

WBS: 9.3.7
QA: N/A

**Civilian Radioactive Waste Management System
Management & Operating Contractor**

Monthly Summary Report

October 1995

Prepared for:

U.S. Department of Energy
Office of Civilian Radioactive Waste Management
1000 Independence Avenue SW.
Washington, DC 20585

Prepared by:

TRW Environmental Safety Systems Inc.
2650 Park Tower Drive
Suite 800
Vienna, Virginia 22180

Under Contract Number
DE-AC01-91RW00134

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PDR WASTE
WM-11 PDR

ENCLOSURE

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EXECUTIVE SUMMARY

General Manager's Summary:

The beginning of fiscal year 1996 was marked by the successful completion of the first two sequences of GA-4 half scale cask model drop tests and another month of solid performance by the Tunnel Boring Machine (TBM). The TBM entered the 1000-foot radius turn from the North Ramp to the Main Drift and passed the mile-and-a-half mark. The tunneling team also excavated test alcove number four to its design length of 52.3 meters in only 10 working days.

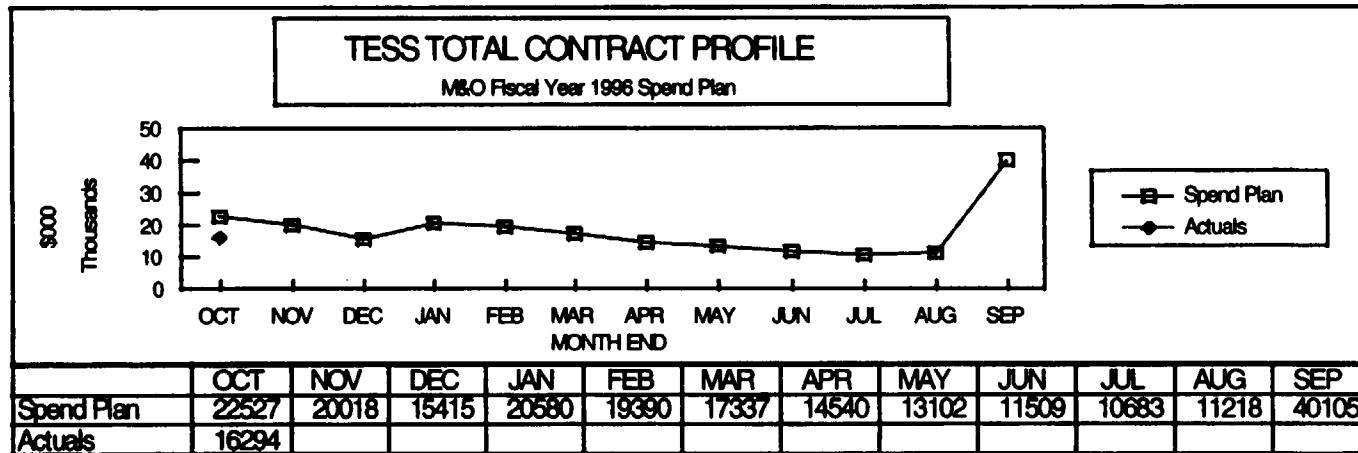
The M&O submitted the Office of Civilian Radioactive Waste Management (OCRWM) National Environmental Policy Act (NEPA) Procedures Guidance Document based on the final DOE Order 451.1. The document outlines the lines of responsibility within OCRWM for compliance with the NEPA and regulations.

We also delivered the Integrated Design Basis Fuels Study. The study included a waste stream analysis of the system impacts of design basis fuel container loading parameters using the Multi-Purpose Canister (MPC) and legal weight truck loading specifications. This is the first study to consider multiple loading constraints for sets of containers.

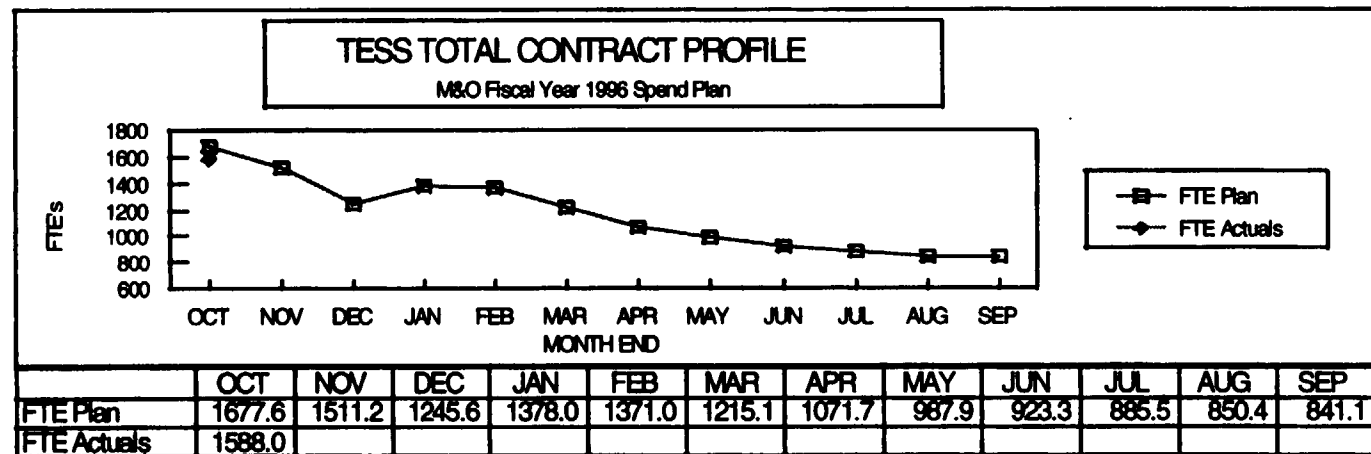
Further highlights for the reporting period include:

- Sent the final draft of the Waste Package Engineered Barrier Segment Conceptual Design Report to DOE satisfying M&O deliverable number TM202. The report will be reviewed in accordance with M&O Quality Administrative Procedure (QAP)-3-1 and issued in January 1996.
- Completed a Level III milestone by submitting a Yucca Mountain Procedure for Geotechnical Core Logging. This procedure provides a uniform geologic logs format for the project and is supported by a computer-based core logging program. The procedure and program are capable of graphical presentation of geologic, geophysical, hydrologic, rock mechanics, and other scientific data. They also provide a powerful and flexible tool supporting both site characterization and engineering design data analysis.
- Completed the report "Analysis of Geophysical Logs from Water-Monitoring Well UE-25 JF-3 in Support of the Water Resources Component of the Yucca Mountain Environmental Monitoring Program." The report describes results derived from acoustic, density, and neutron logs on porosity, degree of fracturing, lithophysae, and welding. The results support a better understanding of the geologic and hydrologic framework of the Topopah Spring tuff of the Paintbrush Group in the Jackass Flats area of the Nevada Test Site.
- Completed a draft report on the electrochemical evaluation of corrosion-resistant materials including the results obtained on critical potentials for nickel-based materials. The report supports development of the Mined Geologic Disposal System (MGDS). An additional section will be added on how these results contribute to the pitting model.

- Enhanced the Lawrence Berkeley Laboratory (LBL)-U.S. Geological Survey (USGS) three-dimensional, site-scale, unsaturated zone ground water flow model. This permits simulation of heat and gas flow in response to heat release from nuclear waste emplaced in a potential repository at the Yucca Mountain site. Results from simulating two thermal loading scenarios of 57 kilowatts per acre and 114 kilowatts per acre generally agree with previous thermal-hydrologic modeling results. There are differences due to the tilted layering of hydrogeologic units within the mountain and the presence of the Solitario Canyon and Ghost Dance faults.
- Completed the final of 15 Repository Environmental Impact Statement (EIS) public scoping meetings. Public meetings were held between August 29, 1995, and October 24, 1995, five in the State of Nevada and ten throughout the nation. Public comments will continue to be received through the close of scoping on December 5, 1995.
- Completed comments on the National Academy of Sciences (NAS) report "Technical Bases for Yucca Mountain Standards." The comments, transmitted to DOE on October 26, 1995, observe that many of the NAS recommendations are consistent with DOE positions but that DOE has significant concerns with the implementability of some of the NAS recommendations.
- Deployed Phase I of the on-line Lotus Notes version of the Director's Resource Book, titled the "OCRWM Resources Database," in coordination with Weston. The database will provide all OCRWM users with immediate access to key program information, make it possible to locate information quickly, and make regularly scheduled updated information immediately accessible.
- Initiated downsizing actions to bring staff levels in line with revised FY95 budget.



TESS Total Financial Status



TESS Total Staffing

Performance Measurement Cost and Schedule Variance

- None.

Variances

- None.

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1. INTRODUCTION

1.1 PURPOSE AND SCOPE

This Management and Operating (M&O) Contractor's Monthly Summary Report (MSR) has been prepared to provide both the M&O and Office of Civilian Waste Management (OCRWM) managers with activity and cost updates. The MSR is a compilation of reports that addresses both the M&O Management and Contract Work Breakdown Structure (CWBS) (direct) elements. Each CWBS area reports Budget and Reporting (B&R) progress by describing activities during the reporting period, publications and presentations, and documenting issues and concerns.

1.2 ORGANIZATION OF THE MONTHLY STATUS REPORT

Section 1, Introduction, describes the purpose, scope, and organization of the M&O MSR and the criteria for Program Management Analysis and Performance.

Section 2, M&O Management Staff Activities, provides monthly activity summaries from Contracts and Subcontracts (C&SC), Finance and Administration (F&A), Human Resources (HR), and Management Systems (MS) non-B&R activities when these activities meet the Program Management Performance Criteria stated in paragraph 1.4, below.

Section 3, Major System Acquisition (MSA) Projects, provides detailed summary reports from the Yucca Mountain Site Characterization Project (YMP) and the Waste Acceptance, Storage and Transportation (WAST) Project CWBS areas. Cost and staffing information are provided following the Program Management Organization section of YMP and Project Integration Section of WAST with accompanying data charts.

Section 4, Program Support (PS) provides Work Authorization Directive (WAD) level CWBS reports and includes Program Control and Administration (PC&A) Program, Quality Assurance (QA), Systems Integration, Regulatory and Licensing (R&L), Strategic Planning (SP), International Waste Management Technology (IWMT), External Relations (ER), Information Management Services (IMS), and Repository Impacts. Cost and staffing information are provided at the end of each WAD section.

The key milestone and deliverables status information normally provided will not be available until there is an approved FY96 Annual Work Plan.

1.3 PROGRAM MANAGEMENT ANALYSIS CRITERIA

Cost and staffing data are provided as graphs at the WAD level. Standard performance measurement reporting cannot be provided until there is an approved FY96 Annual Work Plan. Accordingly, the cost graphs represent actuals versus the preliminary FY96 Spend Plan. The staffing graphs depict actual Full Time Equivalents against the preliminary FY96 Plan. The actual costs represent both deferred FY95 and new FY96 work.

To avoid confusion, the spend plan presented reflects the current \$315M Program Plan, not the \$400M Program Plan in effect October 31, 1995.

1.4 PROGRAM MANAGEMENT PERFORMANCE CRITERIA

Progress During Report Period lists activities related directly to the B&R. These activities represent significant M&O contributions and involvement and include:

- Progress toward achieving the milestones referred to as "superstones"
- Progress in accomplishing the applicable Performance Evaluation Plan (PEP) criteria
- Actions to correct previous deficiencies
- Significant developments that required expenditure of unplanned resources
- Significant presentations and publications.

Issues and Concerns

- Actions impeding progress toward achieving milestones
- Issues requiring DOE involvement or resolution
- Problems with program or project performance.

2. M&O MANAGEMENT STAFF ACTIVITIES

2.1 CONTRACTS AND SUBCONTRACTS

Contracts

- Received Revision 1 of the FY95 WADs from the Contracting Officer. All WADs are under management review and coordination.
- Reconciling an administrative error found under unilateral (final FY95) prime contract modification number A053. Under Obligation of Funds, FY95 funding is set at \$333,505,785; however, the reconciliation of funding by B&R shows the funding at \$331,823,631. Advised the contracting officer that the funds clause is overstated by \$1,682,154. An administrative contract change is anticipated.

Subcontracts

- Notified Westinghouse, by letter and phone, of the decision not to proceed with Phases 2 and 3 of the Multi-Purpose Canister development. Also, certain Contract Line Item Numbers (CLINs)/subCLINs relating to Phase 2 are to be removed.
- Issued FY95 IRG and SAIC subcontracts.

Purchasing

- Revised some existing procedures supporting continuing corrective actions on Deficiency Report VAMO-95-D-009.
- Obtained Organizational Conflict of Interest (OCI) clearance from DOE and approval to extend the five existing Consultant Service Agreements and Purchase Orders for the following consultants: K. Baskin, K. Dufrane, K. Goldmann, C. Marotta, and R. Nickell. The Transportation Department has requested that these existing contracts be extended for an additional 2 years. The amendments to the agreements and the changes to the purchase orders were issued.

Small Business Liaison Officer (SBLO) Activities

- Issued SF 294 and SF 295 Subcontracting Reports as required by FAR 52.219-8 to DOE. The reports show M&O performance compared with Small, Disadvantaged and Women-Owned Business subcontracting goals negotiated with DOE for FY95. M&O negotiated goals compared with an anticipated procurement allotment of \$154M were:

Small	\$15M	10%
Disadvantaged	\$3M	2%
Women-Owned	\$1.5M	1%

M&O performance for FY95 compared with an actual procurement expenditure of \$149.8 (5% less than anticipated) was:

Small	\$17.9M	12%
Disadvantaged	\$3.7M	2.5%
Women-Owned	\$1.6M	1%

This is the fifth year in a row that the M&O has either met or exceeded its Small, Disadvantaged Business Concerns (SDBC) goals.

2.2 FINANCE AND ADMINISTRATION

- Provided weekly and monthly letter of credit reporting requirements to the Contracting Officer and the Controller's Office.
- Provided input to the Travel Reduction Task Team for the DOE FY96 Plan.
- Reassessing FY96 PM&I submittal for reductions with estimated funding levels.
- Worked with the DOE Inspector General regarding the FY95 year-end Voucher Accounting Net Expenditures Accrued (VANEA) audit.
- Worked with the Peat Marwick Main & Co., regarding the FY95 year-end VANEA audit.

2.3 HUMAN RESOURCES

- Submitted salary approval forms (F3220.5s) on eight teammates for DOE approval.
- Met with heads of the Penn State Nuclear Engineering and Materials Engineering departments to discuss 1995-96 recruiting.
- Provided orientation training for 10 starting REECO/EG&G Regulatory and Licensing employees. These employees are continuing the scope of work they had under REECO/EG&G.
- Developed a destaffing process evaluation form to obtain feedback from separating employees.
- Met with Professor Choi from Purdue University to discuss employment opportunities for nuclear engineering students.
- Held an Offsite Planning and Training Meeting in Las Vegas covering task assignments and responsibilities, upcoming events, office processes, organizational structure, and team goals.
- Developed a summer college hire calendar of events, roles, and responsibilities to include universities outside Nevada thereby expanding student selection for both TRW and teammates.
- Met with INROADS to evaluate success of 1995 internship program and discuss plans for 1996.

2.4 MANAGEMENT SYSTEMS

- Closed 7 of the remaining 10 open Corrective Action Plans (CAPs). This is the first time in over a year that there have been as few as three open CAPs.

2.4 ISSUES AND CONCERNS

- None.

3. MAJOR SYSTEM ACQUISITION PROJECTS

3.1 YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT CWBS 1.2

MANAGER: L. D. Foust

3.1.1 Engineering and Integration Operations

MANAGER: R. D. Snell

OBJECTIVE(S): Provide overall Systems Engineering services supporting the Yucca Mountain Site Characterization Project (YMP). Provide Exploratory Studies Facility (ESF), Repository, and Waste Package Design and Construction support services [Mined Geologic Disposal System (MGDS) Development]. Provide Repository Project Engineering services. Conduct product integrity technical assurance and cost effectiveness evaluation and analysis. Provide strategic planning and technical support and integration for the YMP.

3.1.1.1 Progress During Report Period

MGDS Development

- Evaluated the criticality control options for disposing of research reactor fuels in response to a DOE management request. Preliminary evaluations estimated the amount of fuel allowable in a package and the number of extra, smaller capacity packages required to ensure that no criticality could occur, even in the absence of added neutron absorbers. These extra packages were costed and the information provided to Systems Analysis for inclusion in the report "Assessment of Technical Issues and Cost for Direct Disposal of Foreign Research Reactor Fuel."
- Completed a draft report on the electrochemical evaluation of corrosion-resistant materials including the results obtained on critical potentials for nickel-based materials. The report supports development of the MGDS. An additional section will be added on how these results contribute to the pitting model.
- Sent the final draft of the Waste Package Engineered Barrier Segment Conceptual Design Report to DOE satisfying M&O deliverable number TM202. The report will be reviewed in accordance with M&O QAP-3-1 and issued in January 1996.
- Revising final Level III Milestone Deliverable TM577 "Retrieval Conditions Evaluation Report."

Product Integrity

- The Management Plan for Resolving Quality Affecting Issues Resulting from M&O and DOE Audits and Surveillances (paragraph 4.5.2) requires an external review of all quality affecting design products. The Office of Product Integrity (OPI) was requested to lead these reviews.

During October, the OPI consulted with the Engineering staff per OPI's charter. One design product was reviewed resulting in six recommendations. The following design products were reviewed, but the reports have not yet been issued.

- | | | |
|---|-------------------|------------|
| - Waste Handling Building Advanced Conceptual Design (ACD) Study w/ DR LVMO-96-D-03 | 9 recommendations | OPI-95-052 |
| - Subsurface General Construction Specification | 1 recommendation | OPI-96-01 |
| - ESF/Geologic Repository Operations Area (GROA) Interface Drawing Update | 4 recommendations | OPI-96-03 |
| - ESF Alcove Ground Support Analysis | 4 recommendations | OPI-96-04 |
| - ESF/Repository Interface Layout Coordination Geometry | 4 recommendations | OPI-96-05 |
- Issued Performance Report LVMO-95-P-010 following a review of Rockbolt Pull Testing Requirements. The identified deficiency dealt with the selection of stratigraphic units for in-place anchorage load testing of Williams bolts without the use of an approved procedure. Williams bolts are used as one method of ground support in the ESF.
 - Issued Deficiency Report LVMO-96-D-01 dealing with the performance of proceduralized drawing review steps out of sequence following a review of 19 ESF drawing record packages. The drawings are for the ESF Topopah Springs North Ramp Extension Layout.
 - Performed a process review for "Review of Constructor's Required Inspections." The review generated three recommendations and will be documented in report OPI-96-02.
 - Completed a preliminary matrix of required Repository Design Requirements Documents that would apply to Items Important to Site Generated Radioactive Wastes.
 - Provided guidance to the ESF Ground Support Structural Staff for the ESF Subsurface Material Dedication Analysis for Structural Steel and Accessories from a Commercial Grade Source. The staff is to perform a technical evaluation of steel sets' critical characteristics and develop appropriate acceptance methods to ensure that the item will perform its intended safety function. The analysis is based on Electric Power Research Institute (EPRI) NP-5652 guidelines, recognized by licensees within the industry as well as by the licensor.
 - Coordinated the QAP-5-1 natural working group (NWG) briefing slides to be presented at the next Quality Review Board (QRB). This briefing is the culmination of 6-months work by the NWG and presents measures for streamlining the procedure development process.

Repository Advanced Conceptual Design (ACD)

- Completed the Critical Path to Investment Analysis (CP2IA) Network for inclusion as Appendix A in the FY96 Budget Proposal. Specific accomplishments included network modification and reconciliation to accommodate the FY96 Summary Account structure; activity durations, deliverables, and cost estimates; identification and incorporation of Level 1 and 2 milestones

consistent with the milestone listing contained in the proposal's Appendix B; and the addition of Level-of-Effort tasks and programmatic activities previously captured by a supplemental spreadsheet. The network will also provide the basis for development of the Project Long-Range Plan, Project Rebaselining, and the Program Plan Update. Identified the necessary follow-on activities for expansion beyond Investment Analysis supporting long-range plan development.

- Completed detailed Bases of Estimates and draft schedules for the Repository ACD Project Engineering, Office of Product Integrity, and the MGDS ACD (Revised) Design Review presentation efforts for FY96. Also identified and coordinated assumptions and expected participation and support from other WBS elements. The Bases of Estimates were delivered for inclusion in the FY96 Budget Proposal.
- Reviewed and commented on a draft DOE Investment Analysis requirements description. An existing draft M&O position on the Ground rules and Implementation Implications for an Investment Analysis Design (IAD) was provided in the response comments. Rough-cost estimates for completing the IAD in accordance with the Draft M&O definition were compared with those assembled for completion of a mature ACD, Preliminary Design, or Final License Application Design. It was concluded that the Systems Engineering and Repository cost estimates for completion of IAD approximated an expenditure of 40 to 50% of the Preliminary Design Level. The waste package estimate for IAD completion was approximately 40% of Final Design (costs for constructing and testing the Waste Package Prototype were not included in the comparison).
- Conducted a series of WBS Schedule integration meetings reviewing the detailed WBS schedules for consistency and information needs. The process began with the Design, Systems Engineering, and Performance Assessment schedules and is being expanded to include those for the rest of the Project. Identified topics requiring multi-WBS organizational support, and developed topical schedules, which drew upon each of the WBS detailed schedules. Draft integrated schedules have been completed for the MGDS ACD (Revised) Package including a Report (Overview, Repository, and Waste Package), a Director's Summary, Display Models, and a Final Design Review Presentation.
- Documented Project Engineering Office goals, roles, and responsibilities with approach and timeline for accomplishing the goals. Three primary objectives for the office were identified: 1) evolving as a focal point and source of status; 2) integration across the Project; and 3) identification, prioritization, and facilitation of issue resolution.

Systems Engineering

- Completed Requirements Back-Up Sheets (RBSs) for Quality Administrative Procedure (QAP) 6.2 review of the draft Exploratory Studies Facility Design Requirements (ESFDR) document, Revision 2. Completed a status report on the FY95 Backfill System Study and submitted it to satisfy deliverable TM115. The effort identified a series of backfill functions that may benefit total system performance. Defined top-level design features based on the backfill functions and

worked on design alternatives including a thermal analysis of allowable thermal conductivities for backfill material and a review of candidate backfill materials.

- Completed Revision 2 of the Site Design and Test Requirements Document (SD&TRD). Completed a Document Change Notice for Configuration Management in support of Yucca Mountain Administrative Procedure (YAP)-3.5Q. This was the last input from the Requirements Department in the YAP 3.5Q process after Configuration Control Board approval was obtained September 29, 1995. Submitted the SD&TRD Revision 2 to the Document Control Center for controlled distribution.
- Submitted a QAP 6.2 review draft of the Repository Design Requirements Document (RDRD), Revision 1, deliverable TM199B, to the Assistant Manager of Suitability and Licensing (AMSL) on October 20, 1995. This revision splits the old version of the RDRD document into two volumes: Surface and Subsurface. In addition, a new section was added to each volume allocating applicable requirements to a specific Configuration Item Group.
- Completed the Category I Determination of Importance Evaluation (DIE) for Disposal of Super-Chlorinated Water, Category II DIE for Semi-Wet Drilling of SD-7 Borehole, and Category II DIE for Excavation of Scour Chains in Forty-Mile Wash.

3.1.1.2 Issues and Concerns

- None.

3.1.2 Scientific Program Operations

MANAGER: C. T. Statton

OBJECTIVE(S): Provide a scientific basis for evaluating site suitability. Coordinate surface-based and ESF testing activities. Conduct site investigation activities to implement annual and long-range plans. Support suitability evaluations, license preparation, performance assessments, design, construction, and National Environmental Protection Agency (NEPA) activities. Support International program activities that impact Yucca Mountain site characterization.

3.1.2.1 Progress During Report Period

- Completed Nevada Line Procedure (NLP)-S111-5 "Surface-Based Test Management." This M&O procedure was developed to produce a Field Work Package as the single test-implementing document replacing DOE Test Planning Packages and Job Packages.
- Completed a Level III milestone by submitting a Yucca Mountain Procedure for Geotechnical Core Logging. This procedure provides a uniform geologic logs format for the project and is supported by a computer-based core logging program. The procedure and program are capable of graphical presentation of geologic, geophysical, hydrologic, rock mechanics, and other scientific data. They also provide a powerful and flexible tool supporting both site characterization and engineering design data analysis.
- Completed draft outlines for the synthesis reports "Stratigraphy, Structure, and Rock Properties at Yucca Mountain" and "Seismotectonic Framework for Yucca Mountain." Informal feedback from Yucca Mountain Site Characterization Office (YMSCO) WBS managers will be solicited before the outlines are finalized.
- Completed the report "Analysis of Geophysical Logs from Water-Monitoring Well UE-25 JF-3 in Support of the Water Resources Component of the Yucca Mountain Environmental Monitoring Program." The report describes results derived from acoustic, density, and neutron logs on porosity, degree of fracturing, lithophysae, and welding. The results support a better understanding of the geologic and hydrologic framework of the Topopah Spring tuff of the Paintbrush Group in the Jackass Flats area of the Nevada Test Site.
- Completed instrumentation of borehole USW UZ-7a to monitor pneumatic pressure, temperature, and humidity in the Ghost Dance fault adjacent to the main drift of the ESF. A total of 71 sensors were installed in 10 isolated intervals within the borehole starting at a depth of about 640 feet in the Topopah Spring tuff at about the potential-repository horizon. This borehole is monitored to obtain data on the pneumatic and, by inference, hydraulic response of faults and the effects of excavation on the ESF as the TBM advances past the borehole.
- Enhanced the LBL-USGS three-dimensional, site-scale, unsaturated zone ground water flow model. This permits simulation of heat and gas flow in response to heat release from nuclear waste emplaced in a potential repository at the Yucca Mountain site. Results from simulating two thermal loading scenarios of 57 kilowatts per acre and 114 kilowatts per acre generally

agree with previous thermal-hydrologic modeling results. There are differences due to the tilted layering of hydrogeologic units within the mountain and the presence of the Solitario Canyon and Ghost Dance faults.

- Opened and closed selected sliding sleeves and set plugs in the packet instrumentation tubing string in the C-Hole Complex boreholes UE-25c #2 and UE-25c #3. This work supports conducting a suite of hydraulic and tracer injection tests as part of the characterization of the site saturated-zone ground water flow system.
- Closed field activities at Lathrop Wells. Trenches in the summit crater were described, photographed, and closed. Data obtained will help constrain the amount of erosion of the volcano and thereby assist in the interpretation of He-exposure ages.
- Supported the collection of two samples for "Biological Sorption and Transport, Site Characterization Plan (SCP) 8.3.1.3.4.2." This included the development of a testing niche at each sample location and establishment of a Test Activity Exclusion Area.
- Conducted serial convergence measurements in conjunction with excavation progress in Test Alcove #4.

3.1.2.2 Issues and Concerns

- None.

3.1.3 Support Operations

MANAGER: D. K. Chandler

OBJECTIVE(S): Provides the products and services to support the Civilian Radioactive Waste Management System (CRWMS) M&O contract for the YMP in Las Vegas, Nevada, in the areas of Information Management; Training; Institutional and External Affairs; and Environment, Safety, and Regional programs. The support operations include developing computer-based information applications; processing YMP records; providing performance-based training classes; implementing environmental, radiological, and safety and health monitoring and compliance programs; conducting regional socioeconomic studies; and providing public outreach programs, media and communications support, information products, and intergovernmental interactions.

3.1.3.1 Progress During Report Period

Environmental Safety and Health

- Completed the final of 15 Repository Environmental Impact Statement (EIS) public scoping meetings. Public meetings were held between August 29, 1995, and October 24, 1995, five in the State of Nevada and ten throughout the nation. Public comments will continue to be received through the close of scoping on December 5, 1995.
- Conducted a National Environmental Policy Act briefing for the Kaibab Band of Southern Paiutes in Pipesprings, Arizona. The briefing provided information on the scoping process for the Repository EIS.
- Submitted the third quarter CY 1995 Underground Injection Control (UIC) Permit Quarterly Report to the Nevada Division of Environmental Protection in accordance with Yucca Mountain Site Characterization Project (YMP) UIC Permit requirements.
- Presented a briefing titled "Yucca Mountain: Impact on Public Health - Environmental Monitoring" at the Nevada Public Health Association's annual meeting in Las Vegas, NV, and a briefing titled "Yucca Mountain: Transportation of Nuclear Waste Materials" at the California Public Health Association's annual meeting in South Tahoe, NV.
- Completed the quarterly ground-monitoring report for July through September 1995. The report compiles ground-water levels and springflows collected in the Yucca Mountain area and is required for water appropriation permit compliance.
- Submitted the Regulatory Analysis Quarterly Summary - Memorandum of Notification to the Assistant Manager for Environment, Safety, and Health (AMESH). The summary memorandum compiles regulatory source material references reviewed from July through September 1995 and includes an impact analysis for each referenced item.
- Initiated two Focused Special Issue Assessments (FSIA). FSIA 96-1 focuses on the CRWMS M&O environmental and occupational safety surveillance programs, and FSIA 96-2 focuses on

compliance with the Occupational Safety and Health Administration and U.S. Environmental Protection Agency marking requirements of the Code of Federal Regulations, Title 29 and Title 40, respectively. FSIA 96-2 will concentrate on buildings and facilities in Area 25 and includes the ESF.

