Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
P.O. Box 98608
Las Vegas, NV 89193-8608

WBS 1.2.9.1.1

SEP 21 1995

Joseph J. Holonich, Chief
High-Level Waste and Uranium
Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBMITTAL OF PARTICIPANTS' MONTHLY STATUS REPORTS (SCPB: N/A)

As you have requested, the U.S. Nuclear Regulatory Commission is on distribution to receive a copy of the Yucca Mountain Site Characterization Project participants' monthly status reports on a regular basis. Enclosed are the Civilian Radioactive Waste Management System Management and Operating Contractor, EG&G Energy Measurements, Inc., Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and U.S. Geological Survey monthly status reports.

If you have any questions, please call April V. Gil at (702) 794-7622.

9512290152 950921
PDR WASTE
WM-11 PDR

Stephan J. Brocoum
Assistant Manager for
Suitability and Licensing

AMSL:AVG-4611

Enclosures: (NOT RECORD MATERIAL)
1. CRWMS M&O Monthly Summary Report, June 1995
2. EG&G/EM Remote Sensing Laboratory Progress Report, July 1995
3. LLNL Monthly Status Report, June 1995
4. LLNL Monthly Status Report, July 1995
5. Los Alamos Monthly Highlights Report, June 1995
6. USGS Progress Report, July 1995

102.8
WM-11
NH03

1 Ltr. Encl.

Change: RCP 1 0
delete: NMSS/HLWR

YMP-5

270086

cc w/encls:
A. B. Brownstein, HQ (RW-36) FORS
W. D. Barnard, NWTRB, Arlington, VA
R. I. Holden, National Congress of American Indians, Washington, DC
Elwood Lowery, Nevada Indian Environmental Coalition, Reno, NV
R. R. Loux, State of Nevada, Carson City, NV
Bob Price, State of Nevada, Carson City, NV
Cyril Schank, Churchill County, Fallon, NV
D. A. Bechtel, Clark County, Las Vegas, NV
J. D. Hoffman, Esmeralda County, Goldfield, NV
Eureka County Board of Commissioners, Eureka, NV
B. R. Mettam, Inyo County, Independence, CA
Lander County Board of Commissioners, Battle Mountain, NV
Jason Pitts, Lincoln County, Pioche, NV
V. E. Poe, Mineral County, Hawthorne, NV
L. W. Bradshaw, Nye County, Tonopah, NV
Florindo Mariani, White Pine County, Ely, NV
P. A. Niedzielski-Eichner, Nye County, Chantilly, VA
William Offutt, Nye County, Tonopah, NV
C. L. Sisco, M&O/TRW, Washington, DC

cc w/o encls:
R. A. Milner, HQ (RW-30) FORS
C. E. Einberg, HQ (RW-36) FORS
Samuel Rousso, HQ (RW-40) FORS
M. S. Delligatti, NRC, Washington, DC
P. M. Dunn, M&O/TRW, Vienna, VA

see enclosure in packet

WBS: 9.3.7
QA: N/A

Civilian Radioactive Waste Management System
Management & Operating Contractor

Monthly Summary Report

June 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

EXECUTIVE SUMMARY

General Managers's Summary:

Management & Operating Contractor (M&O) progress was again highlighted by the Tunnel Boring Machine (TBM) tunneling over 800 feet and setting another progress record for the second straight month. The TBM passed the 1000 meter mark in the process and is now 7 weeks ahead of schedule. Steel set inventories are currently lower than desired. Recent and scheduled deliveries of steel sets should eliminate any potential impact to tunneling.

The M&O continued to focus on integration and prepared documents addressing three fundamental strategies: Thermal Loading; Disposal Criticality Control; and Licensing. The documents will guide further work on these top-level issues.

Important deliverables for the month included "The Benefits of Full Versus Partial Burnup Credit," the "Evaluation of Dual-Purpose Canisters in the Civilian Radioactive Waste Management System," and the final "Notice of Inquiry, Supplemental Information on Section 180(c) Policy and Procedures."

Waste Package analyses have resulted in a report on preliminary selection of waste package materials, presentations concerning the results of ceramic waste form studies, and criticality risk analysis methodology for commercial spent fuel.

The Multi-Purpose Canister (MPC) subcontract was fully underway with approval or acceptance of four important plans and with meetings between the MPC Contractor and the Nuclear Regulatory Commission (NRC). Acceptable responses to the NRC questions on the structural analyses of the GA-4 and GA-9 casks are being developed, but the schedule for receiving the Certificates of Compliance may be delayed. No impact on the capability to use the GA-4 cask to support an Interim Storage Facility is expected.

Late availability of data on the plutonium waste forms is causing delays in developing the PEIS data inputs, and completing analyses of the different plutonium disposition options. A work-around plan has been submitted to the Office of Fissile Materials Disposition (MD).

Fiscal Year (FY) 1996 funding uncertainties have caused significant concern about developing the FY96 Annual Work Plan. The M&O expended considerable resources this month to address potential funding scenarios and to be prepared for contingencies. Delayed issuance of revised FY96 guidance will make it difficult for the M&O to develop a final plan by October 1, 1995, that could be used as an interim baseline.

Highlights for this reporting period are as follows:

TBM Progress

The tunneling milestone "advance to station 10+60 meters (m)" was achieved on June 16, 1995, 8 weeks ahead of schedule. The TBM advanced from construction station 8+79.6 m to 11+37.9 m or a total of 258.3 m (847.2 feet) and ended the month approximately 7 weeks ahead of schedule.

Strategy Development

Thermal Loading Strategy - Completed several iterations of a top-level proposed OCRWM Thermal Loading Strategy and forwarded the final version to YMSCO. The write-up documents the program's vision for thermal loading, focusing on a preferred higher thermal loading with alternative lower thermal loadings considered in parallel. Follow-on evaluations to determine the implementation details of the strategy will be required upon OCRWM concurrence.

Disposal Criticality Control Strategy - Drafted two "Disposal Criticality Control" strategy documents. One document addressed the "Autocatalytic Events" and the second document concerned itself with the "Disposal Criticality Control Process." The "Disposal Criticality Control Process" briefly outlines the three time-phases of the repository and how the deterministic and probabilistic methods will be applied to each of the repository time phases.

