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MEMORANDUM FOR: Myron Fliegel, Section Leader
Hydrology Section
Geotechnical Branch

FROM: Neil M. Coleman, Project Manager
Hydrology Section
Geotechnical Branch

SUBJECT: TRIP REPORT AND SUMMARY STATUS REVIEW OF SANDIA TA PROJECTS

WM Project RES
 WM Record File
 (A1158) A1166
 A1757
 SNW

WM Project 10/14/85
 Docket No. _____
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On September 22, 1985 I traveled to Albuquerque, New Mexico to conduct an on-site review at Sandia National Labs (SNL) of the status of three technical assistance (TA) projects. FIN numbers and project titles are listed below:

- A1158 Repository Site Definition and Technology Transfer
- A1166 Code Maintenance
- A1757 TA in Numerical Modeling Assessment of HLW

This was my first authorized on-site review trip since I assumed project management responsibilities in 1984. The two-day review was conducted on September 23-24 and included individual meetings with the principal investigators of each project and a meeting with Robert Cranwell, the overall Program Manager. All of my formal, written communications with Sandia are transmitted via Cranwell. These primarily include SNL's monthly status reports and my corresponding review comments. Attached for handy reference purposes is an up-to-date SNL organizational flow chart, dated September, 1985. Also included is a personnel list for SNL's Nuclear Fuel Cycle Systems Safety Department, the department through which all three of the projects under review are managed. In this list the department is subdivided by division and includes staff telephone numbers and a list of subcontractors.

Separate comment sections for each project are attached to provide details regarding the status review of each of the three projects. In addition, attached are outlines of past and projected work activities for projects A1158 and A1757. These outlines are intended to provide management with a quick overview of previous work and that proposed for the next fiscal year. Also attached is a summary list of documents that are either products of the projects under review or products of related TA or RES contracts. Although this is not a complete list of relevant documents, it serves well to illustrate the scope and depth of current and previous high-level work performed for NRC by Sandia.

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Overall, the project review was very informative and provided me with a broader view of the scope and depth of Sandia's technical assistance and research work with NRC. During October I briefed NRC staff and management on the status of projects A1166, A1158, A1757, and related projects. The on-site project review provided information for that briefing that could not readily have been obtained otherwise. Given the highly informative interactions of this on-site review, I plan to conduct future reviews at regular intervals, NRC and SNL staff schedules permitting.