- Completed the Quarterly Progress Report on Archaeological Field Activities, which summarizes YMP archaeological field activities and is distributed to concerned Native American groups.
- Submitted the YMP Socioeconomic Monitoring Program Employment Data Report for the period from April 1995 through June 1995 to the AMESH for distribution to representatives of the State of Nevada and affected units of local government and to other individuals and organizations on the mailing list.
- Completed a report titled "Transition Plan for the Terrestrial Ecosystem Program from EG&G Energy Measurements to the Civilian Radioactive Waste Management System Management and Operations Contractor" as requested by the AMESH. The report discusses how work formerly conducted by EG&G Energy Measurements will be accomplished under the CRWMS M&O.

Information Management

- Completed preparations for the transition of the Research and Study Center (to be known as the M&O Technical Information Center) and the Project Support and Documentation Office (PSDO) Central Files to the M&O Records Management Department effective October 2, 1995.
- Completed publications work on the Site Characterization Program Baseline (SCPB) Revision 14 and submitted it for OCRWM QAP 6.2 review.
- Completed the review and approval of YAP-6.2Q, Distribution, Maintenance, and Use of Controlled and Managed Documents, effective November 8, 1995. This revision allows electronic control of documents in the OCRWM Program Procedures Database issued by the Document Control Center, Las Vegas, resulting in significant cost savings for the program.
- Assembled and submitted 884 Document Decontrol Notice packages to document holders. The package included a cover sheet with instructions, a copy of the documents to be decontrolled for each holder, and an OCRWM Program Procedures Database reference card. To date, 62 packages have been returned by personnel leaving the YMP. Twelve document holders have responded with a request to retain their hard copy documents. The actual decontrol is scheduled for November 1, 1995.
- Document Control sent 194 Rescind/Document Decontrol Notices to document holders of OCRWM AP-16.1Q, 16.2Q and 16.3Q. M&O Document Control/Vienna had issued these documents to holders of the M&O Quality Assurance Manuals. Although holders of these documents can access the procedures on-line, the copies cannot be decontrolled until procedure revisions are completed by the M&O allowing use of electronically controlled copies of documents.

- Processed and approved DOE/RW-0333P, Revision 5, Quality Assurance Requirements and Description (QARD), effective October 31, 1995. Direction was provided to Affected Organizations by the Director, Office of Quality Assurance, to identify implementing documents impacted by this QARD revision and bring them into compliance by March 1, 1996.
- The NWG on Electronic Review and Approval completed their activities and prepared a recommendation on electronic signatures for use in the document review process. Implementation of this recommendation will result in significant cost savings in document processing for the program.

Institutional and External Affairs

- Gave a geology presentation and general project overview for 20 guests of the University of Nevada, Las Vegas, Environmental Studies.
- Held an Earth Rangers workshop, together with the Young Men's Christian Association (YMCA), October 2-6, 1995, at Las Vegas with 36 people participating.
- Coordinated and conducted 11 tours of Yucca Mountain. Of special interest were tours for Senator Frank Murkowski, R-Alaska, National Association of Regulatory Utility Commissioners (NARUC) Commissioners, the Washington Post, and Nye and Clark County Commissioners.
- Gave Native American presentations for 35 guests of the Las Vegas Library District Young People's Department in Las Vegas, Nevada, and for 30 guests in Moapa, Nevada. Also gave a Native American presentation for eight guests of the Kaibab Paiute Indian Reservation, in Kaibab, Arizona.
- Gave a general project update to 32 guests of the California Environmental Health Association in Lake Tahoe, California.
- Conducted three LESSONS Teacher Workshops at the Las Vegas Yucca Mountain Science Center in biology, physics, chemistry, and environmental studies for 105 teachers.
- Coordinated the Affected Units of Government meeting October 20, 1995, in Las Vegas, Nevada.
- Gave a general project update to 60 guests of the association of Law Librarians, in Las Vegas, Nevada.
- Gave a Yucca Mountain Site Characterization Project update at the Duckwater Shoshone Tribal Update Meeting, in Duckwater, Nevada.
- Gave 3 educational presentations in Las Vegas, Nevada, elementary schools to a total of 355 students.

- Conducted a geology field trip at the Las Vegas Yucca Mountain Science Center for 75 fifth-graders.
- The Yucca Mountain Site Characterization Project Home Page on the INTERNET was accessed over 12,400 times by various national and international business, educational, and government entities. Completed 103 Yucca Mountain Site Characterization Project external information requests by providing written responses to written and verbal queries and/or by supplying existing literature. The Civilian Radioactive Waste Management Information Center Toll-free Number (1-800-225-NWPA) staff answered 988 telephone calls and 68 letters, held 28 conversations, and provided information as requested.

Training

- Conducted the following training:
 - General Employee Training (GET)
 - GET Annual Refresher Test
 - YMP Orientation
 - Computer Security Awareness
 - Operations and Maintenance (Module II)
 - Team Performance Measures
 - Standard First Aid
 - General Underground Training
 - AP-16.1Q/AP-16.2Q
 - Records Inventory Disposition System (RIDS)
 - Federal Records
 - Project Overview
 - M&O Program Indoctrination/YMP Orientation
 - Managing Personal Growth
 - Job Search Workshop
 - Corrective Action Request (CAR) YM-95-028 Lessons Learned
 - Planning and Control (PACS) Orientation
 - YAP-2.6Q Training.

3.1.3.2 Issues and Concerns

- None.

3.1.4 Site Construction and Operations

MANAGER: R. M. Sandifer

OBJECTIVE(S): Provide integrated Field Construction and Operations Services in support of the Yucca Mountain Site Characterization Office (YMSCO). Provide the strategic planning and technical integration of all field activities to ensure the execution of project priorities.

3.1.4.1 Progress During Report Period

Construction

- The TBM reached three significant project benchmarks this reporting period. The TBM entered the 1,000-foot radius turn starting at tangent point Station 21+87m/7,173.4 feet (ft) on October 11, 1995. The turn will continue over 617m/2,023.8ft to station 28+04 m/9,197.1ft. In order to make the 115.97 degree turn to the left, the TBM is driven by computerized control devices and lasers instrumented to enable the operator to control the path of the TBM. Production advance is expected to slow while the muck conveyor components are installed behind the TBM trailing gear in the turn with super elevations designed to allow the conveyor to operate through the turn. A mile and one-half of Tunnel or 2,414.6 meters (m) was excavated on October 25, 1995. Finally, the excavation for Alcove #4 was started and completed in 10 working days.
- The period began and ended with the TBM in Category 1 ground (rockbolts).
- The TBM advanced to station 25+38.61m/8,326.6ft by month's end, making 536.5m/1,759.72ft progress for the month. Considering the above, the advancement achieved this month is significant. The TBM advanced past the Drill Hole Wash and Ghost Dance Fault zones, and the ground conditions did not deteriorate as expected. The TBM will exit the curve at station 28+04m and we expect that TBM daily advancement will increase at that time.
- The conveyor was shut down on October 31, 1995, for one shift, to install an additional conveyor belt, and also on October 5-6, 1995, to install the Conveyor Booster Drive Unit #2. In all, the TBM lost nine shifts of production during the month, seven for items related to the conveyor installation and repairs, one for TBM routine Maintenance, and one for electrical problems. The month's average daily advance rate was 24.39 m per day. During the best week, the TBM advanced 28.50m per day. A project record for the "Best Shift" was made during the graveyard shift on October 3, 1995, 23.0m/75.44ft.
- The overall to-date percentage of steel set usage in the tunnel dropped from approximately 39% to approximately 29%.
- Completed the initial excavation work on Alcove #4 with the advancement of the Alpine Miner to station 52.3m/171.54ft. Mapping activities have begun. The refuge chamber work is scheduled to begin on November 6, 1995.

- Continued work on the Change House with installation of the roof panels and insulation, the interior rough-in plumbing, the fire protection piping, the installation of HVAC duct work, and the siding at the sidewalks. Completed installing the door frame for the main entrance and the garage door frame. Began work on assembling the 2nd floor landing and the stairs and hanging the air conditioning unit in the "Top Landers" office.
- Reworked the valve boxes to set at the final grade and placed the concrete around the top of the boxes for the tanks on Exile Hill. Set the chlorination house and anchor bolts and completed the piping connections.
- Completed the backfilling effort over the pipe to the edge of the access road for Water Systems on the pad.
- Placed and backfilled 14 of the 28 laterals from the distribution boxes to the leachfield for Sewer Systems on the pad. Placed rigid piping between the dosing tank and the north distribution box and completed excavation and backfilling for the boxes.
- Focusing efforts on completion of the change house recovery plan prepared by the constructor and submitted to the Configuration Management Organization (CMO) on October 20, 1995. This recovery plan is currently under review by the M&O.

Drilling

- Continued coring operations at the USW SD-7 borehole reaching a depth of 2481.68ft. Progress for the month was 371.73ft cored. The static water table was intersected on October 4, 1995. The water level was initially measured at 2085ft. USGS representatives collected water samples for hydrochemistry testing and coring activities resumed.
- Installed an open-ended 2-3/8" O.D. tubing string in borehole USW G-2 to a depth of 1959.79ft supporting a USGS flow survey. Installed a 2-7/8" O.D. tubing string with an attached wellscreen to a depth of 1909.49ft to support USGS water level monitoring. Completed installation of a progressive cavity to a depth of 1904.05ft to support upcoming hydraulic pump testing.
- Completed instrumentation and stemming operations in the borehole USW UZ-7a. The instrumentation string was emplaced to a depth of 646.62ft. The borehole stemming consisted of layers of polyethylene beads, silica sand, and calcium sulfate grout. Instrumentation and stemming operations were completed in 14 shifts less than anticipated. The instrumentation placed in this borehole will provide a means of defining the unsaturated-zone fluid flow potential and influences of geothermal and atmospheric pressure changes.
- Opened and closed selected sliding sleeves and set plugs in the packer/instrumentation tubing string in the C-Hole Complex boreholes UE-25c #2 and UE-25c #3. This work supports the suite of hydraulic and tracer injection tests to be performed as part of the characterization of the Site Saturated-Zone Ground-Water Flow System.

- Received approval for Work Program YMP/WP/95-23, Revision 0, on October 3, 1995, for the upcoming USW SD-12 Instrumentation/Stemming Program and sent the document to the Document and Records Center for controlled distribution. Conducting construction operations to install a wellhead box and instrument shelter at the SD-12 location before instrumentation and stemming operations begin.

Operations

- Completed modifications to Building 4015, Field Operation Center, fire protection water system. Changes were required to correct a long-standing code deficiency that had been deferred until FY96.
- Removed one atmospherically controlled chemical toilet from the ESF pad resulting in a savings of nearly \$400 per day, an annualized savings of approximately \$115,000. The unit was replaced by two chemical toilets costing \$9 per day.
- Issued the Quarterly Borehole Protective Conditions Report covering July 1, 1995, through September 30, 1995, for approval October 12, 1995. This report satisfies the first quarterly deliverable requirement established under WBS 1.2.7.5.4 for FY96. The deliverable tracking number will be identified when the FY96 budget planning exercises have been completed.
- Returned 24 "E" plate vehicles to the Mercury motor pool as part of the ongoing field cost saving efforts. A total of 59 vehicles have been returned, putting us ahead of schedule for a planned 40% reduction by December 31, 1995.
- Returned 49 hand-held portable radios to Nevada Test Site (NTS) Communications in Mercury as part of the ongoing cost-saving efforts in the field. Thus far, 108 radios have been returned, and 150 will be returned by January 1, 1996. When completed, an annual savings of \$68,400 will be realized.
- Commenced the YMP bus service consolidation and cost savings initiative. Routes and equipment will be streamlined in order to minimize redundancy, increase ridership percentage per bus, and still meet all ongoing work requirements. Beginning October 31, 1995, one bus will be eliminated followed by three more units coming off line starting November 13, 1995. This cost savings move is two months ahead of the four bus reduction planned for January 1996.

Project Engineering

- Finalized summary accounts and Statements of Work for Nevada Test Site M&O workscopes.
- Prepared and submitted a briefing titled "ESF Progress Update" for presentation by DOE Assistant Manager for Engineering and Field Operation at the Nuclear Waste Technical Review Board (NWTRB) Full Board Meeting on October 17-18, 1995, in Arlington, VA.
- Completed preparation of a key decision plan and schedule in case the TBM is authorized to advance beyond Station 39+40 meters in FY96. The schedule will be statused weekly.

- Provided updated information to Directors Resource Database for the ESF and the TBM.
- Prepared and submitted an update to ESF Construction briefing papers supporting an RW-1 briefing to the NRC in December 1995.
- Prepared an ESF information book for Tunnel Consultant Group containing organization charts, FY95 cost information, and the FY96 schedule.
- Completed and submitted WBS 1.2.6, Exploratory Studies Facility, and WBS 1.2.7, Test Facilities, final inputs for the FY96 Project Implementation Plan.

3.1.4.2 Issues and Concerns

- None.

3.1.5 Suitability and Licensing Operations

MANAGER: J. L. Younker

OBJECTIVE(S): Assure site related compliance with Nuclear Regulatory Commission (NRC) agreements, requirements, and policies. Evaluate the performance of the natural, engineered barrier, and total system for meeting regulatory standards. Manage, compile, and maintain technical data and information developed for project related activities. Develop, review and validate levels of confidence for data and information to be used in Technical Site Suitability (TSS) and Licensing Application documentation. Provide evaluations of the potential impacts to waste isolation and integrity of all in-situ disturbing activities conducted at the site.

3.1.5.1 Progress During Report Period

- Used the NRC recommended atmospheric dispersion model to start analysis of Yucca Mountain meteorological data for the frequency of occurrence and duration of the "channeling" of air flow in the vicinity of the proposed site.
- Completed revisions of Total-System Performance Assessment (TSPA)-1995 briefing materials for presentation to the NWTRB on October 18, 1995.
- On October 10, 1995, the Las Vegas Regulatory Office coordinated a DOE/NRC Technical Exchange on the subject of Disposal Criticality Control.
- Participated in the NWTRB Full Board Meeting October 17-18, 1995, in Arlington, Virginia. Presented the TSPA-1995 analyses results entitled "Strategic Concerns, Total System Performance Assessment." The NWTRB indicated they were pleased.
- Completed final revisions to the topical report "YMP/TR-003-NP: Seismic Design Methodology for a Geologic Repository at Yucca Mountain," Seismic Topical Report II. Met with DOE to discuss the report and obtain final approval for its release. This report is a major milestone in the resolution of seismic-related issues with the NRC.
- Completed comments on the National Academy of Sciences (NAS) report "Technical Bases for Yucca Mountain Standards." The comments, transmitted to DOE on October 26, 1995, observe that many of the NAS recommendations are consistent with DOE positions but that DOE has significant concerns with the implementability of some of the NAS recommendations.

3.1.5.2 Issues and Concerns

- None.

3.1.6 Business Management

MANAGER: D. B. Abel

OBJECTIVE(S): Provide overall Project Management, Project Control, Scheduling, and Administration and Facilities for the M&O.

3.1.6.1 Progress During Report Period

Project Management

- Completed the Las Vegas portion of the Period 6 Self Assessment Report and forwarded it to Vienna for incorporation in the report that went to DOE Headquarters on October 10, 1995.

3.1.6.2 Issues and Concerns

- None.

3.1.7 Program Management Organization

MANAGER: C. Metzger

OBJECTIVE(S): The Project Management Organization (PMO) provides management support to the YMSCO, including the Project Manager (PM), Deputy PM, and all of the Assistant Managers. The PMO assist the Project in the preparation of the annual planning guidance, review of the M&O's annual plan and evaluates the progress of the M&O and other Project participants. Using the PACS reports and data, the PMO provided financial and schedule analyses and recommendations. The PMO facilitates and assist in the preparation of the Director's Project Review (DPR) materials. The PMO assist the YMSCO in the preparation and review of plans, including the Yucca Mountain portion of the OCWRM Management Plan.

3.1.7.1 Progress During Report Period

- Completed management review of "ESF/GROA Interface Drawing Update Analysis" and Preliminary Review Draft of "Strategy for Waste Containment and Isolation for the Yucca Mountain Site."
- Coordinated a Yucca Mountain site tour for the Minister-Councilor and the Second Secretary for Science and Technology of the Embassy of the People's Republic of China, October 11, 1995.
- Provided review comments for a Draft YMSCO-NRC letter detailing possible changes in the DOE-NRC working relationship due to Investment Analysis focused FY96 program. Supported off-line YMSCO-NRC management interaction reviewing implications of Investment Analysis.

3.1.7.2 Issues and Concerns

- None.

3.1.8 Health and Safety

MANAGER: C. W. Parker

OBJECTIVE(S): Provide management and oversight of all M&O safety and health functions. Develop and implement M&O safety and health plans, policies and procedures. Maintain recording and record keeping of injuries and illnesses. Perform fire hazards analyses and fire assessments on M&O facilities. Coordinate activities of the M&O Safety Steering Committee and the M&O Employees Safety Committee.

3.1.8.1 Progress During Report Period

- Began project-wide review and implementation of the Emergency Management Program.
- Drafted the Emergency Management Implementing Procedure for Area 25 addressing realistic emergency scenarios and building upon existing Keiwi PB procedures.
- Conducted an Emergency Management Planning Meeting on October 24, 1995, at the Field Operations Center (FOC) with M&O management and NTS Fire and Medical Departments. The meeting discussed plans for an 1995 emergency drill.

3.1.8.2 Issues and Concerns

- None.

3.1.9 Variances

- None.

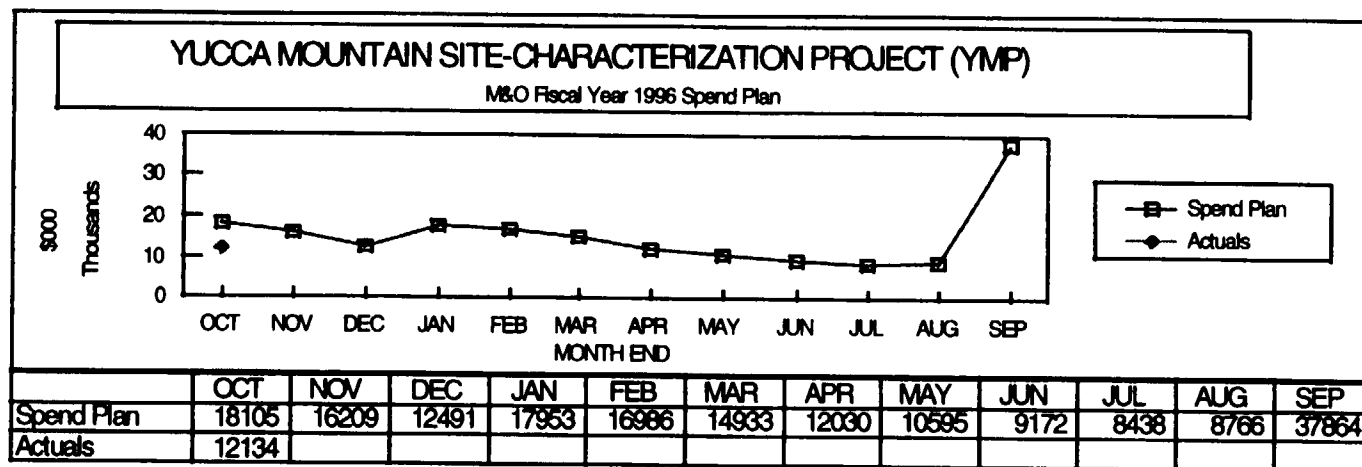


Figure 1. Yucca Mountain Financial Status

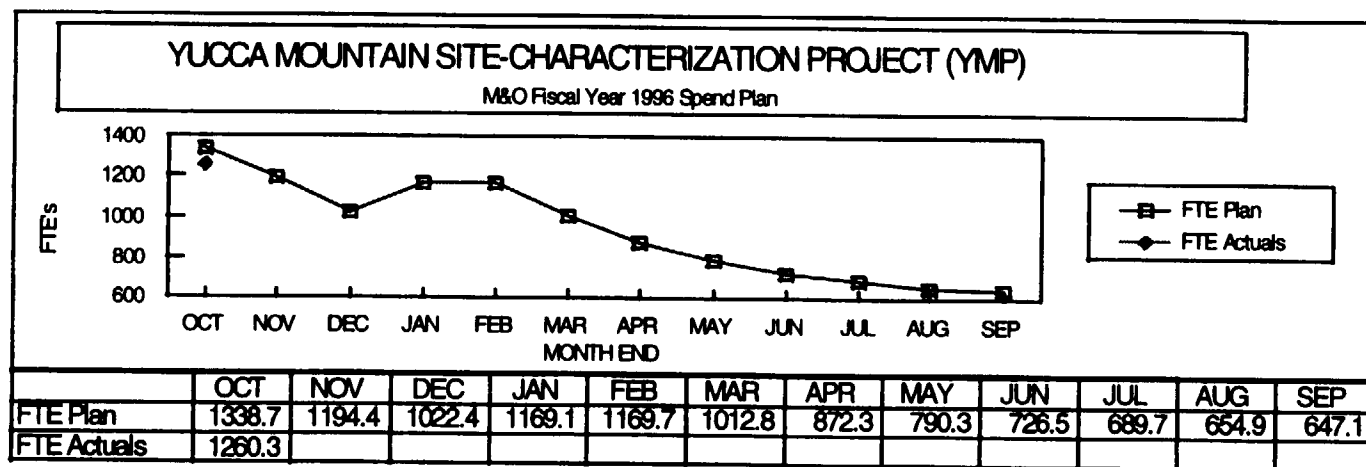


Figure 2. Yucca Mountain Staffing

3.2 WASTE ACCEPTANCE, STORAGE AND TRANSPORTATION PROJECT CWBS 3.0

MANAGER: A. S. Kubo

3.2.1 Multi-Purpose Canister

MANAGER: J. R. Clark/L. S. Smith

OBJECTIVE(S): Provide technical management and integration of activities relating to development of the Multi-Purpose Canister (MPC) Subsystems and Dry Transfer System *920 Provide technical solicitation evaluation support and management of the MPC Subsystems subcontract. Assist the Office of Civilian Radioactive Waste Management (OCRWM) in all aspects of the Waste Acceptance, Storage and Transportation (WAST) MPC licensing process. Assist OCRWM in the development of the MPC Environmental Impact Statement (EIS). Assist OCRWM in supporting public information and institutional tasks regarding MPC activities.

3.2.1.1 Progress During Report Period

Engineering Development

- MPC Contract Activities - Participated in the Second Quarterly Management Review meeting held in Westinghouse GESCO offices in Sunnyvale, CA. Conducted an MPC technical review visit to PacTec offices with RW-46 representatives. Completed Quality Administrative Procedure (QAP)-4-1 review and issued a Burnup Credit technical clarification letter to Westinghouse. Participated in the PacTec QA surveillance in Tacoma, WA. Completed review of the Westinghouse MPC Certification Plan and accepted the deliverable with editorial comments.
- Submitted M&O Specification Change Notices (SCN) for MPC specification revisions for M&O concurrence review. These SCNs revise Design Procurement Specification requirements for MPC internal surface finish, fuel source terms, ambient temperature allowables, and fuel peaking factors.
- Supported DOE/NRC Technical Exchange on Disposal Criticality Control.
- Participated in RW-2 conference call on High Enrichment Fuel Disposal Criticality Safety.
- Delivered technical reports to DOE for the NRC, thus completing all technical reports for the Actinide-Only Burnup Credit Topical Reports.

Regulatory and Licensing

- Established the meeting agenda, developed a detailed issue briefing book for OCRWM management, and developed a meeting summary for the October 5, 1995, management meeting

between the NRC Spent Fuel Project Office and the OCRWM Office of Waste Acceptance, Storage, and Transportation.

- Tracked spent fuel storage and transport vendor activities and associated NRC licensing issues by attending and developing summaries for the following industry meetings:
 - October 17, 1995, Sierra Nuclear, Portland General Electric, and NRC meeting discussing spent fuel storage and transport activities and issues for the Sierra Nuclear dual purpose cask at the Trojan nuclear plant.
 - October 24, 1995, VECTRA and NRC meeting discussing responses to the second round of NRC questions concerning the certification of the MP-187 dual purpose transportation cask.
- Reviewed the preliminary draft of the MPC Part 60 Design Considerations Report, assembled reviewer comments, and developed initial responses to those comments.
- Continued informal interactions with the NRC Spent Fuel Project Office staff discussing interim storage facility licensing issues and MPC System certification issues.
- Continued interim storage facility contingency planning and annual plan and budgets development.

Environmental, Safety and Health

- Reviewed MPC Draft EIS at Argonne National Laboratory's (ANL's) Chicago office on October 23-27, 1995, verifying that all comments from the August 29, 1995, Preliminary Draft EIS review have been accommodated. Revised sections will be provided to staff from EH-42, GC-51, and NE-60 on an ad hoc basis before the formal November 13-17, 1995, concurrence review. Plan to issue the MPC Draft EIS to the public late December 1995.
- Described the history of Monitored Retrievable Storage (MRS) facility siting attempts and associated methodologies in the draft presentation "Civilian Radioactive Waste Management System (CRWMS) Interim Storage Facility Siting Efforts." This presentation recommends a methodology to select an interim storage facility site in a manner satisfying foreseeable legislative mandates to RW-40.

3.2.1.2 Issues and Concerns

- None.

3.2.2 Transportation System

MANAGER: B. R. Teer/L. S. Smith

OBJECTIVE(S): Provide management and integration of all activities relating to transportation cask development, transportation planning and operations, service and maintenance of transportation equipment, application of Systems Engineering to Transportation, collection and maintenance of site-specific engineering and operations data, transportation economic and systems analysis, and integration of transportation with other Civilian Radioactive Waste Management System (CRWMS) program elements. Manage transportation database formulations, model development, and computer code development activities. Assist OCRWM in supporting policy analysis and issue resolution.

3.2.2.1 Progress During Report Period

Safety Analysis Report (SAR) Design

- Completed the Statement of Work for the Alternate Procurement final draft and provided it to RW-46 for review and concurrence. Due to budget constraints, the procurement package has been placed on indefinite hold.

Certification Phase

- Completed and submitted a draft version of the "Recommended Criteria for Buckling Evaluation of the GA-4 and GA-9 Casks" to General Atomics (GA) for their review. The paper was developed to assist GA in responding to the Nuclear Regulatory Commission's (NRC's) comments and questions on the GA-4 and GA-9 Safety Analysis Reports.
- GA completed Drop Test Sequence 1 (two drops) on October 16, 1995. Post test activities were performed on October 17 and 18, 1995. Preliminary measurements and inspections by GA indicate the model body did not sustain any damage, accelerations and strains were within predictions, the impact limiters crushed as predicted, and the containment boundary passed the pressure and leak-tightness tests.
- GA completed the GA-4 half scale model Drop Test Sequence 2. Sequence 2, Test 1 - 30 Foot Slap-Down, was performed on October 24, 1995, and Test 2 - 40 Inch Puncture to Center of Cask Body, was performed on October 27, 1995. Preliminary reports show that the containment boundary passed the pressure and leak-tightness tests. Results of the measurements and inspections of the cask body are not available yet. Test Sequence 3 is scheduled to begin the week of November 6, 1995.
- Drafted a Cost Comparison Matrix between life-cycle costs for the potential use of the Nevada Administrative Code (NAC)-Legal Weight Truck (LWT) and the GA-4/9 casks as a function of the number of truck sites and burnup credit.
- A second qualified trailer welding contractor, Magnetic Inspection Laboratory, Inc. (MIL) Chicago, IL, is now available to support work on the LWT trailer. Both welding contractors

(Holbrook and Holbrook and MIL) are under contract and can be called to perform welding repairs on the GA-9 trailer at Allied Signal Automotive Proving Ground or on the road as necessary.

- Prepared presentation material on the GA contract and certification plan for RW-46 for subsequent presentation to RW-2 on October 11, 1995. The M&O was given guidance to ensure timely resolution of NRC comments on the GA-4 Safety Analysis Reports. An additional presentation on the importance of the GA LWT Cask program will be prepared.
- GA met with the NRC Spent Fuel Project Office (NRC SFPO) on October 3, 1995, to discuss GA's structural analysis strategy for resolving the NRC comments on the GA-4 LWT Cask SAR. The NRC agreed with GA's using a 3-D finite element computer model of the cask and a 2-D computer frame model to generate stresses in the cask and fuel support structure. The next meeting will be held in approximately 6 weeks to discuss the cask buckling criteria and other significant NRC issues.

Environmental

- Issued verbal stop-work orders to Argonne National Laboratory (ANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratory (SNL) on all transportation risk assessment activities until further notice. This will be followed by official written notification. All related unfinished documents are to be shipped to the M&O.
- Received updated Technical Manual for Version 1 of the RISKIND code corresponding to the transportation consequences code version completed in August 1995. This update incorporates comments from the FY95 independent technical review of the code. After internal ANL concurrence, the document will be available for distribution.
- Developed a comprehensive schedule for completion of the GA-4 cask risk assessment for severe accident conditions. LLNL is completing a final report on the structural and thermal performance of the cask, and SNL is to perform the risk assessment based on the LLNL results.