Licensing Strategy - Participated in developing a new strategy for licensing that focuses on obtaining a docket. The revised FY96 priorities emphasize synthesis of previously obtained data to determine license application requirements status versus collecting additional data.

Waste Package Analysis

Ceramic Waste Form Studies - Prepared and presented significant results from the waste package studies for the ceramic waste form (thermal, criticality, shielding) and degraded mode criticality for all waste forms. Prepared comprehensive waste form and package descriptions for the ceramic alternative to be used for repository surface evaluations. This included estimation of the minimum transport cask diameter necessary to contain five ceramic waste canisters.

Waste Package Materials Selection - Prepared a report on preliminary selection of waste package materials in accordance with QAP-3-5, which was approved and submitted to YMSCO on schedule. The report recommended that alloy UNS C70600 be added to the list of materials to be tested. This material is similar to but less costly than alloy UNS C71500, which previously had been recommended for waste packages for high-level waste glass.

Waste Package Criticality Risk Analysis - Presented waste package criticality risk analysis methodology results for commercial spent fuel at the meeting of the DOE steering committee on DOE spent fuel. Established procedures for coordinating criticality risk analysis of DOE spent fuel.

MPC Contract Progress

MPC Plans - Completed reviews and accepted or approved the following four contract deliverables: 1) Westinghouse Milestone Schedule Plan, 2) Sub-Tier Subcontract Management Plan, 3) Revised QA Plan, and 4) Project Management Plan.

MPC Contractor Meetings With the NRC - Held the first Westinghouse, DOE, and NRC meeting on June 8, 1995. Westinghouse held a second meeting with the NRC staff on June 29, 1995, to discuss proprietary design information for the MPC.

Significant Deliverables

Full Versus Partial Burnup Credit - Completed and submitted the Benefits of Full Versus Partial Burnup Credit deliverable to RW-46. The study provides a best estimate of potential benefits to be gained by pursuing full "actinide and fission product" burnup credit. It also, provides burnup credit package loading restriction results based on the actinide-only topical report.

Use of Dual Purpose Canisters - Completed and submitted the Evaluation of the Use of Dual-Purpose Canisters in the CRWMS deliverable to RW-46. The report concludes a Dual-Purpose Canister system has a higher life-cycle cost in the current CRWMS baseline.

Final Notice of Inquiry, Supplemental Information on Section 180(c) Policy and Procedures - Delivered the Final Notice of Inquiry, Supplemental Information on Section 180(c) Policy and Procedures. Document is now in RW concurrence. The document will form a basis for the Notice of Proposed Section 180(c) Policy and Procedures to be published in early 1996.

Performance Measurement Cost and Schedule Variance

WASTE MANAGEMENT SYSTEM

WBS	TITLE	CURRENT MONTH					FISCAL YEAR-TO-DATE					AT COMPLETE		
		BUDGET	EARNED VALUE	ACTUALS	VARIANCE SCHED	VARIANCE COST	BUDGET	EARNED VALUE	ACTUALS	VARIANCE SCHED	VARIANCE COST	BUDGET	PCST	VAR
1.2	TMP	29,370	30,431	39,794	1,061	(9,363)	153,918	154,225	157,123	707	(2,898)	237,325	263,372	(26,047)
3.0	WAST PROJECT	2,428	2,483	1,574	55	919	17,151	16,599	14,684	(552)	1,915	45,287	45,281	6
9.1	PROGRAM QUALITY ASSURANCE	452	452	308	0	144	2,793	2,793	2,445	0	348	3,903	3,607	196
9.2/9.3.2/9.3.3/9.3.5	PROGRAM MANAGEMENT & INTEGRATION	1,778	1,708	2,219	(70)	(511)	12,347	11,939	11,435	(408)	504	17,744	17,662	82
9.3.4/9.3.6	EXTERNAL RELATIONS/INFO RESOURCE MGMT	1,359	1,359	994	0	365	9,432	9,433	8,857	1	576	13,400	13,207	193
9.3.52	YMSCO RENT (Rent for DOE)	0	0	112	0	(112)	0	0	255	0	(255)	0	255	(255)
9.3.7	CONTRACT BUSINESS MANAGEMENT	385	385	385	0	0	6,248	6,248	5,179	0	1,069	15,280	14,246	1,034
1.0.10.11	REPOSITORY IMPACTS	138	138	140	0	(2)	994	990	786	(4)	205	1,287	1,286	1
	TOTAL PROGRAM	35,909	36,962	41,524	1,056	(4,562)	202,483	202,227	200,765	(256)	1,462	334,095	358,906	(24,811)