NSI

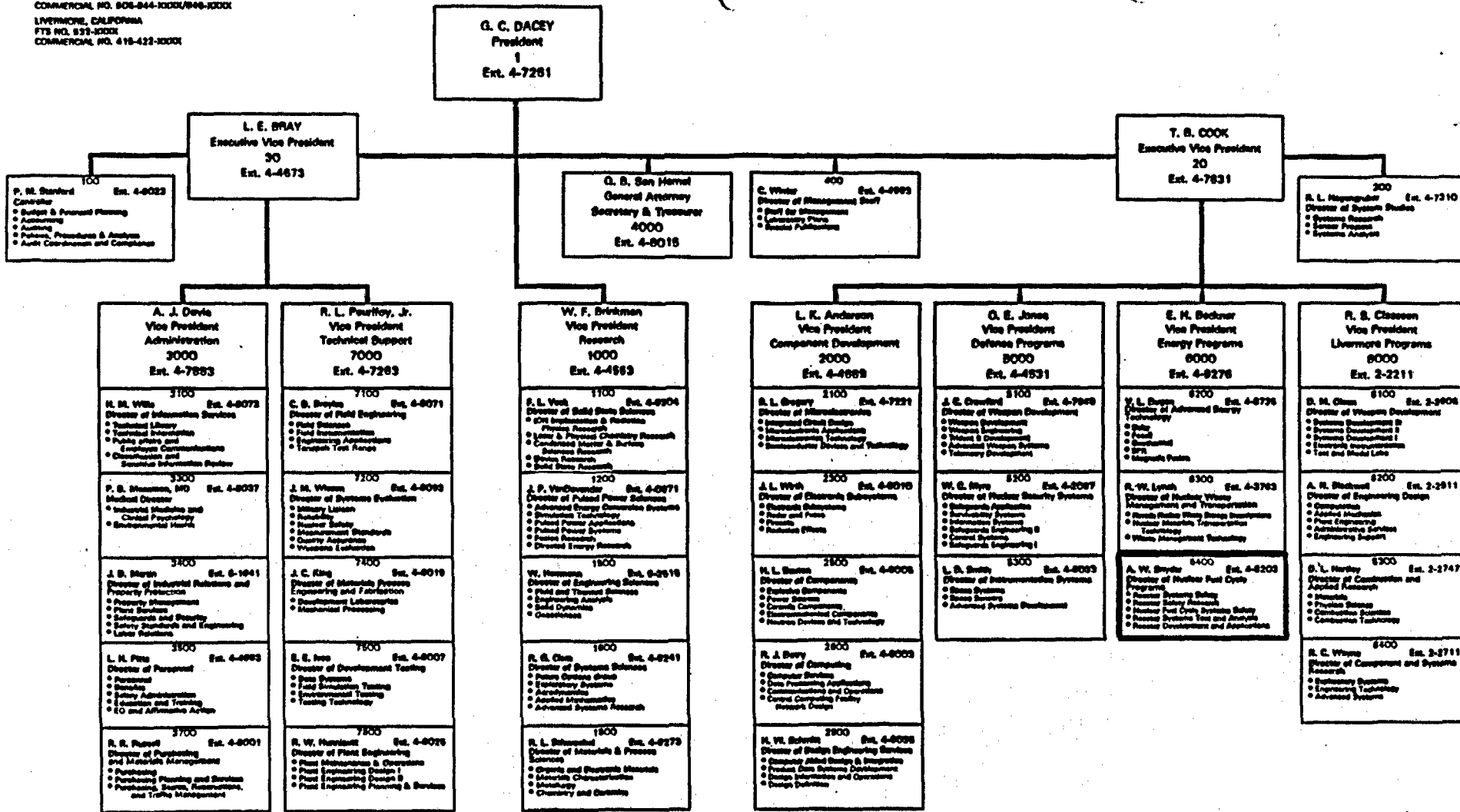
Neil M. Coleman, Project Manager
Hydrology Section
Geotechnical Branch

Enclosure:
As stated

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Sandia National Laboratories Organization

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August 1, 1985

NUCLEAR FUEL CYCLE SYSTEMS SAFETY DEPARTMENT - 6430

Nestor R. Ortiz, Manager 4-5644 823/2413A
Juanita K. Evans, Secretary 6-2963 823/2413

6431 - Waste Management Systems Division

Robert M. Cranwell, Supervisor	4-8368	T56/1
Judy Mattingley, Secretary	4-8108	T56/2
Bonano, Evaristo J. (MTS)	4-5303	T56/4
Chu, Margaret S. Y. (MTS)	4-9931	T56/5
Davis, Paul A. (MTS)	6-5421	T56/7
Emerson, Eugene L. (MLS)	6-9778	T55/7
Harlan, Charlene P. (MTS)	4-8164	823/3080
Hunter, Regina L. (MTS)	6-6337	T55/3
Siegel, Malcolm D. (MTS)	6-5448	T56/6
Wilkinson, Ginger F. (TA)	4-0074	T56/3

6433 - Advanced Nuclear Power Systems Division

Lou O. Cropp, Supervisor	4-8723	823/2413C
Debbie V. Hogan, Secretary	6-2964	823/2413
Aragon, John J. (STA)	6-0350	823/3045
Edenburn, Michael W. (MTS)	4-4003	823/2445
McCulloch, William H. (MTS)	4-7960	823/3011
Thome, Frank V. (MTS)	4-5637	823/3032

