



**Sandia
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**YUCCA
MOUNTAIN**

**YUCCA
MOUNTAIN
SITE
CHARACTERIZATION
PROJECT**

Monthly Status Report

January 1993

DISCLAIMER

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January 1993

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Highlights

SNL staff digitizes the cross sections associated with the geologic map of Yucca Mountain (Scott and Bonk, USGS Open-File Report 84-494); the welded and nonwelded lithologies are coded into indicators with geographic coordinates.

See **1.2.3.2.2.2 Three-Dimensional Rock Characteristics** on page 4

SNL staff completes initial planning for geotechnical monitoring associated with proposed north portal and starter tunnel construction and works with USGS staff to define and conduct thermal and mechanical tests on core from the north ramp holes.

See **1.2.4.1.1 Repository Coordination and Planning** on page 9

Highlights, Continued

SNL staff develops, implements, and tests a new data reduction scheme for the ongoing laboratory Hilbert Transform-based experiments involving small polycarbonate models.

See **1.2.4.2.1.2 Rock Mass Analysis** on page 12

SNL staff meets with members of the Management and Operations Exploratory Studies Facility (ESF) design group to identify and define analyses to support the north ramp design.

See **1.2.4.2.3.2 Design Analysis** on page 13

SNL staff completes SLTR92-0005, the document describing the performance assessment plan for the ESF Title II design support. SNL staff also submits recommendations for controls on surficial water usage and locations of surficial ponds for inclusion in Appendix I of the ESF Design Requirements document and the Surface-Based Testing Field Requirements document.

See **1.2.5.4.7 Supporting Calculations for Postclosure Performance Analyses** on page 23

SNL staff completes the first four major steps in the Transition Plan of the Office of Civilian Radioactive Waste Management Office of Quality Assurance.

See **1.2.11 Quality Assurance** on page 27

WBS Elements Without Reportable Activity This Period

1.2.1.2.1	Program Level Requirements Document Development
1.2.1.2.2	Project Level Requirements Documents Development and Maintenance
1.2.2.4.3	Container/WP Interface Analysis
1.2.5.5	Special Projects

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EXECUTIVE SUMMARY JANUARY 1993

WBS 1.2.3.2.2.2 Three-Dimensional Rock Characteristics

- The cross sections associated with the Scott and Bonk geologic map of Yucca Mountain (USGS Open-File Report 84-494) have been digitized and the welded versus nonwelded lithologies coded into indicators with associated geographic coordinates. This information will be used to construct indicator variograms and to develop a model of spatial continuity for use in simulations of equivalent lithology as part of the 1993 total-systems performance-assessment (TSPA) activity. This modeling is intended to investigate the performance implications of uncertainty in the location of stratigraphic contacts. Undulatory contacts between materials of significantly different hydrologic character might serve to focus groundwater flow, thus leading to fast flow in fractures to the water table. (SCP Activity 8.3.1.4.3.2.1)

WBS 1.2.4.1.1 Repository Coordination and Planning

- SNL staff completed initial planning for geotechnical monitoring activities to be conducted as part of the north portal and starter tunnel construction. These activities are associated with the implementation of Study Plan 8.3.1.15.1.8 that was submitted to the Project Office for approval.
- SNL staff has been working with principal investigators (PIs) from the USGS to define and conduct a series of thermal and mechanical tests on the core from the NRG holes. The testing will be done under WBS 1.2.3, but significant effort from WBS 1.2.4 is required to ensure that the testing is coordinated with ESF design needs.

WBS 1.2.4.2.1.2 Rock Mass Analysis

- Laboratory work continued on the experiments involving small polycarbonate models. SNL staff developed and implemented a new data reduction scheme based on a Hilbert Transform. SNL staff tested the data reduction scheme on a simple test case using a solid sample of polycarbonate, which is geometrically similar to the jointed samples. This sample was loaded in uniaxial compression. Two sets of simple uniaxial loading tests were performed at each of four different stress levels. One set of tests was performed for displacements parallel to the loading direction, and one set was performed perpendicular to the loading direction. The data was compared to the analytical solution of a uniaxially loaded thin plate containing a circular hole. Considering the different boundary conditions between the theory and experiment, the agreement is quite good. A report describing the method is in preparation.



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WBS 1.2.4.2.3.2 Design Analysis

- SNL staff met with members of the M&O ESF design group to identify and define analyses needed to support the design of the ESF north ramp. Three analyses were defined for SNL to complete before the 90% design review. These include far-field thermal analyses to assess the potential for thermal loading of the north ramp, analyses of ramp cross sections to assess long-term stability and support requirements, and a three-dimensional analysis of the intersections of the north ramp with the ramp to the Calico Hills. Thermal as well as structural calculations will be carried out to assist in the completion of the 90% review package due in August 1993.

WBS 1.2.5.4.7 Supporting Calculations for Postclosure Performance Analyses

- SLTR92-0005, the document describing the performance assessment plan for the ESF Title II design support has been completed. The plan described in the document will be developed and implemented.
- Recommendations for controls on surficial water usage and locations of surficial ponds have been submitted for inclusion in Appendix I of the ESF Design Requirements Document and the Surface-Based Testing Field Requirements Document. Recommendations were based on the calculations described in PDM 72-32 that were used to estimate the performance impacts of surficial water use in the controlled zone outside the repository.

WBS 1.2.11 Quality Assurance

- Staff have completed the first four major steps of the Transition Plan specified by the OCRWM Office of QA.

1.2.1 SYSTEMS ENGINEERING

The objective of the Systems Engineering element is to apply the systems engineering discipline to transform the regulatory requirements into functional needs of the MGDS design, system configuration, and site characterization activities. The Systems Engineering element is comprised of four tasks: Systems Engineering Coordination and Planning (1.2.1.1), Program-Level Requirements Document Development (1.2.1.2.1), Project-Level Requirements Documents Development and Maintenance (1.2.1.2.2), and Special Studies (1.2.1.5), which includes development of items important to safety/waste isolation.

1.2.1.1 SYSTEMS ENGINEERING COORDINATION AND PLANNING

Status Report on Ongoing Activities

Comment resolution on five draft subsystem requirements documents continued and is nearing completion.

Major Activities Upcoming Next Three Months

New drafts of the project-level requirements documents will be issued by the Management and Operations (M&O) contractor for review by Sandia National Laboratories (SNL) and other reviewers.

1.2.1.5 SPECIAL STUDIES

Status Report on Ongoing Activities

Assessment Team comments on draft SAND92-2334, "Preclosure Radiological Safety Evaluation-Exploratory Studies Facility," were resolved. Minor text changes were made as a result and the document is being resubmitted for the Project Office policy review. With the release of the two deliverables, SLTR92-0004 and SAND92-2334, SNL's actions under the "Determination of Importance and Grading Enhancement (DIGE) Management Plan" (YMP/92-1) are completed and final records will be submitted to the Problem Definition Memo (PDM) 71-46 file.



1.2.3 SITE INVESTIGATIONS

The objective of the Site Investigations element includes work scope related to site data collection and analysis to support site suitability evaluation, design, licensing, performance assessment requirements, and the natural barrier system component of the multiple barrier system described in the physical system. The Site Investigations element is comprised of eight tasks: Site Investigations Coordination and Planning (1.2.3.1), Systematic Acquisition of Site-Specific Subsurface Information (1.2.3.2.2.1), Three-Dimensional Rock Characteristics Models (1.2.3.2.2.2), Laboratory Thermal Properties (1.2.3.2.7.1.1), Laboratory Thermal Expansion Testing (1.2.3.2.7.1.2), Laboratory Determination of Mechanical Properties of Intact Rock (1.2.3.2.7.1.3), Laboratory Determination of the Mechanical Properties of Fractures (1.2.3.2.7.1.4), and Future Regional Climate and Environments (1.2.3.6.2.1.6).

1.2.3.1 SITE INVESTIGATIONS COORDINATION AND PLANNING

Significant Meetings Attended

SNL staff participated in the Sample Overview Committee (SOC) meeting on January 19, 1993, in Area 25 at the Nevada Test Site (NTS). Various core requests, principally involving the north ramp (NRG) series of holes, were acted upon. The sample request submitted by SNL and subsequently rejected last month by the SOC after it was erroneously reported that no approved study plan was in place for the requesting study was resubmitted and approved. The original study plan describing the testing process is an approved Project document. Confusion on the study plan status occurred because the study plan is being reissued to incorporate the redesigned Exploratory Studies Facility (ESF) as a series of ramps and drifts rather than as a vertical shaft. The revision is in review.

1.2.3.2.2.1 SYSTEMATIC ACQUISITION OF SITE-SPECIFIC SUBSURFACE INFORMATION

Major Accomplishments

"Influence of Deterministic Geologic Trends on Spatial Variability of Hydrologic Properties in Volcanic Tuff," by C. A. Rautman (SNL), J. D. Istok (Oregon State University), A. L. Flint [United States Geological Survey (USGS)], L. E. Flint [Raytheon Services of Nevada (RSN)], and M. P. Chornack (USGS), received Project Office approval and was submitted to the American Nuclear Society (ANS) for publication in April 1993 as part of the *Proceedings of the 4th International High-Level Radioactive Waste Management Conference*. (SCP Activities 8.3.1.4.3.1.1 and 8.3.1.2.2.3.1)

Significant Meetings Attended

SNL staff met with other Project personnel and University of Nevada-Las Vegas (UNLV) computing center faculty on January 29, 1993, to discuss the use of statistics and computer graphics for modeling natural phenomena, including the design of sampling for *spatially correlated* phenomena. The study plan for the Systematic Drilling Program incorporates many of the sampling concepts advocated by UNLV's Dr. Yfantis in its design. The possibility for involvement of the UNLV group in evaluating the adequacy of the drilling and sampling program at Yucca Mountain will be explored further. See Work Breakdown Structure (WBS) 1.2.3.2.2.2.2 for further detail. (SCP Activity 8.3.1.4.3.1.1)