Variances

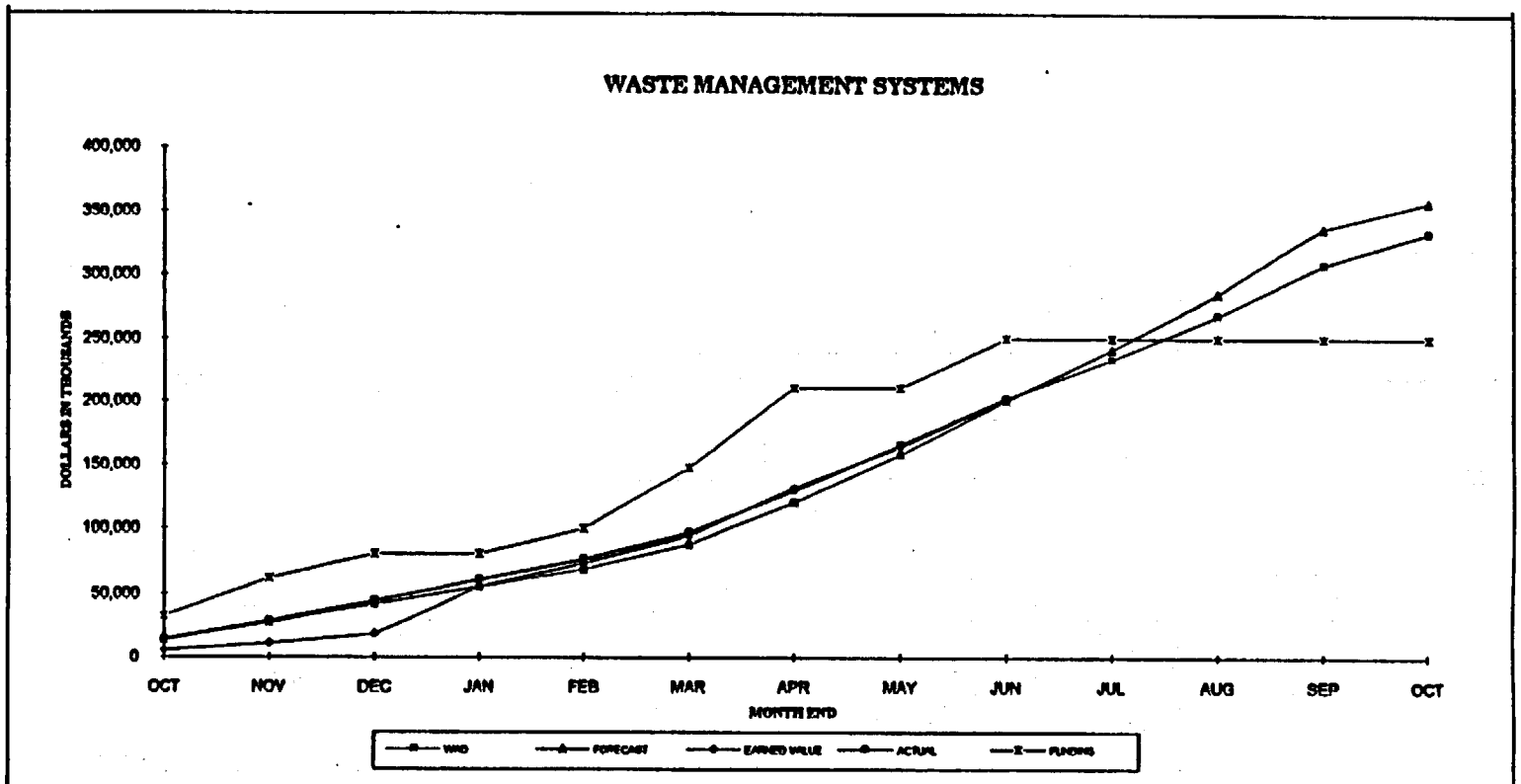
- **CWBS 3.0 Waste Acceptance, Storage and Transportation** - The cumulative cost variance of $1915/11% is due primarily to delayed billings for work performed at the national laboratories, and to late booking of FY94 carryover costs.

- **CWBS 9.1.1 Program Quality Assurance** - The cumulative cost variance of $348K/12% is due to underruns in labor and associated travel and relocation as a result of the audit function transfer in January to OCRWM, the deletion of MPC potential vendor reviews, and the departure of one individual without replacement. There are no program impacts, and no corrective action is required.

- **CWBS 1.0.10 Repository Impacts** - Delayed data is being analyzed on several Repository Impacts task options resulting in the cumulative cost variance of $205K/21%. Based on the current schedule for the PEIS development, only the Existing Reactor, Greenfield Glass, and Greenfield Ceramic options will be analyzed for repository impacts. The M&O and PEIS contractor are working together to establish dates for submission of the analyses.

- All other variances are within tolerance.