RECAP
3 SUPV
10 MTS
1 STA
1 TA
1 MA
16

6000

E. H. Beckner	4-9276	823/4012
Evelyn Ratcliff	4-9277	823/4012
George Kupper	4-2036	823/4054
Margaret Hawk	4-3078	823/2066

6400

A. W. Snyder	4-8203	823/3092
Edwina Nordberg	4-8204	823/3092
Wanda Whitham	4-4192	823/3092

Administrative Coordinators

Dean Davis	4-6265	823/3092
Ruby Cochrell	4-5779	823/3092

OAO

Walt Beyeler	6-3583	T55/8
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Remote Sensing Systems

Bob Guzowski	4-3583	T55/5
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Science Applications, Inc.

Ellen Shepherd	4-2103	T56/8
Dave Updegraff	4-7391	T55/4
Krishan Wahi	4-6268	T56/9
Ken Brinster	4-6059	T56/10

Purchase Analyst

Rosalie Gallegos (3741-2)	4-1939	T51
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SUMMARY OF PROJECT STATUS REVIEWS

Project A1158

Dr. Regina Hunter has been the Principal Investigator for this project for about three years. Work under A1158 is currently scheduled to continue through FY87. Two tasks have been added for FY86 to continue the code maintenance and validation/verification work that was previously conducted under A1166.

The following information was obtained regarding the status of products under this FIN. Three copies of the Unsaturated Tuff RSD, including a camera-ready copy, were hand-delivered to me prior to the end of the fiscal year during the on-site review visit. The camera-ready copy and accompanying paperwork have been delivered to the appropriate NRC office and will be released as a NUREG with a probable cover date of October 1985. A draft of the TOUGH Code Self-Teaching Curriculum is expected to be released by the end of November 1985. Also, the final version of the SWIFT II Self-Teaching Curriculum was estimated to be ready by mid-February, 1986. Completion of this product, along with the corresponding User's Manual and Theory and Implementation Document being completed under RES FIN A1266, is prerequisite to conducting a technology transfer seminar for NRC staff and contractors. It is estimated that such a seminar could be held early in the 3rd quarter of FY86.

I learned that Ginger Wilkinson will be assuming the role of Principal Investigator for Project A1158 during FY86. In discussing this with her it became apparent that she has been fully briefed on A1158 by Regina Hunter, the previous principal investigator. Based on this, and her former work under project A1166, I fully concur with her selection as Principal Investigator for project A1158.

Knowing that Dr. Hunter was outgoing as principal investigator for this project, I debriefed her regarding impressions of SNL interactions with NRC during her tenure. The rapid turnover of NRC project managers during the last three years has been the source of Dr. Hunter's greatest concerns, in that it apparently resulted in inconsistent redirection of some work during this period. Fortunately, a reasonable amount of stability was maintained because there were few staffing changes in recent years on the Sandia side of the project. I looked into the issue of rapid NRC PM turnover and prepared the following list to illustrate the staffing changes:

Project Manager of A1158Date Assumed PM Role

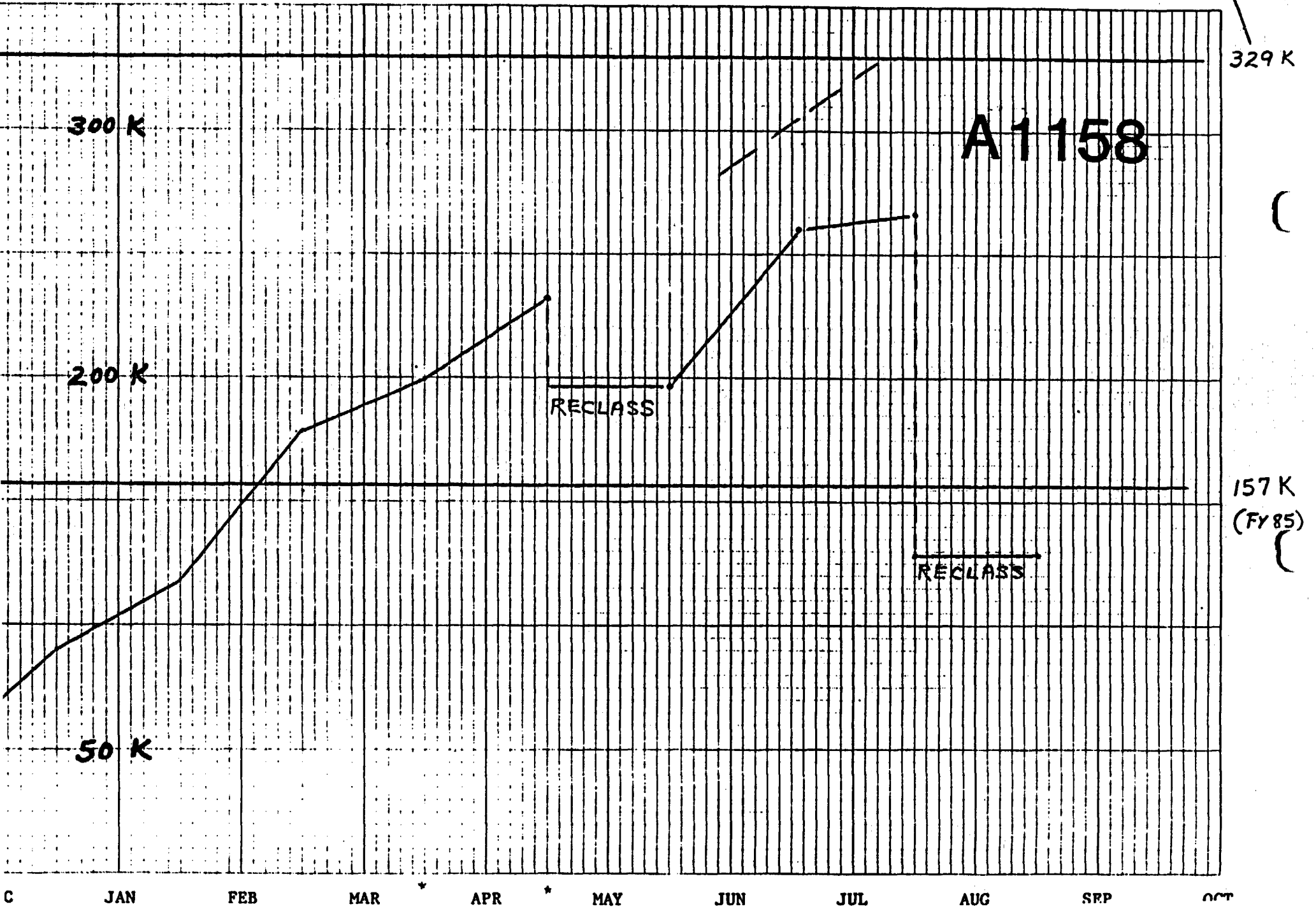
N. Coleman	MAY 1985
R. Codell	OCT 1984
P. Ornstein	JAN 1984
M. J. Wise	SEP 1982
L. Rossbach	?

During the six months that I have managed project A1158, it has become apparent that the procedures used to restore to this project funds spent on other contracts (reclassification) make it very difficult to track, on a monthly basis, the true project funding status. This is especially true when the reclasses occur near the end of the fiscal year. To illustrate this situation, refer to the attached figure that shows actual expenditures under FIN A1158 during the latter part of FY85. The vertical dashed lines represent reclasses of funds that were reassigned to the project account. Note that the sum of the two reclasses exceeds 170K, an amount greater than 50% of the funding available for FY85. During April I had projected that the funds for A1158 would be depleted by July. Fortunately, this proved to be incorrect, but the problem of how to reliably monitor the funding status remained. This matter was discussed with R. Cranwell during the project review, and he stated that the problems have generally been a result of Sandia's accounting procedures and that his recent interactions with the Sandia accounting department should minimize these problems in the future course of this contract.