Status Report on Ongoing Activities

Two data reports in preparation will contain the results of the outcrop sampling studies conducted at Yucca Mountain over the past several years. One report will focus on the two-dimensional set of transects covering



the shardy base microstratigraphic unit of the Tiva Canyon Member, whereas the other will contain the results of more areally and stratigraphically diverse sampling throughout the Yucca Mountain area. The reports will probably be prepared as USGS open-file reports because the laboratory measurements of hydrologic properties were performed at the USGS Hydrologic Research Facility. (SCP Activities 8.3.1.4.3.1.1 and 8.3.1.2.2.3.1)

The paper submitted to the International High-Level Radioactive Waste Management Conference is being rewritten for journal publication. (SCP Activities 8.3.1.4.3.1.1 and 8.3.1.2.2.3.1)

Technical procedures for the Systematic Drilling Program are being drafted in close cooperation with SNL Quality Assurance (QA) personnel. Several SNL QA implementing procedures (QAIPs) will be rewritten in accord with the recently revised Project-level Quality Assurance Requirements and Description (QARD) document and the Systematic Drilling Program interfaces with other Project participants. For example, SNL QAIP 8-1 mandates the use of an SNL sample-numbering system, yet samples for the SD series of drill holes will be processed through the Sample Management Facility (SMF) and assigned a unique sample designator. To retain this Project-level sample identifier requires that the current SNL procedure be modified. (SCP Activity 8.3.1.4.3.1.1)

Geostatistical analysis of hydrologic properties data from outcrop studies of the Bandelier Tuff, a natural analog for some of the nonwelded tuffs at Yucca Mountain, was deferred due to limited staff resources and higher-priority work. (SCP Activity 8.3.1.4.3.1.1)

Major Activities Upcoming Next Three Months

Field sampling to complete the outcrop sampling effort will be conducted in early February 1993, weather permitting. This sampling will emphasize the shardy base of the Topopah Spring Member, which appears to be lithologically similar (and perhaps hydrologically similar) to the shardy base microstratigraphic unit of the stratigraphically higher Tiva Canyon Member. Sampling will also be conducted at other geographic and stratigraphic locations where additional data appear necessary. The data reports for the outcrop sampling work will be drafted and submitted for review as soon as feasible. (SCP Activities 8.3.1.4.3.1.1 and 8.3.1.2.2.3.1)

The technical procedures and modifications to SNL QAIPs that are necessary for the field and laboratory activities of the Systematic Drilling Program will be finalized and issued as controlled documents.

Presentation materials will be prepared for the International High-Level Radioactive Waste Management Conference on April 26 through 30, 1993.



1.2.3.2.2.2 **THREE-DIMENSIONAL ROCK CHARACTERISTICS MODELS**

Major Accomplishments

"Recent Developments in Stochastic Modeling and Upscaling of Hydrologic Properties in Tuff," by C. A. Rautman (SNL) and T. H. Robey (Spectra Research Institute), received Project Office approval and has been sent to the ANS for publication in the *Proceedings of the 4th International High-Level Radioactive Waste Management Conference*. (SCP Activity 8.3.1.4.3.2.1)

Significant Meetings Attended

SNL staff presented the results of several simulation exercises and other developments in simulation technology to investigators from the USGS, Unsaturated Zone Section, in an informal technical information exchange on January 20, 1993, in Las Vegas, NV. These informal meetings, sponsored by the USGS and held at irregular intervals, are particularly valuable in that they bring together modelers, data-gatherers, and field and laboratory personnel investigating the unsaturated zone to discuss activities, needs, problems, and breakthroughs. (SCP Activity 8.3.1.4.3.2.1)

SNL staff met with other Project personnel and UNLV computing center faculty on January 29, 1993, to discuss the use of statistics and computer graphics for modeling natural phenomena. The UNLV computer sciences group has considerable experience in surface estimation and visualization, sampling design, compression of computer-generated images for use in animation sequences, and implementation of parallel processing for complex computer codes. The modified fractal surface-generation algorithms being developed by UNLV students and faculty could provide the basis for an alternative/confirmatory modeling technique to complement the more geostatistical approaches currently in development. Parallel implementation of the simulation algorithm selected to model Yucca Mountain may be mandatory, given the large number of simulations anticipated. (SCP Activity 8.3.1.4.3.2.1)

SNL staff also met with personnel working on the SNL environmental restoration activities in Albuquerque, NM. These personnel are developing a computerized decision-support system for evaluating, monitoring, and remediating various low-level radioactive, hazardous, and mixed waste sites at the SNL plant. The discussions have identified a common need for a user-friendly graphical user interface to more

sophisticated modeling algorithms for hydrologic properties, such as those contained in the GSLIB package of subroutines. The environmental restoration group is implementing the prototype decision-support system on a SUN workstation running under Open Windows, which is completely compatible with SNL YMP computing facilities. Additional discussions will explore jointly funded development of an integrated geostatistical package. Further interest in such a system has been expressed by SNL staff involved in the integrated demonstration project at the Fernald, OH, U.S. Department of Energy (DOE) site. (SCP Activity 8.3.1.4.3.2.1)

Status Report on Ongoing Activities

The cross sections associated with the Scott and Bonk geologic map of Yucca Mountain (USGS Open-File Report 84-494) have been digitized and the welded versus nonwelded lithologies coded into indicators with associated geographic coordinates. This information will be used to construct indicator variograms and to develop a model of spatial continuity for use in simulations of equivalent lithology as part of the 1993 total-systems performance-assessment (TSPA) activity. This modeling is intended to investigate the performance implications of uncertainty in the location of stratigraphic contacts. Undulatory contacts between materials of significantly different hydrologic character might serve to focus groundwater flow, thus leading to fast flow in fractures to the water table. (SCP Activity 8.3.1.4.3.2.1)

The simulations of the N-54/N-55 cross sections produced for the recently completed International High-Level Radioactive Waste Management Conference paper have not yet been rerun using the two-step simulation process identified as a work-around to the simulation artifacts identified last month. Work will continue in this area. (SCP Activity 8.3.1.4.3.2.1)

Major Activities Upcoming Next Three Months

The study plan for the three-dimensional rock characteristics models study will be initiated. The requirements for study plan descriptions of experiments and test work do not fit this activity well. Therefore, content of this study plan will by necessity focus on the geostatistical tools used for analysis. The many one-of-a-kind modeling exercises of this activity and the necessity to guide ongoing modeling activities by the results of the immediately preceding analysis step render the scientific notebook method a very reasonable approach to controlling the three-



dimensional rock characteristics study. SNL QA procedures are currently being revised to facilitate the use of scientific notebooks as described in the QARD. (SCP Activity 8.3.1.4.3.2.1)

Work will also commence on attempting to modify the simulation codes to accommodate the soft information provided by the known microstratigraphic units at Yucca Mountain. SNL staff will discuss with USGS personnel the required interfaces to the geometric model being developed by the USGS. The initial Lynx model of the Topopah Spring Member of the Paintbrush Tuff, including its internal microstratigraphic zonation, will be completed by the USGS in April 1993. (SCP Activity 8.3.1.4.3.2.1)

Presentation materials will be prepared for the International High-Level Radioactive Waste Management Conference, which will be held in Las Vegas, NV, on April 26 through 30, 1993. (SCP Activity 8.3.1.4.3.2.1)

Discussions will continue with UNLV and M&O staff regarding technical support investigations at UNLV. Interactions with SNL environmental restoration personnel will continue as well. (SCP Activity 8.3.1.4.3.2.1)

Issues/Potential Problems Needing Resolution and Potential Impacts

As described above, SNL QAIPs must be revised to accommodate the new Project-level requirements. This will involve and is receiving a significant effort by SNL QA and technical staff, but these revisions are required to initiate modeling that is subject to the QA program. (SCP Activity 8.3.1.4.3.2.1)

1.2.3.2.7.1.1 LABORATORY THERMAL PROPERTIES

Status Report on Ongoing Activities

Reproducibility studies for the C-Matic low temperature (LT) instrument using the moisture containment cell are in process. Five runs using a Pyrex standard have been completed, yielding the differences between the highest and lowest measurements of 4.0%, 5.4%, and 4.9% at 80°C, 50°C, and 30°C, respectively. These test were made using Parafilm M as the interface medium between the sample and moisture containment cell. The higher temperatures were measured first to allow the Parafilm to soften and form a better interface. Repeatability of the instrument without the moisture containment cell is within $\pm 3\%$. The C-Matic LT will be used for measuring thermal conductivity at temperatures from 20°C to 100°C. (SCP Activity 8.3.1.15.1.1.3)

After a calibration and verification is performed on C-Matic LT with the moisture containment cell, additional measurements will be made to determine the accuracy of the instrument when using Parafilm as the interface medium. Technical Procedure (TP) 202, "Measurement of Thermal Conductivity of Geologic Samples by the Guarded-Heat-Flow-Meter Method," will be revised, if necessary, to correct the calibration and verification criteria for measurements made with the moisture containment cell.

Major Activities Upcoming Next Three Months

The scoping study on the effects of saturation on thermal conductivity will begin after the C-Matic LT instrument is calibrated, the data acquisition software is verified and approved, and the relevant procedures are revised. (SCP Activity 8.3.1.15.1.1.3)



1.2.3.2.7.1.2 LABORATORY THERMAL EXPANSION TESTING

Status Report on Ongoing Activities

A 1-inch sample from Busted Butte Unit TSw2 was run at the 0.25°C/min ramp rate as a baseline sample for determining when tridymite and cristobalite undergo polymorphic transformations. As with the 4-inch TSw2 sample that was previously run, there were no sudden increases in the coefficient of thermal expansion (CTE) over the tested range.

A 1-inch sample from thermal/mechanical Unit TSw1 from drill hole USW G1, which contains significant amounts of both tridymite and cristobalite, was tested from ambient temperature to 325°C using a ramp rate of 0.25°C/min. Two significant increases in the instantaneous CTE at approximately 165°C (from ~1.3 to ~3.3 ppm/°C) and 250°C (from ~2.5 to ~5.3 ppm/°C) were measured. These temperatures correspond to those at which a to B polymorphic transformations occur for tridymite and cristobalite, respectively. The sample was then allowed to cool at a rate of less than 1°C/min while the CTE was measured. The significant change in the instantaneous CTE was measured at approximately 120°C, which is assumed to be a temperature hysteresis caused by the silica polymorphs reverting to their initial form. The mineralogy of the sample is being assessed to confirm the presence of tridymite and cristobalite. Tests to establish the appropriate heating rate are continuing using 4-inch samples and a 1°C/min. (SCP Activity 8.3.1.15.1.2.1)

Review comments for TP-203, "Measurement of Thermal Expansion of Geologic Samples Using a Push Rod Dilatometer," are being resolved.