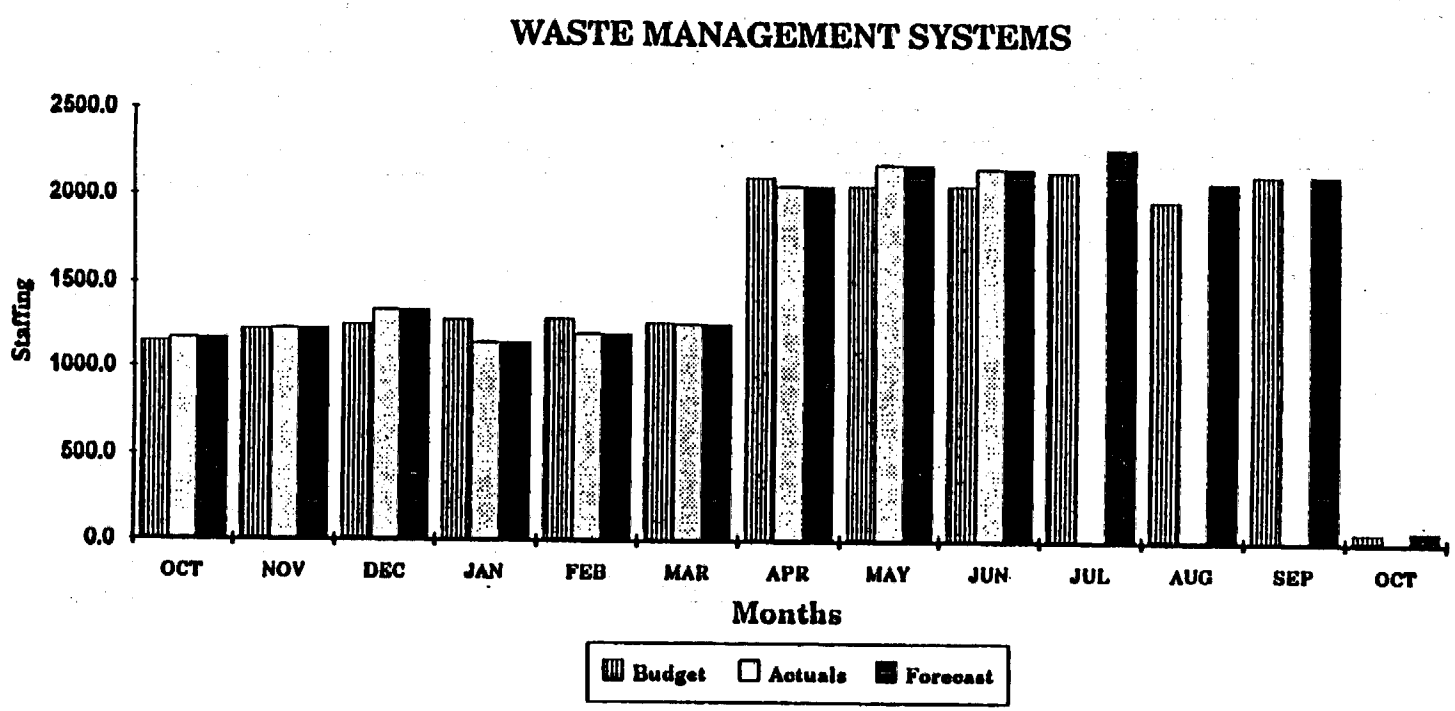
Total Program Financial Status



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	14,136	14,474	15,794	16,500	15,507	20,562	32,830	36,674	35,806	31,565	34,958	39,778	25,291
	FORECAST	13,692	13,630	14,465	13,659	13,613	19,047	32,368	36,747	41,524	41,215	44,002	51,872	21,052
	EARNED VALUE	5,461	5,159	7,951	36,871	17,915	21,087	37,760	33,061	36,962				
	MONTH ACTUAL	13,692	13,630	14,465	13,659	13,613	19,047	32,368	36,747	41,524				
	VAR/SCH	(8,675)	(9,315)	(7,843)	20,371	2,408	905	4,850	(3,613)	1,056				
	VAR/COST	(8,231)	(8,471)	(6,514)	23,212	4,302	2,020	5,392	(5,686)	(4,562)				
CUM	WAD	14,136	28,610	44,404	60,904	76,411	96,973	129,803	166,577	202,483	234,048	269,026	308,804	334,095
	FORECAST	13,692	27,322	41,787	55,446	69,059	88,106	120,494	159,241	200,765	241,980	285,982	337,854	358,906
	EARNED VALUE	5,461	10,620	18,571	55,442	73,357	94,424	132,204	165,265	202,227				
	ACTUAL	13,692	27,322	41,787	55,446	69,059	88,106	120,494	159,241	200,765				
	VAR/SCH	(8,675)	(17,990)	(25,833)	(5,462)	(3,054)	(2,549)	2,301	(1,312)	(256)				
	VAR/COST	(8,231)	(16,702)	(23,216)	(4)	4,298	6,318	11,710	6,024	1,462				
FUNDING	FY95 FUNDING	30,000	59,534	59,534	59,534	79,086	127,047	190,046	190,046	229,866	229,866	229,866	229,866	229,866
	PREV. FUNDED	2,606	2,606	20,992	20,992	20,992	20,992	20,992	20,992	20,992	20,992	20,992	20,992	20,992
	TOTAL FUNDING	32,606	62,042	80,526	80,526	100,066	148,039	211,040	211,040	250,878	250,878	250,878	250,878	250,878

Total Program Staffing

Actuals Thru 6/30/1995



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Forecast	1167.3	1226.3	1337.0	1146.3	1200.1	1257.3	2063.3	2187.4	2167.1	2284.6	2092.4	2138.4	73.9
Budget	1148.5	1222.8	1248.9	1284.1	1290.4	1265.9	2113.9	2065.1	2071.0	2147.9	1983.9	2133.0	61.3
Actuals	1167.3	1226.3	1337.0	1146.3	1200.1	1257.3	2063.3	2187.4	2167.1	0.0	0.0	0.0	0.0

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY i

1. INTRODUCTION 1

1.1 PURPOSE AND SCOPE 1
1.2 ORGANIZATION OF THE MONTHLY STATUS REPORT 1
1.3 PROGRAM MANAGEMENT ANALYSIS CRITERIA 2
1.4 PROGRAM MANAGEMENT PERFORMANCE CRITERIA 2

2. M&O MANAGEMENT STAFF ACTIVITIES 3

2.1 CONTRACTS AND SUBCONTRACTS 3
2.2 FINANCE AND ADMINISTRATION 3
2.3 HUMAN RESOURCES 4
2.4 MANAGEMENT SYSTEMS 4
2.5 ISSUES AND CONCERNS 4

3. MAJOR SYSTEM ACQUISITION PROJECTS 6

3.1 YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT 6

3.1.1 Mined Geologic Disposal System Operations 6
3.1.2 Support Operations 12
3.1.3 Program Management Organization 15
3.1.4 Business Management 17

3.2 WASTE ACCEPTANCE, STORAGE AND TRANSPORTATION PROJECT . 25

3.2.1 Multi-Purpose Canister 25
3.2.2 Transportation System 28
3.2.3 Waste Acceptance 31
3.2.4 Project 34

4. PROGRAM SUPPORT 43

4.1 PROGRAM QUALITY ASSURANCE 43
4.2 PROGRAM MANAGEMENT AND INTEGRATION 49

4.2.1 Systems Integration 49
4.2.2 Regulatory and Licensing 52
4.2.3 Strategic Planning 55
4.2.4 International Waste Management Technology 56
4.2.5 Program Control and Administration 57
4.2.6 Program Management and Integration Variances 59

TABLE OF CONTENTS (Continued)

Page

4.3 EXTERNAL RELATIONS AND INFORMATION RESOURCE MANAGEMENT 69

4.3.1 External Relations 69
4.3.2 Information Management Services 71
4.3.3 External Relations and Information Resource Management Variances . . 74

4.4 REPOSITORY IMPACTS 79

APPENDIX A A-1

APPENDIX B B-1

LIST OF FIGURES

Page

Total Program Financial Status v

Total Program Staffing vi

1. Yucca Mountain Financial Status 18

2. Yucca Mountain Staffing 19

3. Yucca Mountain Key Milestone Schedule 20

4. WAST Project Financial Status 36

5. WAST Project Staffing 37

6. WAST Project Key Milestone Schedule 38

7. Program Quality Assurance Financial Status 46

8. Program Quality Assurance Staffing 47

9. Program Management and Integration Financial Status 60

10. Program Management and Integration Staffing 61

11. Systems Integration Key Milestone Schedule 62

12. Regulatory and Licensing Key Milestone Schedule 64

13. Strategic Planning Key Milestone Schedule 65

14. International Waste Management Technology Key Milestone Schedule 66

15. Program Control and Administration Key Milestone Schedule 67

16. External Relations/Information Resource Management Financial Status 75

17. External Relations/Information Resource Management Staffing 76

18. External Relations Key Milestone Schedule 77

19. Information Management Key Milestone Schedule 78

LIST OF FIGURES (Continued)

Page

20. Repository Impacts Financial Status 81

21. Repository Impacts Staffing 82

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), Information Management Services (IMS), 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 each of the following CWBS areas: Yucca Mountain Site Characterization Project (YMP) and the Waste Acceptance, Storage and Transportation (WAST) Project. In addition, Level 3 Budget and Reporting (B&Rs) for YMP and WAST that exceed the cost or schedule variance thresholds are reported in the Business Management section of YMP and the Project Management section of WAST. For this section, Work Authorization Directive (WAD) Cost and Schedule data charts accompany each WAD paragraph to support variance analysis descriptions.

