Sandia National Laboratories
Albuquerque, New Mexico 87185

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'86 SEP 19 P3:02

September 15, 1986

Mr. John Peshel
Engineering Branch
Division of Waste Management
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, MD 20910

Dear Mr. Peshel:

The enclosed monthly report summarizes the activities during the month of August for FIN A-1755.

If you have any questions, please feel free to contact me at FTS 844-8368 or L. R. Shipers at FTS 846-3051.

Sincerely,

Robert M. Cranwell

Robert M. Cranwell
Supervisor
Waste Management Systems
Division 6431

RMC:6431

Enclosure

Copy to:
Office of the Director, NMSS
Attn: Program Support Branch
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6431 E. J. Bonano
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6431 L. R. Shipers

WM Record File WM-RES A1755 SNL
WM Project 10, 11, 16
Docket No.
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PROGRAM: Coupled Thermal-Hydrological-Mechanical Assessments and Site Characterization Activities for Geologic Repositories

FIN#: A-1755

CONTRACTOR: Sandia National Laboratories

BUDGET PERIOD: 10/85 - 9/86

DRA PROGRAM MANAGER: J. Peshel

BUDGET AMOUNT: 226K

CONTRACT PROGRAM MANAGER: R. M. Cranwell

FTS PHONE: 844-8368

PRINCIPAL INVESTIGATORS: E. J. Bonano FTS PHONE: 844-5303
L. R. Shipers FTS PHONE: 846-3051

PROJECT OBJECTIVES

To provide technical assistance to NRC in the assessment of coupled thermal-hydrological-mechanical phenomena and site characterization activities for high-level waste repositories.

ACTIVITIES DURING AUGUST 1986

Activities and Accomplishments

Work was performed on Tasks 1 and 2 as defined in NRC's letter from J. Peshel to R. Cranwell dated July 10, 1986. Task 1 was initially defined to be an investigation of numerical modelling applications to borehole spalling and disking problems encountered at BWIP. In subsequent discussions with the NRC staff, it was decided that certain other aspects deserved more attention. As such, the scope of Task 1 was redefined to direct the investigation of modelling applications to boreholes, shafts and shaft liners. This effort is underway and is expected to be complete by the end of September, 1986. An approach is outlined in the attached Task 1 Progress Report which includes some results of simplified analyses. Task 2, which consisted of providing assistance in training NRC personnel in the use of thermomechanical computer codes, was completed in early August. K. Wahi and L. Shipers from SNLA spent the week of August 4, 1986 working with N. Tanious of NRC staff and provided him with hands-on training in the use and application of several sophisticated codes such as STEALTH, COYOTE, and SANCHO. The limitations of how much can be learned in one week must, however, be recognized.

During the month of August a number of technical discussions in which SNLA contributed took place in telephone conversations with the NRC staff. Also, at the request of the NRC, a summary of

proposed future work for the extension of this contract was prepared and sent to the NRC.

Travel

None.

Problems Encountered

None.

Stresses Around Package Emplacement Holes

A method is proposed that allows an estimation of stress distribution around waste package emplacement boreholes. It consists of a series of simple solutions that are superimposed to provide the combined effect of in-situ stresses, excavation stresses, and thermal stresses. The following steps outline the procedure.

1. Define depth of repository horizon and the virgin state of stress at that depth. Assign mechanical property values.

2. Compute state of stress around a drift of arbitrary geometry oriented parallel to a principal horizontal stress direction using BDYELM or HEFF. By examining the output, select peak stress values in the floor or the pillar, depending on emplacement configuration. Let these stress values represent a modified state of in-situ stress.

3. Use the modified in-situ stresses as boundary stresses for a region containing a circular hole for a vertical or horizontal emplacement scheme. Compute stress field around the hole using the program CAVITY.

4. For an assumed hollow or solid cylindrical geometry and an appropriate steady-state temperature distribution, compute the thermal stress field with THERST.

5. Superimpose solutions from Steps 3 and 4 to obtain conservative but realistic estimates of thermomechanical stresses around the borehole.

6. Set up a criterion or set of criteria to determine failure potential.

7. The above steps could be consolidated into a single or two computer codes that would run on a Personal Computer. At this time, the above calculations are possible on a PC, but only in discrete steps. It may also be feasible to include a graphics capability to plot certain results.

A-1755
1628.010
August 1986

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

		Current Month	Year -to- Date
I.	Direct Manpower (man-months of charged effort)	0.0	7.7
II.	Direct Loaded Labor Costs	0.0	79.0
	Materials and Services	0.0	0.0
	ADP Support (computer)	0.0	7.0
	Subcontracts	5.0	134.0
	Travel	0.0	1.0
	Other (computer roundoff)	1.0	1.0
	TOTAL COSTS	6.0	222.0

III. Funding Status

Prior FY Carryover	FY 86 Projected Funding Level	FY 86 Funds Received to Date	FY 86 Funding Balance Needed
31K	226K	195K	None