Review comments for TP-215, "Calibration of Lawson Board System," is being reviewed. These systems are used in the Thermal Conductivity Analyzer (TCA), Qualitative Thermal Analyzer (QTA), and dilatometer to reference cold junction temperatures and to convert thermocouple emf to a digital signal.

Major Activities Upcoming Next Three Months

A scoping study on the effects of sample size on thermal expansion will be initiated after the heat-up rates are established and the relevant procedures are issued. (SCP Activity 8.3.1.15.1.2.1)

1.2.3.2.7.1.3 LABORATORY DETERMINATION OF MECHANICAL PROPERTIES OF INTACT ROCK

Major Accomplishments

"Characterization of Porosity in Support of Mechanical Property Analysis" has been accepted for presentation and publication at the 1993 International High-Level Radioactive Waste Management Conference on April 26 through 30, 1993, at Las Vegas, NV. The paper was prepared, approved, and submitted in January 1993 to the conference. (SCP Activity 8.3.1.15.1.3.2)

Status Report on Ongoing Activities

New England Research, Inc. (NER) is conducting a study of time-dependent deformation involving high-temperature experiments at creep and low strain rate conditions. The series of experiments consists of a least six samples of Topopah Spring welded tuff (TSw2) to be tested at a pore pressure of 4.5 MPa, a confining pressure of 5 MPa, and a maximum constant differential stress of 80 MPa. The experiments are initially performed at room temperature and then at 250°C. The furnace has been rebuilt; however, the high-temperature calibration of the system has taken longer than expected. The second experiment should begin in February. (SCP Activity 8.3.1.15.1.3.2)

R. Price visited NER on January 11 through 13, 1993, to discuss progress on and plans for the time-dependent property experiments. A number of reports in process were discussed also. (SCP Activity 8.3.1.15.1.3.2)

SAND92-1810, "Unconfined Compression Experiments on Topopah Spring Member Tuff at 22°C and a Strain Rate of 10⁻⁶s⁻¹: Data Report," has been put into technical and editorial review. (SCP Activity 8.3.1.15.1.3.2)

"The Influence of Strain Rate and Sample Inhomogeneity on the Moduli and Strength of Welded Tuff" has been accepted for presentation and publication at the 3rd U.S. Symposium on Rock Mechanics on June 27 through 30, 1993, at the University of Wisconsin-Madison. (SCP Activity 8.3.1.15.1.3.2)

Major Activities Upcoming Next Three Months

NER staff R. Martin and P. Boyd will be in Albuquerque, NM, in February 1993 to discuss results from the testing of samples of Topopah Spring



Member tuff in the investigation of time-dependent mechanical properties and plans for testing NRG samples.

SAND92-0119, "Experimental Comparison of Laboratory Techniques in Determining Bulk Properties of Tuffaceous Rocks," and SAND92-0847, "The Effect of Frequency on Young's Modulus and Seismic Wave Attenuation in Tuff," have been technically and editorially reviewed. The document revisions in response to the resulting comments will be completed in February 1993. (SCP Activity 8.3.1.15.1.3.2)

1.2.3.2.7.1.4 LABORATORY DETERMINATION OF THE MECHANICAL PROPERTIES OF FRACTURES

Status Report on Ongoing Activities

The technique for making gypsum cement replicas of rough fractures in the welded Topopah Spring Member tuff is being refined. Achieving maximum surface hardness and strength and the problem of entrainment of bubbles are being addressed. A set of replicas are being cast to study the effect of topographic correlation. (SCP 8.3.1.15.1.4.2)

Study Plan 8.3.1.15.1.4, "Laboratory Determination of the Mechanical Properties of Fractures," has been reviewed by other Project participants, the Project Office, and Headquarters personnel. Review comments were received in May 1992; the study plan is being revised. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

Major Activities Upcoming Next Three Months

A revised version of Study Plan 8.3.1.15.1.4, "Laboratory Determination of the Mechanical Properties of Fractures," will be submitted to the Project Office in the next two months. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

SAND92-2216J, a journal article entitled "Simple Mathematical Model of a Rough Fracture" is being drafted and will be submitted for review in the next two months. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

SAND92-2333, "The Effect of Sliding Velocity on the Mechanical Response of Artificial Joints in Topopah Spring Member Tuff," has been drafted and will begin technical and editorial review in the next two months. (SCP Activity 8.3.1.15.1.3.2)



1.2.3.6.2.1.6 FUTURE REGIONAL CLIMATE AND ENVIRONMENTS

Status Report on Ongoing Activities

Funding for this WBS element was allocated for FY93 to complete the Study Plan and prepare a transition plan for SNL's acceptance of this work. A new Task Leader was assigned and is evaluating program status prior to initiating work on these deliverables.

Major Activities Upcoming Next Three Months

The program status will be ascertained and transition actions defined.



1.2.4 REPOSITORY

The objective of the Repository element includes work scope related to the repository component of the physical system including the repository operations system, the underground facility component of the engineered barrier system, the access/borehole seals, and the monitoring system component of the performance evaluation system. The Repository element is comprised of nine tasks: Repository Coordination and Planning (1.2.4.1.1), Excavation Investigations (1.2.4.2.1.1.1), In Situ Thermomechanical Properties (1.2.4.2.1.1.2), In Situ Mechanical Properties (1.2.4.2.1.1.3), In Situ Design Verification (1.2.4.2.1.1.4), Rock Mass Analyses (1.2.4.2.1.2), Certification of Design Methods (1.2.4.2.3.1), Design Analysis (1.2.4.2.3.2), and Sealing and Design Requirements (1.2.4.6.1).

1.2.4.1.1 REPOSITORY COORDINATION AND PLANNING

Status Report on Ongoing Activities

Study Plan 8.3.1.15.1.8, "In Situ Design Verification," completed comment resolution and a final draft was submitted to the Project Office for approval. Work continued on revising Study Plan 8.3.1.15.1.5, "Excavation Investigations," and initial drafts of Study Plans 8.3.1.15.1.6, "In Situ Thermomechanical Properties," and 8.3.1.15.1.7, "In Situ Mechanical Properties," were started.

SNL completed initial planning for geotechnical monitoring activities to be conducted as part of the north portal and starter tunnel construction. These activities are associated with the implementation of Study Plan 8.3.1.15.1.8 under WBS 1.2.4.2.1.1.4. However, funding for these activities is provided under WBS 1.2.6.

SNL staff continues to work with the M&O and staff from Lawrence Livermore National Laboratory (LLNL) to develop a plan for resolving numerous issues related to the thermal loading of the potential repository. Meetings were held at LLNL and the Project Office to begin an evaluation of the current state of repository modeling and determine what additional modeling and laboratory-scale testing is required to provide the level of confidence in the modeling results that is necessary before a design

decision on thermal loading can be made. Also, a working group is being formed to revise the Site Characterization Plan (SCP) thermal goals for repository design. This is a critical step for defining the thermal envelope for Advanced Conceptual Design (ACD) design studies and for defining key information to be obtained from the testing program.

SNL staff is working with the M&O Exploratory Studies Facility (ESF) design team to define a set of thermal-structural analyses to support the ESF design. A series of meetings has been held to discuss the scope of the analyses and the schedule for delivery of results to ESF designers.

SNL staff has been working with principal investigators (PIs) from the USGS to define and conduct a series of thermal and mechanical tests on the core from the NRG holes. The testing will be done under WBS 1.2.3, but significant effort from WBS 1.2.4 is required to ensure that the testing is coordinated with ESF design needs.

Major Activities Upcoming Next Three Months

Significant effort will be required to plan and implement the geotechnical monitoring effort in the starter tunnel. SNL staff will work closely with LLNL staff to coordinate the preparation of a Test Planning Package. Analyses of the thermal and structural analyses of the north ramp will be initiated in support of the ESF design.



1.2.4.2.1.1.1 EXCAVATION INVESTIGATIONS

Status Report on Ongoing Activities

Staff continued to revise Study Plan 8.3.1.15.1.5, "Excavation Investigations," to reflect the current ESF configuration and proposed mining method.

Major Activities Upcoming Next Three Months

Staff will continue to revise Study Plan 8.3.1.15.1.5.

1.2.4.2.1.1.2 IN SITU THERMOMECHANICAL PROPERTIES

Status Report on Ongoing Activities

Staff continued work on the rough draft of Study Plan 8.3.1.15.1.6, "In Situ Thermomechanical Properties."

Major Activities Upcoming Next Three Months

Staff will continue drafting Study Plan 8.3.1.15.1.6.



1.2.4.2.1.1.3 IN SITU MECHANICAL PROPERTIES

Status Report on Ongoing Activities

Staff continued work on the rough draft of Study Plan 8.3.1.15.1.7, "In Situ Mechanical Properties."

Major Activities Upcoming Next Three Months

Staff will continue drafting Study Plan 8.3.1.15.1.7.

1.2.4.2.1.1.4 IN SITU DESIGN VERIFICATION

Major Accomplishments

At the comment resolution meeting of January 12, 1993, the final comments to Study Plan 8.3.1.15.1.8, "In Situ Design Verification," were resolved. All 138 comments have now been resolved and a revision of the Study Plan incorporating comment resolutions has been submitted to the Project Office.

Major Activities Upcoming Next Three Months

Staff will prepare a letter explaining how the revised study plan submitted to the Project Office addresses open items from the Nuclear Regulatory Commission (NRC) Site Characterization Analysis comments.



1.2.4.2.1.2 ROCK MASS ANALYSES

Significant Meetings Attended

SNL and M&O personnel met in Albuquerque, NM, on January 27, 1993 to discuss SNL support of design activities. J. Jung and E. Ryder of SNL will meet with the M&O again on the topic in early February in Las Vegas, NV.