Operations

- Notified subcontractors on October 30, 1995, that work currently in progress will be put on hold until further notice. This is applicable to work being done by Robert H. Jones, Consultant, Hazard Material System, Los Gatos, CA, and Science Applications International Corporation, Oak Ridge, TN.
- Initiated steps to terminate the LWT tractor testing project after receiving a letter from RW-40 directing an orderly shutdown including capturing lessons learned and collecting all test data. Meanwhile, the default shutdown (M&O-recommended) process will be followed.
- Completed the review of 19 Delivery Commitment Schedules (DCS) submitted for Year 4 delivery. No major interface problems were noted.

- Observed shipment of the last of four steam generators from the Trojan Nuclear Plant (35 miles north of Portland, OR) as part of the plant decommissioning effort. The 450-ton steam generator was loaded onto two shipping cradles attached to a transporter with a hydraulically-leveled platform, driven approximately 1/3 mile to a barge, secured on the barge using an approved tie-down system, and then shipped approximately 270 miles up the Columbia River to the Port of Benton. The transporter was then driven 30 miles overland for burial at the U.S. Ecology site, Hanford Reservation, WA. Planning and coordination for this move required approximately 3 years.
- Provided a quick reaction analysis of potential rail routes from an existing Union Pacific line in Nevada to the Nevada Test Site (NTS). The analysis evaluated route length, cost, land conflict issues, EIS timeliness, and other potential rail route considerations. Also, evaluated the Caliente base route, the Lincoln County "B" (Caliente Modified) route, and the Valley Modified route. The results will be provided to RW-1 for October 10, 1995, Congressional Testimony.
- Conducted a Transportation Coordination Meeting with RW-45 staff on October 11, 1995. Reviewed FY95 accomplishments and planned FY96 RW-45 activities. The meeting was very beneficial to both M&O and RW participants. Prepared and forwarded a meeting summary to all participants.
- Prepared "Stop Work" documentation for transportation subcontractors, consultants, and national laboratories and issued the documentation to Subcontracts/Procurement. Prepared the forms necessary to stop current matrix support.
- Developing a consolidated database of tribes possibly affected by OCRWM shipments. Validated an RW-45 mailing list of tribal representatives and organizations. Sent a copy of the Pressurized Ionization Chamber (PIC) database to Pacific Northwest Laboratories, developer of the PASS database, with the concurrence of the PIC point of contact. Drafted a letter to the Bureau of Indian Affairs (BIA) for RW signature requesting their most recent map and geographic information system database to validate the Tribal lands data. Preparing a summary and status report of the results of the comparison.
- Integrating Vienna and Las Vegas Geographic Information System (GIS) capabilities (hardware and software procedures) allowing GIS map and database products developed at either site to be easily transferred and used.
- Compiled a draft of the Transportation Department's Basis of Estimates for the FY97 and FY98 figures to be included in the controlled WAST Cost and Basis of Estimate Data Base - Reference 6.A. The data base is intended to contain a common set of M&O recommended budgetary figures to support various planning activities.
- Assessing DOE-EM, HIGHWAY, INTERLINE, and TRAGIS routing codes to select the actual shipment routes and to address routing codes and the Transportation Geographic Information System (TGIS) interfaces.

- Reviewed modifications made by the agencies to DOT (49 CFR 171-178) and NRC (10 CFR 71) nuclear waste transportation regulations so Federal regulations conform with International standards. The review includes anticipated effects of the revisions on the OCRWM program.

Institutional

- Summarized and answered stakeholder comments on the two Notice of Inquiries (NOI), which were published in the Federal Register on implementation of Section 180(c) of the Nuclear Waste Policy Act (NWPA). Preparing responses for publication in a March 1996 Federal Register Notice of Proposed Policy and Procedures for Section 180(c).
- Attended a Workshop on Designing Effective Programs in Albuquerque, NM, with DOE Federal program managers to discuss some lessons learned from social science research and applying these findings to program design and implementation. The workshop was sponsored by DOE/EM, Sandia, the University of New Mexico Institute for Public Policy, and the Urban Energy and Transportation Corporation. Discussed Social Amplification of Risks and Risk Perceptions, Scientific and Technical Controversy, DOE Trust and Confidence Study, Siting Controversies, and National Transportation Risk Perception Study.

3.2.2.2 Issues and Concerns

- None.

3.2.3 Waste Acceptance

MANAGER: B. M. Cole

OBJECTIVE(S): Provide management and integration of all activities relating to the Standard Disposal Contract, the Spent Nuclear Fuel (SNF) Verification Plan, Waste Acceptance Criteria (WAC) for Alternative Waste Forms, Materials Control and Accounting (MC&A), Safeguards and Security, Waste Acceptance Operations Plan, application of Systems Engineering to Waste Acceptance, interaction with the Energy Information Administration (EIA), support of Integrated Database (IDB) preparation, and development of a unified database (UDB) system.

3.2.3.1 Progress During Report Period

Contract Policy and Procedures

- Prepared comments on the proposed Nuclear Waste Policy Act of 1995 (S.1271) relating to potential Waste Acceptance implications.
- Attended teleconference involving RW-1, RW-44, RW-37, EM-323, Defense Waste Processing Facility (DWPF), and West Valley (NY) Demonstration Project (WVDP) to analyze impacts on DWPF and WVDP startup of the Waste Acceptance (WA-SRD) Revision 02A. EM-323 will issue a memo stating that an impact analysis was performed, that no impacts on startup are anticipated in switching from WA-SRD Revision 01 to Revision 02A, and that the EM-Waste Acceptance Preliminary Specifications (WAPS) Revision 2 will be issued as soon as practicable. EM-323 will also issue a memo requesting that the Waste Acceptance technical baseline (WA-SRD and EM-WAPS) be postponed to allow radioactive operations startup.
- Prepared briefing for RW-44 presentation for RW-40 on Memorandum of Agreement (MOA)-related issues defining processes for establishing waste acceptance criteria, determining annual payments for DOE wastes, allocating and scheduling acceptance for DOE wastes, and collecting data on DOE wastes and facilities.
- Continued review of the DWPF Waste Qualification Report (WQR) Volumes 5 (Glass Product Control Program), 8 (Canister Specifications), and 7 (Glass Phase Stability) in preparation for the November 6-10, 1995, Technical Review Group (TRG) meeting. Volumes 10 (Canister Fill Height) and 11 (Canister Surface Contamination) are also to be reviewed before the meeting.
- Prepared the final version of the Waste Acceptance and Transportation (WAT) Task Team Report, incorporating comments of the WAT Task Team members.

Standard Contract Mandated Activities

- Continued analysis of the Final Delivery Schedule (FDS) process.
- Completed updates to the first draft of Acceptance Priority Ranking tables based on comments and findings from the internal review.

- Processed 16 Delivery Commitment Schedules received for the 4th allocation year and delivered the October DCS Monthly Status Report.
- Updated information on Fort St. Vrain ownership in the draft of Acceptance Priority Ranking tables.

Waste Acceptance Criteria Development Activities

- Provided revision of memorandum from RW-44 to DOE-RL on disposal cost estimates for the German cesium/strontium borosilicate glass canisters. This memo will support DOE-RL as it enters a second round of negotiations with Germany this month.
- Participated in DOE SNF Requirements Report QAP 3.1 review comment resolution meeting. Major areas of concern include developing an inclusive definition of DOE SNF, safeguards and security, Resource Conservation and Recovery Act (RCRA) strategy, and repository performance-related requirements. When DOE SNF is included in the WA-SRD, the DOE SNF Requirements Report will be an input.
- Attended EM/RW Quarterly Status Meeting on High-Level Waste (HLW) and discussed new safeguards-related requirements on HLW Producers in WA-SRD Revision 2.
- Briefed RW-44 on overall near-term and longer-term goals for the Waste Acceptance Criteria development area. Agreed that near-term goals include supporting DOE decisions regarding conditioning, disposing, and transporting DOE SNF and HLW. Longer-term goals include developing and baselining final criteria for acceptance of all DOE SNF and HLW into the CRWMS and ensuring that the Mined Geologic Disposal System (MGDS) License Application and the CRWMS design baseline is consistent with the baselined criteria.

SNF Verification, MC&A, and Safeguard Activities

- Delivered the Integrated Safeguards and Security Requirements Analysis (ISSRA) preliminary draft and distributed it for informal review and comment.
- Notified NRC that Option 2—postponing IAEA safeguards until dual purpose canisters are opened before final disposition at a central storage facility—should not be sent to IAEA. Requested early response on the original proposal and written instructions on responsibility for financing IAEA safeguards.
- Completed a draft letter to NRC on Specific Approaches to IAEA Safeguards of Spent Nuclear Fuel.
- Completed a draft letter to NN-40 on Data Verification Needs for Vitriified High-Level Waste.

Logistics and System Engineering Activities

- Issued the Waste Acceptance Design Requirements Document (WA-DRD) Technical Document Preparation Plan (TDPP), Revision 1, to DOE.
- Completed QAP-3-1 review and provided comments on the MGDS Transportation Interface Control Document (ICD) concerning its impacts on Waste Acceptance.
- Coordinated a joint Waste Acceptance and Transportation approach to planning and scheduling Purchaser Campaign activities and updated the Schedule Waste Acceptance section of the WA-DRD to reflect this approach including developing requirements for a 5-year Campaign Schedule based on submitted Delivery Commitment Schedules (DCSs) used for budgeting and procurement planning; a 1-year Acceptance and Transportation Delivery Schedule (ATDS) based on submitted FDSs used for planning near-term acceptance activities; and individual Campaign Plans describing the detailed Transportation and Waste Acceptance activities needed for loading at a purchaser site.
- Continued developing the draft Concept of Operations (CONOPS) portion of the Waste Acceptance, Storage, and Transportation Operations Plan (WASTOP).

Planning and Integration Quality Assurance Activities

- Completed the Program Plan draft redline/strikeout to address proposed changes that might be necessary to reflect programmatic options and scenarios under consideration.
- Performed QAP-2-0 analyses on FY96 Annual Plan activities.
- Completed preparation of the Basis of Estimates (BOEs) for the FY96 WA workscope.

Data Collection, Analysis, and Dissemination

- Began development of the Spent Fuel Storage Requirements (SFSR) Report tables by reviewing the files from the RW-859 master files. Checked the files against the draft copy of the tables from the DOE/EIA Service Report.

Unified Database System Activities

- Demonstrated the UDB prototype to RW-40.
- Continued developing the UDB Life-Cycle Plan (LCP) and the Functional Requirements Document (FRD); established an internal review schedule for the draft FRD; continued incorporating the WA Element DRD functional structure, draft descriptions, and applicable UDB inputs and outputs into the LCP and FRD; and coordinated UDB inputs and output reports between the DRD and the FRD.

- Continued developing a strawman user interface and screen hierarchy, and presented work-in-progress to a peer group for review. The group will continue to explore various alternatives and develop user design guidance for the UDB System.
- Developed a draft agenda and plan for a formal UDB Requirements Review to resolve Phase I UDB issues and finalize the schedule, development plan, and functional to the satisfaction of RW-40, potential UDB users, M&O QA, Information Resources Management (IRM), and technical peers.

3.2.3.2 Issues and Concerns

- None.

3.2.4 Project Integration

MANAGER: T. R. Stevens

OBJECTIVE(S): Conduct project financial and technical integration activities across the WAST project to maintain the WAST project development.

3.2.4.1 Progress During Report Period

Project Scheduling and Control

- Participated in M&O revised program baseline planning and coordination meeting supporting completion of a Level 3 Baseline by the end of November, assuming timely budget guidance.
- Developed a most-likely-case to present to the Directors Program Review Executive Session on October 26, 1995, and continued to refine contingency planning, briefings, and option analyses.
- Updated the WAST summary network reflecting the baseline approved in Baseline Change Proposal (BCP)-03-95-0002 Revision 01. All activities and milestones were statused to the end of the Fiscal Year. Additionally, with the assistance of the MPC Project engineering staff, added Westinghouse schedule data for the Phase 1 procurement into the network in time for the Directors Program Review (DPR).
- Prepared schedules and assumption for Office of Management and Budget (OMB) Scenarios I and II. Scenario I is based on the Program Plan. Distributed guidance on Scenario II based on potential legislation and assuming interim storage site selection by October 1996. WAST managers are to aid in its completion.
- Developed text, milestones, and budget profiles for three Quick Reaction OMB scenarios to present to RW-35.

FY96 Planning

- Initiated staff reductions consistent with revised FY96 Budget and scope.
- Developed a projected FY96 Cost Plan based on Option 6, which included estimated FY95 Uncosted Obligations. The time-phased plan was established assuming historical burn-rate expense through November 15, 1995, when passage of the Appropriations Bill is expected and continuing generic Program Plan activities until site-specific activities begin, possibly next spring.
- Continuing work on an integrated approach allowing schedules to serve as source data for PACS and other management tracking systems. Detailed schedule activities will be used in the performance measurement system baselined for FY96 and beyond.

Quality Assurance

- Completed the QAP-3-1 technical document review of the MGDS/Trans ICD identified the interfaces between the MGDS and the Transportation System element of CRWMS. It also identifies the configuration items (CIs) comprising the interfaces, the characteristics of the CIs, and the value of the characteristics. Twelve comments, six of which were mandatory, were submitted.
- Reviewed the WA-SRD, Revision 02A. Describing the functions to be performed and the technical requirements for a Waste Acceptance system for accepting spent nuclear fuel and high-level radioactive waste. Fifteen comments, ten of which were mandatory, were submitted.
- Reviewing revisions to the Westinghouse SEG QA Program Quality Management System Manual, QA Procedures, and Engineering Procedures submitted by Westinghouse/GESCO to determine if the documents are in compliance with 10 CFR 71 and DOE Quality Assurance Requirements and Descriptions (QARD).

Project Systems Engineering

- Distributed the Draft Annotated Outline of the WAST Operations Plan within M&O WAST for comment and met with RW-40 to begin an OCRWM review of the outline.
- Developed and coordinated a BCP to proceed with various Specification Change Notices against the MPC Design Requirements Documents; this BCP was forwarded to RW-40 senior staff and RW-46 for review and comment.
- Assisted RW-40 in preparing draft FY97 OMB Submittal options.
- Completed QAP-3-1 review and comment resolution for the draft WA-SRD revision and provided concurrence notification on the QAP-3-1 Transportation SRD review draft revision.
- Completed a draft At-Reactor Modal Capabilities Design Analysis and submitted it for checking.
- Completed the GA-4/9 Requirements Trace Design Analysis and routed it for WAST approval.
- Conducted first meeting of the Testing Natural Working Group (NWG) and prepared draft mission statement for review.

3.2.4.2 Issues and Concerns

- None.

3.2.5 Variances

- None.

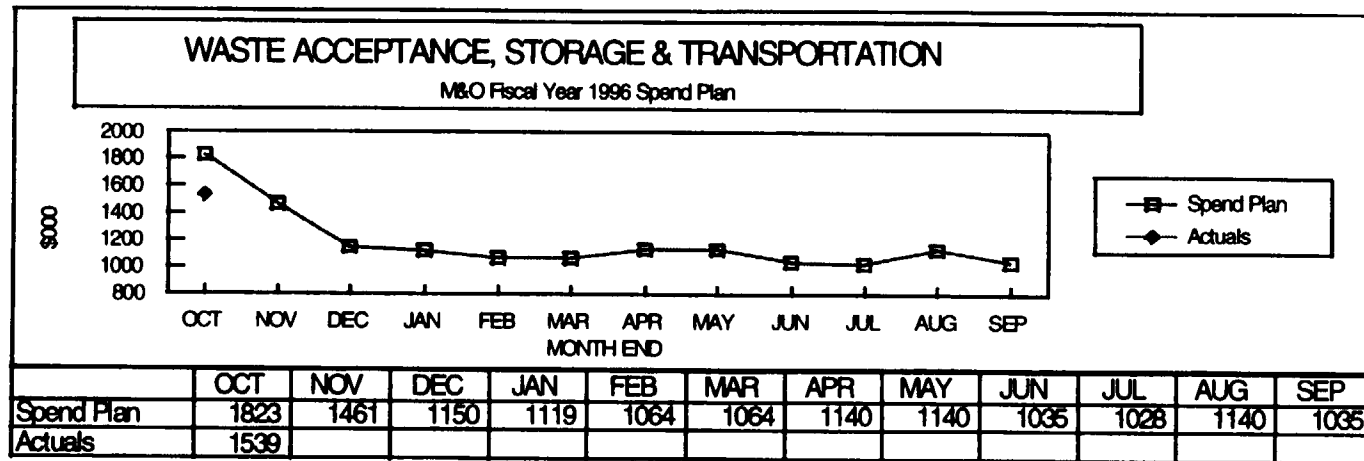


Figure 3. WAST Financial Status

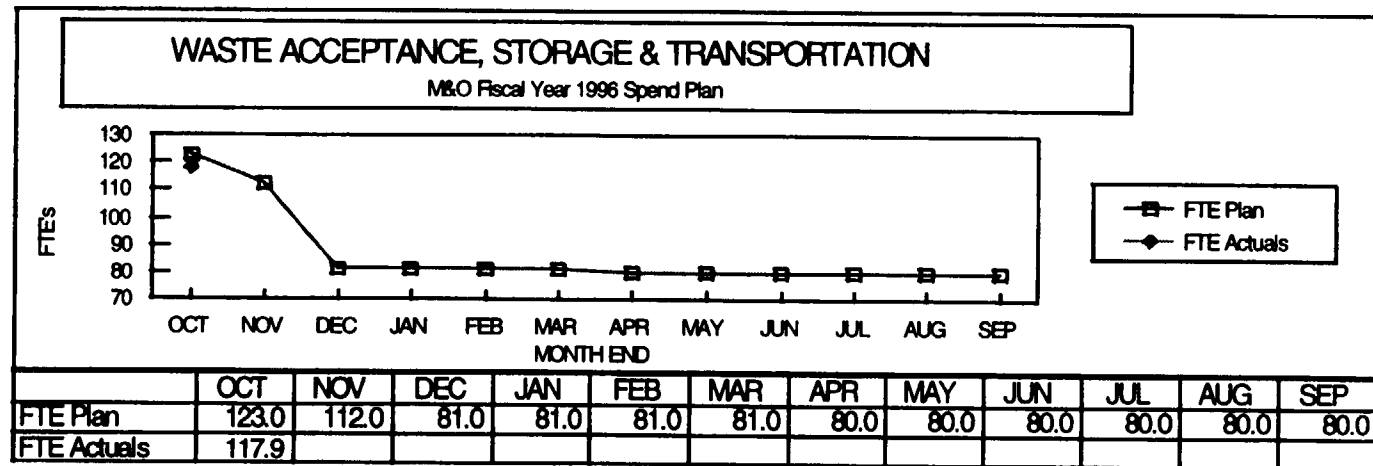


Figure 4. WAST Staffing

4. PROGRAM SUPPORT CWBS 9.0

4.1 PROGRAM QUALITY ASSURANCE CWBS 9.1

MANAGER: R. P. Ruth

OBJECTIVE(S): Establish a quality assurance program that meets Office of Civilian Radioactive Waste Management (OCRWM) Program Quality Assurance Requirements and Description (QARD) requirements and is maintained through surveillances and reviews of all Civilian Radioactive Waste Management System (CRWMS) M&O quality-affecting activities.

4.1.1 Progress During Report Period

Las Vegas

- The Quality Review Board (QRB) approved the following: Quality Administrative Procedure (QAP)-3-12, Revision 6; QAP-2-4, Revision 5 (for Cancellation); QAP-16-2, Revision 2 for Cancellation). LV QA approved Nevada Line Procedure (NLP)-3-10, Revision 6, "Preparation of Field Changes to Engineering Drawings and Specifications"; NLP-3-29, Revision 0, "Documentation of Title III Implementing Actions"; NLP-3-31, Revision 0, "Review and Approval of Submittals"; NLP-SIII-3, Revision 0, "Surface Based Test Management" and Nevada Work Instruction (NWI)-QA-001Q, Revision 0, "Requirements Matrix Review and Acceptance."
- Prepared an independent package to satisfy the NRC In-Field Verification, Phase III, open item # 4, commitment to update the objective evidence package documenting Design Package 2C Corrective Action Reports (CARs) resolution. A new objective evidence package contains only updated information on the nine CARs open when the original Objective Evidence Package was prepared.
- Completed Surveillances 95-NSS-39 "REECO Transition Plan," 95-NSS-041 "Procedure Action Requests," 95-NSS-50 "Impact Review for QAP-3-4," 95-NSS-51 "Preparation of NWIs," 96-NSS-01 "Kiewit/PB Audits and Surveillances," and 96-NSS-08 "Activity Evaluations' Lessons Learned."
- Performed SP1.73 review of vendor manual VM/OE-94/002, Mettler Balances, for controlled distribution.
- Issued letter to Yucca Mountain Quality Assurance Division (YMQAD) requesting removal of SAIC/Employment Security Department (ESD) and Analytics from the OCRWM Qualified Suppliers List (QSL).

Vienna

- Reviewed the General Atomics (GA) Road Profile Test and Durability Test Report (910813) on a GA-9 Trailer, Volumes 1, 2, and 3; the GA-4 Legal Weight Truck (LWT) From Reactor Spent Fuel Shipping Cask Final Design Report (FDR) (910353); and the Final Design Drawing Package (PC-000333 and PC-000334) of the GA-4 LWT From Reactor Fuel Shipping Cask. GA designed and built the prototype trailer to transport the spent fuel shipping cask and selected the Allied-Signal Automotive Proving Grounds to develop an accelerated durability test route using road profile measurements and to conduct the durability test.
- Reviewed the QAP-3-1 Mined Geologic Disposal System (MGDS)/Transportation Interface Control Document identifying the interfaces between the Mined Geologic Disposal System element and the Transportation System element of CRWMS. It also identifies interface configuration items, the Configuration Items (CIs) characteristics, and the value of the characteristics.
- Reviewed the Waste Acceptance System Requirements Document (WA-SRD), Revision 02A, describing the functions to be performed and the technical requirements for a Waste Acceptance System for accepting spent nuclear fuel and high-level radioactive waste. Fifteen comments were submitted, ten of which were mandatory.
- Reviewed revisions to the Westinghouse SEG QA Program Quality Management System Manual, QA Procedures, and Engineering Procedures submitted by Westinghouse/GESCO to determine if the documents are in compliance with 10CFR71 and DOE QARD.
- Completed Surveillances 95-VIS-029 "Design Analyses," 95-VIS-36 "GESCO Evaluation of Subtier Suppliers," 95-VIS-38 "GESCO Audit of Design Requirements Document (Chem Nuclear)," and 95-VIS-41 "Design Requirements Document (DRD) Reviews."
- Reviewed the revised DOE Spent Nuclear Fuel (SNF) Requirements Document. Incorporated M&O mandatory comments and provided two new nonmandatory comments. Also reviewing the Savannah River Program Plan for Defense Waste Processing Facility (DWPF) Waste Qualification for Systems Engineering.
- Informed NRC that interpretation of regulations is not Subject to Quality Assurance Requirements until used in a Q Design or Licensing Document.
- Reviewed Preliminary Draft Multi-Purpose Canister (MPC) Part 60 Report and provided comments on the format, Non-Destructive Examination (NDE), American Society of Mechanical Engineers (ASME), QA, and Waste Acceptance activities.
- Evaluating the potential consolidation of project and M&O procedures and determining which of the following procedures is appropriate for performing external reviews: DOE QAP-6.2, M&O QAP-3-1, or proposed M&O procedure QAP-2-10.

- Submitted the Management Report of OCRWM CAR HQ-94-015 Review Team Activities to the Records Processing Center.

4.1.2 Issues and Concerns

- None.

4.1.3 Variances

- None.

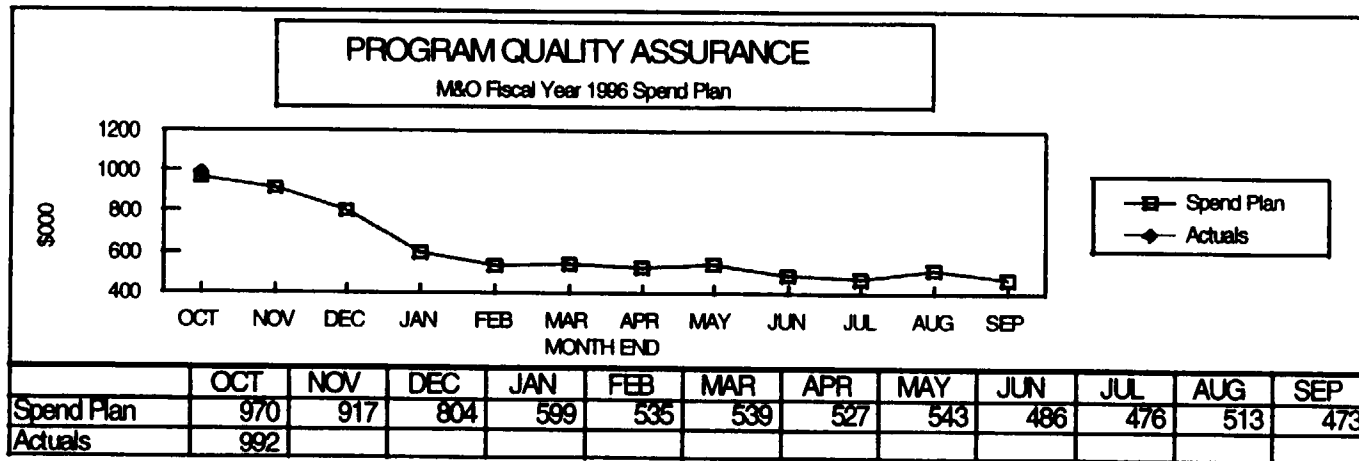


Figure 5. Program Quality Assurance Financial Status

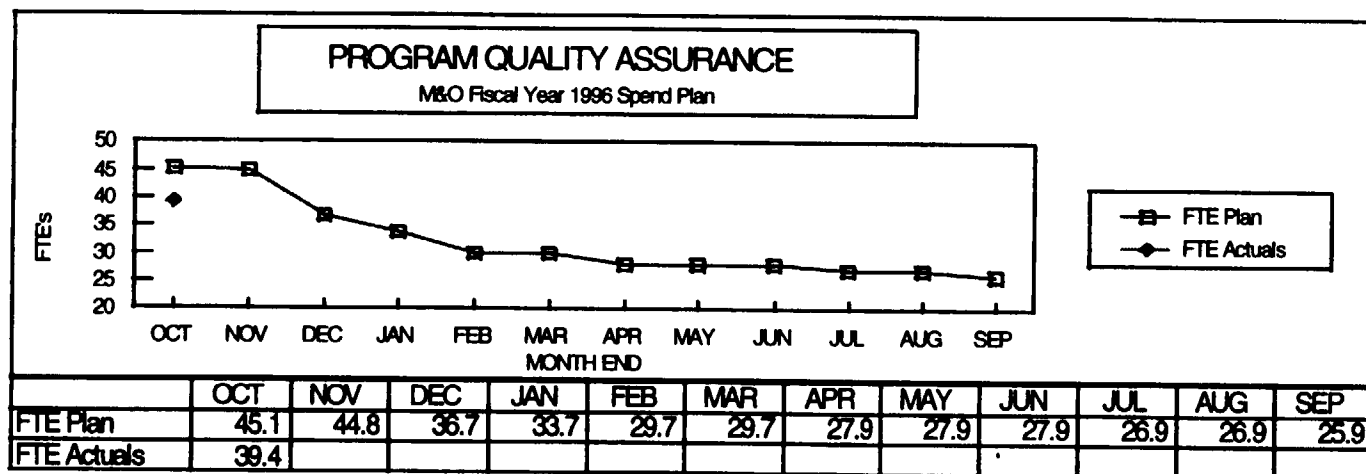


Figure 6. Program Quality Assurance Staffing

4.2 PROGRAM MANAGEMENT AND INTEGRATION

CWBS 9.2.1, 9.2.2, 9.2.3, 9.2.4, 9.2.5

4.2.1 Systems Integration

MANAGER: G. A. Caruth

OBJECTIVE(S): Develop management system documentation, develop automated system for the management of system requirements, integrate engineering specialties, perform system safety and risk assessments, and establish technical performance measurement system and conducts evaluation. Identify systems analysis requirements; develop, integrate, and allocate system requirements; develop program test and evaluation program; maintain the system technical baseline; and verify the adequacy of designs and construction and compliance with system requirements.

4.2.1.1 Progress During Report Period

System Planning and Integration

- Began the QAP-3-1 Mined Geologic Disposal System (MGDS)/Transportation Interface Control Document review. The document focuses on the interface between the Multi-Purpose Canister and the Disposal Waste Package. Ninety mandatory and 24 non-mandatory comments were received. Responses to all comments were generated and provided to reviewers. Two responses, both affirmative, have been received from the ten reviewers as of the end of the month.
- Supported issue resolution on the Waste Containment and Isolation Strategy and explained the strategy in a presentation to RW and the Nuclear Waste Technical Review Board. The strategy provides a potential basis for redefining the objectives of repository characterization and design activities for FY96 and beyond.
- Delivered a revised draft of the System Concept of Operations (CONOPS) incorporating comments received from RW-37 and Yucca Mountain Site Characterization Office (YMSCO). The document, based on the current Program Approach, was distributed for DOE review. Began revising the current document to reflect contingencies including possible inclusion of interim storage into the program baseline.
- Supported YMSCO in the preparation and review of presentation materials for the Nuclear Regulatory Commission Technical Exchange on Disposal Criticality Control. Observed the review and identified and evaluated interchange results.
- Supported OWAST review of Waste Acceptance Design Requirements Document development efforts to ensure they support the development of the Unified DataBase (UDB) Functional Description Document. Analyzed inputs and outputs with WAST personnel for each Manage Waste Acceptance Information function.