Project A1166

This project was originally scheduled to terminate at the end of FY85. It is currently operating under a no-cost extension agreement through December, 1985 to allow completion of ongoing work. This work includes the finalization of a draft product, "Quality Assurance (QA) Plan for Computer Software", now undergoing comprehensive review by the NRC staff. This document will be the final product to be delivered under FIN A1166.

I met with Ginger Wilkinson, Principal Investigator of Project A1166, on September 23rd. She assumed the role of Principal Investigator during June and will assume similar responsibilities under A1158 for FY86. I indicated that NRC's comments on the SNL QA Plan for Software would be transmitted as soon as practicable and that the SNL staff should review these comments, estimate how much time will be needed to complete the product, and notify me of the delivery date. Project A1166 will be formally terminated after receipt of that final product.



Project A1757

On September 23rd I met with Paul Davis of SNL and Ken Brinster, a subcontractor and employee of SAI, Inc. I briefed Davis and Brinster on the meeting we had had earlier in September with William Meyer of the USGS in Tacoma, Washington. Meyer is involved with the Interagency Modeling Task Force (working group) that is reviewing performance assessment issues at the BWIP site. We discussed problems that have arisen because the USGS will not release its Extended Pasco Basin Geohydrologic Model. Access to the specific data set used to construct the model and assumptions made in estimating boundary conditions would have greatly facilitated work on our regional model for a region that approximates that covered in the USGS model. Meyer had indicated that all or most of the data used in their regional model was available via WATSTORE, a USGS geohydrologic data base. However, data available for the area and vicinity of the regional model are derived from a voluminous set comprising over 24,000 well records. Of these, only about 5% were used in preparing the regional model. The task of independently sorting through this very large data set to extract the applicable data would be very costly and time-consuming. Given available funds, it seems unreasonable to attempt this task under Project A1757 during FY86. Noting that the DOE had initiated similar work for their own data base, I noted that NRC will probably request access to that information as it is assembled. Our primary task at that time would be to review the selected data for usefulness and applicability to site characterization of the BWIP site.

In view of the problems discussed in the preceding paragraph, I recommended that we take this opportunity to consider development of an intermediate scale model within the Pasco Basin. This model would primarily include the Cold Creek Syncline as currently defined. Plausible boundary conditions were discussed, and it was concluded that the Posson version of the USGS 3-D code could adequately handle most of the projected geohydrologic scenarios. We identified a number of difficulties in evaluating boundary conditions for this subregion. For example, the east and west sides of the Cold Creek Syncline are not clearly definable in a structural sense, although the Columbia River is present to the east. Of greater concern is the presence of a surface hydrologic boundary with transient characteristics due to prevalent wastewater disposal practices within the 200 Areas at Hanford. Also, hydraulic heads in areas adjacent to the Hanford Site are being perturbed by surface applications of river-derived irrigation waters. Other hydraulic disturbances are being caused by nearby groundwater withdrawals. In general, it is recognized that calibration of this intermediate scale model cannot readily be achieved until the Regional Pasco Basin Model is better established.

We also discussed issues raised previously during our BWIP EA review. We reviewed the difficulties encountered in trying to estimate correlation ranges for hydrologic parameters. Davis expressed concern that the transmissivity correlation range values used by DOE to support its EA analyses may be too large. It was noted that if useful and reliable correlation ranges cannot be obtained, then an approach similar to Latin Hypercube Sampling may have to be considered.

We discussed at length the conceptual difficulties of trying to accurately define the term "effective porosity" with respect to both groundwater travel time and solute transport. Numerous complications are introduced when looking at fractured, vesiculated media in three dimensions. It appears that the definition may be somewhat relative, depending on whether one is either considering or neglecting dispersive behavior of solutes.