Status Report on Ongoing Activities

Laboratory work continued on the experiments involving small polycarbonate models. Last month, SNL developed and implemented a new data reduction scheme based on a Hilbert Transform. This scheme is designed to extract two-dimensional strain/displacement information from images of Moire fringes. This month, SNL tested the data reduction scheme on a simple test case using a solid sample of polycarbonate, which is geometrically similar to the jointed samples used for the multiple layered tests. This sample was loaded in uniaxial compression. Two sets of simple uniaxial loading tests were performed at each of four different stress levels. One set of tests was performed for displacements parallel to the loading direction, and one set was performed perpendicular to the loading direction. The data was compared to the analytical solution of a uniaxially loaded thin plate containing a circular hole. Considering the different boundary conditions between the theory and experiment, the agreement is quite good. SNL staff also tested the software on simulated fringe data containing displacement discontinuities. A problem resulting in occasional false displacement magnitude was identified and corrected. Next month, data from the jointed block experiment will be analyzed. A report describing the method is in preparation.

A study is underway to explore the surface characteristics of natural fractures and relate these to the frictional data gathered on replicas of the surfaces. This study will place special emphasis on determining whether the fitting parameters on the Barton Model for

frictional behavior have physical significance or not. The majority of the experimental work will be carried out by a University of Colorado at Boulder (CU) graduate student at SNL. Five natural fracture surfaces have been prepared for replication. These surfaces have a range in surface roughness from relatively smooth to very rough in appearance. The surfaces have been profiled for detailed analysis with fractal and other statistical techniques. Also, more than 10 gypsum cement samples (with varying amounts of water content) have been cast for testing beginning in February.

A series of experiments designed to study the effects of a nonstandard loading condition on frictional properties has been conducted at CU. Replicas of fractures in rock samples have been tested for normal stiffness and shear deformation properties. SAND 92-1853, "Effect of Boundary Conditions on the Strength and Deformability of Replicas of Natural Fractures in Welded Tuff: Data Report," a report detailing the experiment techniques, has completed technical review and is in management review. A graphical model used to predict the shear behavior has been compared to the data. This analysis is being reported in SAND92-2247, "Effect of Boundary Conditions on the Strength and Deformability of Replicas of Natural Fractures in Welded Tuff: Comparison Between Predicted and Observed Behavior," which is close to completing editorial and technical review. Additional analyses of the data will be reported in a third SAND document that is being drafted.

Major Activities Upcoming Next Three Months

R. Price and J. Jung of SNL will visit CU on February 10, 1993, to discuss the progress of the data and analysis reports and the new studies.

Data reduction and analysis will begin for tests performed on a set of layered plate experiments.

Plans for SNL support of the M&O's design efforts will be finalized and the supporting thermal and mechanical analyses will begin.



1.2.4.2.3.1 CERTIFICATION OF DESIGN METHODS**Status Report on Ongoing Activities**

JAC2D YMP V1.00, SNL's primary thermomechanical finite element code, has been converted to double precision and placed on the SUN local area network (LAN). This version of the code received QA certification. With this implementation, SNL can now conduct thermomechanical analyses at essentially the same precision as on a CRAY computer, but at a significantly reduced cost.

Work at CU is continuing to fit the experimental data developed in WBS 1.2.4.2.1.2 to a constitutive model that can be used for analyses. This month was spent primarily studying the discrete element code, DDA, to determine how a new joint constitutive model can be implemented.

In other work at CU, modifications to DDA are being studied. The concept of breaking rock blocks into sub-blocks to obtain higher accuracy is being explored. At SNL, the mathematical foundation for this concept is being pursued. The basic equations for the blocks have been reformulated to facilitate the sub-block concept. Also, different methods of joining the blocks together are being investigated at SNL. Penalty, Lagrangian, and augmented Lagrangian methods are being considered to enforce interblock compatibility.

In a separate activity, the continuum joint constitutive model is being reviewed. Several aspects of the model that can be improved, including the addition of more joint sets, the inclusion of joint dilation, and an increased model robustness are being implemented.

Major Activities Upcoming Next Three Months

J. Jung (SNL) will be traveling to CU in February 1993 to discuss progress on the joint constitutive model work and the discrete element activities.

1.2.4.2.3.2 DESIGN ANALYSIS**Status Report on Ongoing Activities**

SAND92-0589, "Yucca Mountain Site Characterization Project: New Three-Dimensional Far-Field Repository Field Thermomechanical Calculations," by R. Hardy et al., has been transmitted for policy review. This report documents the work completed for Problem Definition Memo (PDM) 75-25. The analyses defined in the PDM were intended to provide information on the temperatures, stresses, and strains expected in the vicinity of ESF openings that may become part of the repository. The "new repository design" was used in the analysis, with thermal loadings of 57 and 80 kW/acre. (SCP Section 8.3.2.4.1.1)

SAND92-7344C, "The Results of Near-Field Thermal and Mechanical Calculations of Thermal Loading Schemes," by J. Holland, has been accepted for presentation at the 1993 International High-Level Radioactive Waste Management Conference. This report documents predictions of the near-field thermal and structural response of an emplacement drift to in-borehole and in-drift emplacement over a range of initial thermal loadings.

SNL staff met with members of the M&O ESF design group to identify and define analyses needed to support the design of the ESF north ramp. Three analyses were defined for SNL to complete before the 90% design review. These include far-field thermal analyses to assess the potential for thermal loading of the north ramp, analyses of ramp cross sections to assess long-term stability and support requirements, and a three-dimensional analysis of the intersections of the north ramp with the ramp to the Calico Hills. Thermal as well as structural calculations will be carried out to assist in the completion of the 90% review package due in August 1993.

Major Activities Upcoming Next Three Months

SNL emphasis will be on defining and completing thermal/structural calculations supporting ESF design. Analyses will include far-field thermal evaluations of proposed repository layouts as well as near-field structural evaluations of the north ramp and proposed intersections.



1.2.4.6.1 SEALING DESIGN AND DESIGN REQUIREMENTS

Status Report on Ongoing Activities

Work associated with the development of a strategy to seal exploratory boreholes continued. The following table shows the status of specific areas of the strategy report.

Airflow performance calculations	Completed
Assessment of the relative significance (airflow only) of boreholes	Completed
Hydrologic calculations	Completed
Calculations due to stress induced from thermal, in situ, and backfill stresses	Completed
Casing stability calculations	Completed
Chapter 4 preparation	Completed
Chapter 5 preparation	Completed
Airflow calculation	Underway
Preparation of Chapter 2	Underway
Preparation of Chapter 3	Underway
QA checks for calculations	Underway
Development of strategy	Initiated
Preparation of Chapter 6	Not initiated
Technical editing	Not initiated

Final technical editing of SAND92-0960, "Initial Field Testing Definition of Subsurface Sealing and Backfilling Tests in Unsaturated Tuff," is underway. This technical editing was in response to DOE review.

Major Activities Upcoming Next Three Months

The draft borehole sealing strategy report will be completed.



1.2.5 REGULATORY

The objective of the Regulatory element is to assure site-related compliance with Nuclear Regulatory Commission agreements, requirements, and policies; evaluate the performance of the natural barriers, engineered barriers, and total systems for meeting regulatory standards; and manage, maintain, and accumulate technical data and information produced by site characterization, design development, and performance assessment activities for the project. The Regulatory element is comprised of 11 tasks: Regulatory Coordination and Planning (1.2.5.1), Site Characterization Program (1.2.5.2.2), Technical Database Input (1.2.5.3.5), Total System Performance Assessment (1.2.5.4.1), Repository Performance Assessment (1.2.5.4.3), Site Performance Assessment (1.2.5.4.4), Interactive Graphics Information System (1.2.5.4.5), Development and Validation of Flow and Transport Models (1.2.5.4.6), Support Calculations for Postclosure Performance Analyses (1.2.5.4.7), Development and Verification of Flow and Transport Codes (1.2.5.4.9), and Special Projects (1.2.5.5).

1.2.5.1 REGULATORY COORDINATION AND PLANNING

Significant Meetings Attended

At meetings in Albuquerque, NM, on January 14 and 29, 1993, SNL management met with DOE/YMP managers and M&O personnel to discuss assignments and detailed plans for the remainder of FY93.

Status Report on Ongoing Activities

SNL staff reviewed the regulatory sections in the report of the cost-evaluation working group. Comments were provided through the SNL Technical Project Officer (TPO).

SNL staff completed final adjustments to the baselined budget and work scopes for regulatory activities.

Major Activities Upcoming Next Three Months

The FY94 budget process will require significant effort from the SNL managers and task leaders for regulatory activities.

1.2.5.2 SITE CHARACTERIZATION PROGRAM

Status Report on Ongoing Activities

Study Plan 8.3.1.8.1.2, "Physical Processes of Magmatism and Effects on the Potential Repository," was technically reviewed by C. A. Rautman and submitted to the Project Office on January 6, 1993.

For Study Plan 8.3.1.2.2.2, Rev. 1, "Water Movement Test," the verification of comment resolution was completed by M. D. Siegel and submitted to the Project Office on January 8, 1993.

For Study Plan 8.3.1.12.2.1, Rev. 1, "Meteorological Data Collection at the Yucca Mountain Site," the verification of comment resolution was completed by Y. Behl and submitted to the Project Office on January 8, 1993.

The second draft of Study Plan 8.3.1.15.1.8, "In Situ Design Verification," was submitted by J. Pott to the Project Office on January 19, 1993.



1.2.5.3.5 TECHNICAL DATABASE INPUT**Major Accomplishments**

D. Eley (Department 6351) assumed responsibility for this task from R. J. Orzel.

Status Report on Ongoing Activities

Eight Technical Data Information Forms (TDIFs) were submitted to the Automated Technical Data Tracking (ATDT) between December 18, 1992, and January 29, 1993. Five of these TDIFs were forwarded to the Central Records Facility (CRF).

Major Activities Upcoming Next Three Months

D. Eley will meet with J. Beckett at Edgerton, Germeshausen, and Grier Corp. (EG&G) to discuss GENISES input.

1.2.5.4.1 TOTAL SYSTEM PERFORMANCE ASSESSMENT**Major Accomplishments**

Papers written by SNL staff that have been approved by the Project Office and submitted to the 1993 International High-Level Radioactive Waste Management Conference include:

- "Sensitivity Analyses for Total System Performance Assessment," SAND92-2600C, by M. L. Wilson;
- "Implications of Stability Analysis for Heat Transfer at Yucca Mountain," SAND93-7005C, by B. Ross, Y. Zhang, and N. Lu;
- "The Most Likely Groundwater Flux Through the Tuff Matrix at USW H-1," SAND92-2386C, by J. Gauthier;
- "A Working Definition of Scenarios and a Method of Scenario Construction," SAND92-2828C, by G. Barr and E. Dunn; and
- "Scenario Development for Performance Assessment—Some Questions for the Near-Field Modeler," SAND92-2784C, by G. Barr and R. Barnard.