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), IMS, and Repository Impacts. Cost and schedule variances are reported at the end of each WAD section.

Appendix A, FY95 M&O Major Deliverable Status, identifies all major M&O deliverables as defined in the WADs. It further shows which items were delivered early, on-time, late, and/or have a changed date through the Baseline Change Request (BCR) process.

Appendix B, M&O Monthly Progress/Update Summary, provides monthly financial reporting data representing the B&R cumulative values for budgets, forecasts, Financial Information System (FIS) actuals, and variances.

1.3 PROGRAM MANAGEMENT ANALYSIS CRITERIA

Variance analysis thresholds for FY95 are calculated at the WAD level. These variance thresholds are +/- 10% for the cumulative cost and schedule.

The data is provided as a cost graph at the WAD level. Graphs are also provided at CWBS levels 2 and 3 for areas that contribute to a variance breaking a threshold at the WAD levels. The data contained in the graph represents budget, earned value, and forecast for new FY95 work, approved deferred work from FY94, and carryover work for FY94. The actual costs represent all of the above plus the FY94-95 carryover. Cost graphs also depict FY95 funding, previously funded values (FY94-95 deferred and carryover work), and a total with the two funding sources combined.

Basic and award fees will be shown in Appendix B, B&R #DB093700, Contract Business Management, which includes lease termination funds. These fees have not been budgeted nor booked since the FY95 Annual Plan and Fee Proposal have not been negotiated.

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

- Reviewed status of the basic prime contract statement of work (SOW) with RW-14 and DOE Procurement. The focus was to completely revise the SOW, first developed in FY91, to reflect the changes in the program. DOE Procurement does not want to revise the SOW. Procurement's direction is to amend the preamble of the basic SOW to recognize the annual Work Authorization Directive (WADs) as the DOE's yearly affirmation of the M&O's workscope falling under the generic SOW. The preamble will also recognize that the Work Breakdown Structures (WBSs) found in the basic SOW could be changed by the WADs.

- Provided back-up detail to DOE in support of the deobligation of Sandia National Laboratories (SNL) contract value and funding obligation to TRW. The Albuquerque field office deobligated $4.5M from the SNL contract. The internal (PR) is in the signature process to provide the $4.5M in funding to TRW.

Subcontracts

- Prepared and sent an SAIC definitization package to the DOE Administrative Contracting Officer at the request of the Contracting Officer.

- Forwarded the Integrated Resources Group (IRG) definitization package to the DOE Contracting Officer. Prepared and sent an additional package for the Administrative Contracting Officer (ACO).

Purchasing

- Placed orders for latex gloves and binders with M&M Office Suppliers, a minority woman-owned business, in a continuing effort to place orders locally in Las Vegas and to reduce our supplier base outside of Nevada.

2.2 FINANCE AND ADMINISTRATION

- Submitted initial Program Management and Integration (PM&I) budgets for FY96 to DOE Administrative Contracting Officer (ACO).

- Worked with field offices, DOE HQ, and the DOE Contracting Officer to ensure that the Albuquerque field office has adequate funding for Sandia and Los Alamos National Laboratories.

2.3 HUMAN RESOURCES

- Assumed training responsibilities for OCRWM procedures QAP-16.1Q and QAP-16.2Q for the YMP. Coordinated training with the United States Geological Survey (USGS) and National Laboratories.

- Distributed M&O Affirmative Action Policy and Sexual Harassment Statements to all employees.

- Facilitated meeting on employee opinion survey action plans with senior management. Reviewed organization's action plans and agreed upon key organizational issues.

- Held Diversity Awareness Training for managers in Las Vegas.

- Submitted the Contractor Salary - Wage Increase Report for our non-exempt population to DOE.

2.4 MANAGEMENT SYSTEMS

- Completed corrective actions for and closed 11 open Corrective Action Plan (CAP) deficiencies resulting from the periods 3 and 4 Performance Award Fee Determinations. The period 5 Performance Award Fee Determination resulted in 15 new CAPs, leaving a total of 31 open CAPs.

2.5 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 Mined Geologic Disposal System Operations

MANAGER: R. M. Sandifer

OBJECTIVE(S): Provide overall Systems Engineering services in support of the Yucca Mountain Site Characterization Project (YMP). Provide strategic planning and technical integration for the YMP.

3.1.1.1 Progress During Report Period

Advanced Conceptual Design Project Engineering

- Reviewed and assembled comments for the planned Waste Package, Repository, and Systems Engineering workscopes for FY96, focusing on integration among the Mined Geologic Disposal System (MGDS) development activities and interfaces with other internal project organizations. Initiated planning discussions with interfacing program organizations. The comments will be used to enhance the next iteration of workscope descriptions for each Work Breakdown Structure (WBS) element with particular attention to those workscopes supporting or requiring support from other WBS elements.

- Completed a preliminary draft of the MGDS design integrated schedules for FY96 through the 2001 License Application. Developed a three-pronged approach to schedule development involving a logic diagram-driven methodology, an activity-driven methodology, and a systems requirements-driven methodology. The three approaches can be overlaid upon each other to ensure consistency and to improve the strength of the final schedules developed. Completed a top level strawman version of a systems requirements-driven schedule. Completed a rough draft of a design logic flow emphasizing the minimum requirements for docketing a license while keeping the ultimate construction and long-term use of the system in sight. This activity is coordinated with and supports a project-wide initiative to develop licensing schedules considering expected reductions in funding. This activity also satisfies a long-standing Yucca Mountain Site Characterization Office (YMSCO) request to develop long-term MGDS integrated schedules. Scheduling support issues associated with this activity were successfully resolved, and a status briefing was provided to YMSCO.

- Completed several iterations of a top-level proposed OCRWM Thermal Loading Strategy and forwarded the final version to YMSCO. The write-up documents the program's vision for thermal loading, focusing on a preferred high thermal loading with viable risk-mitigating alternative thermal loadings developed in parallel. Follow-on evaluations to determine the implementation details of the strategy will be required upon OCRWM concurrence.