- Participated in the first meeting of the Integrated Test Planning Working Group to implement a consistent approach to Test and Evaluation across the program. Explained the purpose of the OCRWM Test and Evaluation Master Plan and distributed the document to all members.

System Requirements and Design

- Submitted a draft of the MGDS-Requirements Document, Revision 02, to RW-37 for review. Incorporated RW-37 comments and initiated the QAP-3-1 review.
- Completed the draft Program Task Team Report for the DOE Spent Nuclear Fuel (SNF) Steering Group and distributed the report to task team members for comments. The report presents several important issues concerning acceptance of DOE SNF for disposal and strategies for their resolution.
- Baseline, approved, and delivered the software and documentation for ORIGEN-ARP Version 1.0 and the Automated Requirements Management System, Version 1.1.4.
- Continued the QAP-3-1 review of Revision 2 to the Trans-System Requirements Document (SRD), Storage SRD, and Waste Acceptance SRD. Conducted comment resolution and documentation throughout this reporting period.
- Completed and delivered the Configuration Information System Configuration Audit Acceptance Test Procedure in preparation for the Phase 3 Acceptance Test, to be held at YMSCO from October 31 through November 2, 1995.

4.2.1.2 Issues and Concerns

- None.

4.2.2 Regulatory and Licensing

CWBS 9.2.2

MANAGER: D. F. Fenster

OBJECTIVE(S): Coordinate and develop an integrated OCRWM programmatic approach and strategies for regulatory compliance and licensing issues. Coordinate and develop regulatory interpretation and guidance documents. Lead the National Environmental Protection Agency (NEPA) policy and compliance approach process. Serve as a point of contact on policy for environmental, safety and health compliance. Coordinate and facilitate NRC interactions.

4.2.2.1 Progress During Report Period

Environmental Requirements and Compliance

- Submitted the OCRWM NEPA Procedures Guidance Document to RW-36 based on the final DOE Order 451.1.
- Provided RW-36 with a white paper on the potential effect of H.R. 1020 and S. 1271 on the current OCRWM NEPA Compliance Approach.
- Participated with Argonne National Laboratories (ANL) in final edit and review of the Draft MPC Environmental Impact Statement (EIS).
- Reviewed and provided draft comments to RW-36 on the Draft Nevada Test Site EIS Transportation Study dated October 1995.

Working Group and Committee Support

- Reviewed the DOE Pollution Prevention Crosscut Plan, 1995, and provided draft comments to RW-36.

Regulatory Compliance and Guidance Support

- Revised draft action memorandum and draft memorandum from RW-1 to EH-1 and CR-1 requesting that OCRWM be exempted from preparation of future Environment, Safety, and Health Management Plans. The Plans are used by EH and CR as part of the DOE budget planning process. The Plans are not used by OCRWM for budget planning.

Licensing and Regulatory Program Support

- Delivered Revision 1 of the RTS Administrative Procedure for DOE review. Met with RW-36 to discuss further implementation enhancements of the RTS in response to tracking and notification questions raised by RW-2.

- Delivered OCRWM Headquarters Administrative Guideline for NRC Interactions providing guidance for preparation for NRC meetings and incorporating M&O and RW-36 review comments.
- Incorporated comments received to date in the edited preliminary draft of the MPC Part 60 Design Considerations Report and provided the mark-up to Technical Publications.

External Interactions

- Participated in the Environmental Radiological Control Coordinating Committee meeting on October 10, 1995. The Committee facilitates a smooth and consistent implementation of 10 CFR Part 834 Radiation Protection of the Public and the Environment.

Issues and Concerns:

- The evaluation of OCRWM licensing strategy and regulatory compliance program in context of a constrained budget and revised program approach is a concern.

4.2.2.2 Issues and Concerns

- None.

4.2.3 Strategic Planning

CWBS 9.2.3

MANAGER: F. Ridolphi

OBJECTIVE(S): Provide complete strategic and system analyses to DOE OCRWM and to the general manager of the M&O contract

4.2.3.1 Progress During Report Period

- Developed and submitted a draft annotated outline for the upcoming revision to the CRWMS Program Plan to RW-34 in coordination with Weston.
- Began developing draft text for the revised Program Plan in coordination with Weston. Sections 1.1 and 1.2 were prepared by Weston, and Section 2.3 was prepared by the M&O. All were submitted to RW-34 on October 31, 1995.
- Deployed Phase I of the on-line Lotus Notes version of the Director's Resource Book, titled "OCRWM Resources Database," in coordination with Weston. The database will provide all OCRWM users with immediate access to key Program information, make it possible to locate information quickly, and make regularly scheduled updated information immediately accessible.
- Deployed a Lotus Notes limited-access database titled "M&O RW-1 Papers" containing recent rapid-response information and briefing materials presented to RW-1/2. The database is used to archive electronic files accessible to the RW front office for subsequent use.

4.2.3.2 Issues and Concerns

- None.

4.2.4 International Waste Management Technology CWBS 9.2.4

MANAGER: F. Ridolphi

OBJECTIVE(S): Maintain an awareness of international activities relating to the disposal of spent fuel and high-level waste (HLW) in order to integrate information from these foreign programs into the domestic program. Report on special issues regarding international program activities and provide specific recommendations.

4.2.4.1 Progress During the Reporting Period

- Conducted a tour of Yucca Mountain for 12 Spanish visitors from ENRESA and the Spanish Senate.
- Reviewed the proposed work agreement between the Japanese Power Reactor and Nuclear Fuel Development Corporation (PNC) and the DOE. Evaluated potential FY96 Japanese cooperative activities at Yucca Mountain in support of a November 2, 1995, meeting between Dr. Dreyfus and PNC in Washington, DC.
- Submitted comments on transmission of an NEA document entitled "The Meaning and Application of the Concept of Potential Exposure" to the DOE.
- Reviewed data requested by ANDRA (France) regarding proposed U.S. expenditures for deep geologic disposal. Forwarded relevant information to the DOE for transmission to ANDRA.
- Reviewed the U.S. status report on Radioactive Waste Management for its inclusion in the NEA/OECD nuclear waste bulletin that provides information updates on waste management policies and programs.

4.2.4.2 Issues and Concerns

- None.

4.2.5 Program Control and Administration CWBS 9.2.5

MANAGERS: J. L. Stern/M. H. King

OBJECTIVE(S): Provide Program Control support to OCRWM by implementing and maintaining a Program Control System (PCS) for the program and program support elements. Develop program management policy and process documents, support the OCRWM Program Baseline Change Control Board (PBCCB) management of baseline changes, maintain and update the OCRWM Program Summary Networks, prepare monthly analysis on program and project status, and coordinate bimonthly Director's Program Reviews (DPRs). Initiate the FY96 Total System Life-Cycle Cost (TSLCC) analysis and maintain the Program Cost and Schedule Baseline (PCSB) and WBS dictionaries.

4.2.5.1 Progress During Report Period

- Participated in the M&O working group established by the M&O Assistant General Manager, Program Integration, to identify and resolve issues on program management policy finalization. Developed a summary of the M&O open issues on the proposed OCRWM Program Management Plan (PMP). Developed charts summarizing the result of the proposed single management suite described in the PMP on current documents. Supported meetings with M&O Yucca Mountain organizations.
- Assisted OCRWM in allocating FY96 Budget Authority consistent with Congressional direction. Completed the preliminary draft of the Cost and Schedule Estimating Requirements and Guidelines.

4.2.5.2 Issues and Concerns

- None.

4.2.6 Program Management and Integration Variances

- None.

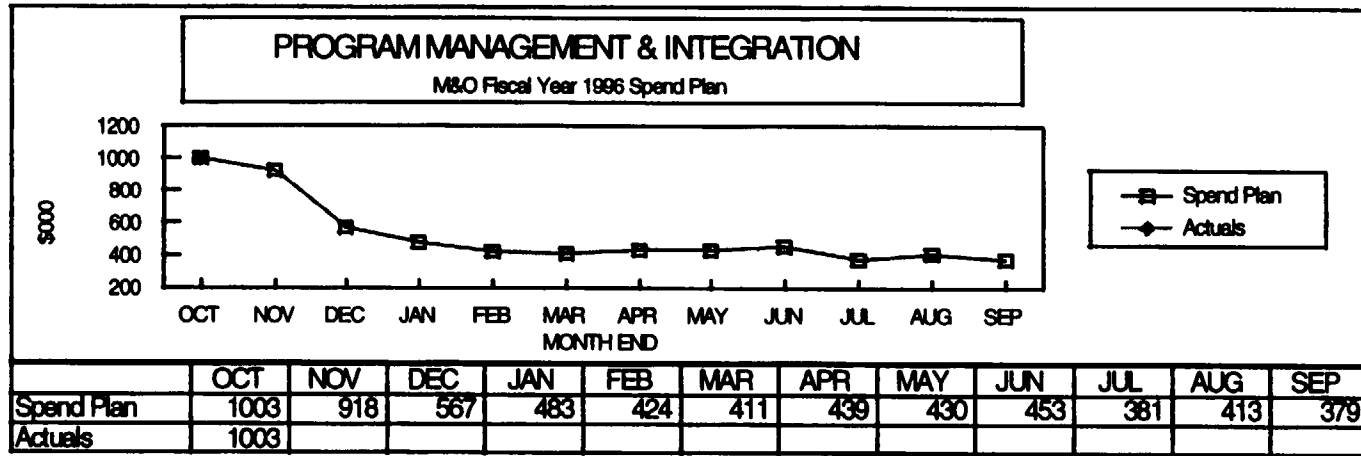


Figure 7. Program Management and Integration Financial Status

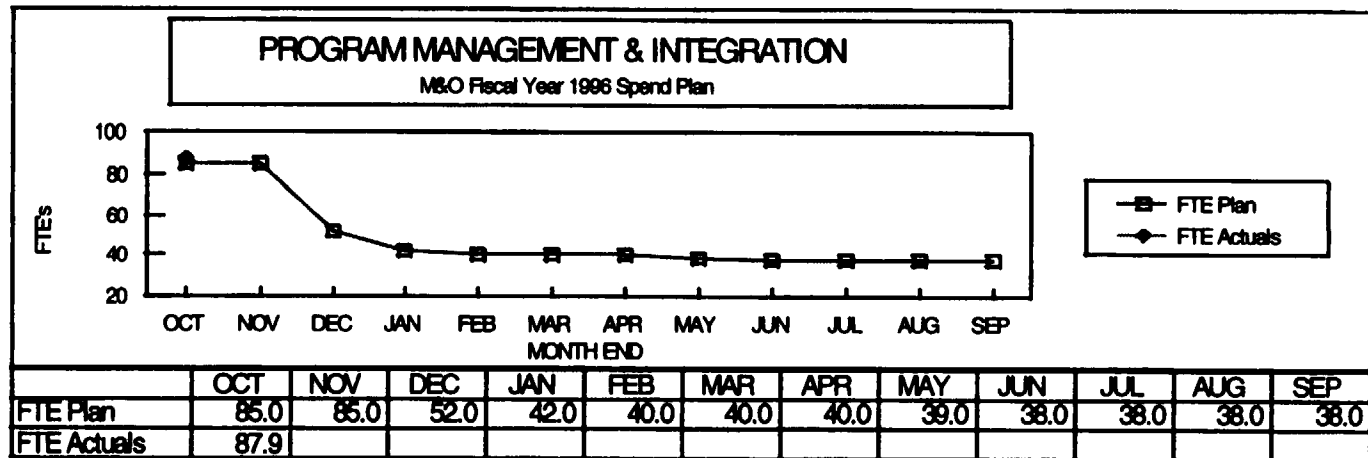


Figure 8. Program Management and Integration Staffing

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4.3 EXTERNAL RELATIONS AND INFORMATION RESOURCE MANAGEMENT

CWBS 9.3.3.1, 9.3.4, 9.3.5

4.3.1 External Relations

CWBS 9.3.3.1

MANAGER: F. Ridolphi

OBJECTIVE(S): Manage and operate the OCRWM National Information Center; develop, implement, maintain, integrate, and disseminate program-wide public, educational, and technical information materials, including publications, audiovisual resources, video productions, exhibits, presentations, briefings, INFOLINK, and OCRWM Home Page; manage the inventory of materials; and implement the program-wide integration of DOE communications policies and publications procedures.

4.3.1.1 Progress During Report Period

Library Resources

- Responded to 247 information requests.
- Distributed 110 Yucca Mountain Work Update videotapes to Utility Information Center points of contact; distributed the "OCRWM Calendar."

Electronic Systems

- Posted the fall 1995 "OCRWM Bulletin"; four program announcements; Dr. Dreyfus' testimony before the House Subcommittee on National Parks, Forests, and Lands; and the November OCRWM Calendar of Events on the OCRWM Home Page. Updated activities of 10 cooperative agreement groups. During the month of October, the OCRWM Home Page was accessed 25,528 times compared with 17,329 times during September.
- Uploaded 38 new images to the Digital Media Database (DMD), responded to several requests from RW-34 for DMD visuals, and installed DMD capability at the Technical Information Center in Vienna.
- Researched and wrote 18 stories for the CRWMS Media Summary, which provides a weekly summary of news media coverage related to program activities.

Exhibits and Utilities

- Staffed OCRWM program-wide exhibits at the Ecoloday 1995 Fair, Fairfax, VA; American Council on Education, Kansas City, MO; and the National Science Teachers Association's Western Area Conference in Salt Lake City, UT. Exhibit reports were prepared and delivered for each of these events.

- Set up and displayed the “Managing the Nation’s Nuclear Waste” exhibit in the Forrestal building and the DOE Germantown facility in observance of Energy Awareness Month.

Publications

- Submitted the electronic “Questions and Answers” for final approval before posting on the OCRWM Home Page.
- Researched and prepared responses for 17 public-mail inquiries relating to diverse aspects of the OCRWM program.

Education

- Made two OCRWM resource curriculum presentations to educators and administrators at the Kentucky Governors’ Conference on Environmental Education.

4.3.1.2 Issues and Concerns

- None.

4.3.2 Information Management Services **CWBS 9.3.4, 9.3.5**

MANAGER: C. L. Kerrigan

OBJECTIVE(S): Evaluate, develop, and implement plans, policies, procedures, and information systems to facilitate the management of OCRWM program information, data, and records. Operate the Records Data Management System (RDMS) for the storage and retrieval of electronic images of OCRWM records. Manage and operate the OCRWM Records Management System. Operate OCRWM's Quality Records Center, Correspondence Control Unit, and Mail Room. Provide computer operations and support to the M&O Vienna and Capital Gallery facilities.

4.3.2.1 Progress During Report Period

- **Unified Scanning System (USS)** - Discussed USS architecture with OCRWM Headquarters IM team members. Short-term strategy is unchanged; long-term strategy will include migrating the LN:DI/MSS implementation of Correspondence Tracking System (CTS) to one which uses the Watermark Image Server. Made progress on incorporating an endorsement feature to USS (i.e., addition of accession number to TIFF header for interface with RDMS).
- **Records Computer-Based Training (CBT)** - Incorporated the majority of suggestions from feedback items into the Records CBT application. Deployed CBT to members of a second pilot group in Las Vegas.
- **Digital Media Database (DMD)** - Demonstrated DMD to the Energy Information Agency (EIA). Continued work to resolve the color printing problem experienced with the latest COTS upgrade (LeadTools Express). Testing an alternate print method using PowerPoint with NIC and Rapid Response Team (RRT) users, who indicate the output is acceptable.
- **Integrated Tracking System (ITS)** - Completed integrating the Controlled Milestone Reporting System (CMRS) with the Notrix version of ITS. Also enhanced ITS to include the requested updates to views, fields, labels for CMRS, CTS, and RW-Tracker views. Provided demonstration of product to the Special Assistant to the OCRWM Director for Administration who expressed his appreciation for the professionalism, responsiveness, and speed with which this strategically important system has been developed. ITS now goes into network and operational testing before formal delivery to OCRWM Headquarters.
- **Automated Forms System** - Completed Automated Forms System Version 2.1 pilot deployments to all sites (approximately 12 participants).
- **Management System (MS) Access Databases** - Delivered a copy of the Records Retention Schedule database to the DOE EM organization. This database enables the on-line creation and maintenance of a master retention schedule. Delivered a statistical reporting capability to the Human Resource (HR) organization for HR's Employee Database, which is an employee master file containing personal, education, and work experience information for all M&O employees.

- **RDMS** - The M&O Vienna Records department participated in the deployment of the RDMS CD-R creation workstation at the Vienna site. The RPC staff received training on writing CD-R and operating the equipment.
- **CRWMS Contact Directory** - Launched a macro program to deliver the CRWMS Contact Directory records to M&O HQ users with a request for updated information. Over 130 users have responded with updates. Plan to launch similar update requests to Las Vegas and OCRWM HQ users so the entire CRWMS Contact Directory is up to date with locations, phone numbers, supervisors, FAX numbers, etc.
- **Hotline Phone Number for System Status** - Initiated an Audix account (x3800) for M&O Vienna systems server status. Providing users with a method to obtain status during outages and estimated times for system recovery. Users would call this number prior to coming in on weekends or after planned maintenance activities, for instance, to status system availability.
- **Integrated Spent Nuclear Fuel Database** - Successfully deployed the latest version of the Integrated Spent Nuclear Fuel Database to YMSCO Las Vegas M&O offices, OCRWM Headquarters, and Vienna M&O offices.
- **Lotus Notes Support** - Established a duplicate Lotus Notes database of "RW-1 Papers Database" to be used as the "M&O Papers Database." Demonstrated the automated workflow capabilities of Lotus Notes to the TRW Foreign Broadcast Information Services (CIA) program. The demonstration included CTS, ITS, Help Desk, automated deployments, automated user surveys, intersite account coordination, and other smaller applications.
- **E-Mail as a Record Working Group** - Held the first meeting of the "E-mail as a Record" Vienna working group to determine the approach the M&O and OCRWM will use to comply with the new E-mail regulations. Records Management needs to propose policy based on requirements identified in the regulations.
- **DOE Information Management Strategic Alignment Initiative on Corporate Systems** - Developed a draft Corporate Information Systems Implementation Plan with inputs from other team members; hosted a DOE IM roundtable on corporate systems; presented recommendations on implementing a corporate information management environment at DOE to W. Hall, Deputy Assistant Secretary for Information Management.

4.3.2.2 Issues and Concerns

- None.

4.3.3 External Relations and Information Resource Management Variances

- None.

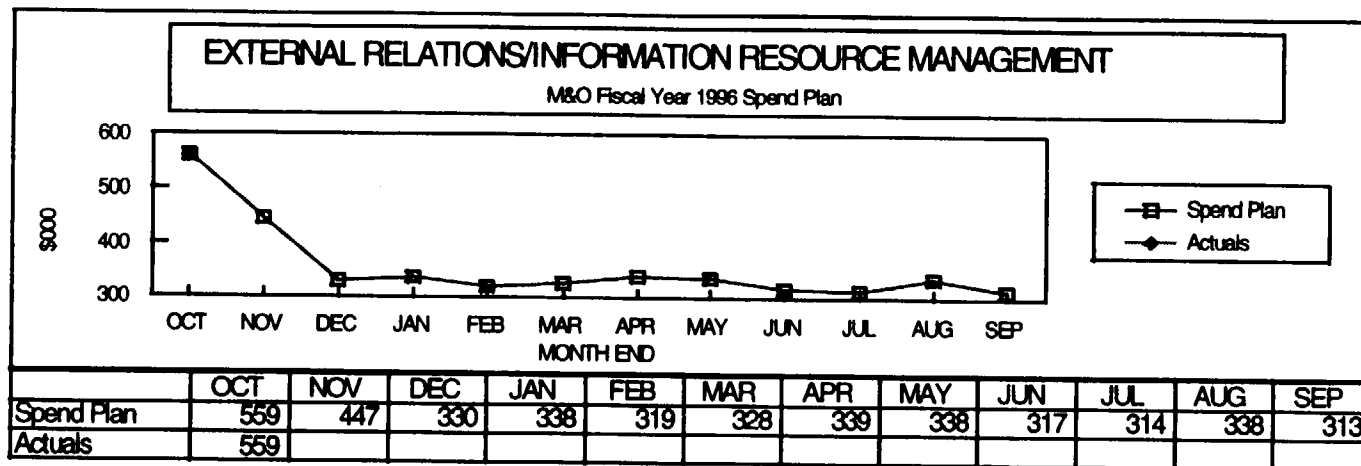


Figure 9. External Relations/Information Resource Management Financial Status

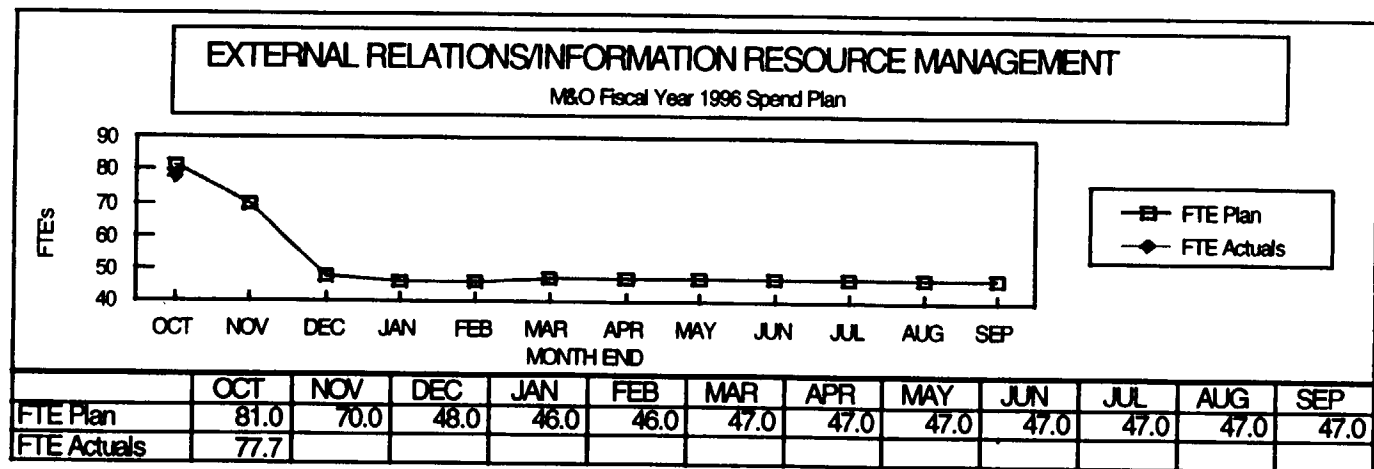


Figure 10. External Relations/Information Resource Management Staffing

4.4 REPOSITORY IMPACTS

CWBS 1.0.10

MANAGER: S. S. Sareen

OBJECTIVE(S): In support of a Programmatic Environmental Impact Statement (PEIS) and a DOE Record of Decision (ROD), determine the potential impact of disposing spent fuel from plutonium-burning reactors and/or plutonium immobilized with high-level radioactive waste (HLW) on the existing HLW Geologic Program. Assess the regulatory and statutory impacts, develop design basis for a repository, and initiate efforts towards a repository design.

4.4.1 Progress During Report Period

PEIS

- Completed Electrometallurgical Treatment (ET) analyses and developed and submitted PEIS input to Tetra Tech ahead of schedule.
- Initiated Borosilicate Glass Can-in-Canister analysis for PEIS input following completion of the ET alternative. Can-in-Canister Ceramic evaluation for PEIS input will follow.
- Reviewed Appendix H (repository appendix) of the PEIS and provided inputs to the PEIS contractor.

Alternative Team Support

- Supported the Reactor Alternative Team Report review at Oak Ridge.
- Reviewed technical reports and provided comments to the team lead.

4.4.2 Issues and Concerns

- None.

4.4.3 Variances

- None.

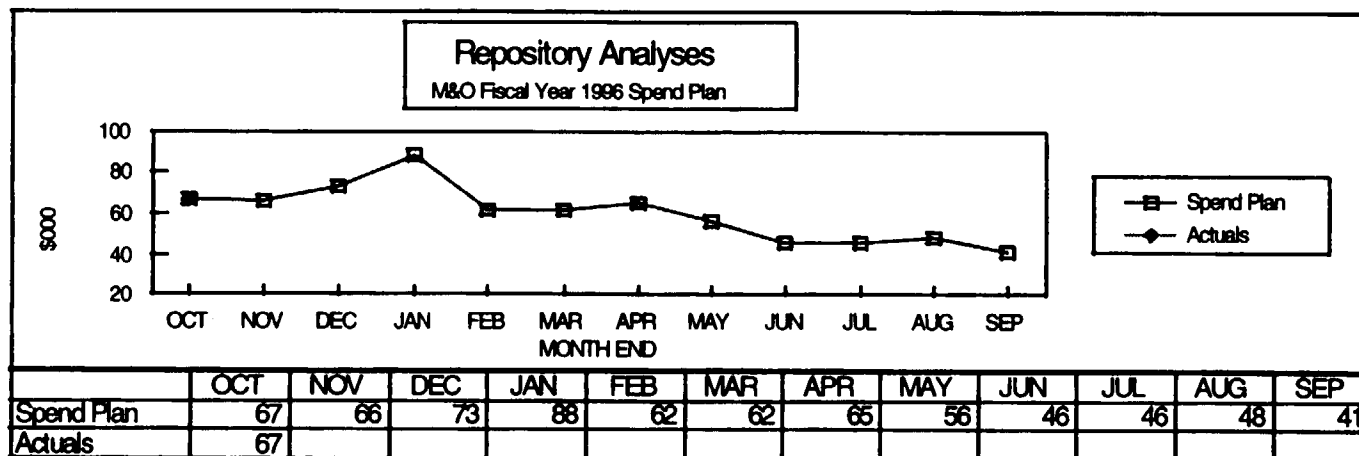


Figure 11. Repository Analyses Financial Status

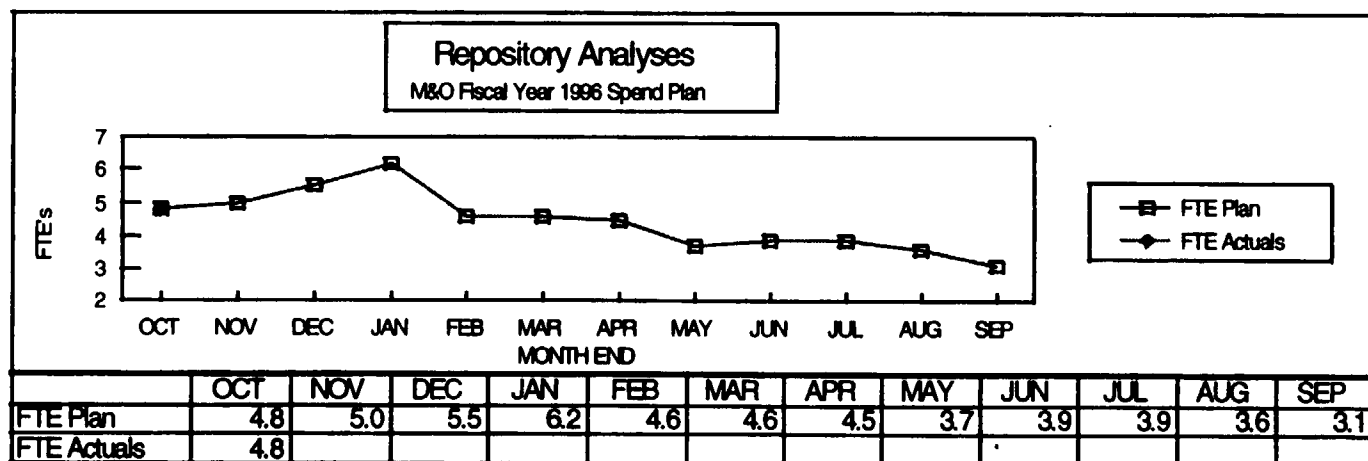


Figure 12. Repository Analyses Staffing

Los Alamos

NATIONAL LABORATORY

Earth and Environmental Sciences Division
EES-13 - Nuclear Waste Management R&D
Mail Stop J521, Los Alamos, NM 87545
Phone (505) 667-9768, Fax (505) 667-1934

November 7, 1995

LA-EES-13-11-95-001

Dr. Colin A. Heath
CRWMS M&O Assistant General Manager for Program Integration
TRW Environmental Safety Systems Inc.
2650 Park Tower Drive
Suite 800
Vienna, VA 22180

Dear Dr. Heath,

Submittal of Los Alamos Monthly Management Analysis Report for October 1995 (SCPb:NA)

Attached is the Los Alamos Monthly Management Analysis Report for October 1995. This report includes five sections:

- (1) a summary of our technical efforts, including information on completion of contract deliverables and major problems;
- (2) a summary of personnel changes;
- (3) a list of any unusual current and/or anticipated financial performance problems;
- (4) a list of programmatic issues that may impact the overall CRWMS M&O effort; and
- (5) a summary of work planned for next reporting period.