"A Semianalytical Method of Path Line Computation for Transient Finite-Difference Ground Water Flow Models," SAND92-7035J, by N. Lu, was submitted to the Project Office for programmatic review.

Significant Meetings Attended

One person from SNL participated in the tour of the Waste Isolation Pilot Project (WIPP) facility in Carlsbad, NM, on January 12, 1993. The tour was held in conjunction with the YMP/WIPP roundtable meeting held for the NRC in Albuquerque, NM, on January 13, 1993.

SNL staff attended a meeting with M&O/INTERA personnel in Albuquerque, NM, on January 13, 1993, to discuss the use of the Repository Integration Program (RIP) computer code from Golder Associates, Inc. for total system performance assessment (TSPA). The M&O/INTERA personnel presented their recent results; the SNL staff commented on the models, data, and interpretations embodied in those results. Together, the two groups identified further work with the RIP code.



Status Report on Ongoing ActivitiesTotal System Performance Assessment-93

Work is continuing on the development of SAND92-2431, a report on the selection of radionuclides to be used in performance-assessment analyses. The current effort will expand the list of nuclides by incorporating more geochemical sorption and solubility data.

SNL staff members have defined the near-field interactions for the source term for the next TSPA iteration. They will assume that throughout the thermal history of the repository, it will be possible to have weeps dripping on waste packages. Furthermore, throughout the history, it will be possible for locally saturated conditions to exist such that fracture flow from the repository to the water table can occur. To model this will require developing a distribution in time and space of "input" weeps at the repository and "draining" from the repository. SNL staff has been meeting with LLNL staff to coordinate analyses. SNL staff has also started developing the features, events, and processes (FEP) diagrams to describe these processes.

As part of the SNL interaction with LLNL on the radionuclide source term for total-system performance assessment, SNL staff transmitted a portion of the Total System Analyzer (TSA) program for LLNL staff use for sensitivity studies. A new source term is being encoded, and the TSA is being run for colloid sensitivity studies.

An SNL report is being written to help define the calculational regimes for which one-dimensional calculations are appropriate. For total-system assessments, one-dimensional codes are currently the only feasible way to compute multiple realizations of water and solute transport through Yucca Mountain because of their relatively short execution-time requirements. SNL staff intends to approximate as many two-dimensional effects in these one-dimensional codes as possible. To produce the report, staff will examine the past work in two-dimensional simulations and run additional simulations as necessary.

A series of three-dimensional stratigraphies of Yucca Mountain for TSPA-93 is being developed, along with

the necessary data sets. The stratigraphies will be based on welded/nonwelded categories. Two-dimensional slices through the baseline stratigraphy will be used for gas-flow calculations. For the composite-porosity groundwater-flow calculations, 10 one-dimensional columns through the baseline stratigraphy and perhaps 10 other stratigraphies will be taken. Monte Carlo simulations are being performed with the TSA to develop the columns and flow tubes for the composite-porosity model. A new automatic mesh generator for TOSPAC was designed and programmed. The new mesh generator should allow the TSA to run with many different stratigraphies without having to construct each calculational mesh by hand.

A group was formed to develop a plan to address the thermal modeling problem. A three-pronged approach was planned: (1) performing laboratory experiments, (2) modeling laboratory experiments, and (3) modeling Yucca Mountain. One proposed experiment uses a container filled with glass beads and water with a 60°C heat source at the bottom and a 20°C source at the top. The experiment is expected to provide information about the relative importance of convection and conduction under these conditions. Discussions with K. Preuss of Lawrence Berkely Laboratory (LBL) have resulted in changes to ensure that competing effects are reduced and also to decrease the possibility that three-dimensional effects are introduced into a two-dimensional problem. The experiment is currently being designed (reported under WBS 1.2.5.4.6) and is expected to be completed in the summer. At that time, SNL workers will attempt to model the phenomena observed using TOUGH. Although full results of this plan will not be available in time to be incorporated in TSPA-93, the work is expected to provide insights that can be incorporated.

Scenario Development

"Scenarios Constructed for Basaltic Igneous Activity at Yucca Mountain and Vicinity," SAND91-1653, by G. Barr, E. Dunn, R. Barnard, H. Dockery, B. Crowe, and G. Valentine, has completed SNL's internal technical review process and is undergoing review by the coauthors from LANL. Progress is being made on the development of figures for the nominal-flow scenarios report.



1.2.5.4.3 REPOSITORY PERFORMANCE ASSESSMENT

Status Report on Ongoing Activities

SAND92-2838C, "Comparison of Predicted Far-Field Temperatures for Discrete and Smeared Heat Sources," by E. Ryder, has been approved for presentation at the 1993 International High-Level Radioactive Waste Management Conference. The study evaluates the use of areally extensive plate sources as opposed to discrete canister representations in three-dimensional thermal modeling. (SCP Design Activity 1.11.6)

Near-field thermal calculations have been initiated that will provide M&O waste package designers with near-field boundary conditions for detailed modeling of the internal waste package environment.

Documentation of a study comparing the predictions of near-field thermal response using approximations of smeared two-dimensional heat sources and discrete three-dimensional representations continued. This study is intended to provide a preliminary evaluation of the adequacy of smeared source approximations in two-dimensional thermal modeling. Local areal power densities of 20, 25, 34, 57, 80, and 114 kW/acre were examined.

Major Activities Upcoming Next Three Months

Work will begin on a series of laboratory-scale experiments to validate modeling concepts of hydrothermal flow in the unsaturated zone. Small fractures will be inserted into thin models of specially prepared porous sand. The visualization experiment will observe the extent of the dry zone and location and extent of the condensation zone. Numerical model simulations of the experiment will be performed for comparison of results.

1.2.5.4.4 SITE PERFORMANCE ASSESSMENT

Major Accomplishments

SAND92-0461, "Pre-Waste-Emplacement Ground-Water Travel Time Sensitivity and Uncertainty Analyses for Yucca Mountain, Nevada," by P. Kaplan, has been printed and distributed.

Papers written by SNL staff that have been approved by the Project Office and submitted to the 1993 International High-Level Radioactive Waste Management Conference include:

- "Recent Developments in Stochastic Modeling and Upscaling of Hydrologic Properties in Tuff," SAND92-2671C, by C. Rautman and T. Robey; and
- "Numerical Methods for Fluid Flow in Unsaturated Heterogeneous Tuff," SAND92-2672C, by T. Robey.

"Geostatistics and Upscaling of Hydrologic Properties for an Adaptive Mixed Finite Element Method Applied to Unsaturated Porous Media Flow," SAND92-2419A, by T. Robey, was submitted for the SIAM Conference on Mathematical and Computational Issues in the Geosciences in Houston, TX, on April 19 through 21, 1993.

M&O staff have reviewed 17 unsaturated flow codes that have been developed for modeling water flow through unsaturated porous media. They selected 7 codes for further testing, one of which was LLUVIA-II. They encountered long execution times when LLUVIA-II was used to compute the Jornada Trench test problem. By request from the M&O, SNL staff reviewed these results after obtaining a copy of the LLUVIA-II deck modified for personal computer (PC) use. The modifications appear to have been done correctly. A test case was executed on the SUN and Cray computers. Additionally, a timing test program was written and run on the SPARC 2 and 10 and Cray computers. The resulting execution times appeared to be consistent. The results of these investigations were provided to the M&O staff.

Significant Meetings Attended

A member of the SNL staff attended the National Ground Water Association short course "Probability, Statistics, and Geostatistics for the Environmental Professional" in Tampa, FL, on January 26, 27 and 28, 1993. The material presented in this course has direct



application to the probabilistic modeling being performed in WBS 1.2.5.4.4.

A member of the staff participated in an NRC workshop entitled "Flow and Transport Through Unsaturated Fractured Rock" in Tuscon, AZ, on January 25 through 28, 1993.

Two SNL staff members attended a course entitled "Risk Assessment for the Environmental Professional" sponsored by the National Groundwater Association. It covered the methods of preparing a risk assessment and other technical information appropriate to the statistical methods under development in WBS 1.2.5.4.4.

Status Report on Ongoing Activities

A program was written to convert the digitized polygons from the Scott and Bonk geologic map to a regular grid with the corresponding unit assigned. The program has been tried out on a test file. The output is to be used to compute variograms for the indicator simulations. Review of the drill holes for determining breakpoints between hydrogeologic classes has been completed. The input parameters have also been reviewed and updated, except those dependent on the digitizing of the Scott and Bonk cross-section maps.

Yucca Mountain drill-hole stratigraphy interpretation relevant to performance assessment was completed. The structural elements of strike and dip have been determined. A breakout in percent of welded to nonwelded with emphasis on the Prow Pass welded was determined. These parameters have been examined and provided for stratigraphy model generation. An interesting fact that became apparent was that the stratigraphy between holes H-4 and UZ-16 show very little dip. This is due to the fact that this area is bounded by faults that offset the regional dip of 6° to the southeast. Even the accepted regional dip of 6° may be too shallow by about 0.8°. A logic check on the completed, reinterpreted stratigraphies from the boreholes was accomplished to add confidence to the results to date. Documentation of the reexamination

and interpretation of the Yucca Mountain stratigraphy has started and will be complete in early February. This will be the first documentation available for the new TSPA report.

Work proceeded in the continuing effort to develop realistic groundwater-flow models of Yucca Mountain. Presently, the effort has several fronts, including upscaling of hydrologic properties, correlating hydrologic parameters to attach hydraulic conductivities and moisture-retention curves to the porosity-based geostatistical stratigraphies, developing graphical images, and incorporating an analytical integration method for constructing element matrices in the porous-media flow solver, DUAL.