MGDS Development

- Performed X-ray diffraction analysis on partially oxidized spent fuel samples subjected to dissolution under semi-static conditions. The analysis showed the presence of only UO_2 and U_4O_9, with no U_3O_8 or other uranium-bearing phases. It was also observed that the grain boundaries were weakened as a result of the exposure to dissolution.

- Drafted two "Disposal Criticality Control" strategy documents. One document addressed the "Autocatalytic Events" and the second document concerned itself with the "Disposal Criticality Control Process." The "Disposal Criticality Control Process" briefly outlines the three time-phases of the repository and how the deterministic and probabilistic methods will be applied to each of the repository time phases.

- Initiated cyclic polarization testing to determine critical potentials for passive film breakdown and repassivation. This work will serve as a basis for the experimental program on long-term corrosion testing under electrochemical control.

- Prepared and presented significant results from the waste package studies for the ceramic waste form (thermal, criticality, shielding) and degraded mode criticality for all waste forms. Prepared presentation materials to be used by management. Prepared comprehensive waste form and package descriptions for the ceramic alternative to be used for repository surface evaluations. This included estimation of the minimum transport cask diameter necessary to contain five ceramic waste canisters.

- Prepared a report on preliminary selection of waste package materials in accordance with QAP-3-5, which was approved and submitted to YMSCO on schedule. The report recommended that alloy UNS C70600 be added to the list of materials to be tested. This material is similar to but less costly than alloy UNS C71500, which previously had been recommended for disposal containers for high-level waste glass.

- Held a coordination meeting between Waste Package Development and WAST to review the Spent Nuclear Fuel (SNF) loading for the Westinghouse Multi-Purpose Canister (MPC). Loading curves will be generated to provide the burnup and initial SNF enrichment that can be loaded into the MPC. From early calculations, a subset of the first 10 years of discharge SNF will be acceptable.

- Analyzed waste relocation after 100 years (compressing 100 Metric Tons of Uranium (MTU)/acre to 200 MTU/acre). Created and implemented a methodology for specifying a periodic boundary condition in the 3-D thermal analysis.

- Presented waste package criticality risk analysis methodology results for commercial spent fuel at the meeting of the DOE steering committee on DOE spent fuel. Established procedures for coordinating criticality risk analysis of DOE spent fuel.

- Performed an interdiscipline review of the As Low As Reasonably Achievable (ALARA) Program on June 23, 1995. This is in support of the ALARA Analysis Update Report, TM438, which was delivered on schedule to YMSCO.

- The "Emplacement Mode Evaluation Report," TM540, will be issued to YMSCO on schedule. This evaluation has significant implications for waste package development.

- Completed review draft of Nevada Line Procedure (NLP)-3-28 "Check Lists for Design Products" and distributed it for review.

- Conducted sixth classroom briefing training for NLP-3-10, "Preparation of Field Change Requests and Baseline Change Proposals for Field Changes to Engineering Drawings and Specifications," Revision 4. Over 50 individuals have received the training.

Construction Management

- The tunneling milestone "advance to station 10+60 meters (m)" was achieved on June 16, 1995, 8 weeks ahead of schedule. TBM progress during the reporting period increased slightly compared to the previous period. Daily TBM advance rates averaged 10.33 m per day for the month; progress during the best week averaged 19.22 m per day. The TBM advanced from construction station 8+79.6 m to 11+37.9 m or a total of 258.3 m (847.2 feet). The tunnel excavation is currently ahead of schedule by approximately 7 weeks. TBM production remained steady even though alcove #2 was also under construction. Alcove #2 has advanced to station 00+38.5 m or 126.28 ft. Ground conditions alternated from Category 1 (Rock Bolts) to Category 4 (Steel Sets). Currently, the ground conditions are requiring the contractor to use Ground Support Category 4. Fifty-nine steel sets were installed this period, and 531 sets have been installed to date.

- Surface construction continued with progress to the Switchgear building, Change House building, access road for the surface conveyor, the bent foundations for the surface conveyor, and Booster Pump Station. The water tanks are ahead of schedule. The overall surface construction gained a week during the reporting period and is now approximately 11 weeks behind compared with 12 weeks reported last period.

System Engineering

- Completed the QAP-3-1 review of the "Seismic Design Methodology for a Geologic Repository at Yucca Mountain," Topical Report YMP/TR-0030NP. This report is the second in a series of three reports to develop and define the seismic design loading that will be used by the Yucca Mountain Geologic repository Operations Area structures, systems, and components.

- Completed the Calico Hills System Study and published the draft report titled "Calico Hills Needs and Access Study Report." This report was submitted to YMSCO to satisfy contract deliverable TM112.

- Held the MGDS Project Systems Engineering Management Plan (SEMP) Revision Kick-off meeting on June 8, 1995. The purpose of the meeting was to brainstorm the System Engineering process and the draft outline to the SEMP revision.

- Briefed YMSCO on the need for a DOE Human Factors Design Guideline. The briefing ended in an understanding that Specialty Engineering needs the ability to identify Human Factors Engineering (HFE) design input requirements.

- Completed the following Determination of Importance Evaluation (DIE) activities: Category II DIE for "Underground - Southern Nevada - Waste" (USW) WT-11 Workover and Pump Test, Revision 00; Category II DIE for Geologic Mapping, Revision 00; Category I DIE for Engineered Barrier Large Block Test (Fran Ridge), Revision 00; and Category II DIE for Modification/Construction of Ghost Dance Fault Trenches (GDF-T)3 [GDF-T3A] and GDF-T4, Revision 1.

- Initiated the Revision 1 effort for the (ESF) Concept of Operations. Chaired the first of a series of meetings in which the team responsible for the initial document is developing responses to the comments received from the QAP 6.2 review by YMSCO. Completed responses to comments received from Assistant Manager of Suitability and Licensing (AMSL), which represents approximately one-third of the total number of comments.

Site Investigations

- Continued preparation support to the Project Implementation Plan. Developed workscopes, schedules, bases of estimate, and deliverable criteria statements for the WBS 1.2.3 target budget. Responded to the possibility of a significantly reduced budget for FY96; participated in developing a new strategy for licensing focusing on obtaining a docket. Revised FY96 priorities for a new strategy. New priorities emphasize synthesis of previously obtained data to determine license application requirements status. Data collection is given a lower priority than synthesis of available data.