This technical sections of this report have not received formal technical or policy review by Los Alamos or the YMP. Data presented in this document constitute predecisional information, should not be referenced, and are not intended for release from the U.S. Department of Energy as referenceable information.

If you have changes to our distribution list, please call Susan Klein at (505) 667-0916.

Sincerely,



Julie A. Canepa

JAC/SHK/lb

Attachment: a/s

WBS: 1.2.9.1

QA: N/A.

DIVISION

CG:

CC:

CC:

CC:

CC:

CC:

CC:

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REC'D IN YMP

11/17/95

"ENCLOSURE"

3

Dr. Colin A. Heath
August 7, 1995
LA-EES-13-08-95-001
Page 2

Cy w/att:

W.E. Barnes, YMSCO, Las Vegas, NV
G. Bovarddson, LBL, Berkeley, CA
G.A. Bussod, EES-13, MS J521
M.W. Chisholm, , M&O/TRW, Las Vegas, NV
W.L. Clarke, LLNL, Livermore, CA
L. Costin, SNL, Albuquerque, NM
R.L. Craun, YMSCO, Las Vegas, NV
W.R. Dixon, YMSCO, Las Vegas, NV
J.R. Dyer, YMSCO, Las Vegas, NV
N.Z. Elkins, EES-13/LV, MS J900/527
L.D. Foust, M&O/TRW, Las Vegas, NV
A.V. Gil, YMSCO, Las Vegas, NV
L.R. Hayes, USGS, Denver, CO
V.F. Iorii, YMSCO, Las Vegas, NV
S.B. Jones, YMSCO, Las Vegas, NV
S.H. Klein, EES-13, MS J521
A.L. Thompson, EES-13/LV, MS J900/527
M.D. Voegelé, SAIC, Las Vegas, NV
D.R. Williams, YMSCO, Las Vegas, NV
K.A. West, EES-13, MS J521

RPC File (S. Martinez), MS M321
LA-EES-13 File, MS J521

Los Alamos Monthly Management Analysis Report for October 1995

(1) Summary of (a) Los Alamos' technical accomplishments, (b) deliverables completed, and (c) major problems that may impact future performance.

(a) Technical Accomplishments

WBS 1.2.3.1 Site Investigation Coordination and Planning. Staff represented the Los Alamos Site Characterization Project Leader at weekly surface-based testing meetings and Civilian Radioactive Waste Management System Management & Operating Contractor work scope consolidation meetings.

WBS 1.2.3.2.1.1.1 Transport Pathways. *Studies of Calcite as a Factor in Flow Models and Radionuclide Transport Retardation.* Milestone 3326, "Stratigraphy, Trace-Element Geochemistry, and Evidence for Surface Reaction among Calcites in Tuffs of Yucca Mountain, Nevada," was approved by YMSCO. This report will be submitted for publication to *Geochimica et Cosmochimica Acta*. The authors use calcite trace-element chemistry to show that (1) local tuff glasses have been leached to provide the lanthanide elements in YMP calcites; (2) competition with other minerals (principally Mn oxides for lanthanides and zeolites or smectites for Sr) provides a geologic model of natural and analog retardation processes at Yucca Mountain; (3) even trace minerals can have a significant impact on transport; and (4) heat released by radioactive decay in a high-level waste repository may lead to increased calcite precipitation, entrapping ^{14}C and transuranic wastes that might be released from waste canisters while temperatures are elevated.

Studies of calcite chemistry at Yucca Mountain were being used to supply information on the transport of elements that occur in the natural environment as well as in high-level waste (Sr, Cs, Ba, C). Other chemical species that occur in the natural environment and are geochemically analogous to man-made radionuclides (e.g., lanthanide elements as analogs to Am, Pu, and Np) are also important in evaluating site performance.

Synthesis and Summary Reports. The data required for the Synthesis and Summary Report on Mineralogy of Transport Pathways were being compiled. Over 3,000 pages of published data emanating directly from this task need to be digested and synthesized for this report. A much larger quantity of notebook and logbook information also needs to be reviewed and a large, but yet

Predecisional information—preliminary data—do not reference

unknown, amount of ancillary references will be used in the synthesis of available data. Staff met with S. Nelson on 20 October to discuss the Project's needs in the development of this report.

Planning Activities. Min-Pet PIs continued to evaluate their roles and schedules in light of current funding constraints. With the loss of B. Carlos from the Project, remaining staff will be required to compile, summarize, and synthesize her data on fracture mineralogy. Similarly, the work done by D. Broxton over the last decade will have to be summarized by other staff because D. Broxton is no longer supported by the Project. These shifts in burden will stretch the available resources for synthesis and summary activities in 1.2.3.2.1.1.1.

Project Support. D. Bish met with YMSCO staff in Las Vegas on 30 October to provide input for the development of the 3-D database.

WBS 1.2.3.2.1.1.2 Alteration History. The PI met with Steve Nelson, TRW/M&O, to discuss the contents of the summary and synthesis report and to establish reporting requirements. Staff began to prepare an outline of the contents for the Alteration History portion of the report.

Efforts to integrate this task's research results into Performance Assessment continued with the preparation of a presentation for the Geological Society of America meeting next month entitled "Consequences of the dehydration and rehydration of clinoptilolite-rich rocks on the thermo-hydrologic evaluation of a model radioactive waste repository." An approved milestone paper, "Equilibrium in the clinoptilolite-H₂O system," was revised for publication.

Full papers on ion exchange and dehydration effects on K and Ar contents of clinoptilolite and on Alteration History studies in the ESF were prepared for inclusion in the *Proceedings of the Scientific Basis for Nuclear Waste Management XIX Symposium*. The ESF paper will include x-ray diffraction data that could not be incorporated into milestone 4009 at the end of FY95. The contents of both papers will become part of the summary and synthesis report.

WBS 1.2.3.2.1.2 Stability of Minerals and Glasses. The report on the dissolution/precipitation kinetics of clinoptilolite as a function of the activities of H₂O, SiO₂, Al₂O₃, and NaCl, milestone 3445, was submitted to the YMSCO early this month. All research activities related to this study stopped on 1 October and will not continue this fiscal year due to termination of funding.

Staff began formulating an outline for the Kinetics and Thermodynamics portion of the Min-Pet summary and synthesis report. Staff also continued to address comments on the study plan.

Predecisional information—preliminary data—do not reference

WBS 1.2.3.2.5 Volcanism. A presentation on volcanism studies was given at the NWTRB meeting in Washington, D. C., on 18 October. The primary results of the spatial and structural simulation modeling (FRACMAN code), and the results of modeling of eruptive and subsurface releases associated with magmatic processes (RIP code) were summarized in the presentation. A brief discussion was also presented on the impact of the proposed changes in the regulatory standards as suggested by the National Academy of Sciences on the volcanism issue.

Probability Studies. The data appendix for the volcanism status report was submitted to YMSCO this month. In preparation for this submission, the entries were cross-checked for consistency and accuracy. All field and laboratory notebooks were re-checked, and several new entries were discovered and added to the data appendix. Appendix two, which traces data in the volcanism status report to individual notebook entries, was compiled. The summary report for the data appendix was also completed.

Structural Controls of Basaltic Volcanism. Milestone 3399 was submitted to YMSCO. The final report on work activities was received from Golder Associates and attached as an appendix to this milestone.

Geologic Field Studies. Staff examined field trenches in the crater fill deposits of the Lathrop Wells volcanic center as part of synthesis activities for this task. The units exposed in the trenches provide constraints on the maximum thickness of deposits eroded from the crater rim, which in turn can be applied to chronology models that constrain the ages of eruptive events. Additionally, the field and sedimentological characteristics of crater-fill deposits that interfinger with thin playa deposits in the floor of the crater are consistent with either a reworked or primary origin (mixed hydrovolcanic-strombolian fragmentation/eruptive processes). Discrimination of the alternative emplacement models may be possible only from examination of major and trace-element geochemical data.

Geochemistry Studies. Staff began systematic use of the MELTS software package to constrain the crystallization history of magmas in the Yucca Mountain. The crystallization history of a basalt sample with high MgO from the 3.7 Ma cycle of volcanism in Crater Flat was calculated for different pressures and water contents.

A series of spreadsheet models were formulated to test whether geochemical variations at Lathrop Wells could be caused by mixing with or assimilation of crustal wallrock. Assimilation was found to be a viable model only at high rates (>1) of assimilation/fractionation.

Preparatory studies have started on an assessment of the use of neural-network software implementing back-propagation techniques as a method of testing geochemical data for classification of volcanic events at the Lathrop Wells. Back propagation shows considerable promise when compared to multivariate discriminate analyses for providing an alternative method of classifying nonlinear multivariate data and will be used as a method of testing alternative eruptive models in the final volcanism synthesis report.

WBS 1.2.3.3.1.2.2 Water Movement Test. Preliminary chlorine-36 results were obtained for 24 samples from boreholes UZ-N15, UZ-N16, UZ-N17, UZ-N27, UZ-N38, UZ-N39, UZ-N64, and ONC#1 (1160 ft only), and for five samples from the ESF North Ramp where it intercepts the Bow Ridge Fault. The objective of these analyses is to provide confirmatory evidence for the magnitude of infiltration rates indicated from moisture monitoring of the neutron holes, and of the role of the Bow Ridge Fault in transmitting infiltration. The ONC#1 sample from 1160 ft and the UZ-N39 alluvial sample from 40 ft were about 80% of the background level. Two near-surface samples were likewise near background. However, elevated levels were observed in all other samples, implying that fracture flow through the Tiva Canyon welded unit has occurred at least once during the past 45 years in each of the topographic sites sampled by the shallow neutron holes listed above. These results are not acceptable for quality-affecting work until the process blanks accompanying the samples are also analyzed, which is to take place next month.

The rebuilt pump for the ion chromatography system was received and connected. The system was used to obtain chloride and bromide for five groundwater samples from SD-7, collected in August, and one from WT-12. The SD-7 results were indistinguishable from analyses of samples obtained in March and did not show any trends in these components. Both waters had low Cl concentrations and Cl/Br ratios consistent with fast infiltration of rainwater. Unfortunately, after these data were collected, the pump failed again and a replacement rebuilt pump was requested.

In order to reduce storage costs at Los Alamos, 200 cuttings samples in 33 barrels were returned to the SMF. Small splits of each sample were retained at Los Alamos to permit some limited analysis, as judged necessary. This action also frees up space to allow new samples to be transferred from the SMF to Los Alamos for analysis.

WBS 1.2.3.3.1.2.5 Diffusion Tests in the ESF. Tests have been deferred due to lack of funding.

WBS 1.2.3.3.1.3.1 Reactive Tracer Testing. *Lithium Bromide Column Experiments.* Experiments were conducted to investigate the effects of kinetics and nonlinear sorption on the transport behavior of Li in columns packed with Bullfrog tuff from the C-wells. The conclusions drawn from this study could have an important impact on both the pre-test predictions of LiBr transport in the C-wells field-scale experiments and on the interpretation of the field experiments.

Field Testing. LBL sent the staff fluorescein breakthrough data from the tracer tests conducted at Raymond Quarry (California) in July and August of 1995, but they have not yet received lithium or bromide breakthrough data from these tests (see the July and August monthly reports for details of the tests). Analyses of the data is progressing, with emphasis on explaining differences between the fluorescein and polystyrene microsphere breakthrough curves. The microspheres clearly broke through sooner than the fluorescein in both tests, and the difference between the microsphere and fluorescein breakthrough curves was greater in the second test. These results seems to indicate preferred transport pathways for the microspheres, with matrix diffusion and/or more pronounced channeling being possible explanations for the later arrival of fluorescein. However, fluorescein recovery in both tests was significantly greater than that of the microspheres, which suggests deposition or settling of the microspheres in the formation. More details and interpretations of these tests will be provided in subsequent monthly reports. A paper titled "Microsphere Tracer Studies in a Fractured Granite" was being prepared and will be presented at the Fall 1995 American Geophysical Union meeting in San Francisco (December 1995). This paper will document the results of the efforts described above.

Pre-Test Predictions of Solute Transport. Milestone 4077, "Predictions of Tracer Transport in Interwell Tracer Tests at the C-Hole Complex," was submitted to YMSCO. In this paper, particle-tracking models were developed to simulate conservative and reactive tracer transport in interwell tracer tests in the saturated, fractured media at the C-Hole complex near Yucca Mountain. Because there is little existing data at the C-Holes to support estimates of a nonhomogeneous or anisotropic hydraulic conductivity field, the models assume that the media are homogeneous and isotropic. However, dual-porosity effects, such as matrix diffusion, and borehole storage effects, which may be very important at the C-Holes because of the large injection interval volumes relative to injected volumes of tracer solution, are accounted for in the models. Simulations were conducted to investigate sensitivities to (1) type of tracer (fracture flow only, nonsorbing solute, sorbing solute), (2) injection/ production strategy (flow rates and durations), (3) injection well (C#1 or C#2), (4) fracture porosity, (5) matrix porosity, (6) average

Predecisional information—preliminary data—do not reference

fracture aperture, (7) sorption parameter (K_d), (8) solute diffusion coefficient, (9) formation dispersivity, and (10) whether the aquifer being tested can be considered confined or unconfined (i.e., 2-D and 3-D models). The simulations suggest that the most direct approach to studying the effects of solute matrix diffusion and sorption at the C-Holes is to conduct multiple tracer tests at different flow rates in the same formation and between the same two wells (other formations and other wells could be tested later). Conceptual models that account for solute matrix diffusion and sorption in saturated, fractured media would be tested by observing and interpreting differences in (1) breakthrough curves of different tracers in the same test and (2) breakthrough curves of the same tracers in tests at different flow rates. In order to ensure that differences in breakthrough curves from different tests can be attributed primarily to matrix diffusion and/or sorption, it is essential that all tests be conducted with a minimal amount of tracer holdup in the injection boreholes, and that tests at different flow rates be conducted in such a way that flow field dispersion (that is, dispersion due to flow streamlines of different lengths and velocities) is approximately the same in each test. These criteria can best be met by conducting fully-recirculating tests at different flow rates. However, practical considerations at the C-Holes (and in fully-recirculating tests, in general) suggest that it may be better to conduct convergent tracer tests at different flow rates, with the provision that tracer injection be followed by a water chase of at least two injection interval volumes to ensure that tracer is flushed out of the injection borehole.

A 3-D finite element grid was also being constructed to allow nonhomogeneous, anisotropic calculations of flow and tracer transport at the C-wells using FEHMN (assuming data to support assumptions of nonhomogeneous, anisotropic media are generated). The particle-tracking models developed for the letter report will offer bench-marking comparisons with the more sophisticated 3-D finite-element calculations when they become available.

WBS 1.2.3.2.6.1.4. Paleoenvironmental History of Yucca Mountain. Tuff samples previously collected for beryllium dating have now been analyzed by the University of Pennsylvania laboratory. These data are being evaluated and from them surface exposure ages and bedrock erosion rates are being calculated.

Chemical preparation of all remaining samples for beryllium analyses have been completed, and this month they will be sent to the University of Pennsylvania Laboratory for analysis.

WBS 1.2.3.4.1.1 Groundwater Chemistry Model. Additional analytical data have been obtained for water-rock interaction experiments started in July and September. The experiments started in

Predecisional information—preliminary data—do not reference

July involve two synthetic ground water compositions (AGW #1 and AGW #2) and seven different rock samples. The rock samples used in the experiments include two surface samples of Tiva Canyon Tuff containing caliche and opal, a nonwelded vitric tuff from the PTn, three devitrified tuffs and one zeolitic tuff. Relative to the original water compositions, the waters in contact with the Tiva Canyon Tuff, vitric tuff and the zeolitic tuff show the greatest changes in composition. The data obtained this month show the impact of silicate hydrolysis reactions as well as ion exchange and carbonate dissolution reactions.

The experiments started in September involve artificial ground waters similar to AGW #1 and AGW #2 but the new waters are also saturated with amorphous silica. These experiments are designed to test the effect of silica saturation on rock dissolution

WBS 1.2.3.4.1.2.1 Batch Sorption Studies. Staff completed compiling the sorption database that will be used for data synthesis. They also began verifying the data entry verification for this data base; the verification is one-third complete.

Staff also worked on the outline to be used for the data synthesis report. The details of this outline have yet to be determined but the major portions of the outline are

1. Groundwater Chemistry (and its effects sorption)
2. Mineralogy Variability (and its effects on sorption)
3. Sorption Data (determined by batch experiments)
 - a. Sorption of simple cations
 - b. Sorption of simple anions
 - c. Sorption of actinides
4. Models that can explain the measured sorption data
5. Recommended sorption data for PA

WBS 1.2.3.4.1.2.2 Biological Sorption and Transport. Two samples were collected from the ESF on 24 October. The first was collected from location 18 + 01, and the second was collected from 21 + 05. The second sample was collected in the upper lithophysal unit of the topopah spring formation—one of the formations that will contain the repository. So far staff has collected 10 samples, from the surface to the depth of the repository. As has been done with previous samples, these samples sent to four universities for microbial analyses (see June 1995 monthly report for a description of these analyses).

WBS 1.2.3.4.1.3 Speciation/Solubility. Efforts in literature searches and database collection have made up the bulk of this month's work. In addition, Letter Report 4091 (Pu[VI] hydrolysis) was submitted to the YMSCO.

WBS 1.2.3.4.1.5.1 Retardation Sensitivity Analysis. *Site-Scale Transport Modeling.* Milestone 3468, "An Unsaturated Zone Flow and Transport Model for Yucca Mountain," was submitted to YMSCO. In this paper, the movement of key radionuclides, particularly ^{237}Np , from the potential repository to the water table are simulated. The relevant geochemical, hydrologic, and mineralogic data are integrated into a comprehensive numerical model for the transport of ^{237}Np through the unsaturated zone. Underpinning the model is the hydrostratigraphic understanding of the site, which controls the transport system because of the vast differences in hydrologic properties and mineralogy in the various layers. FEHM, a comprehensive simulator of flow and transport in two and three dimensions, was used for the flow and transport calculations of the present study. 3-D simulations of the hydrologic system were compared to another flow model of the site unsaturated zone. Then, simulations of the movement of bomb-pulse ^{36}Cl and background ^{36}Cl are shown to agree qualitatively with the observed data, although an exact calibration of the model to these data are not yet possible. After reviewing in detail the extensive laboratory data base on ^{237}Np , we then present a series of 2- and 3-D simulations of ^{237}Np transport from the potential repository to the water table. For most simulations, sorptive retardation of ^{237}Np delays the arrival at the water table by roughly an order of magnitude relative to a conservative solute. Sensitivity analyses are presented varying the position of release of the radionuclides, the sorption coefficient, and the impact of certain key uncertainties in the hydrologic parameters. The dual-permeability model formulation is employed specifically to examine the role of fractures on transport. At high enough infiltration rates, substantial fracture flow is induced, but as a result of diffusion of ^{237}Np into the rock matrix, some of the negative aspects of fracture flow on waste isolation are mitigated. 3-D transport simulations indicate that significant lateral flow effects are present in three dimensions that are not observed in two-dimensional cross sections. As a result, 3-D calculations need to be included whenever possible to provide the most accurate predictions possible.

Code Development. Testing was carried out to determine if linear equation solution methods used in other codes would provide improved code performance. It was determined that the Generalized Minimum Residual (GMRES) technique currently used in the GZSOLVE equation solver of FEHM is superior to competing techniques for the equation sets of interest, namely those resulting from unstructured finite element computational grids.

A prototype version of a reactive transport speciation model was developed and tested in FEHM, and initial results were very encouraging. This advance will allow us to solve for the transport of multiple species by tracking components rather than each species, resulting in the ability to solve multispecies transport problems more readily.

WBS 1.2.5.4.9 Development and Verification of Flow and Transport Codes. *Code*

Development. Staff completed testing the reduced degree of freedom for the 2-phase isothermal simulations. Tests show significant improvement in speed and storage capacity over the standard 2-phase formulation. Problem size of over 100,000 nodes are now possible on a work station. It should be noted that the approximations involved in this technique involve only the solution of equation, and the full 2-phase solution is preserved.

Grid Generation. Staff continued work on the FEHMN/FACMAN/GEOMESH interface. Since the multiply defined nodes technique is now implemented in both FEHM and GEOMESH, work was begun on optimizing the connectivity description which is shared between GEOMESH and FEHM. The GEOMESH code produces parent nodes of multiply defined nodes which are zero volume and zero area. These should be eliminated before the data set is passed to FEHM. Testing should take several weeks.

WBS 1.2.3.9.7 ESF Test Coordination. Staff provided multiple-shift field coordination and PI support for ESF North Ramp and Alcove tests. Planning for the Thermal Test Program was continued.

Geologic Mapping and Consolidated sampling activities are underway using the mapping gantry.

Work continues on assembling Field Document Records Center files for activities conducted in the North Ramp. This effort includes the maintenance of an administrative data base that identifies sample locations and their corresponding photo identifiers.

Administrative test management progress reports are generated to assure test requirements are met and issues are identified. ESF TCO Staff continues to support both the Field Change Control Board and the Baseline Change Control Board (level III) on a weekly basis.

WBS 1.2.6.1.1 Exploratory Studies Facility (ESF) Management, Planning and Technical Assessments. Staff attended the weekly design and construction meetings. Staff has participated in discussions with the DOE & the design team to merge planned future design activities into the existing 2C design package. Provided design input to support field changes related to the North

Ramp Alcove #3 construction. Staff developed weekly and monthly administrative management reports for testing activities and facilitated job package record development. Provided field test coordination and administrative support for ESF North Ramp construction.

WBS 1.2.6.1.2 / 3 Quality Assurance and Safety Analysis. Staff attended the weekly design and construction meetings and routinely observed ESF field testing activities. Reviewed test planning records and test-related Field Change Requests for compliance with QA and safety concerns.

WBS 1.2.6.1.6 Exploratory Studies Facility (ESF) Test Management. Staff attended the weekly design and construction meetings. Supported the development of weekly and monthly administrative management reports for testing activities and facilitated job package record development. Provided field test coordination and administrative support for ESF North Ramp construction.

WBS 1.2.6.8.4 Integrated Data and Control System (IDS). IDS design and development oversight continued. Staff actively pursued program integration and review of data flow requirements that are implemented and controlled by test planning records and Project procedures. Continued the review of field record submissions and facilitated data transfers to the constructor and test organizations.

WBS 1.2.11.2/.3/.5 Quality Assurance. Program Development. Staff continued to submit budget scenarios at the request of DOE. Staff was still evaluating several options for putting forms on line. Planning activities involve identifying where cuts can best be absorbed and functions still remain viable. An all hands meeting was held, and the current funding status was described. Several initiatives at the TCO are underway. They include preparation of draft procedures for drilling, developing an office strategy for field work packages, and developing an acquisition system for the ESF.

Procedure Revisions. DARs have been initiated for YAPs 5.5Q and 5.6Q. Comments are now being resolved. Four quality administrative procedures were issued: QP-3.20, R3 (software configuration management); QP-03.21, R4 (software life cycle); QP-06.4 (ESF testing field work package); and QP-17.6, R4 (records management). QPs -0.24 (management assessment), -03.26 and -03.27 (software procedures) and the SQAG (software QA guidebook) were deleted.

Travel. On 11 October, S. Bolivar met with R. Williams to discuss budget scenarios. Bolivar also attended a FEHNM Superstone presentation in Las Vegas. S. Bolivar attended a QNM training course (on Baldrige training) in Albuquerque 23-27 October.

M&TE. Several balances were due for calibration in October. Because the contractor who normally does these calibrations was furloughed, staff was looking into having a Los Alamos staff member perform the calibrations.

Verifications. Internal DR 251 was closed. This was the last open internal deficiency. LANL-95-DR-001 (which had to do with controlled documents) was also closed. A vendor survey of SIMCO resulted in deficiency YMQAD-95-DR-011. Los Alamos personnel helped SIMCO prepare a response.

(b) Deliverables Completed

- 4077 Predictions of Tracer Transport in Interwell Tracer Tests at C-Hole Complex
- 3445 A Rate Law for Clinoptilolite Dissolution/Precipitation at 50-125°C in Basic Solutions
- 4009 Alteration History in the ESF, YM, Nevada
- 4075 Letter report: Model Implementation
- 3463 Modeled Actinide Solubilities and Speciations
- 3063 Transport of Radionuclides through Natural Fractures under Saturated Conditions
- 3219 Sorption as Function of Groundwater Composition to Elucidate Sorption Mechanisms
- 3339 Interim Report: Sorption Isotherms
- 3422 (Appendix) Data Appendix: Volcanism Studies for the YMP

(c) Problem Areas

NA

(2) Personnel Changes

WBS 1.2.3.2.1.2.2 Stability of Minerals and Glasses. All contract personnel at Yale and Penn State Universities left the Project on 1 October .

WBS 1.2.3.2.1.1.1 Mineralogy of Transport Pathways. As reported last month, B. Carlos, the principal researcher in Fracture Mineralogy studies, is no longer on the Yucca Mountain Project. D. Broxton is also no longer on the Project. Efforts are being made to plan around this serious personnel loss in meeting FY96 milestones.

(3) Unusual Costs and Possible Financial Performance Problems

WBS 1.2.11.2/.3/.5 Quality Assurance Program Development, Verification and Engineering.

Our level of efforts for FY96 will be directly affected by budget limitations. At proposed levels it will be difficult for us to maintain an effective quality assurance effort. We further believe that a transfer to the YMQAD QA program (i.e. investigators follow the YMQAD QA program rather than the Los Alamos program) would further lead to a reduction in quality and greatly increase inefficiency as well as costs.

Because of budget cuts and program directives, contractor support was furloughed. Subsequently, M&TE calibrations for October are due, but no one is available to do the calibrations. We don't believe data is currently being collected, but it is only a matter of time before it will be necessary to collect data. A person has been assigned to determine the extent of the problem.

(4) Programmatic Issues That may Impact the Overall CRWMS M&O Effort

WBS 1.2.3.2.1.2.2 Stability of Minerals and Glasses. Due to the termination in research funding for this study, all in-progress activities at Penn State and Yale Universities have been terminated and associated data were lost. The YMSCO will obtain only partial kinetic data on clinoptilolite and analcime dissolution/precipitation reactions, and the data are insufficient to formulate an accurate conceptual model of mineral evolution at Yucca Mountain. The question of whether clinoptilolite will transform to analcime under the thermal influence of a repository will remain unanswered.

WBS 1.2.3.2.1.1.1 Mineralogy of Transport Pathways. In their development of mineralogically-based transport models, C. Gable and B. Robinson have identified important mineralogic parameters needed for adequate transport modeling. Zeolites continue to appear as the principal sorptive phase that is both effective and occurring in mappable abundance at the Yucca Mountain site. A small amount of technical work will be devoted to filling in glaring data gaps from immediately beneath the potential repository horizon, but this work will require timely receipt of core samples of SD-7, SD-9, and SD-12 from the SMF. The diminished activities at the SMF may impact progress in generating realistic transport calculations.

WBS 1.2.3.3.1.3.1 Reactive Tracer Testing. There is an anticipated financial problem that will occur if reactive tracer tests are conducted in FY 1996. Namely, the current LANL budget for

reactive tracer testing (\$300K) is insufficient to support (1) laboratory chemical analyses of tracers in samples collected during the tests and (2) interpretation of the tests. We believe we could conduct a small number of tests (2-3) under the current budget, but it would not be possible to analyze for tracers or to interpret the tests unless the budget was increased by at least \$100K. In effect, the money in the current budget would be entirely spent preparing for and conducting the tests. This problem has been brought to the attention of DOE and CRWMS M&O staff.

(5) Worked Planned

WBS 1.2.3.2.1.1.1 Mineralogy of Transport Pathways. Work planned for the coming months includes the following: (1) continue to provide input to mineralogic models for site transport evaluations and (2) support the project in preparation of synthesis and summary reports.

WBS 1.2.3.2.1.1.2 Alteration History. A preliminary outline for the Alteration History portion of the Mineralogy of Transport Pathways summary and synthesis report, in support of a site investment analysis, will be completed next month. Papers prepared for the Scientific Basis for Nuclear Waste Management XIX symposium will be revised in response to reviewer comments.

WBS 1.2.3.2.1.2.2 Stability of Minerals and Glasses. Summary and synthesis report writing will continue, and study plan comments will be addressed.

WBS 1.2.3.2.6.1.4 Paleoenvironmental History of Yucca Mountain. We anticipate the receipt of the final batch of sample cosmogenic data from the University of Pennsylvania. The evaluation of data already received and the data to be finished will complete the analytic data. These data will be worked up and incorporated into the Erosion report will be the primary task of the next month.

WBS 1.2.3.2.5 Volcanism. Synthesis of volcanism activities will proceed.

WBS 1.2.3.3.1.2.2 Water Movement Test. Obtain chlorine-36 results for remaining samples submitted for analysis in September 1995. Process critical ESF samples for chlorine-36. Prepare outlines of synthesis milestone reports due end of FY96. Continue acquisition of halide data from step-leaching procedure to characterize in-situ Br/Cl in rocks and apply to correction of ground-water travel times. Continue acquisition of halide data for chlorine-36 samples already submitted for isotope analysis. Participate in planning activities for sample collection from ESF

and boreholes. Revise FY95 milestone after receipt of YMPO review comments. Submit data to YMP Technical Database.