Output from the three-dimensional geostatistical simulations contains complex interfaces between geologic units. A geostatistical unit adaptive method (GUAM) has been programmed to take output from the geostatistical simulations and to superimpose simplified boundaries. The program will be revised as better interpretations of the drill-hole logs are developed. GUAM has been modified to correspond with interpretations of the drill-hole information and is being debugged and tested.

Chapter 4 of the draft of SAND92-0799, "Model Domains and Hydrologic Data Base to Support Early Site Suitability and Total Systems Performance Assessment Models," by Gainer et al., was completely rewritten. Chapter 5 also requires major changes and will be rewritten during the month of February.

Data-base management is being maintained by a temporary person until a permanent solution is found. She has accessed the system and become familiar with the system and the contents. Transmissivity data have been retrieved for members of the SNL staff to apply to TSPA efforts. The transmissivity data were reformatted to meet analysis requirements. The interface role has been reactivated between the data base and ARC/INFO to provide ready access to the Yucca Mountain through the geographical information system (GIS).



1.2.5.4.5 INTERACTIVE GRAPHICS INFORMATION SYSTEM

Status Report on Ongoing Activities

Work continues on the development of data conversion techniques. A data dictionary has been started to provide users with a guide to the ARC/INFO coverage now available.

Major Activities Upcoming Next Three Months

Staff will begin development of visualization techniques using Advanced Visualization Systems (AVS). Additional training in AVS will be obtained as needed.

Staff will begin work with GENISES to develop techniques to transfer data via the networks. Staff will begin replacing existing data with data qualified under a QA procedure when it becomes available.

The following CALMA jobs are in progress:

- Job 386 for H. A. Dockery - Drill holes/Section
- Job 397 for D. L. Eley - Convert GTMs to ARC/INFO
- Job 398 for D. Guerin - Hydrogeologic Drill Holes
- Job 399 for J. A. Fernandez - New Proposed/Exist Drill Holes

1.2.5.4.6 DEVELOPMENT AND VALIDATION OF FLOW AND TRANSPORT MODELS

Significant Meetings Attended

R. Glass attended the workshop on "Unsaturated Flow and Transport Through Fractured Rock—Related to High-Level Radioactive Waste Disposal," in Tucson, AZ, hosted by the NRC. R. Glass also presented an "Update on the Subsurface Flow and "Contaminant Transport Laboratory" at the meeting.

R. Glass gave a tour of the YMP flow and transport visualization laboratory to K. Pruess of LBL on January 14, 1993. Discussions covered flow in fractures, fracture-matrix interaction, and experiments to challenge nonisothermal flow calculations.

Status Report on Ongoing Activities

Flow and Transport Through Single Fractures

In early January, work emphasis was on completion of the following papers for the 1993 International High-Level Radioactive Waste Management Conference:

"Small-Scale Behavior of Single Gravity-Driven Fingers in an Initially Dry Fracture," by M. J. Nicholl, R. J. Glass, and H. A. Nguyen. Abstract: This paper presents experiments investigating the behavior of individual, gravity-driven fingers in an initially dry, rough-walled analog fracture. Fingers were initiated from constant flow to a point source. Finger structure is described in detail. Specific phenomena observed include desaturation behind the finger tip, variation in finger path, intermittent flow structures, finger-tip bifurcation, and formation of dendritic subfingers. Measurements were made of finger-tip velocity, finger width, and finger-tip length. Nondimensional forms of the measured variables are analyzed relative to the independent parameters, flow rate, and gravitational gradient.

"Wetting Front Instability in an Initially Wet Unsaturated Fracture," M. J. Nicholl, R. J. Glass, and H. A. Hguyen. Abstract: This paper presents experimental results exploring gravity-driven wetting front instability in a pre-wetted, rough-walled analog fracture. Initial conditions considered include a uniform moisture field wetted to field capacity of the analog fracture and the structured moisture field created by unstable infiltration into an initially dry fracture. As in previous studies performed under dry initial conditions, instability was found to result both at the cessation of stable infiltration and at flux lower than



the fracture capacity under gravitational driving force. Individual fingers were faster, narrower, longer, and more numerous than observed under dry initial conditions. Wetting fronts were found to follow existing wetted structure, providing a mechanism for rapid recharge and transport.

"Surface and Aperture Characteristics for Saturated Fluid Flow and Transport Calculations in a Natural Fracture," by P. W. Reimus, R. J. Glass, and B. A. Robinson. Abstract: This paper discusses the aperture distribution within a natural fracture determined from surface profile data measured with a noncontact laser profilometer. The surfaces and apertures were found to be isotropic. The aperture distribution was equally well described by either a normal or a lognormal distribution. The aperture spatial correlation varied over different areas of the fracture, with some areas being much more correlated than others. The fracture surfaces did not have a single fractal dimension over all scales, which implied that they were not self-similar. The saturated flow field in the fracture was approximated by solving a finite-difference discretization of the fluid flow continuity equation in two dimensions. Tracer breakthrough curves were then calculated using a particle-tracking method. Comparison of breakthrough curves obtained using both coarse- and fine-resolution aperture data (0.5 mm and 0.05 mm spacing between points, respectively) over the same subset of the fracture domain suggest that the spacing between aperture data points must be less than the correlation length to obtain accurate predictions of fluid flow and tracer transport.

"Modeling Gravity-Driven Fingering in Rough-Walled Fractures Using Modified Percolation Theory," by R. J. Glass. Abstract: Pore-scale invasion percolation theory is modified for imbibition of wetting fluids into fractures. The effects of gravity, local aperture field geometry, and local in-plane air/water interfacial curvature are included in the calculation of aperture filling potential, which controls wetted structure growth within the fracture. The inclusion of gravity yields fingers oriented in the direction of the gravitational gradient. These fingers widen and tend to meander and branch more as the gravitational gradient decreases. In-plane interfacial curvature also greatly affects the wetted structure in both horizontal and nonhorizontal fractures, causing the formation of macroscopic wetting fronts. The modified percolation model is used to simulate imbibition into an analog rough-walled fracture, where both fingering and horizontal imbibition experiments were previously conducted. Comparison of numerical and

experimental results showed reasonably good agreement. This process-oriented physical and numerical modeling is a necessary step toward including gravity-driven fingering in models of flow and transport through unsaturated, fractured rock.

Development of a methodology to produce epoxy casts of natural fractures continued. A natural tuff fracture, collected from the Bandelier formation near Los Alamos, NM, was prepared for casting. Silicon rubber was used to create negative replicas of both sides of the fracture. In February, the negative molds will be used to create clear epoxy replicas of the original fracture. Other natural fracture samples, also collected from the Bandelier tuff, were cut to rectangular shape in preparation for additional casting.

A second natural fracture from the Bandelier formation was used in an experiment demonstrating gravity-driven wetting front instability. The fracture was cut to a rectangular shape (33 cm x 66 cm) and carefully cleaned prior to reassembly. The two halves were fitted into place and then clamped. The complete fracture was then placed in a fixture such that the long axis of the fracture was oriented vertically and the upper boundary was horizontal. Silicon putty encircled the fracture along the upper boundary, creating a reservoir. Thirteen ml of deionized water was rapidly introduced into the reservoir, using a linear array of 15 10cc syringes. To increase visual contrast, the deionized water was dyed blue with FD&C blue #1 at a concentration of 1 g/l. The fluid was allowed to infiltrate for several minutes and the fracture was disassembled for inspection. The wetted structure clearly showed the development of individual fingers oriented primarily in the downward direction. All steps of this experiment were recorded photographically. The fracture surfaces are being cleaned in preparation for additional experiments.

Preliminary experiments investigating the effects of air entrapment on fracture permeability and tracer migration continued. Additional scoping experiments were performed to further develop an experimental methodology. Work concentrated on testing and refining computer control of the pumps, scales, and solenoid valves.

Fracture/Matrix Interaction

Work was completed on the paper "Investigation of Fracture-Matrix Interaction: Preliminary Experiments in a Simple System," by S. D. Foltz, V. C. Tidwell, R. J. Glass, and S. R. Sobolik, prepared for submission to the International High-Level Radioactive Waste



Management Conference. Abstract: Paramount to the modeling of unsaturated flow and transport through fractured porous media is a clear understanding of the processes controlling fracture-matrix interaction. As a first step toward such an understanding, two preliminary experiments have been performed to investigate the influence of matrix imbibition on water percolation through unsaturated fractures in the plane normal to the fracture. Test systems consisted of thin slabs of either tuff or analog material cut by a single vertical fracture into which a constant fluid flux was introduced. Transient moisture content and solute concentration fields were imaged by means of x-ray absorption. Flow fields associated with the two different media were significantly different owing to differences in material properties relative to the imposed flux. Richards' equation was found to be a valid means of modeling the imbibition of water into the tuff matrix from a saturated fracture for the current experiment.

Field, Lab. and Numerical Experimentation to Determine Scaling Laws for Effective-Media Properties in Heterogeneous Media

Work is 90% complete on construction of the automated gas permeameter. Efforts are increasingly being turned to the development of software to drive the automated system. Models for predicting the gas permeability based on permeameter data are also being explored to evaluate suitability for application in this project.

Caisson Test

Preliminary studies of sorption of mixtures of nickel, lithium, and bromine by the Wedron 510 sand have been initiated to determine if competition between tracers for the sorption sites will affect tracer transport in the caisson. Long-term studies of nickel solubility in 0.001 M NaCl electrolyte over the pH range 6 to 10 continued. "Preliminary Characterization of Materials for a Reactive Transport Model Validation Experiment," SAND93-0039C, by M. D. Siegel, D. B. Ward, W. C. Cheng, C. Bryan, C. S. Chocas, and C. G. Reynolds, was prepared for presentation at the 1993 International High-Level Radioactive Waste Management Conference in Las Vegas, NV.

A joint LANL/SNL paper entitled "Testing Models of Flow and Transport in Unsaturated Porous Media," by E. Springer, M. Siegel, P. Hopkins, and R. Glass, was prepared for presentation at the 1993 International High-Level Radioactive Waste Management Conference in Las Vegas, NV.

Reactive Transport Model Development

Efforts to implement the LEHGC coupled reaction-transport computer code on a massively parallel architecture continued.