Regulatory and Technical Evaluation

- Discussed potential changes in the Exploratory Studies Facility design process with YMSCO and members of the (NRC's) onsite representative office. The DOE will be generating small, discrete design products rather than large design packages. External groups, such as the NRC and affected units of government, will not be involved in the official external review process. However, they would still receive the design products for their information. The onsite representatives provided favorable feedback on the proposed changes, which have also been discussed with NRC headquarters personnel.

- Delivered Progress Report #12 to DOE/HQ on June 23, 1995, for concurrence.

- Coordinated and participated in the DOE-NRC Technical Exchange on Engineered Barrier System (EBS) Release Rates and Waste Form Testing on June 28-29, 1995. The NRC expressed concern that the DOE has not addressed performance allocation for each EBS component, in particular the waste form, and suggested this was required to comply with the requirements of 10 CFR 60.21. The NRC also stated it will focus on Key Technical Issues important to waste isolation.

- Completed and delivered the "Estimation of the Extent of the Disturbed Zone Around a Repository Drift Caused by Excavation and Thermal Loading" report to DOE for the Ground Water Travel Time working group.

ESF Site Project Engineering

- Completed a revision to the Calico Hills shaft option recommendation in an effort to reduce schedule impact. Based on YMSCO direction, completed and staffed a letter to the Architectural Engineer (A/E) with Assistant General Manager approval, to start a plan for the development of a performance specification supporting the alternate Calico Hills shaft option. Supported development and presentation of the Calico Hills Option plan to DOE Assistant Manager of Engineering and Field Operations (AMEFO).

- Prepared a memo documenting the sequence of events from the tripping of the drive motors for the hydraulic drill motors on the TBM to the eventual discovery of the problem that resulted in power fluctuations at the ESF pad on June 5-6, 1995. The problem that caused the power failure was an open disconnect switch on one of the phases of the power line at the Canyon Substation. The system has operated normally since the switch was closed. The single phase disconnect switches will be replaced with gang-operated three-phase disconnects in the next 2 months as part of the Canyon Substation upgrade work.

- The site power problems on June 5-6, 1995 brought to light the potential impact to the program of extended power outages. The transformer at Substation 25-16 can be a critical single point failure. Since there are no spares currently available for this transformer, the following options to provide a spare transformer are being pursued:

  - REECo has requested DOE Nevada Test Site Operations (NTSO) purchase a spare transformer. Issuance of a purchase order, fabrication, and delivery will take approximately 20 weeks.

  - The M&O design group is checking with suppliers who lease equipment to determine if a compatible transformer can be located and leased immediately.

  - The M&O design group is checking with other end users to determine if a transformer can be borrowed on an emergency basis.

  - The project has a 69/4.16 kV 10 Reactive Megavolt Ampere (MVA) transformer on the REECo surplus list. The possibility of having this unit rewound as a spare unit is being investigated.

  - M&O Construction and Operations Project Engineering was requested to develop a workaround in the event of a failure of the transformer at Substation 25-16 until a replacement can be obtained. A review of the Nevada Test Site (NTS) system resulted in a proposal to extend the 12.47 kV line from Substation 25-15 to the ESF pad. This would make a power source available if the 10 MVA transformer failed. The current load at Substation 25-15 is less than .05 MVA on the 2 MVA transformer. This available

capacity will handle the current 1.5 MVA demand at the ESF pad until the replacement transformer is delivered and installed.

- Prepared a draft letter for YMSCO requesting DOE NTSO extend the 12.47 kV line from substation 25-15 to the ESF pad, and directed REECo to purchase a used transformer located by DOE NTSO.

- The agreement for the loan of the Nevada Power Company transformer being used at the 25-16 Substation runs until December 31, 2003, with the condition that DOE NTSO not contract with another utility to supply power to NTS. Since negotiations are currently in progress for the contract to supply power to NTS, the potential exists to lose the loan of the transformer from Nevada Power Company. The 69 kV Task Force requested DOE Project Development and Management Division (PDMD) begin negotiations with Nevada Power Company to purchase the loaned transformer.

- Established a schedule and budget for DOE NTSO to begin breaker change-out work for Substation 25-16 on Monday June 26, 1995. The initial plan was to remove the breakers from Jackass Flats Substation and Substation 25-16 simultaneously and then install the breaker from Jackass Flats at Substation 25-16 with the system being re-energized on July 2, 1995. After discussion between REECo and Kiewit it was agreed that the outage of Substation 25-16 would be delayed because of concerns about running the diesel generators for three shifts per day during the outage time. Scheduling and execution of the breaker change out work for Substation 25-16 is postponed until an alternative is agreed upon.

- Prepared a briefing paper concerning ESF tunneling costs in response to a Congressional request.

Product Integrity

- Reviewed eleven products from the ESF and systems organization as part of and developed many recommendations. A meeting was held with all Office Managers who have recommendations outstanding. The meeting reviewed individual recommendations and the Office Managers discussed proposed resolutions. Additional meetings will be held as necessary.

- Performed a field investigation regarding the installation and inspection of steel sets. A report documenting the findings is in progress.

3.1.1.2 Issues and Concerns

- The steel set inventory is a concern. Sixty additional sets were delivered on July 26, 1995, and should be sufficient to avert a work stoppage. Concern remains, however, because of continuing vendor delivery delays. The ground conditions are currently category 4, and steel sets are required.

3.1.2 Support Operations

- **MANAGER:** D. K. Chandler

OBJECTIVE(S): Provides the products and services to support the 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.

3.1.2.1 Progress During Report Period

Information Management

- Trained the Lawrence Livermore National Laboratory (LLNL) Report Package Collection (RPC) staff on retrievals and accessioning. Each remote site will begin identifying records that need to be accessioned after training is completed. The accuracy of records indexed will be increased and retrievability will be enhanced, because the remote site will have more input regarding the processing of their records. Training for United States Geological Survey (USGS) and Los Alamos National Laboratory (LANL) has been scheduled.

- Completed the Policy and Procedures Department (PPD) "Document Control Database" and submitted process documentation to YMSCO for their review and acceptance. PPD loaded all Quality Affecting Documents into the document Control Database in Lotus Notes, providing affected organizations with access to "electronic controlled copies" of all Quality Affecting Documents.

Environmental Safety and Health

- Transmitted the Site Environmental Report for calendar year 1994 to DOE Office of Environment, Safety and Health as required by DOE Order 5400.1. This report summarizes the YMP environmental program's successful compliance with environmental requirements and significant programs and efforts during the year.

