracture Modeling . . . . . .
      5.3.4 Some Preliminary Findings of Fracture Modeling . . . . . .
6. QUANTITATIVE MODELING OF MATRIX DIFFUSION OF RADIONUCLIDES ON A REPOSITORY SCALE: PROBLEMS AND PROSPECTS . . . . . .

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PROBLEM AREAS:

None.

COST/BUDGET REPORT:

Expenditures were $28.6K for April 1986 and $290K for FY 86 to date. A detailed cost/budget report will be sent under separate cover.