Reactive Transport Experimentation

Long-term stability studies of pH in batch titration systems containing acid-cleaned Wedron 510 sand and the reference α -quartz continued. Progress was made in development of a method to perform in situ batch sorption studies in unsaturated media. A method to measure the concentration of aqueous uranium in wet sand using laser excitation was demonstrated at the Massachusetts Institute of Technology. A Nd-YAG laser was used to obtain a time-dependent fluorescence signal from a 2ppm uranium solution without use of a phosphorescence enhancer. Planning and instrumentation of the reactive transport laboratory continued. A Perkin Elmer Lambda 2 UV/VIS double-beam scanning spectrophotometer with a flow-through cell and an AMINCO Bowman Series 2 luminescence spectrometer were ordered for use in column studies and uranium batch sorption studies.

Major Activities Upcoming Next Three Months

The automated gas permeameter test system will be completed and tested. Experiments on blocks of tuff involving the measurement of gas permeability at different scales will be initiated.

Systematic experimentation of the effect of flow rate, fracture and matrix properties, and initial saturation on the matrix imbibition of water from an unsaturated fracture will be initiated. These studies will be conducted in thin experimental systems cut normal to the plane of the fracture.

Detailed studies of sorption of boron, bromine, lithium, and nickel by sand to be used in caisson or in supporting laboratory studies will continue. Lithium-nickel ion exchange studies with sand will be performed. Staff will fill and instrument the caisson, continue isotherm experiments to determine the linear range of sorption of tracers, continue surface potentiometric titration of sand, and implement the LEHGC code on massively parallel architecture. Staff will also continue development of the method for unsaturated K_d measurements with a Turbula mixer and optimize the method for laser fluorescence measurements of uranium in sand.



1.2.5.4.7 SUPPORTING CALCULATIONS FOR POSTCLOSURE PERFORMANCE ANALYSES

Major Accomplishments

SLTR92-0005, the document describing the performance assessment plan for the ESF Title II design support has been completed. The plan described in the document will be developed and implemented.

One effort has been completed using the calculations described in PDM 72-32 to estimate the effects on repository performance of surficial water use in the controlled zone outside the repository. Recommendations for controls on surficial water usage and locations of surficial ponds have been submitted for inclusion in Appendix I of the ESF Design Requirements (ESFDR) document and the Surface-Based Testing Field Requirements Document (SBTFRD). These recommendations had previously completed a technical review in accordance with Department Operating Procedure (DOP) 2-4.

Status Report on Ongoing Activities

The calculations described in PDM 72-32 to estimate the effects on repository performance of surficial water use in the controlled zone outside the repository will be documented in SAND92-2248. This report is currently being drafted and should be submitted for technical review shortly.

Preliminary efforts for model validation exercises in isothermal flow are continuing in collaboration with WBS 1.2.5.4.6. Preliminary calculations are being performed in conjunction with a series of experiments investigating matrix/fracture interaction by modeling

flow through a discrete fracture. These experiments are being performed by SNL Department 6115. Results of initial calculations were included in a paper to be presented at the 4th International High-Level Radioactive Waste Management Conference in Las Vegas, NV, in April 1993.

Preliminary efforts have begun for model validation exercises in nonisothermal flow in collaboration with WBS 1.2.5.4.3 and with the Department 6115 Flow Laboratory. A series of experiments using two different constant temperature boundaries has been tentatively planned for late summer/early fall.

A new ESF PA Analysis is being formulated with the writing of a work agreement. This analysis will address concerns regarding underground water usage for dust control during excavation and fire fighting in the north ramp tunnels and future ESF tunnels.

Major Activities Upcoming Next Three Months

SAND92-2248 will be completed.

A new ESF PA Analysis investigating the sensitivity of previous analyses to uncertainty in the hydrologic properties of the nonwelded Paintbrush tuff will be initiated with the writing of a work agreement.

Hydrologic flow codes (either LLUVIA-II or TOUGH-2) will be submitted to the Software Management System for use in ESF PA Analysis 13.

Information will be gathered for borrowing or buying various pieces of test equipment for the nonisothermal experiments planned with WBS 1.2.5.4.3. Information will be gathered on thermocouples, thermopiles, infrared scanners, and potential flow media materials (silica, alumina, sands, etc.).



1.2.5.4.9 DEVELOPMENT AND VERIFICATION OF FLOW AND TRANSPORT CODES

Status Report on Ongoing Activities

Software QA (No SCP activity)

A group of interested SNL staff formed a software Process Management Team (PMT). However, the acceptance of the QARD, Supplement I, December 18, 1992, by the NRC, led to postponement of the PMT meeting until January 14, 1993, to allow time to evaluate the impact of Supplement I on the procedures. Items of discussion planned for the first meeting included the impact of Supplement I upon the existing procedures, definition of a mission statement, definition of the process of entering codes into the system, and determination of a PMT leader. When the first meeting was held, the members decided to make this group a Quality Action Team (QAT) rather than a PMT. W. Miller was chosen as the QAT leader. In the meeting discussions, it was determined that the QARD now requires that verification and validation plans be written and reviewed for all scientific and engineering software (SES) codes. Only SES codes may now have to meet the requirements of the QARD; all other types of software may be exempt. The QAT is waiting for a determination from the Project office on this issue. A draft of QAIP 3-2 that will meet the requirements of the QARD for SES codes is in preparation. It was suggested that desk instructions containing examples of how to enter codes into the system be issued with the next revision of QAIP 3-2. Two action items were assigned: 1) determine the software contact at the Project Office, whether the Software Advisory Group (SAG) will remain intact to provide QARD interpretations, and whether the QARD addresses only SES codes, and 2) develop a draft of the QAT mission statement.

Work is continuing to revise the process for placing non-SES calculational codes under configuration control. The procedure for handling platform changes for qualified codes was also changed. Some procedures in QAIP 3-2 were revised, and an Interim Change Notice (ICN) reflecting these changes has been issued to the staff. These changes provide a more expedient method for entering software into the system by speeding up the process without sacrificing quality. The ICN will become effective on January 22, 1993.

M. Wernig will be leaving Department 6351 at the end of the month. SNL software QA staff are currently determining allocation of remaining personnel.

TOSPAC Version 1.10 has been entered into the Software Configuration Management System. A computer-readable copy of the source code, a listing of the source code, and a draft of the "Installation and Checkout Report for TOSPAC Version 1.10" were produced. The "Installation and Checkout Report for TOSPAC Version 1.10" was completed and the necessary paperwork—the MOD Request form, the MOD Resolution Form, and the Software Classification Form—was completed and submitted. Although SNL has versions of TOSPAC that run on VAX computers and personal computers, the TOSPAC Version 1.10 only runs on SUN workstations. The VAX and PC programs write out a warning message stating that they are not identical to the TOSPAC Version 1.10 in the Software Configuration Management System.

In response to an SNL YMP Corrective Action Report (CAR) concerning TOSPAC Version 1.00, comparison was made of the output from TOSPAC Version 1.00 with the published version of the TOSPAC User's Guide. Six discrepancies were identified. A memorandum to 110/12147/110-127/1.00/6.5/QA, from J. H. Gauthier, Technical Contact for TOSPAC, addressing the subject of "Software Documentation, Section 6.5 of QAIP 3-2," was written to document these discrepancies. All discrepancies were caused by improvements to TOSPAC during the two years between the time TOSPAC Version 1.00 was entered into the Software Configuration Management System and the TOSPAC User's Guide was published. The discrepancies were as follows:

- (1) The mass-balance calculation was made more accurate.
- (2) The characteristic-curve tables were modified to provide greater resolution near residual saturation.
- (3) An extraneous error message was omitted.
- (4) The groundwater-travel-time (GWTT) plot was modified to include GWTT calculated using the composite water velocity.
- (5) A new source option was added.
- (6) An option to allow calculation of solute transport in the saturated zone was added.

None of the discrepancies influenced the results of the quality-affecting Exploratory Studies Facility Performance Assessment Analysis 72-28.

Other ongoing work has included transitioning the duties of the software librarian, qualifying the SUN version of JAC2D YMP 1.00, and processing software QA records.



1.2.6 EXPLORATORY STUDIES FACILITY

The objective of the Exploratory Studies Facility element includes work scope related to the design, construction, and operation of the Exploratory Studies Facility. The Exploratory Studies Facility element includes the Exploratory Studies Facility Coordination, Planning, and Technical Assessment (1.2.6.1.1) task.

1.2.6.1.1 ESF COORDINATION, PLANNING, AND TECHNICAL ASSESSMENT

Status Report on Ongoing Activities

Construction monitoring plans for the ESF starter tunnel continued to be refined. An Experiment Procedure and work agreement are being drafted and input to the test planning package is being prepared.

Major Activities Upcoming Next Three Months

Staff will work with LLNL staff, under LANL coordination, to consolidate ESF thermomechanical testing with hydrothermal testing.

Documentation for construction monitoring activities for the ESF starter tunnel, including a work agreement, an experimental procedure, and a QA grading report, will be developed. A data acquisition system (DAS) will be assembled, geotechnical instruments will be procured, and monitoring activities begun.



1.2.9 PROJECT MANAGEMENT

The objective of the Project Management element includes work scope related to project-level planning and control, and management of contract activities. The Project Management element includes two tasks: Technical Project Office Management (1.2.9.1.2) and Project Control (1.2.9.2.2).

1.2.9.1.2 TECHNICAL PROJECT OFFICE MANAGEMENT

Significant Meetings Attended

L. E. Shephard attended the TPO meeting in Las Vegas, NV, on January 19, 1993.

Status Report on Ongoing Activities

J. Schelling has relocated to Las Vegas, NV, to act with D. Kessel as SNL's on-site representatives.

1.2.9.2.2 PROJECT CONTROL

Major Accomplishments

During January, the December cost report was transmitted to the Project on schedule; the revised budget with carryover was also transmitted. The monthly report and the weekly reports were transmitted electronically to YMP. The first monthly cost and Full Time Equivalent (FTE) report was submitted to the M&O. The new NOVELL server for the Project Control group is online, with all users connected to the new server. A dramatic improvement in response time has been noted on Primavera.