Paul Davis expressed concerns regarding the minimal preparation time that he has had in the past to prepare for the NRC/DOE workshop interactions. I agreed that this was a problem, and noted that it was caused by difficulties in reaching advance interagency agreement on firm meeting dates. I explained that I will continue to notify him of the best projected dates that we have, and that meeting agendas will be transmitted to him on receipt in our offices.

REVIEW OF FIN A1158**TASK 1: Repository Site Definitions (RSD's) [NOTE: ALL FUTURE WORK UNDER TASK 1 HAS BEEN DEFERRED INDEFINITELY]**

- Task 1 work begun in 1980.
- Domed salt - Work not initiated.
- Granite - Discontinued after 1 year and documented (60% complete).
- Shale - Discontinued after 1 year and documented (50% complete).
- Basalt - Completed (See NUREG/CR-2352, March 1982).
- Tuff - Completed (See NUREG/CR-2937, October 1983).
- Unsaturated Tuff - To be completed during FY85 and documented in FY86.
- Bedded Salt - Completed under Project FIN A1168 (See NUREG/CR-3129, 1983).

TASK 2: Technology Transfer**Subtask 2.1: Resources****Subtask 2.2: Example Problems (intended to help transfer the methodologies - prepared in the form of Self-Teaching Curricula)**

- a. Scenario development
- b. Hydrogeology
- c. Radionuclide transport
- d. Environmental dispersion of radionuclides
- e. Dose to man
- f. Sensitivity and uncertainty analyses
- g. Probabilistics

Subtask 2.3: Technology Transfer Seminars (tutorial sessions for NRC staff members - requires as a prerequisite that user's manuals for codes and self-teaching curricula be available)**Subtask 2.4: Scheduling (requires generation of a program plan for the performance of all work under Task 2)****Subtask 2.5: Documentation (development of user's manuals for codes and creation of self-teaching curricula)**

TASK 3: Code Maintenance

This work was originally performed under FIN A1166. Under this task SNL shall maintain current, standard versions of codes as previously agreed or as required. Codes currently being maintained are shown in the following list:

SWIFT	Latin Hypercube Sampling
Simplified SWIFT	Stepwise Regression
Dual Porosity SWIFT	TOUGH
SWIFT II	USGS 3-D (Poisson Version)
NWFT/DVM	Generalized DVM
DNET	PATH1
Dose and Health Effects	

TASK 4: Validation and Verification Review

This task work was also originally performed under FIN A1166. Under this task the performing organization documents the various tests that have been requested to validate and verify various portions of codes developed by SNL. It is especially important for SNL to identify and carefully document any limitations or deficiencies encountered during the validation process.

A Quality Assurance Plan for computer software has been submitted in draft form for NRC review and comment.

TASK 5: Short-Term Technical Assistance

Requested on an as needed basis, generally consisting of reviews of DOE site characterization program activities and documentation.

REVIEW OF FIN A1757

TASK 1: Perform Mathematical Modeling Studies of Specified Field Sites as Directed by the NMSS PM.

Subtask 1.1: Prepare a Summary of Conceptual Models

A preliminary draft of this data summary has been submitted by the performing organization. This document contains the data that will support all of the modeling activities under subtask 1.4, and is to be modified as new data are gathered during DOE's site characterization activities.

Subtask 1.2: Develop a Program Plan

This work is currently underway, and will outline a proposed schedule for the completion of additional work under this project.

Subtask 1.3: Prepare Simulation Packages for NRC Review

A significant portion of this work has been completed under RES project FIN A1266, and will not be duplicated under this project. Work under this subtask involves developing simulation packages that contain the following kinds of information:

- Clear statement of the scenarios that the models are designed to address
- Maps showing the spatial distribution of all pertinent geologic and geohydrologic data
- Complete list of data variables and their definitions
- Statistical evaluations of data variables
- Designation of an appropriate set of governing equations with written discussions defending the selection within the framework of available data and required assumptions
- Clear presentation of boundary conditions
- Explicit and comprehensive statement of uncertainties and code limitations

Subtask 1.4: Revise Simulation Packages and Perform Numerical Modeling

The following scenarios have been identified as likely targets for numerical modeling investigations:

1. Base case (almost fully developed under FIN A1266)
2. Wastewater disposal practices in the Cold Creek Syncline and elsewhere on the Hanford Reservation
3. Future migration of major channels of the Columbia River
4. Groundwater withdrawals both on- and off-site
5. Effects of constructing the Exploratory Shaft and the In Situ Test Facility
6. Surface application of irrigation waters derived from the Columbia River and/or from groundwater sources
7. Post-emplacement effects on the hydrogeologic system caused by repository-induced thermal loadings
8. Hydrologic effects caused by varying pool elevations (or failure) of the Priest Rapids Dam; also, the effects of any new reservoir construction
9. Hydrologic testing on the full scale of the Cold Creek Syncline
10. Significant future departures from present-day precipitation levels in the Pacific Northwest
11. Appropriate combinations of the above scenarios

TASK 2: Short-Term Technical Assistance

DOCUMENTS RELEVANT TO SNL PROJECTS

- NUREG-0856, 1983. Final Technical Position on Documentation of Computer Codes for High-Level Waste Management.
- NUREG/CR-1608, 1980. Scenario Development and Evaluation Related to the Risk Assessment of High Level Radioactive Waste Repositories (FIN B6693).
- NUREG/CR-1968, 1982. SWIFT Self-Teaching Curriculum (FIN A1158).
- NUREG/CR-2081, 1981. Risk Methodology for Geologic Disposal of Radioactive Waste: The NWFT/DVM Computer Code User's Manual (FIN A1192).
- NUREG/CR-2324, 1981. User's Manual for the Sandia Waste-Isolation Flow and Transport Model (SWIFT), Release 4.81 (FIN A1192).
- NUREG/CR-2352, 1982. Repository Site Definition in Basalt: Pasco Basin, Washington (Basalt RSD, FIN A1158).
- NUREG/CR-2391, 1983. DNET Self-Teaching Curriculum (FIN A1158).
- NUREG/CR-2394, 1982. PATH 1 Self-Teaching Curriculum (FIN A1158).
- NUREG/CR-2419, 1981. Reference Repository Definition (Shale RSD, FIN A1158).
[Note: Not formally released as a NUREG by NRC]
- NUREG/CR-2419 Supplement, 1986. Unsaturated Tuff RSD (currently being finalized under FIN A1158 - expected NUREG release date: OCT 85).
- NUREG/CR-2422, 1983. NRC Report on Dosimetry and Health Effects Self-Teaching Curriculum (FIN A1158).
- NUREG/CR-2739, 1983. Data Base for Basalt Methodology (FIN A1266).
- NUREG/CR-2782, 1982. Summary of Repository Siting Models. (Final Report) (FIN B6985).
- NUREG/CR-2937, 1983. Repository Site Data Report for Tuff: Yucca Mountain, Nevada (Tuff RSD, FIN A1158).
- NUREG/CR-3066, 1982. Parameters and Variables Appearing in Repository Siting Models (FIN B6985).

NUREG/CR-3097, 1982. Benchmark Problems for Repository Siting Models (FIN B6985).

NUREG/CR-3129, 1983. Repository Site Data and Information in Bedded Salt: Palo Duro Basin, Texas (FIN A1168).

NUREG/CR-3316, 1984. Verification and Field Comparison of the Sandia Waste-Isolation Flow and Transport Model (SWIFT) (FIN A1166).

NUREG/CR-3378, 1984. Verification of the Network Flow and Transport/Distributed Velocity Method (NWFT/DVM) Computer Code (FIN A1166).

NUREG/CR-???, 1986. SWIFT II Self-Teaching Curriculum (currently being finalized under FIN A1158).

NUREG/CR-???, 1986. Quality Assurance Plan for Computer Software (Product currently being finalized under FIN A1166).

SAND79-1473, 1980. Latin Hypercube Sampling (Program User's Guide) (Product under DOE contract).