WBS 1.2.3.3.1.3.1 Reactive Tracer Testing. Continue to work on a YMSCO milestone report describing the results of the LiBr column studies. This report will discuss the ability to predict the transport behavior of lithium by assuming an equilibrium adsorption isotherm based on the results of earlier batch sorption experiments (milestone 3249).

WBS 1.2.3.4.1.2.1 Batch Sorption Studies. Complete the verification of the sorption data base to be used for the data synthesis report.

WBS 1.2.3.4.1.1 Ground-Water Chemistry Model. Continue development of quantitative models for soil zone chemical processes. Continue to refine conceptual models for processes that could control groundwater chemistry at Yucca Mountain. Continue implementation of laboratory experiments designed to evaluate controls on ground water compositions in the unsaturated and saturated zones at Yucca Mountain.

WBS 1.2.3.4.1.2.2 Biological Sorption and Transport. Staff will collect one more sample from the ESF. The purpose of this sample will be to quantitative the effects of our sampling technique on the microbial population. Once all of the data has been compiled, staff will bring the investigators of the four universities together for a workshop, to discuss and present the data. The product of the workshop will be a peer reviewed publication(s) on the microbial activity along the ESF, from surface to repository depth. Staff will publish three additional papers on 1) the chelated transport of iron through unsaturated columns, 2) the identification of the siderophore(s) produced by the *Pseudomonas* sp., and 3) the metabolic response of the *Pseudomonas* sp. to hematite as a source of iron.

WBS 1.2.3.4.1.3. Solubility/Speciation. Efforts in database collection and evaluation will continue for next month's work.

WBS 1.2.3.4.1.5.1 Retardation Sensitivity Analysis. Produce a final version of Milestone 3468, answering any comments by Project participants. Publish the document as a Los Alamos report.

Prepare presentations for the upcoming GSA and MRS meetings.

Develop thermal repository calculations to determine if the presence of repository heat significantly impacts the predicted travel times of radionuclides to the water table.

Predecisional information—preliminary data—do not reference

WBS 1.2.5.4.9 Development and Verification of Flow and Transport Codes. Continue work described above; revise the Superstone, milestone 3468.

WBS 1.2.11.2/.3/.5 Quality Assurance Program Development, Verification, and Engineering. As soon as budgets become finalized, we will direct our efforts to determining which functions we can provide. Efforts on the QA home page will continue, and work will begin on the 1995 status report. We will continue to examine options for putting forms on line and streamlining the QP revision process.

Los Alamos

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December 12, 1995

LA-EES-13-12-95-908

Dr. Colin A. Heath
CRWMS M&O Assistant General Manager for Program Integration
TRW Environmental Safety Systems Inc.
2650 Park Tower Drive
Suite 800
Vienna, VA 22180

Dear Dr. Heath,

Submittal of Los Alamos Monthly Management Analysis Report for Month 1995 (SCPB:NA)

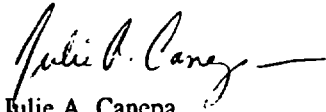
Attached is the Los Alamos Monthly Management Analysis Report for Month 1995. This report includes five sections:

- (1) a summary of our technical efforts, including information on completion of contract deliverables and major problems;
- (2) a summary of personnel changes;
- (3) a list of any unusual current and/or anticipated financial performance problems;
- (4) a list of programmatic issues that may impact the overall CRWMS M&O effort; and
- (5) a summary of work planned for next reporting period.

This technical sections of this report have not received formal technical or policy review by Los Alamos or the YMP. Data presented in this document constitute predecisional information, should not be referenced, and are not intended for release from the U.S. Department of Energy as referenceable information.

If you have changes to our distribution list, please call Susan Klein at (505) 667-0916.

Sincerely,


Julie A. Canepa

JAC/SHK/cmv

Attachment: a/s

WBS: 1.2.9.1

QA: N/A.

523
DIVISION

CC: Brockman
CC: Crown / Homstad
CC: Dixon / Hucker
CC: Dyer / Wards
CC: Edwards / Williams
CC: Forri / Boyle
CC: Jones / Glenn-C
CC: Patterson

REC'D IN 112

12/14/95

"ENCLOSURE" 4

Cy w/att:

R.W. Andrews, M&O/INTERA, MS 32
W.E. Barnes, YMSCO, MS 523
H.A. Benton, M&O/B&W, MS 423
A.I. Berusch, DOE, Washington DC
D.L. Bish, EES-1, MS D469
K.K. Bhattacharyya, M&O MK, MS 423
J.A. Blink, LLNL/LV, MS 423
B. Bodvarsson, LBL, Berkeley, CA
S.L. Bolivar, EES-13, MS J521
M. Brady, SNL, Las Vegas, NV, MS 465
S.J. Brocoum, DOE/YMSCO, MS 523
G.A. Bussod, EES-13, MS J521
J.A. Canepa, EES-13, MS J521
M.W. Chisholm, M&O/TRW, MS 12
W.J. Clarke, LLNL, MS 423
P.L. Cloke, M&O/SAIC, MS 423
R.L. Craun, YMSCO, MS 523
B.M. Crowe, EES-13/LV, MS J900/527
C. DiBella, NWTRB, Arlington, VA
W.R. Dixon, YMSCO, MS 523
J.R. Dyer, YMSCO, MS 523
N.Z. Elkins, EES-13/LV, MS J900/527
J.T. Fabryka-Martin, CST-7, MS J514
L.D. Foust, M&O/TRW, MS 423
A.V. Gil, YMSCO, Las Vegas, NV
L.R. Hayes, USGS, Denver, CO
J. Haynes, LATA, MS J521
S. Hanauer, OCRWM, Washington, DC
C.D. Harrington, EES-1, MS D462
L.E. Hersman, LS-2, MS M880
V.F. Iorii, YMSCO, MS 523
S.B. Jones, YMSCO, MS 523
H.N. Kalia, EES-13/LV, MS J900/527

S.H. Klein, EES-13, MS J521
S.S. Levy, EES-1, MS D462
S. T. Nelson, M&O/WCFS, MS 423
F.V. Perry, EES-13, MS J521
P.W. Reimus, EES-4, MS D443
B.A. Robinson, EES-5, MS F665
R.A. Rumsey, BUS-8, MS J521
S.F. Saterlie, M&O/TRW, LV, MS 423
W.D. Schutt, M&O/TRW, LV, MS 423
A.M. Simmons, DOE/YMSCO, MS 523
E.T. Smistad, DOE/YMSCO, MS 523
D. Stahl, M&O/B&W, MS 423
C.T. Statton, M&O/WCFS, MS 423
R.L. Strickler, M&O/TRW, MS 6
D.P. Stucker, DOE/YMSCO, MS 523
D.C. Tait, CST-4, MS G739
A.L. Thompson, EES-13/LV, MS J900/527
I.R. Triay, CST-7, MS J514
G.A. Valentine, EES-5, MS F665
D.T. Vaniman, EES-1 MS D462
A.E. VanLuik, M&O/INTERA, MS 423
R.G. Vawter, M&O/TRW, MS 423
M.D. Voegelé, SAIC, MS 423
K.A. West, EES-13, MS J521
N. White, Nuclear Regulatory Commission, LV, NV
D.R. Williams, YMSCO, MS 523
J.L. Younker, M&O/TRW, MS 423
G.A. Zyvoloski, EES-5, MS F665

RPC File (S. Martinez), MS M321
LA-EES-13 File, MS J521

Los Alamos Monthly Management Analysis Report for November 1995

(1) Summary of (a) Los Alamos' technical accomplishments, (b) deliverables completed, and (c) major problems that may impact future performance.

(a) Technical Accomplishments

WBS 1.2.3.1 Site Investigation Coordination and Planning. Staff represented the Los Alamos Site Characterization Project Leader at weekly surface-based testing meetings and Civilian Radioactive Waste Management System Management & Operating Contractor work scope consolidation meetings.

WBS 1.2.3.2.1.1.1 Transport Pathways. *Studies of Radionuclide Transport Retardation using Microautoradiography.* D. Vaniman presented a paper titled "Microautoradiography in Studies of Pu(V) Sorption by Trace and Fracture Minerals in Tuff" at the Materials Research Society Meeting in Boston on 28 November. Vaniman's paper describes the relative partitioning of Pu between phases in thin sections used for microautoradiography (microscopic examination of photoemulsion particle decay tracks from radionuclides retained by specific features in thin sections exposed to radionuclide-bearing solutions). The results for studies of zeolitized tuffs from Yucca Mountain show that electron microprobe mapping of Ag tracks in emulsions can provide measurable mineral/mineral distribution coefficients for Pu between tectosilicates (quartz and feldspar), zeolites, and smectites, with zeolite Pu retention slightly higher than the tectosilicates, and smectite Pu retention almost two orders of magnitude greater than the zeolites. These results will be compared with retardation factors obtained by batch and fracture rock/solution experiments to provide an independent cross-check of how robust the retardation factors are for transport calculations. This cross-check will be addressed in the Synthesis and Summary Report on Mineralogy of Transport Pathways (see below).

Synthesis and Summary Reports. The final outline for the synthesis and summary report on Mineralogy of Transport Pathways has been prepared. Text sections on fracture mineralogy were obtained from B. Carlos before she left Los Alamos employment this month. Data compilations and analysis for this report continued throughout the month. The outline for this report was revised to reflect the incorporation of Alteration History and Kinetics Studies as a parallel-format volume. Data synthesis and analysis of outcrop and core samples of zeolitic and vitric tuffs was continuing. The outcrop samples at Yucca Mountain (Prow Pass and Busted Butte) were examined as surrogate localities in case the ESF does not extend to the Calico Hills Formation. These localities are now being used to fill in gaps and provide outcrop-scale data that would otherwise be unavailable for the synthesis and summary report.

Planning Activities. Discussions were held with other Los Alamos YMP personnel on studies that would meet Project needs in chlorine 36 studies and in studies of fracture calcite. Discussions were also held with USGS personnel on the studies of calcite in the ESF; although the Los Alamos studies of calcite-deposit mineralogy and especially of calcite trace-element chemistry were proposed, it was ultimately decided that the ESF calcites would only be dated.

Project Support. D. Vaniman represented Los Alamos in the teleconference Sample Overview Committee meeting on 21 November. D. Bish gave presentations on Yucca Mountain geology and geochemistry for audiences at the University of Illinois at Urbana and at the University of Illinois at Chicago. He also met with R. Clayton and M. Au of the M&O to discuss input of Los Alamos Min-Pet data into the framework model. They decided on data types and formats to be provided electronically. R. Clayton also provided an electronic copy of the complete stratigraphic log for each drill hole at Yucca Mountain.

Predecisional information—preliminary data—do not reference

WBS 1.2.3.2.1.1.2 Alteration History. Staff completed an outline of the contents for the Alteration History portion of the Mineralogy-Petrology summary and synthesis report. There are two major sections: natural alteration history and dehydration/rehydration of Yucca Mountain hydrous phases. Topics in the first section include syngenetic alteration of pyroclastic rocks, diagenetic alteration, regional hydrothermal alteration, surficial alteration, brecciation, colloids, and natural analog studies. The dehydration/rehydration section includes long-term and dynamic studies of zeolite, smectite, and glass dehydration and rehydration, equilibrium and calorimetric studies of clinoptilolite dehydration and rehydration, and contributions of hydrous minerals to repository heating effects and water budget.

Bill Carey presented a paper at the Geological Society of America meeting in New Orleans, La., titled "Consequences of the dehydration and rehydration of clinoptilolite-rich rocks on the thermo-hydrologic evaluation of a model radioactive waste repository." The effect of clinoptilolite on the thermo-hydrologic evolution of Yucca Mountain was investigated by considering a 2-D numerical model for heat and mass transfer using the program FEHM. The model consists of a rock unit with a central heat source (representing a radioactive waste repository) in which the heat flux and the amount and distribution of clinoptilolite are variables. The calculated results show the extent to which clinoptilolite (and by analogy other hydrous minerals) would affect the thermo-hydrologic evolution of Yucca Mountain by delaying temperature rise and dry-out of rock units and by contributing to free water in the mountain. For example, clinoptilolite-rich rocks at 150°C and 1 bar will consume 70% more thermal energy and release an additional 5 vol % of water compared to rocks with anhydrous minerals. This work is part of a continuing effort to integrate alteration history research results into Performance Assessment.

Schön Levy attended the Scientific Basis for Nuclear Waste Management XIX symposium of the Materials Research Society fall meeting in Boston and chaired the session on Site Characterization and Natural Analog Studies. Schön presented two papers, "Ion Exchange and Dehydration Effects on Potassium (K) and Argon (Ar) Contents of Clinoptilolite," by Giday WoldeGabriel and Schön Levy, and "Alteration History Studies in the Exploratory Studies Facility, Yucca Mountain, Nevada, USA," by Schön Levy and David Norman (New Mexico Tech). The first presentation reported the results of cation exchange, short-term dry heating, and long-term (six months) water-saturated heating on the radiogenic argon contents of clinoptilolite. The second presentation described alteration history studies to date in the ESF, concentrating on the interpretation of fluid-inclusion gases in calcite from the ESF and from Trench 14 at the surface of Exile Hill above the ESF and on a possible fossil fumarole in nonwelded tuffs just above the Topopah Spring Tuff.

Schön Levy provided technical input to the development of a proposal for the Southern Tracer Complex tentatively to be located near the WT-17 drill site in Dune Wash. Mineralogic evaluation of the rock matrix and fractures will be an important contribution to the success of a sorbing tracer test.

WBS 1.2.3.2.1.2 Stability of Minerals and Glasses. Summary and Synthesis Reports. Staff completed the outline for the Kinetics and Thermodynamics portion of the Mineralogy-Petrology summary and synthesis report. This report will be divided into two major sections discussing (1) the Thermodynamic Stability of Minerals and Glass at Yucca Mountain; and (2) the Kinetics of Mineral and Glass Transformation at Yucca Mountain. In detail, the first section will address (1) conditions which result in stability of the major zeolites (clinoptilolite, mordenite, analcime, and stellerite); (2) conditions which result in the stability of the rare zeolites (laumontite, chabazite, phillipsite, erionite); (3) conditions specific to the formation of erionite at Yucca Mountain; (4) conditions necessary for the clinoptilolite to analcime transition; (4) limited data on heulandite/stellerite stability; (5) compare and contrast field and modeling results on zeolite stability. The second section will discuss the effects of glass, feldspar and silica mineral dissolution on aqueous silica activity and zeolite stabilities, and clinoptilolite and analcime dissolution/precipitation kinetics.

Project Support. Staff continued to address comments on the study plan.

WBS 1.2.3.2.5 Volcanism. Probability Studies. Staff reviewed opinions the volcanism expert judgment panel on volcanic hazard assessment (PVHA) in preparation for the meeting with this group in December. Data in the assessment were integrated with the results of simulation modeling from the Los Alamos milestone report 3399, "Letter report on the evaluation of structural controls of basaltic volcanic activity," and the latest results of the simulation modeling was used to develop probability distributions for E_2 , the disruption ratio.

Preliminary data was received for individual elicitations from the volcanism expert judgment panel. These data are being compiled and evaluated for comparison with the probability distributions assessed in the "Status of Volcanism Studies for the Yucca Mountain Site Characterization Project" (Crowe et al. 1995). Any differences in probability distributions will be highlighted to aid DOE in the development of a regulatory strategy for the volcanism issue.

Geologic Field Studies. A systematic review of the Lathrop Wells geologic map, which is compiled on a black-and-white orophotographic base, was being conducted in preparation for transferring the map to a topographic base and incorporating the map into the volcanism synthesis report.

Geochemistry Studies. A series of Monte Carlo simulations were run to assess whether mixing of a single Lathrop Wells parental magma with Miocene tuff can account for the range of geochemical variations in eruptive units at Lathrop Wells.

Effects Studies. Staff concentrated on literature review and synthesis activities related to the geometries on shallow basaltic intrusions, and to hydrothermal alteration of silicic tuffs intruded by basalt.

WBS 1.2.3.3.1.2.2 Water Movement Test. Preliminary chlorine-36 results were obtained for samples from boreholes UZ-N54, UZ-N37, UZ-N61, UZ-N36, and ONC#1, and for a soil profile from Midway Valley Pit MWV-P2, plus all associated process blanks. The objective of these analyses is to provide confirmatory evidence for the magnitude of infiltration rates indicated from moisture monitoring of the neutron holes. In the samples from the soil pit, which extended from the surface to 2.1 meters, no bomb pulse chlorine-36 was found below a depth of 1.5 meters.

Preliminary chlorine-36 results were also obtained for a suite of samples prepared from packrat midden samples which had been dated by the carbon-14 method. The results suggest that the meteoric chlorine-36/chlorine ratio over the past 30,000 years was significantly higher than at present. Consequently, the elevated chlorine-36 levels measured previously for cuttings from the Calico Hills and deeper units and for perched water in UZ-14 and SD-7 may be consistent with travel times on the order of tens of thousand of years or more, as opposed to being an indicator of bomb-pulse at these depths.

The SMF was directed to send to Los Alamos all ESF samples collected to-date (a total of about 118 samples).

At the request of Thomas Statton (M&O), staff submitted a proposal to undertake an intensive, systematic sampling of rocks exposed in the ESF for the purpose of estimating ground-water travel time throughout this facility based upon measurements of chloride, bromide and chlorine-36 concentrations in the rock pore space. The sampling targets three types of sampling locations: systematic sampling of the TSw unit every 200 m, sampling of potential fast paths in the TSw unit, and sampling of stratigraphic contacts in the PTn unit to evaluate their effects on vertical water

Predecisional information—preliminary data—do not reference

movement. Several trips into the ESF were made to coordinate the selection of sample sites with those being made for related USGS activities (moisture monitoring and isotopic dating of fracture minerals). A memorandum outlining the sampling protocol was submitted to the TCO, and staff marked all desired sampling locations in the ESF.

Staff prepared outlines of three synthesis reports due at the end of FY96: (a) Near-surface infiltration processes indicated by chlorine-36 and chloride distributions, (b) Distribution of chlorine-36 in deep surface-based boreholes and from the ESF, and (c) Chlorine-36 and halide distributions in the saturated zone.

WBS 1.2.3.3.1.2.5 Diffusion Tests in the ESF. Tests have been deferred due to lack of funding.

WBS 1.2.3.4.1.1 Ground-water Chemistry Model. Additional analytical data were obtained for water/rock interaction experiments started in July and September. The experiments started in July involve two synthetic ground-water compositions (AGW #1 and AGW #2) and seven different rock samples. The rock samples used in the experiments include two surface samples of Tiva Canyon Tuff containing caliche and opal, a nonwelded vitric tuff from the PTn, three devitrified tuffs and one zeolitic tuff. Relative to the original water compositions, the waters in contact with the Tiva Canyon Tuff, vitric tuff and the zeolitic tuff show the greatest changes in composition. The data obtained this month show the impact of silicate hydrolysis reactions as well as ion exchange and carbonate dissolution reactions.

The experiments started in September involve artificial ground-waters similar to AGW #1 and AGW #2 but the new waters are also saturated with amorphous silica. These experiments are designed to test the effect of silica saturation on rock dissolution behavior.

WBS 1.2.3.4.1.2.1 Batch Sorption Studies. Staff completed the first draft of chapter 1 (Ground-water Chemistry and its effects on sorption) of the summary and synthesis report. They also continued to verify the sorption database that will be used in this report. The database was 80 percent verified.

WBS 1.2.3.4.1.3 Speciation/Solubility. Efforts in literature searches and database collection have made up the bulk of this month's work. Staff used their newly obtained in-office CAS on-line search capability, which has made these searches much easier to perform.

WBS: 1.2.3.4.1.4.1/2 Transport. Staff completed two unsaturated solid tuff column experiments begun FY 95 and targeted for completion in FY96. The transport of Se and U through zeolitic and devitrified unsaturated intact tuff were studied. Results indicate that batch sorption Kds can predict the migration of Se and U through unsaturated tuff conservatively.

WBS 1.2.3.4.1.5.1 Retardation Sensitivity Analysis. Site-Scale Transport Modeling. The technical review of milestone 3468, "An Unsaturated Zone Flow and Transport Model for Yucca Mountain," was completed, and the milestone was delivered to the Los Alamos YMP office. In this paper, the movement of key radionuclides, particularly ^{237}Np , from the potential repository to the water table are simulated. The relevant geochemical, hydrologic, and mineralogic data are integrated into a comprehensive numerical model for the transport of ^{237}Np through the unsaturated zone. Underpinning the model is the hydrostratigraphic understanding of the site, which controls the transport system because of the vast differences in hydrologic properties and mineralogy in the various layers. FEHM, a comprehensive simulator of flow and transport in two and three dimensions, was used for the flow and transport calculations of the present study. 3-D simulations of the hydrologic system were compared to another flow model of the site unsaturated zone. Then, simulations of the movement of bomb-pulse ^{36}Cl and background ^{36}Cl are shown to agree qualitatively with the observed data, although an exact calibration of the model to these data are

not yet possible. After reviewing in detail the extensive laboratory data base on ^{237}Np , we then present a series of 2- and 3-D simulations of ^{237}Np transport from the potential repository to the water table. For most simulations, sorptive retardation of ^{237}Np delays the arrival at the water table by roughly an order of magnitude relative to a conservative solute. Sensitivity analyses are presented varying the position of release of the radionuclides, the sorption coefficient, and the impact of certain key uncertainties in the hydrologic parameters. The dual-permeability model formulation is employed specifically to examine the role of fractures on transport. At high enough infiltration rates, substantial fracture flow is induced, but as a result of diffusion of ^{237}Np into the rock matrix, some of the negative aspects of fracture flow on waste isolation are mitigated. 3-D transport simulations indicate that significant lateral flow effects are present in three dimensions that are not observed in two-dimensional cross sections. As a result, 3-D calculations need to be included whenever possible to provide the most accurate predictions possible.

Work continued on a prototype version of the reactive transport speciation model for FEHM. A new numerical technique, which will allow multi-species transport problems to be solved much more readily, was introduced. Staff continued to benchmark the code against other reactive transport codes, and this yielded favorable results. When this phase of the work is completed, the code will be used on two transport problems in three dimensions: the aqueous and gas phase movement of C-14 and the transport and speciation of Np-237.

Coupled Flow and Geochemistry. A revision to FEHM was made to incorporate zeolite hydration reactions into the water and heat balances. Thermodynamic experimental data on clinoptilolite from the Mineralogy/Petrology task was incorporated into the code so that the water content in zeolites could be computed dynamically during a repository heating scenario. Initial scoping calculations showed that the impact of zeolite hydration reactions on the water and heat budgets should be relatively limited, compared to other uncertainties such as bulk permeability of the rock mass. However, the impact on observable parameters such as the time until dry-out and the rewetting time, changed for different permeabilities, which suggests that the nature of the coupling is complex and in need of further elucidation. A talk on this subject was presented at the New Orleans GSA conference.

Code Development. Numerical techniques for improving the performance and memory utilization of FEHM have been developed. The methodology of these so-called reduced-degree-of-freedom methods is to reduce the number of variables that must be solved directly at each node point while still solving the entire equation set without compromising on the physics of the problem. For example, for an isothermal air-water simulation such as those presented in milestone 3468, the two unknowns per node point can be reduced to one unknown being sent to the linear equation solver, with the other unknown computed afterward. For dual permeability problems, the four unknowns per grid point are reduced to two. As a result we have been able to further refine the three-dimensional transport model grid below the potential repository and compute flow fields on this 100,000 node grid. In dual permeability, a flow solution on our 51,000 node grid was also accomplished, compared to the previous work in which a 14,000 node solution was obtained. Improvements in both computational speed and memory utilization have been made with this approach. Transport calculations on these new grids will be compared to results from previous work to assess numerical errors of previous calculations.

Additional code development work has focused on improving the efficiency of transport calculations by developing techniques that assign an active node set upon which the full transport equations are solved simultaneously, followed by a successive over-relaxation (SOR) technique for the remaining nodes. The primary savings of this method will be in memory utilization, but computational speed is also expected to improve. Testing of the revised method is ongoing.

Other. Staff attended the GSA and MRS conferences. Andrew Wolfsberg presented a paper on transport in the unsaturated zone titled "Migration of Solutes in unsaturated, fractured rock at Yucca Mountain" was presented at the MRS meeting.

WBS 1.2.5.4.9 Development and Verification of Flow and Transport Codes. Code

Development. Staff installed new reduced-degree-of-freedom algorithms in FEHM for studying isothermal two-phase flow. Both equivalent-continuum and dual-permeability models were tested. As a test, staff ran a 100,000-gridblock equivalent-continuum model and a 51500-node dual-permeability site-scale model of the IBM 6000/590 computer. This technology represents a major advance over current technologies. The savings in computer memory were significant enough so that the dual-permeability model could be run on a workstation.

Staff removed the limitation on the number of relative permeability models allowed by FEHM. Not having this limitation will help SNL and Los Alamos represent the statistical variation of flow parameters at Yucca Mountain.

Grid Generation. Staff generated several new site-scale saturated zone grids while working with John Czarnecki of the USGS. The latest grid includes the monitoring wells. The grids have been run with simple boundary conditions and will be modified by Czarnecki to include heads or flows obtained with the USGS regional scale model.

WBS 1.2.3.9.7 ESF Test Coordination. Staff provided multiple-shift field coordination and PI support for ESF north ramp and alcove tests. Planning for the thermal test program was continued.

Geologic mapping and consolidated sampling activities are underway using the mapping gantry.

Work continued on assembling Field Document Records Center files for activities conducted in the north ramp. This effort includes the maintenance of an administrative data base that identifies sample locations and their corresponding photo identifiers.

Administrative test management progress reports are generated to assure test requirements are met and issues are identified. ESF TCO Staff continues to support both the Field Change Control Board and the Baseline Change Control Board (level III) on a weekly basis.

WBS 1.2.6.1.1 Exploratory Studies Facility (ESF) Management, Planning and Technical Assessments. Staff attended the weekly design and construction meetings. Staff has participated in discussions with the DOE & the design team to merge planned future design activities into the existing 2C design package. Staff provided design input to support field changes related to the North Ramp Alcove #3 construction. Staff developed weekly and monthly administrative management reports for testing activities and facilitated job package record development. Staff provided field test coordination and administrative support for ESF north ramp construction.

WBS 1.2.6.1.2 / 3 Quality Assurance and Safety Analysis. Staff attended the weekly design and construction meetings and routinely observed ESF field testing activities. Reviewed test planning records and test-related field change requests for compliance with QA and safety concerns.

WBS 1.2.6.1.6 Exploratory Studies Facility (ESF) Test Management. Staff attended the weekly design and construction meetings. Supported the development of weekly and monthly administrative management reports for testing activities and facilitated job package record development. Provided field test coordination and administrative support for ESF North Ramp construction.

WBS 1.2.6.8.4 Integrated Data and Control System (IDS). The design team was notified that the IDCS has been placed on indefinite hold because of budgetary constraints. The IDCS data acquisition equipment received in FY 1995 continued to undergo acceptance testing and will be configured as

Predecisional information—preliminary data—do not reference

portable data acquisition stations (DASs) for use in FY 1996. The ESF TCO continued to prepare a field work plan document titled "ESF Data Collection Systems" to direct the configuration, deployment, calibration, and operation of the data acquisition systems in the ESF. This FWP will direct the data collection of the ESF testing organizations in FY 1996 and 1997.

WBS 1.2.11.2/3/5 Quality Assurance. Program Development. Staff was still evaluating several options for putting forms on line. Planning activities involved identifying where cuts can best be absorbed and functions still remain viable. Task orders have been developed, discussed, and issued to support staff. Several initiatives at the TCO continued. These include preparation of draft procedures for drilling, developing an office strategy for field work packages, and developing an acquisition system for the ESF.

Procedure Revisions. Quality administrative procedures QP-3.20, R4 (software configuration management) and QP-03.21, R5 (software life cycle) were issued for review. Sections requiring pseudocode was overly restrictive and eliminated. Detailed technical procedure DP-609 (balance calibration) is being revised to better reflect calibration procedures. P. Gillespie recently began evaluating QARD changes with respect to the RTN matrix. Updating the RTN matrix will be a major undertaking in FY96.

Travel. On 15-16 November, S. Bolivar attended the QA Managers meeting. Bolivar also met with M&O and DOE representatives to discuss budget, audit schedules, and other QA issues in Vegas on 20-21 November.

Training. Staff examined the possibility of putting the training database on the local computer server; however because of security and privacy issues this was not done.

M&TE. Staff established a new process for conducting balance calibrations using Los Alamos personnel. This process will be evaluated.

Deficiencies. The proposed corrective action for deficiency YMQAD-95-D-015 (vendor survey of SIMCO) was accepted by the DOE. Los Alamos has one open deficiency report (LANL-95-DR-002). Corrective actions were due at the end of November.

Quality Engineering. B. Gundlach has revised the two software procedures. He is also working with investigators on certifying FEHMN. It is hoped that this code will be certified by January.

(b) Deliverables Completed

WBS 1.2.3.4.1.2.2, Milestone 3410, "Desferrioxamine B-Enhanced Transport of Iron in Volcanic Tuff During Unsaturated Conditions"

WBS 1.2.3.2.5.1.1, Milestone 3399, "Letter report on the evaluation of structural controls of basaltic volcanic activity"

WBS 1.2.3.4.1.5.1, Milestone 3468, "An Unsaturated Zone Flow and Transport Model for Yucca Mountain"

(c) Problem Areas

WBS 1.2.11.2/3/5 Quality Assurance. The request by DOE to revise procedures in response to the latest QARD changes, within 120 days, may not be reasonable based on recent staff reductions. Staff will provide an estimate in the near future when they expect these revisions to be completed.