Status Report on Ongoing Activities

Progress continues on corrections and refinements to the personnel database in INFORMIX for the Configuration Management System. Modifications are being made to detailed reports generated to support the budget planning process. The modifications will simplify the report-generation process and will eventually address errors due to rounding budget amounts to the nearest \$1000.00. Work is progressing on developing detailed descriptions of Level 3 milestones.

Major Activities Upcoming Next Three Months

The procurements database will be revised to reflect the FY93 WBS structure.



1.2.11 QUALITY ASSURANCE

The objective of the Quality Assurance element includes work scope related to the development and maintenance of project participants' assurance programs consisting of all those planned and systematic actions necessary to provide adequate confidence that the information to obtain a license for siting, constructing, and operating a geologic repository and monitored retrievable storage facility will be met and complies with Federal regulations.

1.2.11 QUALITY ASSURANCE

Status Report on Ongoing Activities

The transition of the SNL YIAP QA Program necessitated by the new Office of Civilian Radioactive Waste Management (OCRWM) QA Requirements and Description (QARD) document is well underway. The first four major steps of the Transition Plan specified by the OCRWM Office of QA have been completed at SNL. These steps are:

- to generally review the document for familiarization and to assign personnel to be trained on the Requirements Tracking Network,
- to determine specifically which major sections of the QARD do and do not apply to us as a Participant organization,
- to complete and submit a draft QA implementation matrix, providing a "snapshot" of QARD implementation, and
- to prepare and submit an impact analysis and transition plan.

The next major step, that of revising the various QAIPs to make them consistent with the QARD, has been initiated. Prioritization of these revisions has been established in a way to support preparation for the ESF starter tunnel field investigations. As a result, revisions to QAIPs 1-2, 2-10, 5-1, 6-3, and 11-1 have begun.

QA personnel have been working with research staff in the development of Experiment Procedures (EPs) for

the acquisition of subsurface information in the Systematic Drilling Program.

A software QAT has been established and has begun efforts to improve software processes, identify simplifications to the software QA procedure, and to implement the the software QA requirements of the new QARD.

Major Activities Upcoming Next Three Months

Planning and preparation for field work at the Yucca Mountain site for collection of geotechnical data at the ESF north portal starter tunnel will start in February. L. Costin, the responsible SNL manager for the work, and J. Pott, the PI, met with SNL QA staff to develop a plan to address applicable QA requirements.

During the coming months, the investigators will, among other activities, work with QA staff to translate the work into a work agreement, establish the graded application of QA to the work, develop an EP, and define calibration requirements for the instrumentation to be used.

Two audits are planned for the next three months. Disposal Safety Inc. and the Massachusetts Institute of Technology will be audited. Also, surveillances will be performed on initiating and implementing work agreements and on JAC2D software certification.

Other Items to Report

Two Department 6319 personnel attended Requirements Traceability Network (RTN) training at YMP. All SNL YMP procedures have been entered into the RTN database. Requirements will be entered next.



1.2.12 INFORMATION MANAGEMENT

The objective of the Information Management element includes work scope related to the project-level establishment of systems to facilitate organization, storage, and retrieval of information/documents. The Information Management element is comprised of four tasks: Information Management Coordination and Planning (1.2.12.1), Local Records Center Operation (1.2.12.2), Participant Records Management (1.2.12.3), and Document Control (1.2.12.5).

1.2.12.1 INFORMATION MANAGEMENT COORDINATION AND PLANNING

Significant Meetings Attended

Staff attended the Information Resource Management (IRM) council meeting in Las Vegas, NV, on January 13, 1993.

Major Activities Upcoming Next Three Months

The Information Technology Report/Long Range Plan (ITR LRP) and the Information Technology Report/Short Range Plan (ITR SRP) responses will be developed and submitted to YMP. Input to the IRM Strategic Plan will be provided.

1.2.12.2 LOCAL RECORDS CENTER OPERATION

Major Accomplishments

Seven boxes of YMP Limited Value Records were delivered to SNL Microfilming for processing.

A study was initiated to evaluate the installation of a record scanning and optical character recognition (OCR) software program for use in the Records Management Program. The software reviewed included LaserFiche, File Net, RKYVE, SNL Organization 2800 software, and Text Pro.

Major efforts included reviews of Project documents from three individuals no longer on YMP and one completed subcontract. Three thousand pages of duplicate materials were identified and destroyed.

Verification of pre-1990 hardcopy records against the Project microfilm was conducted with 6,000 pages being reviewed.

Status Report on Ongoing Activities

SNL Records Center inventory performed liaison activities for SNL/YMP staff, including planning meetings, introductions to YMP managers, and scheduling YMP personnel for interviews by the Millican & Associates Contractor Group, who are doing the records inventory for Sandia National Laboratories. In addition the following activities are underway:

- (1) An update of the NTS photo database was initiated,
- (2) A plan to review and process cancelled/closed datasets was initiated,
- (3) Corrections or changes were submitted for three laboratory experiments,
- (4) One new dataset was opened,



- (5) Five TDIFs were submitted to the RMS, and
- (6) Eight TDIFs were entered into the YMP ATDT.

Major Activities Upcoming Next Three Months

All Desk Guidances will be completed.

All microfilm will be verified against records from 1989 to the beginning of the Project. Verified hardcopy will be destroyed if approvals are issued or boxed and sent to the SNL Archives. No direction has been issued by OCRWM regarding ownership and disposition of dual storage YMP records.

Literature research has been initiated to research and propose a phased approach to development of a Disaster Preparedness and Recovery Plan for the YMP Records Management Program.

Staff will identify all "completed or cancelled" technical data activities to ensure that all records packages were appropriately identified, prepared, and forwarded to the YMP CRF. A plan for completion of this activity will be established if the quantity is too large to process in three months.

Staff will work through the Records Management QAT to review the technical data record packaging process to determine if improved processing is possible to reduce redundancy and duplication of efforts and improve protection of data.

Staff will review and revise Desk Guidance for Participant Data Archive (PDA) activities.

Issues/Potential Problems Needing Resolution and Potential Impacts

A possible breakdown in implementation of AP 5.2Q in identification of data to be submitted to the YMP Technical Data Base has been identified. Staff will work with the Task Leader to clarify responsibilities and processes.

1.2.12.2.3 PARTICIPANT RECORDS MANAGEMENT

Major Accomplishments

Staff was appointed co-chair of the OCRWM Technology Integration and Methodology Analysis (TIMA) committee on "Communication." A preliminary charter was prepared and committee members are corresponding via E-mail and teleconference.

Staff prepared a Records Management Processes List to be used in the OCRWM TIMA Requirements and Regulations Committee matrix.

Significant Meetings Attended

On January 5, 1993, the first SNL Records/Nonrecords Inventory meeting was held to conduct strategic planning for implementation within SNL Nuclear Waste Management Division 6300. Information from the OCRWM YMP Records/Nonrecords Inventory was shared and discussed.

In Las Vegas, NV, on January 11, 1993, staff chaired a meeting of all YMP Records Coordinators to discuss common concerns and to request operational records management clarifications. On January 12, 1993, staff attended the NIRMA DOE SIG and presented the Preliminary Draft of a committee paper addressing "What Is A Nuclear Quality Assurance Record?" Staff also attended the YMP Records Coordinators Meeting and the YMP IRM Council Meeting.

Status Report on Ongoing Activities

Staff prepared cost estimates for equipment and furniture for the Nuclear Waste Management Center Records and Information Center.

Major Activities Upcoming Next Three Months

Staff will initiate the Records Management QAT to review the Record Series, the Master List of File Codes, and revise records packaging processes to simplify work and enhance the organization of project or topic files.

Staff will obtain SNL and OCRWM approval/authorization for the identification of YMP Project duplicate storage records as Federal nonrecords. When so designated, approval/authorization for the verification and destruction of said records will be obtained.



1.2.12.2.5 DOCUMENT CONTROL

Status Report on Ongoing Activities

Several modifications have been made to the SNL Controlled Documents System in INFORMIX, and detailed program code documentation has been initiated.

Major Activities Upcoming Next Three Months

QRPs for superseded and recalled Controlled Documents will be prepared and submitted to the LRC. The goal is to have all back-log ORPs submitted.



1.2.15 SUPPORT SERVICES

The objective of the Support Services element includes work scope related to project-level general administrative and project support activities. The Support Services element is comprised of three tasks: Support Services Coordination and Planning (1.2.15.1), Administrative Support (1.2.15.2), and YMP Support for the Training Mission (1.2.15.3).

1.2.15.1 SUPPORT SERVICES COORDINATION AND PLANNING

Status Report on Ongoing Activities

Routine oversight of support service activities were conducted.

1.2.15.2 ADMINISTRATIVE SUPPORT

Major Accomplishments

A list of excess equipment was sent to DOE/YMP. This property will be dispositioned as soon as a response is received. Priorities for property actions were identified.

Two SAND reports were printed and distributed.

One SLTR was completed and distributed.

Seventeen 1993 International High-Level Radioactive Waste Management Conference papers were approved by the Project Office.

Significant Meetings Attended

Staff attended a meeting regarding the implementation of the semi-annual forecast for the Socioeconomic Monitoring Plan in Las Vegas, NV, on January 12, 1993.

Status Report on Ongoing Activities

The "Desk Guidance for Reports Publication" preliminary draft was reviewed and approval was given to produce the final draft.

"Nuclear Waste Fund" tags are being applied to all property.

Major Activities Upcoming Next Three Months

Work has been initiated on compiling historical data for the purpose of forecasting procurements and labor resources through FY2001. This information is being compiled for the YMP Socioeconomic Monitoring Report. All property actions identified will be completed.



1.2.15.3 YMP SUPPORT FOR THE TRAINING MISSION

Major Accomplishments

The "Geology for Non-Geologists" course was completed.

A new training manager was selected.

Status Report on Ongoing Activities

Video tapes of the "Geology for Non-Geologists" course are being edited. Training record packages were prepared and submitted to the LRC.

Major Activities Upcoming Next Three Months

Editing of the "Geology for Non-Geologists" course tapes will continue.

Training for improving computing skills will be initiated.

Replacement training support staff may be hired. The new training manager will attend the "Train the Trainer" course and the Training Coordinator meeting in Las Vegas, NV, in February.

A three-day course entitled "Initial Instructor Training" will be offered on site at SNL by the YMP Training Department in February.

