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December 11, 1985

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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

WM-RES  
WM Record File  
B0287  
ORNL

WM Project 10, 14, 16  
Docket No. \_\_\_\_\_  
PDR ✓  
LPDR B, U, S

Distribution: \_\_\_\_\_  
\* DBrooks \_\_\_\_\_  
\* Tran-ticket \_\_\_\_\_  
(Return to WM, 623-SS) \_\_\_\_\_

Dear Dave:

Please find enclosed the progress report for the month of November 1985 for B0287, "Technical Assistance in Geochemistry."

Sincerely,



Gary K. Jacobs  
Environmental Sciences Division

GKJ/

Enclosure:

Monthly Progress Report For November 1985

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

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GKJ  
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MONTHLY PROGRESS REPORT FOR NOVEMBER 1985

PROJECT TITLE: Technical Assistance in Geochemistry  
PROJECT MANAGER: G. K. Jacobs  
PROJECT STAFF: J. T. Bell, J. G. Blencoe, R. M. Gove, G. K. Jacobs,  
A. D. Kelmers, J. C. Mailen, 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

TECHNICAL HIGHLIGHTS:

Task 1 - Hanford Site Geochemical Technical Assistance

Jim Blencoe will continue to revise the topical report on solubility information for the Hanford Site after he has completed the revised version of the topical report on matrix diffusion.

Task 2 - Yucca Mountain Geochemical Technical Assistance

Jim Blencoe is continuing to revise the topical report on matrix diffusion. As part of this activity, Jim reviewed the report Field and Theoretical Investigations of Fractured Crystalline Rock near Oracle, Arizona, by J. W. Jones, E. S. Simpson, S. P. Neuman, and W. S. Keys, NUREG/CR-3736, 1985. A detailed letter report will be forwarded under separate cover. A summary of Jim's findings is included below:

The subject report describes a state-of-the-art investigation of the hydrologic properties of a fractured mass of "crystalline rock." Two major conclusions are suggested by this research. First, to elucidate groundwater flow in fractured rocks, several characterization methods will have to be employed, including surface mapping of fractures, core logging, downhole geophysical logging, packer and tracer tests, and geostatistical modeling. Second, despite the application of sophisticated methods to the Oracle "granite," the results obtained to date are semiquantitative at best and largely serve to emphasize the complexities and difficulties in attempting to quantify groundwater flow in fractured rocks.

As part of her review of information on the geochemical conditions for Yucca Mountain, Karen Von Damm reviewed the report Reaction of Topopah Spring Tuff with J-13 Well Water at 90°C and 150°C, by V. M. Oversby, UCRL-53552, 1984. A Letter Report with her detailed comments will be forwarded under separate cover. A summary of the letter report is included below:

The purpose of the reported study was to attempt to establish changes in water chemistry that might occur as a result of water/rock interactions at elevated temperatures within the disturbed zone of a repository. The results of the study are well documented and the author recognizes many of the limitations of the equipment and techniques used. A few additional limitations and suggestions for further consideration are discussed in the detailed letter report.

**Task 3 - Salt Sites Geochemical Technical Assistance**

No activity to report this month.

**Task 4 - Short-Term Technical Assistance**

Dave O'Kelley reviewed the report "Measurement of thermal neutrons in the subsurface," by M. W. Kuhn, S. N. Davis, H. W. Bentley, and R. Zito, Geophysical Research Letters 11, 1984, p. 607-610. A detailed letter report will be sent under separate cover. A summary of the letter report is included below:

The subject report has a significant bearing on the use of  $^{36}\text{Cl}$  isotopes as tracers and dating methods for groundwaters. The use of  $^{36}\text{Cl}$  has already been documented by BWIP for the Hanford Site, and it is anticipated that other sites will also use this technique to investigate groundwater ages and support conceptual hydrologic models. The subject report addresses an important aspect of  $^{36}\text{Cl}$  studies, because part of the analysis involves calculating the generation of  $^{36}\text{Cl}$  at depth through neutron fluxes. The report documents an attempt to validate these calculations for a few selected rock types through a comparison of calculated neutron production rates with values measured in boreholes and in mines. The authors concluded that at depths greater than 800 m more thermal neutrons are produced than are calculated; however, from the experimental errors presented, it is not clear that the differences are significant.

Dave O'Kelley reviewed the report "The kinetics of the oxidation of ferrous iron in synthetic and natural waters," by W. Davison and G. Seed, Geochimica et Cosmochimica Acta 47, 67-79 (1983). The detailed letter report was sent under separate cover.

**PROJECT MANAGEMENT:**

A no-cost extension of the subcontract for the catalog of natural analogs (D. G. Brookins) was granted. The extension (to the end of January 1986) was necessary to ensure the best possible product.

**MEETINGS AND TRIPS:**

No activity to report this month.

**REPORTS AND PUBLICATIONS:**

Letter Report, LR-287-16, "Review of "The kinetics of the oxidation of ferrous iron in synthetic and natural waters," by W. Davison and G. Seed, Geochimica et Cosmochimica Acta 47, 67-79 (1983)", by G. D. O'Kelley.

Letter Report, LR-287-17, "Review of Reaction of Topopah Spring Tuff with J-13 Well Water at 90°C and 150°C. by V. M. Oversby, UCRL-53552, 1984.", by K. L. Von Damm

Letter Report, LR-287-18, "Review of Field and Theoretical Investigations of Fractured Crystalline Rock near Oracle, Arizona, by J. W. Jones, E. S. Simpson, S. P. Neuman, and W. S. Key, NUREG/CR-3736, 1985.", by J. G. Blencoe

Letter Report, LR-287-19, "Review of 'Measurement of Thermal Neutrons in the Subsurface,' by M. W. Kuhn, S. N. Davis, H. W. Bentley, and R. Zito, Geophysical Research Letters 11, 1984, p. 607-610.", by G. D. O'Kelley

Meeting Report, MR-287-6, Annual Meeting of the Geological Society of America, by J. G. Blencoe and G. K. Jacobs

PROBLEM AREAS:

None.

COST/BUDGET REPORT:

Expenditures were \$46.4K for November 1985 and \$103.4K for FY 86 to date. A detailed cost/budget report will be sent under separate cover.