(2) Personnel Changes

WBS 1.2.3.2.1.1.1 Transport Pathways. Half of the thin-section preparation technical staff at Los Alamos were laid off this month. As our current YMP thin-section preparation needs are light, this is not expected to impact schedule.

WBS 1.2.3.4.1.2 /4 Spr[ition/Transport. Key staff, unfunded for FY96, were laid off this month.

WBS 1.2.3.3.1.2.2 Water Movement Test. Paul Dixon, a Los Alamos technical staff member, was added to this activity.

(3) Unusual Costs and Possible Financial Performance Problems

NA

(4) Programmatic Issues That may Impact the Overall CRWMS M&O Effort

WBS 1.2.3.2.1.1.1 Transport Pathways. Assessments of available microautoradiography data for the Synthesis and Summary Report on Mineralogy of Transport Pathways have shown that meaningful mineral/mineral radionuclide distribution factors can be obtained from a wide range of minerals, including those with relatively low affinity for Pu retention. This will be addressed as a factor in the section of the Synthesis and Summary Report on Mineralogy of Transport Pathways that deals with mineralogy as a factor in sorption. In particular, these results will be used to describe the role of fracture minerals in radionuclide retardation.

WBS 1.2.11.2/3/5 Quality Assurance. Because of staff reductions, staff cannot do calibrations in a timely manner. They have established a new process but it remains to be seen if this process will efficiently work.

(5) Worked Planned

WBS 1.2.3.2.1.1.1 Mineralogy of Transport Pathways. Work planned for the coming months includes the following: (1) continue to provide input to mineralogic models for site transport evaluations and (2) support the project in preparation of synthesis and summary reports.

WBS 1.2.3.2.1.1.2 Alteration History. Staff will begin writing the Alteration History portion of the Mineralogy of Transport Pathways summary and synthesis report, in support of a site investment analysis. Papers prepared for the Scientific Basis for Nuclear Waste Management XIX symposium will be revised in response to reviewer comments. Staff will continue to assist in the planning of field tracer experiments.

WBS 1.2.3.2.1.2.2 Stability of Minerals and Glasses. Summary and synthesis report writing will continue, and study plan comments will be addressed.

WBS 1.2.3.2.5 Volcanism. Synthesis of volcanism activities will continue.

WBS 1.2.3.3.1.2.2 Water Movement Test. Obtain final chlorine-36 results for samples submitted for analysis in September 1995. Process ESF samples for chlorine-36. Continue acquisition of halide data from step-leaching procedure to characterize in-situ Br/Cl in rocks and apply to correction of ground-water travel times. Continue acquisition of halide data for chlorine-36 samples already submitted for isotope analysis. Participate in planning activities for sample collection from ESF and boreholes. Revise FY95 milestone after receipt of YMSCO review comments. Submit data to YMP Technical Data Base.

WBS 1.2.3.3.1.3.1 Reactive Tracer Testing. Continue code development on reduced degree of freedom methods and transport model improvements. Perform transport calculations on larger three dimensional grids, compare the results to previous calculations.

WBS 1.2.3.4.1.2.1 Batch Sorption Studies. Staff will complete the verification of the sorption data base to be used for the data synthesis report and to write the first draft of Chapter 3 (Sorption Data, determined by batch sorption experiments).

WBS 1.2.3.4.1.1 Ground-Water Chemistry Model. Continue development of quantitative models for soil zone chemical processes. Continue to refine conceptual models for processes that could control groundwater chemistry at Yucca Mountain. Continue implementation of laboratory experiments designed to evaluate controls on ground water compositions in the unsaturated and saturated zones at Yucca Mountain.

WBS 1.2.3.4.1.3 Solubility/Speciation. Continue work discussed above.

WBS 1.2.3.4.1.5.1 Retardation Sensitivity Analysis. Continue work discussed above.

WBS 1.2.5.4.9 Development and Verification of Flow and Transport Codes. Continue work described above.

WBS 1.2.11.2/3/5 Quality Assurance Program Development, Verification, and Engineering. Staff will determine which procedures need to be revised in response to the latest QARD revision. The two software procedures, recently revised, will be issued. A Q meeting will be held early in December. Efforts on the QA home page will continue, as will work on the 1995 status report. Staff will continue to examine options for putting forms on line and streamlining the QP revision process.



United States Department of the Interior

U. S. GEOLOGICAL SURVEY

Box 25046 M.S. 425

Denver Federal Center

Denver, Colorado 80225

IN REPLY REFER TO:

INFORMATION ONLY

November 15, 1995

Charles Fox
Yucca Mountain Site Characterization
Project Office
U. S. Department of Energy
P.O. Box 98608
Las Vegas, Nevada 89193-8608

SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS)
Progress Report, October, 1995

Attached is the USGS progress report in the required format for the month of October, 1995.

If you have any questions or need further information, please call Raye Ritchey Arnold at (303)236-0516, ext. 282.

Sincerely,

for Raye R. Arnold

Robert W. Craig
Acting Technical Project Officer
Yucca Mountain Project Branch
U.S. Geological Survey

Enclosure:

cc: S. Hanauer, DOE/Forrestal
R. Dyer, DOE, Las Vegas
A. Gil, DOE, Las Vegas
S. Jones, DOE, Las Vegas
W. Kozai, DOE, Las Vegas
R. Patterson, DOE, Las Vegas
A. Simmons, DOE, Las Vegas
R. Spence, DOE, Las Vegas
T. Sullivan, DOE, Las Vegas
M. Tynan, DOE, Las Vegas
D. Williams, DOE, Las Vegas
C. Glenn, NRC, Las Vegas (2 copies)
P. Burke, M&O, Las Vegas
M. Lawson, LANL, Las Vegas
R. St. Clair, M&O, Las Vegas
M. Chornack, USGS, Denver
L. Ducret, USGS, Denver
D. Gillies, USGS, Denver
W. Day, USGS, Denver

DIVISION *Fox*

CG: *Dyer*

CG: *Gil*

CG: *Jones*

CG: *Kozai*

CG: *Patterson*

CG: *Simmons*

CG: *Spence*

CG: *Sullivan*

REC'D IN YMP

11/17/95

"ENCLOSURE"

5

REC'D NOV 17 1995

D. Hoxie, USGS, Las Vegas
R. Keefer, USGS, Denver
R. Luckey, USGS, Denver
B. Parks, USGS, Denver
Z. Peterman, USGS, Denver
R. Ritchey Arnold, USGS, Denver
R. Spengler, USGS, Denver
J. Whitney, USGS, Denver
R. Williams, USGS, Denver
T. Williams, USGS, Denver

U. S. Geological Survey
EXECUTIVE SUMMARY
October 1995

WBS 1.2.3.1 Coordination and Planning

U.S. Geological Survey - Yucca Mountain Project Branch is currently processing 165 scientific publications by USGS authors. Of these, 55 are hydrologic-related reports, and 110 are geologic-related reports. In addition, 79 abstracts by USGS authors are being processed as well as 23 reports from LBL.

Considerable time and effort have been expended in reorganizing and replanning as a result of the deep budget cuts and consequent loss of most supporting contract personnel.

WBS 1.2.3.2 Geology

Geologic Framework

A team has been assembled to prepare a synthesis report on "Stratigraphy, Structure and Rock Properties of Yucca Mountain, Nevada", and an outline for this report has been prepared and submitted to DOE.

Recent detailed mapping along the west side of Yucca Crest shows that the main trace of the Solitario Canyon fault is as much of 300 m east of the location shown as inferred on previous maps.

The final draft of the report on the seismic line across Yucca Mountain has been completed, and the manuscript on the ground magnetics along this line has been reviewed. An administrative report that was a level three milestone for FY 95 was completed and submitted to DOE: Provisional Results of Geophysics Relating to Volcanism.

Geologic mapping of the North Ramp (ESF) was accomplished as follows: (1) full periphery field maps completed to station 23+60; (2) detailed line surveys completed to station 23+85; (3) stereophotography completed to station 23+86; and RQD and Q ratings calculated to station 23+01. A milestone report on structure and stratigraphy for stations 0+60 to 4+00 was prepared as well as a report on photogrametric analysis for stations 3+60 to 4+25.

Ground Motion

The final meeting of the ground motion modeling project was held Oct. 30th in Menlo Park, CA. Final results were analyzed and the different sources of variability were explored. These steps resulted in a revision of some of the modeling results by individual modelers and additional

constraints on the analysis of variability (randomness and uncertainty). Issues were discussed such as the use of linear/nonlinear transfer functions, the parameter sensitivities, representative stress drops, and whether other physical or empirical constraints exist.

Final revisions were made to a letter report on ground motion attenuation .

Tectonic models

An administrative report that was a level three milestone for FY 95 was completed and submitted to DOE: A Progress Report on Tectonic Effects on Ground Water.

A lengthy administrative report that was a level three milestone for FY 95 was completed and submitted to DOE: Current Evaluation of Tectonic Models for the Yucca Mountain Region.

The outline for the synthesis report on the seismotectonic framework for Yucca Mountain has been prepared and submitted to DOE.

Temperature and heat flow were analyzed and interpreted for borehole USW G-2, and a draft report was prepared on the evolution of temperature in that borehole from December 1981 through September 1995.

Seismic source characterization

Most studies in the preclosure tectonics program relate to seismic source characterization and are involved primarily in data compilation and analysis, and in the preparation of interpretive reports several of which are now being technically reviewed. Data and report processing have been slowed by the loss of support personnel. Reports in preparation and/or review include:

1. Catalog of seismic activity for 1994
2. Excavation induced seismicity
3. Evaluation and characterization of Quaternary faulting, Bare Mountain fault zone
4. Evaluation and characterization of Quaternary faulting on the Death Valley and Furnace Creek faults
5. Quaternary faulting -- Bow Ridge, Paintbrush Canyon and Stagecoach Road faults
6. Quaternary faulting -- postulated Fortymile Wash fault zone
7. Quaternary faulting -- Ghost Dance fault and northwest-trending faults

8. Quaternary faulting -- Solitario Canyon, Crater Flat, Windy Wash, and Fatigue Wash faults
9. Characterization of Quaternary faulting within the Rock Valley fault system
10. Characterization of Quaternary faulting within the Mine Mountain fault system
11. Characterization of Quaternary faulting within the Cane Spring fault system

Logging and sampling continued on the new trenches in Crater Flat. A new trench and a modification of an existing trench were completed for the Ghost Dance fault.

During October, responsibility for the seismic net, which is maintained by the University of Nevada Reno Seismological Laboratory, was transferred from the USGS to the M&O.

WBS 1.2.3.3 Hydrology

Regional Hydrology

Three of the five weather stations were discontinued and dismantled, and the instruments were prepared for closing calibrations. The tipping bucket rainfall network remains in place until an analysis of future operational options can be completed; downloading from this network was not necessary because of the lack of precipitation. The nonrecording rain-gage network has been completely abandoned but left in place because of the lack of personnel to dismantle it.

The synoptic site meteorological data for FY 1994 have been submitted to the Local Records Center. However, acceptance of the data by the LRC has not occurred because of the LRC staff reduction, preventing formal completion of the associated milestone, 3GMM102M. FY1995 data have been reviewed and formatted. QA records for calibration are being assembled, and instruments used in the field during FY 1995 are being sent to certified vendors for closing calibrations.

All sites in the streamflow-precipitation monitoring network were visited to collect data through the end of FY 1995. With the exception of three recording streamflow gages in Fortymile Wash, the network has been deactivated; the maintenance interval for the three remaining sites will be increased from 1 to 1½ months because of funding constraints. Completion of the FY 1995 data collection is delayed until scour chains buried by sediment during the March 11, 1995 large runoff event are excavated, currently rescheduled for December 1995.

Hydraulic testing in USW G-2, scheduled for October, was postponed because of support-contractor operational and equipment problems. The USGS staff has maintained readiness, and hydraulic testing is expected to begin in November to develop a better understanding of the

hydrogeologic conditions that cause the large hydraulic gradient toward central Yucca Mountain from the north. Temperature data from USW G-2 from December 1981 through September 1995 were analyzed and interpreted. The results will supplement and constrain future interpretations of the other data pertaining to the large hydraulic gradient.

In support of characterizing recharge to the saturated zone beneath Fortymile Wash, data on the depth to water in several holes that displayed water-level changes after periods of precipitation were assembled for further analysis.

Refinement of the regional saturated-zone flow model continued with MODFLOWP parameter-estimation simulations for recharge, evapotranspiration, hydraulic conductivities, and vertical anisotropy. The hydraulic conductivity arrays were modified to better simulate the hydrologic effects of faulting in the region. Additional emphasis was given to MODFLOWP simulations and to analytical-element modeling at the University of Minnesota, both supporting the evaluation of boundary conditions for the model.

Unsaturated Zone

In support of defining infiltration properties of surficial materials, the FY 1995 laboratory data were assembled, reviewed, and forwarded for QA processing. Data packages for water-balance data and for infiltration properties of fractures and faults were also completed and submitted to the Local Records Center. The final ARC/INFO coverages for the surficial-geology maps were received from EG&G and reviewed for completeness. Another recently obtained digital map set, Preliminary Surficial Deposits Maps for the Southern Half of the Busted Butte 7.5° Quadrangle, is also being processed for incorporation into the net infiltration flux map and for extending its coverage to correspond approximately with the area of the USGS/LBL 3-D site-scale infiltration model. The final set of neutron-moisture-meter data planned for collection, that for the wet 1995 year, is being processed for inclusion in the analysis for the flux map. Inclusion of these data will help mitigate the biases introduced formerly by using mostly data from dry years.

A detailed outline was prepared to identify the work requirements for completion of the synthesis report on infiltration. This outline will serve as the basis for the report and provide direction for analysis of existing data. Among the considerations in the synthesis report will be: (1) the conceptual infiltration model that is currently being formulated; (2) data analyses being conducted for the report, "Estimation of shallow infiltration and presence of potential fast pathways for shallow infiltration in the Yucca Mountain area"; and (3) the net infiltration flux map.

Further air-permeability testing of surface-based boreholes has been cancelled, and equipment and supplies related to fabricating, repairing, servicing, calibrating, and housing field test equipment has been transferred to other testing programs or put into storage. The final data package -- pressure, temperature, and mass-flow measurements from the borehole USW SD-12 air-injection test conducted 2/27/95 - 5/18/95 -- was reduced, reviewed, and submitted to the Local Records Center. A report summarizing the results and conclusions from the surface-based air-permeability

testing program is being prepared. It will include results from boreholes UZ-16, SD-12, NRG-6, and NRG-7a.

Acquisition of vertical-seismic-profiling (VSP) data from UE25 UZ-16, and editing and stacking of the records is underway. Stacking reduces the data-processing load, reduces random noise, and increases signal-to-noise ratios. Survey data for source locations, which are essential for further processing, are scheduled to be provided by the M&O during the first week of November. The VSP investigation is intended to reveal faults or other structures that might influence water percolation in the unsaturated zone.

Borehole UZ-7a was instrumented and stemmed from October 8 through October 13. Ten instrument stations, the deepest at a depth of 650 feet, were established in this borehole. Instrumentation is being housed in a temporary shelter pending EG&G completion of IIS#3, for which funding was interrupted in September; work has resumed, and delivery of the shelter is expected by the end of November. The one borehole remaining for instrumentation in FY 1996 is USW SD-12, for which the instrumentation and stemming plan was completed and forwarded to the DOE in October. Monitoring of the newly instrumented and previously instrumented boreholes and processing of the data are continuing.

Laboratory determinations of matrix properties are closely tracking drilling and the availability of core for testing. Routine tests for inclusion in the matrix properties database, currently containing data for about 4500 samples, are complete except for the bottom of USW SD-7, which is still being drilled. Ten packages of data from FY 1994 and FY 1995 core-drilling have been prepared. All packages but one, that for SD-7 which is still being cored, have been technically reviewed and have received initial QA reviews. Preliminary analysis of the database indicates that there are 27 hydrogeologic units with distinct enough properties to warrant separate designations. Additional, non-routine matrix- and flow-properties tests being conducted on smaller sets of samples include air permeability, relative permeability, saturated hydraulic conductivity, and moisture retention.

Among tests scheduled for the Exploratory Studies Facility, the Intact Fractures Test is not funded in FY 1996 and has been suspended. The USGS Open-File Report, "Optical, Noncontact, Automated Experimental Techniques for Three-Dimensional Reconstruction of Object Surfaces Using Projection Moire, Stereo Imaging, and Phase-Measuring Profilometry", by J. F. Cardenas-Garcia and G. Severson will undergo final processing for publication when digital files of figures are available.

Hydrologic testing in ESF Alcove 2 is progressing. Thermal data obtained from borehole 1 in September are being processed and analyzed. The temperature signals indicate high permeability associated with the Bow Ridge fault and a nearby fracture zone. The multiport packer string and associated equipment have been installed for pneumatic monitoring and gas sampling in borehole 1.

Water from wet rock in the ESF at the transition from the Tiva Canyon welded unit to the Paintbrush non-welded unit was extracted for chemical and isotopic analysis. The C-14 activity in the water is 85% modern, which provides an apparent age of 1300 years. This is similar to C-14 ages obtained from water in cores of the same stratigraphic level in surface-based boreholes. Tritium concentrations below detection limit are also consistent with an age of about 1000 years.

Comparative analyses of pneumatic data from NRG 6, NRG 5, NRG 7a, and SD 9 are documenting the effects of the TBM as it progressed westward along Drillhole Wash and turned southward beneath the wash. NRG 5 and SD 9 continue to be monitored. The TBM excavated past NRG 5 in September, and the downhole pressures began to respond to the presence of the ESF on September 13, equilibrating about three days later. Stemmed and instrumented borehole NRG 6, which is directly across Drillhole Wash from NRG 5, had apparently not shown a response to the presence of the ESF as of October 15. This implies the presence beneath the wash of an impediment to lateral pressure transmission, probably a fault or fracture zone.

A proposed schedule for FY 1996 gas sampling, subject to several instrumental and operational uncertainties, has been prepared with priority placed on acquiring gas samples from the Calico Hills tuff. Porewater was extracted by one-dimensional compression from several SD 12 and NRG 7/7A cores.

Author responses to technical-review comments are complete for the milestone report, "Chemical and isotopic data and interpretations, unsaturated-zone boreholes, Yucca Mountain, Nevada". The report has been transmitted to the USGS QA office and to Central Region for final review.

The computational efficiency of the unsaturated-zone fracture-flow model of the Tiva Canyon Tuff has been greatly enhanced by the development of new fracture networks with a 1.25-meter truncation value. About 70 percent of the small fractures were eliminated with no effect on the number of pathways or the percolation threshold.

Saturated Zone

At the saturated-zone tracer site, downhole equipment in boreholes UE-25c #3 (the pumping well) and UE-25 c#2 was reconfigured in mid-October to change the tested interval from the Bullfrog and Tram Tuffs to the Prow Pass Tuff. An attempt to pump at a rate of about 200 gallons per minute produced drawdown to the pump intake. Alternatives for testing with the lower-than-expected productivity are being evaluated. Analyzing the effects of earlier pumping tests in UE-25c#3 on distant observation wells progressed with filtering the effects of earth tides and barometric pressure changes from the raw data.

With the reduction of funding for FY 1996, the operation of the site potentiometric-levels monitoring network has been significantly reduced. The October and November monthly manual measurements in 23 wells (29 zones) have been cancelled, but measurements will be made in December to complete the 1995 records. Continuous potentiometric-level monitoring is

continuing in UE-25p #1 and the USW H-5 upper and lower intervals; however, the continuous monitoring of USW H-6 has been discontinued. The 1994 water-level data report was revised in response to two colleague reviews and is being prepared for submittal for USGS Director's approval and as a letter report to DOE.

Analyses of the data from two pumping tests have proved problematical. Data from the August-September test of UE-25 WT#12 probably will not yield reliable transmissivity and storage values because poor hydraulic connection between the well and the aquifer caused insufficient stress on the aquifer. Although a consistent conceptual model of flow in the perched-water layer in USW SD-12 has been developed, existing and proposed new methods of analysis have not provided conclusive or highly defensible calculated permeabilities for the producing fracture and bounding matrix blocks.

For the site-scale saturated-zone flow model, work continued in the following areas: (1) Some of the required revisions were made to the conceptual model report. (2) Geologic and geophysical data for the framework model were processed and internally reviewed. (3) Using GEOMESH and the regional hydrogeologic framework, a new finite-element mesh of the site model area was developed.

WBS 1.2.3.6 Climatology

An annotated outline for a synthesis report on paleoclimate and Quaternary hydrology was completed and submitted to DOE. The outline summarizes both data and interpretations to be included and information needs.

Paleoclimatic and paleohydrologic studies continued along several lines of investigation, including:

1. Work continued on refining the diatom record from the Owens Lake core. A comparison of that record with Earth's orbital parameters was initiated in order to evaluate climate induced changes on surface water characteristics.
2. Collection and submission of more samples for radiocarbon dating continued in order to provide additional key information on the timing of climatic- and hydrologic-linked changes in the Yucca Mountain area.
3. Radiocarbon analyses from the Corn Creek section in the Las Vegas Valley yielded much older ages for the base of the section than expected. Also the upper portion of the section seems to represent a greater span of time than previously anticipated. Work is now planned to provide a check of these results.
4. Chemical processing and isotopic analyses of uranium and thorium continued in order to date pedogenic components collected from fault trenches, soil pits, and natural

exposures associated with surficial deposits in Fortymile Wash, and Sever Wash and trenches along the Bare Mountain and Rock Valley.

5. Thermoluminescence analyses of pedogenic and detrital eolian materials from two trenches on the Crater Flat were completed to provide geochronological control for Quaternary dip-slip movement.
6. Thermoluminescence dating was attempted on several surficial units in order to provide a geochronologic framework for the on-going surficial mapping project.
7. Photo interpretation and field checking continued for the surficial deposits map of the Amargosa Valley 7.5' quadrangle.
8. Approximately 210 samples were analyzed for carbon and oxygen isotopic compositions, and petrography was completed for approximately 90 samples. Both activities provide analytical results in support of paleohydrology and paleoclimate studies.

WBS 1.2.13.4 Water Resources Monitoring

Ground-water levels at 29 sites and discharge at one flowing well were measured. September monitoring data were checked, filed, and incorporated into the FY 1995 Fourth Quarter Monitoring Report. Information copies of the report were delivered to the DOE and the M&O on October 26.

The data records package and summary report for water-resources monitoring through Calendar Year 1994 both advanced in processing. The data package was submitted to USGS Earth Science Investigations Program for completion and forwarding to the Local Records Center. The report draft was completed, and colleague and technical-specialist reviews were initiated.

USGS LEVEL 3 MILESTONE REPORT
OCTOBER 1, 1995 - OCTOBER 31, 1995
Sorted by Baseline Date

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
LTR RPT: 4th QUARTER FY95 Milestone Number: 3GWR623M	10/30/95	10/30/95	10/30/95	

Element ID - ZZ

See the current WBS Dictionary

[illegible]

WBS No. - 1.2 - Yucca Mountain Project

Resource Distributions by Element of Cost

Fiscal Year 1996

Estimate to Complete

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	0	24906	24446	23867	23554	23532	21485	21367	20958	20358	20300	20212	244985
LABOR	0	1015	983	971	956	946	851	856	814	802	800	804	9798
SUBS	0	41	39	41	41	37	27	30	32	33	33	26	380
TRAVEL	0	41	41	31	43	34	36	32	26	23	20	16	343
PM&E	0	18	23	36	31	21	20	33	27	15	11	3	238
OTHER	0	155	155	163	152	152	166	157	155	162	146	143	1706
Total ETC	0	1270	1241	1242	1223	1190	1100	1108	1054	1035	1010	992	12465

Resource Distributions

Fiscal Year 1996

Fiscal Year 1996		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BCWS	1255	1270	1241	1242	1223	1190	1100	1108	1054	1035	1010	992	13720	
BCWP	1248	0	0	0	0	0	0	0	0	0	0	0	1248	
ACWP	1067	0	0	0	0	0	0	0	0	0	0	0	1067	
ETC	0	1270	1241	1242	1223	1190	1100	1108	1054	1035	1010	992	12465	

Fiscal Year Distribution

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YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant U.S. Geological Survey

MONTHLY COST/FTE REPORT

Fiscal Month/Year OCTOBER 1995Date Prepared 11/14/95 14:42Page 1 of 1

	<u>CURRENT MONTH END</u>					<u>FISCAL YEAR</u>			
WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCON HOURS	PURCHASE COMMITMENTS	SUBCON COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1.2.1	0	0	0		0		0	7	0
1.2.3	732	17907	846		577		9575	1470	732
1.2.5	14	304	0		0		365	75	14
1.2.9	47	1020	104		88		664	63	47
1.2.11	49	1056	208		235		650	0	49
1.2.12	5	256	0		0		80	30	5
1.2.13	41	684	0		0		515	50	41
1.2.15	180	1816	228		52		1871	125	180
TOTALS	1068	23043	1386	0	952	0	13720	1820	1068

OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.9
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.9
79.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.6
79.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.6
93.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93.5
11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4
3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
14.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9
34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.1
111.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	111.3
145.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	145.4
5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
14.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
14.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2
18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2
206.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	206.9
6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1
7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4
28.9	0.0	0.0	0.0	0.0	0							

OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
17.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5
74.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2
104.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	104.5
29.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.5
0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
30.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.4
9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6
9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6
26.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.2
26.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.2
6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9
6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9
7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
39.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.6
11.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8
63.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.1
6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
14.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9
11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
26.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.4
341.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	341.2
5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
22.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.4
5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.3
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1
16.9	0.0	0.0	0.0	0.0								

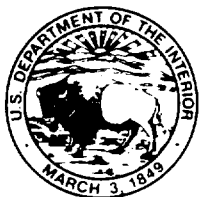
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U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/95 - 10/31/95

	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
*1.2.11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
**1.2.11	49.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.3
OGC52196B Records Operation (USGS)	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
1.2.12.5.2.1	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
*1.2.12.5	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
**1.2.12	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4
OGD2596B Occupational Safety and Health	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
1.2.13.2.5	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
*1.2.13.2	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3
OGD4596B Radiological Studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.2.13.4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OGD4796H Water Resources Monitoring	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3
1.2.13.4.7	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3
*1.2.13.4	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3
**1.2.13	40.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.6
OGF2396B1 Support/Personnel Services	49.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.0
OGF2396B2 Facilities Management - Space	85.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.4
OGF2396B3 Facilities Management - Computers/Phones	24.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.9
OGF2396B4 Facilities Management - Other	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3
OGF2396B5 Procurement/Property Management - USGS	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2
1.2.15.2.3	174.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	174.8
*1.2.15.2	174.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	174.8
OGF396B YMP Support For The Training Mission (US	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
1.2.15.3	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
*1.2.15.3	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
**1.2.15	180.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.4
1.2 OPERATING	1068.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1068.1
CAPITAL EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GRAND TOTAL	1068.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1068.1
FTEs													
FEDERAL	133.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CONTRACT	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	141.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

* Fourth level WBS roll-up

** Third level WBS roll-up



United States Department of the Interior

U. S. GEOLOGICAL SURVEY

Box 25046 M.S. 425

Denver Federal Center

Denver, Colorado 80225

IN REPLY REFER TO:

INFORMATION ONLY

December 13, 1995

Charles Fox
Yucca Mountain Site Characterization
Project Office
U. S. Department of Energy
P.O. Box 98608
Las Vegas, Nevada 89193-8608

SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS)
Progress Report, November, 1995

Attached is the USGS progress report in the required format for the month of November, 1995.

If you have any questions or need further information, please call Raye Ritchey Arnold at (303)236-0516, ext. 282.

Sincerely,

Raye R. Arnold
for Robert W. Craig
Acting Technical Project Officer
Yucca Mountain Project Branch
U.S. Geological Survey

Enclosure:

cc: S. Hanauer, DOE/Forrestal
R. Dyer, DOE, Las Vegas
A. Gil, DOE, Las Vegas
S. Jones, DOE, Las Vegas
W. Kozai, DOE, Las Vegas
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D. Williams, DOE, Las Vegas
C. Glenn, NRC, Las Vegas (2 copies)
P. Burke, M&O, Las Vegas
R. St. Clair, M&O, Las Vegas
M. Chornack, USGS, Denver
L. Ducret, USGS, Denver
D. Gillies, USGS, Denver
W. Day, USGS, Denver
D. Hoxie, USGS, Las Vegas

DIVISION

cc: *Fox/Williams D*
cc: *Dyer*
cc: *Gil*
cc: *Jones A*
cc: *Kozai/Tynan*
cc: *Patterson*
cc: *Simmons A*
cc: *Spence/Sullivan A*

REC'D IN YMP

12/18/95

"ENCLOSURE"

6

R. Keefer, USGS, Denver
R. Luckey, USGS, Denver
B. Parks, USGS, Denver
Z. Peterman, USGS, Denver
R. Ritchey Arnold, USGS, Denver
D. Soeder, USGS, Las Vegas
R. Spengler, USGS, Denver
J. Whitney, USGS, Denver
R. Williams, USGS, Denver
T. Williams, USGS, Denver

U. S. Geological Survey
EXECUTIVE SUMMARY
November 1995

WBS 1.2.3.1 Coordination and Planning

U.S. Geological Survey - Yucca Mountain Project Branch is currently processing 164 scientific publications by USGS authors. Of these, 62 are hydrologic-related reports, and 102 are geologic-related reports. In addition, 17 abstracts by USGS authors are being processed as well as 22 reports from LBL.

