

A1755

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Sandia National Laboratories

Albuquerque, New Mexico 87185

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April 15, 1987

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 March for FIN A-1755.

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

Sincerely,

Robert M. Cranwell

Robert M. Cranwell
Supervisor
Waste Management Systems
Division 6416

RMC:6416

Enclosure

Copy to:
Office of the Director, NMSS
Attn: Program Support Branch
6400 R. C. Cochrell
6410 N. R. Ortiz
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6416 L. R. Shippers
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WM Project 10, 11, 16
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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: 10/86 - 9/87

DRA PROGRAM MANAGER: J. Peshel BUDGET AMOUNT: 250K

CONTRACT PROGRAM MANAGER: R. M. Cranwell FTS PHONE: 844-8368

PRINCIPAL INVESTIGATOR: L. R. Shippers FTS PHONE: 846-9777

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 MARCH 1987

Activities and Accomplishments

The primary activities during March were: 1) attempts to install and run the two-dimensional Waste Isolation (W.I.) version of STEALTH 2D on the Open NOS (CDC) and the CTSS (CRAY-1) Operating Systems at Sandia; 2) data search for the mechanical properties of the overburden and the basalt flows above the Cohasset; 3) building of appropriate post-processor libraries for the STEALTH codes; and 4) a project meeting with the NRC Project Manager on FIN A-1755 to report on the progress to date and to define tasks for the remainder of FY87.

After updating and compiling the STEALTH 2D W.I. file (source file from the old CRAY version) on the Open NOS, it was discovered that on Open NOS the code needs to have an "overlay structure". Without overlays, the memory requirements to load and execute the program are outside the range of available memory. On the CRAY, or other machines with virtual memory, it is not necessary to overlay the various sub-programs in the code. Among the options to overcome this problem, the most sensible one is to convert the CDC Standard version to the CDC W.I. version with updates rather than modifying the existing CRAY file (as was previously attempted). Satisfactory but slow progress is being made on the COS to CTSS operating system conversions for the CRAY version of the code. It has not been possible to date to locate references that might have site or region specific data on the mechanical properties of the overburden at BWIP; although some data have been located for the basalt flows above Cohasset. Currently, generic data on the mechanical properties of clays or clay sands will be used in the model for the vertical cross-section of a shaft at BWIP. Post processor libraries (GRADIS and PLTLIB) have been created on the

Open NOS operating system that are appropriate for one-, two-, and three-dimensional versions of STEALTH. A trip report is attached that briefly describes the meetings between SNLA and NRC staff in Silver Spring on March 18-19, 1987. Also attached is a list of tasks for FIN A-1755 that resulted from this meeting.

Travel

L. Shipers and K. Wahi met with J. Peshel, the NRC Project Manager for FIN A-1755, at the NRC offices in Silver Spring, Maryland on March 18 and 19, 1987 to discuss the work to be performed during the remainder of FY87 on FIN A-1755.

Problems Encountered

None.

Trip Report for March 18-19, 1987 meetings at NRC:

L. Shipers and K. Wahi travelled to Silver Spring, Maryland to meet with John Peshel, the NRC Project Manager for FIN A-1755. The meetings took place at the NRC offices in Silver Spring on March 18 and 19, 1987.

The main purpose of these meetings was to discuss the work to be performed during the remainder of FY87 for FIN A-1755. A list of activities had been proposed earlier by SNLA in a written communication to the NRC. A briefing on what had been accomplished to date in FY87 was given by L. Shipers and K. Wahi. Technical discussions on each of the proposed activities resulted in the decision to continue with or initiate work on Items 1, 2, 3, 5, and 6 of the initial proposed work by SNLA. A summary of these items is attached. The remaining activities were either deemed as potential for future work or thought to be covered by another contract. Two additional areas in which SNLA could assist the NRC were also discussed. One was the modeling of explosive detonation during the process of excavation of shafts or underground openings. This would provide insight into the relative damage caused by blasting in comparison to mechanical excavation. The other was a suggestion to develop semi-analytical solutions to very near-, near- and far-field thermal behavior problems with possible consideration of convection and radiation. No decision was made regarding either of these items.

The possibility of performing generic thermomechanical response calculations for different emplacement designs in all three media was also discussed. It was agreed that the SNLA and NRC management would be approached to avoid any possible objections to performing generic tuff calculations.

While at the NRC, at the request of J. Peshel, L. Shipers and K. Wahi attended three presentations on subjects that are of generic interest to FIN A-1755. The first one was a presentation by Dean Stucker (OCRWM) on the "Siting and Licensing Role of the Exploratory Shaft Facility" on March 18 at the George Washington University campus. The second presentation was by three different representatives of the Zeni Drilling Company on the topic of "Shaft Drilling Applied to Nuclear Waste Disposal." This presentation was made at NRC on the morning of March 19. The third talk, also at NRC on March 19, was given by Lokesh Chaturvedi (EEG, New Mexico) on their concerns at the WIPP site.

WORK TO BE COMPLETED UNDER FIN A-1755 DURING FY87

The following subtasks are to be completed under Task 1 of FIN A-1755 as an effort to explore areas that require further investigation under this contract. This list of items is the result of meetings held on March 18 and 19, 1987 at the NRC offices in Silver Spring, Maryland between L. Shipers (SNLA), K. Wahi (SNLA/GRAM), and J. Peshel (NRC). Completion of any or all of these subtasks during FY87 is dependent upon the type and quantity of work requested by the NRC project director under Tasks 1 and 2 of the contract. The subtasks are as follows:

1. Continue the 2-dimensional modelling of a shaft liner at BWIP as discussed in the October and November monthly reports.
2. Extend the BWIP shaft liner analysis to include a fully 3-dimensional model. This, when coupled with the results of the previous task, could be used to assess the relative merits of 2- and 3-dimensional modelling in this type of application.
3. Computerize existing simple analytical and semi-analytical shell solutions (based on pressure vessel theory) for use in shaft liner design and analysis. This should result in a computer code capable of running on a PC that has the potential to analyze the coupled thermal-mechanical response of a shaft liner and its surrounding rock mass.
4. Continue installation of the STEALTH 3D computer code received from EPRI (see November monthly report) on the Open NOS computer system at SNLA. This effort will include verification of the standard 3-dimensional version and generation of appropriate 3D updates to allow the code to function in a static or quasi-static mode. An extension of currently available STEALTH 2D updates will be used to generate a static or quasi-static 3D version of the code. This updated version would allow repository-type analyses in a fully 3-dimensional mode and should be easily transportable to the NRC or INEL.

A-1755
 1628.010
 March 1987

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)	0.5	2.5
II. Direct Loaded Labor Costs	3.0	16.0
Materials and Services	0.0	0.0
ADP Support (computer)	1.0	3.0
Subcontracts	-9.0	35.0
Travel	1.0	2.0
G & A	-2.0	4.0
Other (computer roundoff)	-1.0	-1.0
TOTAL COSTS	-7.0	59.0

III. Funding Status

Prior FY Carryover	FY 87 Projected Funding Level	FY 87 Funds Received to Date	FY 87 Funding Balance Needed
None	250K	250K	None