WBS 1.2.3.2 Geology

Geologic Framework

Geologic mapping of the North Ramp (ESF) was accomplished as follows: (1) full periphery field maps completed to station 30+00; (2) detailed line surveys completed to station 30+00; (3) stereophotography completed to station 30+10.58; and RQD and Q ratings calculated to station 30+00. Review of the full periphery maps from stations 8.00 to 10+00 was completed. An unscheduled activity of comparing the expected and actual geology from stations 0+00 to 20+00 was completed and presented to DOE and project participants.

The contact between the upper lithophysal (TSw-1) and middle nonlithophysal (TSw-2) zones of the crystal-rich member of the Topopah Springs Tuff was positively identified in the ESF at station 27+20. This contact was projected in the USGS 3-D lithostratigraphic model to be at 27+00. The model was only in error by 20 m along the length of the tunnel, which translates to 0.5 m in stratigraphic position.

Work has begun to compile geophysical logs for the WT holes and comparing them with the litho-stratigraphic logs.

The USGS provided a speaker for the public tour who did the briefing from the top of the mountain.

The final draft of the report on hybrid-source seismic-reflection profile across Yucca Mountain (regional lines 2 and 3) has been completed, and the manuscript on the ground magnetics along the seismic line has been submitted to the YMPB reports unit. A rough draft on the structural domains along the north ramp was completed, and the conclusions were discussed with other PIs in terms of pneumatic inter-connection between the ESF and instrumented boreholes. A preliminary cross-section was developed in the vicinity of the planned alcove from the main drift of the ESF to the Ghostdance fault.

Ground Motion

Work continued on historic seismicity. Previously unrecognized evidence for possible ground rupture in response to the 1934 Excelsior, Nevada earthquake was found, but no evidence for rupture was found in the epicentral region of the Clarkston, Montana quake. Several consultants report that they are on schedule for submitting their draft reports for various aspects of ground motion.

Seismic source characterization

Field work on the Cane Spring fault showed no evidence for the fault west of the northern entrance to Area 27 which indicates that the fault either does not extend into Rock Valley, or that it has no surface expression. Thus it is very old relative to the Mine Mountain and Rock Valley faults.

Data and report processing have been slowed by the loss of support personnel. Reports in preparation and/or review include:

1. Map of the Calico Hills, final field review and technical review of the report completed.
2. Evaluation and characterization of Quaternary faulting, Bare Mountain fault zone, report is in technical review.
3. Evaluation and characterization of Quaternary faulting on the Death Valley and Furnace Creek faults, report is in technical review.
4. Quaternary faulting -- Bow Ridge, Paintbrush Canyon and Stagecoach Road faults, Submitted to Director and DOE for approval.
5. Quaternary faulting -- postulated Fortymile Wash fault zone, has received Director's approval, and submitted to DOE for approval.
6. Quaternary faulting -- Ghost Dance fault and northwest-trending faults, through technical review and in QA review.
7. Quaternary faulting -- Solitario Canyon, Crater Flat, Windy Wash, and Fatigue Wash faults, report is in technical review.
9. Characterization of Quaternary faulting within the Rock Valley fault system, in preparation.

10. Characterization of Quaternary faulting within the Mine Mountain fault system, in QA review.

Logging and sampling continued on the new trenches in Crater Flat. A new trench and a modification of an existing trench were completed for the Ghost Dance fault.

WBS 1.2.3.3 Hydrology

Regional Hydrology

Review and formatting of the FY 1995 site meteorological data were completed. Effort was shifted to compiling QA records pertaining to instrument calibration, including closing calibrations by certified vendors. The two remaining weather stations are being maintained and the current data downloaded periodically. Data from the tipping-bucket network have not been downloaded because of the continued lack of precipitation.

Technical reviews have been completed and processing for submittal is underway for three reports: (1) "Meteorological data for Water Years 1988-1994 from five weather stations at Yucca Mountain", by Flint and Davies; (2) "Analysis of meso-scale precipitations and synoptic scale weather patterns during water years 1992 and 1993 for the Yucca Mountain region, Nevada-California", by Hevesi, Ambos, and Flint; (3) "Geostatistical model for estimating precipitation and recharge in the Yucca Mountain region, Nevada-California", by Hevesi and Flint.

Based on discussions with the USGS-TPO and the DOE Hydrology Team Leader, data collected and processed for FY 1995 for 13 recording streamflow gages, 12 crest-stage gages, and 20 precipitation gages will be published in the Nevada District's annual data publication, "U.S. Geological Survey Water Resources Data - Nevada". Data for those sites not published this year will be included in the report for the following year. Project staff computed and checked records for 12 crest-stage and some precipitation gages during the month and began computing records for the recording-streamflow and remaining precipitation gages. With the assistance of a backhoe, five of six scour chains were excavated at the Fortymile Wash at the Narrows streamflow gage on November 16, 1995. One of the chains had been completely washed out. Information obtained from the scour chains will provide valuable quantitative and qualitative data for processing the streamflow records pertaining to the March 11, 1995 large runoff event.

Collection of streamflow data will continue for three recording-streamflow gages on Fortymile Wash, located at the Narrows, near J-13, and near Amargosa Valley. Routine data collection and maintenance were performed by project staff at the three sites during the last week of November. Runoff was neither observed nor reported during the reporting period for the three gages or for the Yucca Mountain area.

Hydraulic testing in borehole USW G-2 has been replanned again because of continued test-support problems in obtaining a working downhole pump for use in the test. A poster presentation entitled "Testing in Borehole USW G-2 at Yucca Mountain: The Saga Continues" was prepared by J. Czarnecki, P. Nelson, J. Sass, and G. O'Brien for presentation at the American Geophysical Union conference in San Francisco on December 11, 1995. C. Savard prepared a poster, "Ground-Water Recharge from Small to Large Sreamflow Events During El Niño Periods under Fortymile Wash near Yucca Mountain, Nevada", also for the AGU meeting; the contents will be incorporated into the Fortymile Wash recharge report.

Regional flow model calibration runs using hydraulic-conductivity arrays that were modified to improve simulated effects of faulting resulted in significant decrease (two orders of magnitude) in the sum of squared weighted residuals, indicating an improved representation of the natural system. Parameter-estimation simulations, using MODFLOWP to evaluate anisotropy factors, showed that results were most sensitive to vertical anisotropy for the lowest model layer.

In support of regional model-boundary specification, software validation for the analytical-element model was received from the University of Minnesota and will be evaluated under a contract with the International Ground Water Modeling Center at the Colorado School of Mines. All simulations planned for the software validation for MODFLOW and MODFLOWP, the software that will be used for the regional model to provide input to site model boundaries, were completed. Software specifications, identification, and validation plans for both codes were submitted to the QA office. This activity is completed, but work will continue under activity 3GRM610, Review Updated Boundaries.

Data documentation for the vegetation and potentiometric-surface maps was continued for the regional hydrogeologic framework. The draft potentiometric surface map and documentations of recharge and discharge rates also were edited.

Unsaturated Zone

Analysis and revisions are continuing to answer the technical reviewer comments on the U.S. Geological Survey Water Resources Investigation Report entitled "Estimation of shallow infiltration and presence of potential fast pathways for shallow infiltration in the Yucca Mountain area". This report contains the data that will be submitted to the TDB and will be the basis for a paper on the net infiltration and fast-pathways flux maps. The area of the maps includes the southern half of the Topopah Spring NW 7.5' Quadrangle and the entire Busted Butte 7.5' Quadrangle.

Preliminary stochastic estimates of annual precipitation amounts and the spatial distribution of this rainfall have been made. The techniques used in the flux map investigation are being used to describe the temporal and spatial rainfall distributions.

Information compiled from a review of infiltration literature is being applied in the development of the conceptual model report and in the revision and annotation of the UZ Infiltration synthesis report outline.

Data were downloaded from heat dissipation probes and net radiometers. The heat dissipation probe data were compiled into a data base to be used in further developing the conceptual model of infiltration. The neutron data have been assembled into a data base and spreadsheet. Graphs of the data are being prepared before submittal for technical review.

In support of defining infiltration properties, copies of the ARC/INFO surficial geology maps received in October from EG&G have been edited to remove disturbed areas and roads and to reduce the 37 surficial geologic units to 11 surficial material units defined on the basis of infiltration properties. In addition, a refined estimate of the depth to bedrock and geomorphic position maps have been completed. Physical properties that are currently being determined for 133 drive-core samples from seven neutron boreholes will be used to further refine the maps.

Additional samples from borehole SD-7 and the ESF are being processed for addition to the matrix properties database, and additional samples from both sources are anticipated. Flow-properties determinations requiring centrifuge processing were delayed by equipment problems that have been referred to the manufacturer. The high-pressure permeameter is also still in the developmental phase with the evaluation of operational techniques and interfacing of instruments with computer control programs.

Editing and sorting of seismic records from the UE-25 UZ-16 VSP survey continued during the reporting period. Stacking of records also continued, but progress was delayed by operational difficulties with the specialized data tape drive, also delaying the milestone report, "Shear- and P-wave velocities, UZ-16 VSP" (3GUP620M). The drive has been shipped for repair. Geophone locations in the borehole and survey data for locations of the seismic-source points along the several walk-aways were received from the M&O.

Instrumentation of borehole UZ-7a is complete, satisfying the criteria for milestone 3GUP632M. Ten instrument stations, including a total of 84 sensors, were established in this borehole; 83 of the sensors are operational. The deepest station is located at a depth of 638 feet. Each instrument station was provided with a sliding sleeve to support gas sampling and open-borehole flow tests within the station interval. The data acquisition system for this borehole was tested and certified during the week of November 6. The downhole instrumentation records have been assembled, and compilation of other "as-built" records was begun. Monitoring and records processing are underway.

The instrumentation and stemming plan for SD-12, which is the last borehole-instrumentation activity planned in the FY 1996 PACs for this account, was approved by DOE on November 6. The instrument shelter formerly at the HRF was moved to the SD-12 borehole site and

installed. Installation of instrument packages was accomplished November 14-15, and grouting and stemming commenced. Monitoring was begun when the instruments were emplaced, but the DAS for SD-12 has not yet been tested and certified.

Preparation continued on several reports to integrate UZ data analysis and interpretations. The report summarizing the surface-based air-permeability testing program will include test results and conclusions from boreholes UZ-16, SD-12, NRG-6, and NRG-7a. For a report on the in-situ borehole monitoring data, work continued on the preparation of figures for displaying pneumatic pressure, temperature, and water potential time-series data for NRG-6 and NRG-7a thru mid-September, 1995. Analysis of the pneumatic diffusivity characteristics of the various stratigraphic units at UZ-4 and UZ-5 was completed, utilizing in-situ pneumatic pressure data collected at these two boreholes since June 1995. Development of the detailed outline for the north ramp hydrology report continued, as did the design and layout of figures for presenting borehole data in a vertical profile format. A draft section on the structural and tectonic setting of the report area was completed.

Using a multiport packer string in Alcove 2, borehole 1, the USGS has monitored pneumatic pressure responses to barometric pressure changes. The pressure responses are presently being analyzed as indicators of the connectivity of the test intervals. The second phase of testing has begun with pumping to recover drilling gases from the Pre-Rainier Mesa and Tiva Canyon Formations and from the Bow Ridge fault. The SF-6 concentrations in the four deepest zones are high, indicating that the rock gas is contaminated. Pumping will continue until SF-6 concentrations are reduced. After the contaminated rock gas is removed, samples of rock gas will be collected for C14 and C12/13 analysis.

A new downhole packer assembly has been undergoing testing for use in the ESF and is expected to be operational by the end of the year. The new system uses an alternative banding system to attach the packer bladders and modifications of the inflation and sampling ports to eliminate leaks.

Boreholes NRG 5 and SD 9 continue to be monitored for downhole pressure responses to barometric pressure changes. The TBM excavated past NRG 5 in September and the downhole pressures began to respond to the presence of the ESF on September 13, equilibrating to the presence of the ESF by September 16. Borehole SD-9 appears to have begun responding to the presence of the ESF about November 9.

One-dimensional modelling of NRG 5 data has been conducted to determine vertical permeability to air prior to effects of the TBM passage. Comparative analysis of pneumatic data from NRG 6, NRG 5, NRG 7a, and SD 9 is ongoing to chart the effects of the TBM as it progressed westward along Drillhole Wash and turned across the Drillhole Wash fault. A small-scale 3-dimensional model of the North Ramp and part of the Main Drift is being constructed to attempt to analyze the horizontal permeability of the rocks affected by the ESF excavation. The model will simulate the progress of the TBM by applying barometric stresses at the ESF horizon

and will be calibrated against both pressure changes within each geologic unit and the time at which the borehole first began to be affected by the ESF.

Discussions continue on the best methods to use while attempting tracer tests between surface boreholes and ESF alcove boreholes. A letter report on preliminary gas tracer-test analysis (3GGP108M) has been delayed because of the loss of contract personnel. However, the preliminary results are sufficiently developed to be used for planning future tests and for UZ modeling efforts.

Porewater was compressed from four SD-12 core samples using one-dimensional compression methods. Other UZ hydrochemistry laboratory activities were concentrated on equipment and hardware development, calibration, and testing. A cost estimate has been requested from Baski Industries for a straddle-packer system needed for gas sampling at boreholes SD-12 and UZ-7a. A supply of maraging steel was provided to IHL Y Industries for the construction of top and bottom drainage plates for the compression cell. The existing cell and drainage plates were also supplied to IHL Y Industries as a guide during construction of the new plates.

In support of the release of the letter report, "Preliminary UZ Hydrochemistry at Yucca Mountain", a data package was prepared so that the requisite review of the data can be completed. The data package includes: isotopic and chemical composition of perched water from UZ-14, SD-7, SD-9, NRG-7a, G-2, and ONC#1; isotopic composition of porewater from UZ-14, UZ-16, NRG-6, and NRG-7a; chemical composition of porewater from UZ-N2 and UZ-N46; and isotopic and chemical composition of gas from UZ-1 for the years 1986-87.

A first draft of the report, "Development of Conceptual & Numerical Models of Flow in UZ Fractured Rock", is finished, including text, figures, and tables. Editing and refinements are underway. Potential authors of the conceptual model of the UZ hydrologic system met to discuss the purpose, scope, and outline of the report, as well as the relevance of several published reports.

The three-dimensional gas-flow model at Yucca Crest was used in conjunction with measured borehole flow logs at UZ6S to make estimates of the permeabilities of major hydrostratigraphic units penetrated by that borehole. Estimates obtained for the Tiva Canyon hydrostratigraphic unit are several orders of magnitude higher than estimates obtained for the same unit at other boreholes, perhaps reflecting local conditions at Yucca Crest.

Saturated Zone

During the week of November 20, experimental pumping was initiated in UE-25c#3 from the Lower Prow Pass zone in UE-25c #3 while the packer separating the Lower Prow Pass from the Bullfrog-Tram zones was deflated to allow contribution from the high-producing Bullfrog-Tram zone. It was established that in this configuration, the pump can produce 160 gpm, in contrast to the 139 gpm obtained when pumping had been attempted from the deeper sliding sleeve in the

Bullfrog-Tram zone. This confirmed the theory that pumping from a shallower sliding sleeve will result in less friction losses, and, therefore, less total head that the pump will have to overcome, thereby resulting in a higher pumping rate. When the packer separating the Lower Prow Pass from the Bullfrog-Tram was gradually inflated during this test, thereby restricting the source of water from which the pump can draw to the Lower Prow Pass zone, that zone was not able to provide any more than a flow rate estimated to be between 14 and 30 gpm. Testing of the low-flow Lower Prow Pass zone, therefore, will be deferred to sometime in the future when a lower capacity pump can be installed in UE-25c# 3.

The data package for the May 22, 1995 aquifer test at the UE-25c site was finalized during November and will be submitted for review in December. Work continued on processing the data from the distant wells (wells other than the 3 c-holes) that were used as observation wells during the May 22 test to remove the effects of earth tides and barometric effects and determine the residual effect of pumping UE-25c #3 on these wells. These distant observation wells were WT#14, p#1, H-4, WT#3, and ONC#1. It appears that, in addition to ONC#1, there was a discernable effect at H-4 of the open-hole pumping in UE-25c #3 during the May 22 test.

Preparations continued for conducting a tracer test in the first week of January 1996: procurement of a small, portable, non-submersible pump, to be used for various functions as part of the surface-plumbing system, was initiated; oversight was performed over the process of synthesizing the 3-Carbamoyl-2-Pyridone by the University of Wyoming; tracking was done of the shipment of fluorinated benzoic acids purchased from a British company; and effort was spent on making the Campbell Scientific Specific-conductance/ temperature and pH probes, which are controlled by a 21x Campbell data logger, work correctly as a system. Detailed drawings of the surface plumbing system were made available to the M&O Construction Management and Surface-Based Test Coordination Offices, and to the NTS-YMP contractor, Kewitt, so that procurement of all the necessary components of the surface-plumbing system can be initiated.

Consultations continued between the USGS and LANL on the best approach to conduct a tracer test (whether it be a conservative or a reactive tracer test) and on the elements of the surface plumbing system that is required to do both tests. Consultations will continue to ensure that both the requirements of conducting a conservative tracer test (responsibility of the USGS) and those of conducting a reactive tracer test (responsibility of LANL) are met. To that end a final design of the tracer injection system had been developed during October, which allows for both injecting tracer without chase water (the configuration that the USGS is planning to conduct its first conservative tracer test in) and with chase water (which is the arrangement preferred by LANL).

The 1994 water-level data report "Water levels in the Yucca Mountain area, Nevada, 1994", by R.P. Graves, P. Tucci, and R.L. Goemaat, was submitted to DOE on November 17, 1995.

Due to FY 1996 changes in the water-level network, no wells were scheduled for manual measurements during the month of November. However, well USW G-2 was measured to support the hydraulic test scheduled for this well.

Transducer data of all wells that were monitored hourly through the end of September 1995 and then discontinued for fiscal year 1996, as well as supporting barometric data, have been processed, reviewed, and edited. Logbooks of site visits to wells monitored hourly are being reviewed. The review of the logbooks for wells USW WT-1, UE-25 WT #3, UE-25 WT #4, USW WT-10, UE-25 WT #14, UE-25p #1, USW H-1 tubes 3 and 4, USW H-3 (upper and lower zones), USW H-4 (upper and lower zones), USW H-5 (upper and lower zones), and USW H-6 (upper and lower zones) was completed during November.

Compilation of data collected at well UE-25 WT#12 during pumping from 8/15 to 9/19/95 was completed. The data package, submitted for review on 11/29/95, includes drawdown and recovery water-levels, barometric pressure, water temperature, discharge, and some water-quality data.

Compilation of the surface geology data and the well data was completed for the site SZ hydrogeologic framework model. The surface geology data and the digital elevation data were used to form files for the surface expressions (x,y,z) of the hydrogeologic units to be used in the gridding process. Additional well information was compiled to further define the alluvial deposits in the Amargosa Valley, especially the Tertiary limestones. Further research was done on geophysical data that would be useful for defining the depth to the basement to refine the framework model and for gridding purposes.

The new finite element mesh of the site model area developed by LANL using regional hydrogeologic framework data (GEOMESH) supplied USGS was successfully employed in model runs on the MAGMA and VEGA LANL workstations. The mesh included nodes corresponding to water-level observation points in wells, which were added to an existing fully three-dimensional tetrahedral-element mesh, and new tetrahedral elements generated automatically satisfying Delauny requirements. A smaller mesh of the northeast corner of the model domain was also generated in a similar manner and used in successful model runs using FEHMN.

WBS 1.2.3.6 Climatology

Paleoclimatic and paleohydrologic studies continued along several lines of investigation, including:

1. Work continued on refining the diatom record from the Owens Lake core. A companion study was started on the ostracod record for confirmation of results. A

comparison of these records with Earth's orbital parameters will be used to evaluate climate induced changes on surface water characteristics.

2. Collection and submission of more samples from the ESF for radiocarbon dating continued in order to provide additional key information on the timing of climatic- and hydrologic-linked changes in the Yucca Mountain area.
3. A simple mathematical model was developed to describe isotopic behavior of vein materials deposited over a continuum of ages, but sampled to only include finite amounts of material. Results from these models are consistent with some of the results obtained from sub-surface vein material, which implies that finite ages observed in some of the vein samples could represent mixtures between older and more recent components rather than representing a single discrete geologic age.
5. A plan was developed to accelerate collection of age information from the ESF, and a coordinated sampling trip was completed.
6. An experiment to leach water-soluble strontium from drill core cuttings in order to identify possible pathways of paleo-water movement was completed. The preliminary results suggest that perched water zones can be traced upwards to a pedogenic source via small residua left within the unsaturated zone.
7. Photo interpretation and field checking continued for the surficial deposits map of the Amargosa Valley 7.5' quadrangle. It was noted that finer-grained deposits of the March 11 streamflow event have already been redistributed and added to older alluvium. This provides an analog of past eolian additions to soils
8. Several members of the climate team have begun drafting a response to a paper by Carol Hill and other TRAC personnel which was published in Environmental Geology which purports to prove that a hypogene origin is possible for several of the calcite-silica deposits at and near Yucca Mountain.

WBS 1.2.13.4 Water Resources Monitoring

During November ground-water levels were measured at 30 sites, and discharges were measured at five springs and one flowing well. Water-level data were not collected at site MV-1 because the well does not have an access tube to allow water-level measurements; these will be obtained only when staff is notified that the pump has been temporarily removed.

The Principal Investigator and Site Characterization staff are evaluating options for meeting monitoring responsibilities in view of the FY 1996 reductions in site-characterization monitoring.

The Principal Investigator reviewed Rayrock Mine's proposed ground-water monitoring plan for Crater Flat and related DOE and NPS comments on that monitoring plan. The camera-ready copy of the Well JF-3 report was reviewed and returned to the Nevada District office.

Comments of two colleague reviewers of the summary monitoring report through calendar year 1994 were received and responded to, and indicated revisions were completed. The author began preparation of final illustrations while awaiting review by the District ground-water specialist.

USGS LEVEL 4 MILESTONE REPORT
OCTOBER 1, 1995 - NOVEMBER 30, 1995
Sorted by Baseline Date

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
PROV RESULTS: OUTLINE SYNTHESIS REPORT Milestone Number: 3GGU100M	11/15/95	11/15/95	11/15/95	
ADMIN RPT: 1994 REGIONAL SEISMIC PROFILES Milestone Number: 3GGU130M	11/15/95	11/13/95	11/13/95	
DATA TO CRF & TDB: INFIL. & FAST PATHS FLUX MAPS Milestone Number: 3GUI610M	11/30/95	12/29/95		
ADMIN RPT: SHEAR- & P-WAVE VELOCITIES, UZ-16 VSP Milestone Number: 3GUP620M	11/30/95	12/21/95		
MEMO TO TPO: INSTRUMENTATION UZ-7a COMPLETE Milestone Number: 3GUP632M	11/30/95	11/30/95	11/30/95	
ADMIN REPORT: 1994 WATER-LEVEL DATA Milestone Number: 3GWF112M	11/30/95	11/17/95	11/17/95	
REVIEW DRAFT: DEATH VALLEY HYDROCHEMISTRY Milestone Number: 3GWH607M	11/30/95	12/29/95		
DATA TO LRC: LAB MEAS OF HYDRO PROP OF SURF MTLs Milestone Number: 3GUI602M	12/29/95	11/06/95	11/06/95	
DATA TO LRC: FY95 WATER BALANCE DATA Milestone Number: 3GUI622M	12/29/95	12/29/95		
ADMIN REPORT: NORTH RAMP HYDROLOGY Milestone Number: 3GUP667M	12/29/95	01/31/96		
DATA TO LRC: 3RD/4TH QTR FY95 PERCHED WATER DATA Milestone Number: 3GUS602M	12/29/95	12/29/95		
DATA TO LRC: 3RD & 4TH QTR FY95 GAS-PHASE DATA Milestone Number: 3GGP601M	12/29/95	12/29/95		

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
DATA TO LRC: DATA FOR WELLS TESTED - 7/95-9/95 Milestone Number: 3GWF620M	12/29/95	12/29/95		

Resource Distributions by Element of Cost

| Estimate to Complete

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	0	0	23164	23093	22517	22542	20619	20366	19467	19055	18883	18970	208676
LABOR	0	0	950	977	944	924	848	830	784	776	771	783	8587
SUBS	0	0	39	41	41	38	28	30	33	33	33	28	344
TRAVEL	0	0	39	40	43	36	34	35	27	25	21	22	322
PM&E	0	0	24	44	46	21	23	32	32	14	15	7	258
OTHER	0	0	167	162	157	159	167	158	158	165	151	155	1599
Total ETC	0	0	1219	1264	1231	1178	1100	1085	1034	1013	991	995	11110

Fiscal Year 1996	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BCWS	1200	1231	1175	1189	1164	1141	1041	1059	996	982	951	941	13070
BCWP	1193	1238	0	0	0	0	0	0	0	0	0	0	2431
ACWP	1018	1052	0	0	0	0	0	0	0	0	0	0	2070
ETC	0	0	1219	1264	1231	1178	1100	1085	1034	1013	991	995	11110

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YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant U.S. Geological Survey

MONTHLY COST/FTE REPORT

Fiscal Month/Year NOVEMBER 1995Date Prepared 12/12/95 13:36Page 1 of 1

WBS ELEMENT	CURRENT MONTH END			FISCAL YEAR					
	ACTUAL COSTS	PARTICIPANT HOURS	SUBCON HOURS	PURCHASE COMMITMENTS	SUBCON COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMULATIVE COSTS
1.2.1	0	0	0		0		0	22	0
1.2.3	803	17723	966		632765		9575	4092	1534
1.2.5	16	232	66		62898		365	213	30
1.2.9	50	880	141		80762		664	182	97
1.2.11	0	0	0		0		0	0	0
1.2.12	4	176	0		0		80	88	9
1.2.13	34	667	0		0		515	142	75
1.2.15	143	1880	320		49263		1871	363	324
TOTALS	1050	21558	1493	0	825688	0	13070	5102	2069

[illegible]

[illegible]

[illegible]

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/95 - 11/30/95

	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
1.2.11.5	0.0	27.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.4
*1.2.11.5	0.0	27.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.4
**1.2.11	49.3	64.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	113.8
OGC521968 Records Operation (USGS)	5.4	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9
1.2.12.5.2.1	5.4	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9
*1.2.12.5	5.4	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9
**1.2.12	5.4	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9
OGD25968 Occupational Safety and Health	7.3	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
1.2.13.2.5	7.3	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
*1.2.13.2	7.3	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
OGD45968 Radiological Studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.2.13.4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OGD4796H Water Resources Monitoring	33.3	26.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.2
1.2.13.4.7	33.3	26.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.2
*1.2.13.4	33.3	26.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.2
**1.2.13	40.6	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.9
OGF239681 Support/Personnel Services	49.0	42.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.6
OGF239682 Facilities Management - Space	85.4	85.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	170.8
OGF239683 Facilities Management - Computers/Phones	24.9	24.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.8
OGF239684 Facilities Management - Other	13.3	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.6
OGF239685 Procurement/Property Management - USGS	2.2	12.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6
1.2.15.2.3	174.8	178.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	353.4
*1.2.15.2	174.8	178.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	353.4
OGF3968 YMP Support For The Training Mission (US	5.6	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6
1.2.15.3	5.6	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6
*1.2.15.3	5.6	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6
**1.2.15	180.4	183.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	364.0
1.2 OPERATING	1068.1	1154.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2222.8
CAPITAL EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GRAND TOTAL	1068.1	1154.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2222.8
FTEs													
FEDERAL	118.1	131.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CONTRACT	7.9	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	126.0	141.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

* Fourth level WBS roll-up

** Third level WBS roll-up

Element ID - ZZ

See the current WBS Dictionary

Resource Distributions by Element of Cost

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	23259	23807	22792	22575	22103	22269	19984	20107	19531	19082	18956	19060	253525
LABOR	954	972	920	920	900	898	795	807	758	752	744	755	10175
SUBS	34	41	39	41	41	37	27	30	32	33	33	26	414
TRAVEL	30	41	38	32	41	33	33	32	26	22	19	15	362
PM&E	25	18	23	36	31	21	20	33	27	15	11	3	263
OTHER	157	159	155	160	151	152	166	157	153	160	144	142	1856
Total BCWS	1200	1231	1175	1189	1164	1141	1041	1059	996	982	951	941	13070

[illegible]

-Yucca Mountain Project

| Estimate to Complete

Fiscal Year 1996	Resource Distributions												Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
BCWS	1200	1231	1175	1189	1164	1141	1041	1059	996	982	951	941	13070
BCWP	1193	1238	0	0	0	0	0	0	0	0	0	0	2431
ACWP	1018	1156	0	0	0	0	0	0	0	0	0	0	2174
ETC	0	0	1204	1209	1187	1165	1083	1070	1011	993	968	961	10851

[illegible]