- Received Nevada Operations Office permit approval to operate two new seismic stations at the Nevada Test Site on Red Mountain and Twin Peaks.

- Submitted the C-Well remediation of hydrocarbon contaminated soils final closure report to the Nevada Division of Environmental Protection.

- Submitted the DOE YMP Waste Minimization Pollution Prevention Plan to the Plans and Procedures Department for distribution as required by DOE Order 5400.1. This plan outlines how the CRWMS M&O minimizes waste and pollution by recycling and properly disposing of hazardous waste.

how the CRWMS M&O minimizes waste and pollution by recycling and properly disposing of hazardous waste.

- Submitted revisions to the draft OCRWM Environment, Safety and Health Management Plan (Fiscal Years 1997-2001) to the Assistant Manager for Environment, Safety and Health (AMESH) for transmittal to RW-36.

- Formed the YMP CRWMS M&O Contractor Employee Safety and Health Committee (ESHC). The ESHC provides a forum for discussion of safety and health issues ranging from policy to specific worksite issues.

- Submitted a Corrective Action Verification Report to the AMESH stating that all findings of the EG&G Energy Measurements environmental audit met YMSCO environmental program requirements and recommending the audit be closed.

- Submitted the draft document titled "Land Use Profile: Clark and Nye Counties, Nevada" to the AMESH for review. This profile focuses upon the land use characteristics of Clark and Nye counties and provides a background for understanding land use planning and management within the two counties.

Institutional and External Affairs

- Provided eight public speaking presentations, including five educational and three general YMP overview presentations, for a total attendance of 937 people.

- Coordinated and conducted 9 tours to Yucca Mountain for a total of 48 guests. A Public Open House tour was also conducted for 92 guests. Of special interest were media tours for guests from Arizona Silver Belt Newspaper and for two guests from the Japanese media, and a tour for a guest from Taiwan Power Company.

Training

- Continuing to work training database implementation requirements.

- Continuing to reduce records backlog. Working with Information Resources Management (IRM) to ensure easy transfer of data from all existing databases.

- Conducted the following training classes:

  - Facilitation Skills
  - Teambuilding
  - Effective Listening
  - Managing Change
  - Computer Security Awareness
  - M&O Program Indoctrination
  - TQM Awareness
  - M&O Project Overview

- QAP-2.8Q
- Intro to Federal Records
- Module III, Files Management
- CRWMS M&O Overview
- Seven Habits class
- Initial Instructor
- General Employee Training (GET)
- GET Annual Refresher Test
- General Employee Recertification Training (GERT) Recertification Test
- Exploratory Studies Facility Visitor's Briefing
- Standard First Aid
- General Underground Training (GUT)
- YMP Orientation
- Estimate at Complete
- Cost Estimating
- Records - IRIS
- Records - RIDS

3.1.2.2 Issues and Concerns

- None.

3.1.3 Program Management Organization

MANAGER: R. G. Vawter

OBJECTIVE(S): The Project Management Organization (PMO) provides management support services to the YMSCO by preparing short- and long-term Technical Implementation Plans, integrated project schedules, and draft budget documents for DOE use in its Office of Management and Budget (OMB) and Internal Review Budget (IRB) budget process. The PMO facilitates YMSCO monthly management meetings and prepares YMSCO managers for the Directors Program Review meeting. PMO staff assist YMSCO in monitoring individual participant progress through operating the Planning and Control System (PACS) and through monthly budget and schedule performance analysis. The PMO facilitates YMSCO baseline management through its support of the Level 2 Configuration Control Board (CCB). The PMO provides individual WBS Level 3 Integrators to ensure coordination of each functional work area.

3.1.3.1 Progress During Report Period

- Initiated preparation of Options Analyses addressing the potential site suitability evaluation process and Technical Site Suitability (TSS) successor scenarios for AMSL.

- Initiated preparation of a summary document that identifies DOE commitments to its stakeholders and to the public that result from the development and implementation of OCRWM's Process for Evaluating the Suitability of the Yucca Mountain Site for Development as a Repository for High-Level Radioactive Waste and Spent Nuclear Fuel for AMSL.

- Submitted Change Request (CR) 95/219 for the project rebaseline to the YMP Change Control Board (CCB) June 16, 1995, as requested by the Deputy Project Manager. The CR is for a complete revision to YMP/CM-0015, Project Cost and Schedule Baseline, and reflects the YMSCO portion of the Program Plan. The revision will contain historical costs, projected cost to complete, the complete Project Summary Schedule, and the level 2 milestone criteria. In preparation for CCB action, the rebaselining process and results were briefed to the CCB members in the Project Manager's staff meeting June 20, 1995.

- The Licensing Support System (LSS) Technical Working Group (TWG) met in Dallas, Texas, June 14-15, 1995, to review the LSS Functional Requirements Document Phase II. Comments were incorporated, and these requirements will be presented to the LSS Advisory Review Panel (LSSARP) in Green Bay, WI, July 6, 1995. The agreed-upon LSS requirements will permit the make or buy analysis to proceed as scheduled.

- Developed an analyses to address two of the issues arising from the TWG meeting of June 14-15, 1995: the impact upon the LSS design and development if 1) the transition from black and white to color is made and 2) remote locations for affected local government units, in addition to those identified in the rule, are added to the system.

- Met with NRC staff on June 28, 1995, to discuss definition of LSS milestones. This is one of the steps identified in the draft Memorandum Of Understanding (MOU) for design and development of LSS.

- Prepared the DOE Records Information System (RIS) presentation to be presented to the LSSARP describing the RIS access and capability that DOE is going to make available to the NRC and other interested parties. The LSSARP meeting is scheduled for July 5-6, 1995, at Green Bay, WI.

- Performed the ESF Layout Calculation design review, which is part of the ESF Main Drift Design Analysis External review package for AMSL.

3.1.3.2 Issues and Concerns

- None.

3.1.4 Business Management

MANAGER: D. B. Abel

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

3.1.4.1 Progress During Report Period

Project Management

- Submitted the "Super" Cost/Schedule Change Request (C/SCR) to the Project CCB incorporating Cost Accounting Standard (CAS) 402, contractor consolidation, mid-year review direction, and revised scope and deliverables based on current-level staffing.

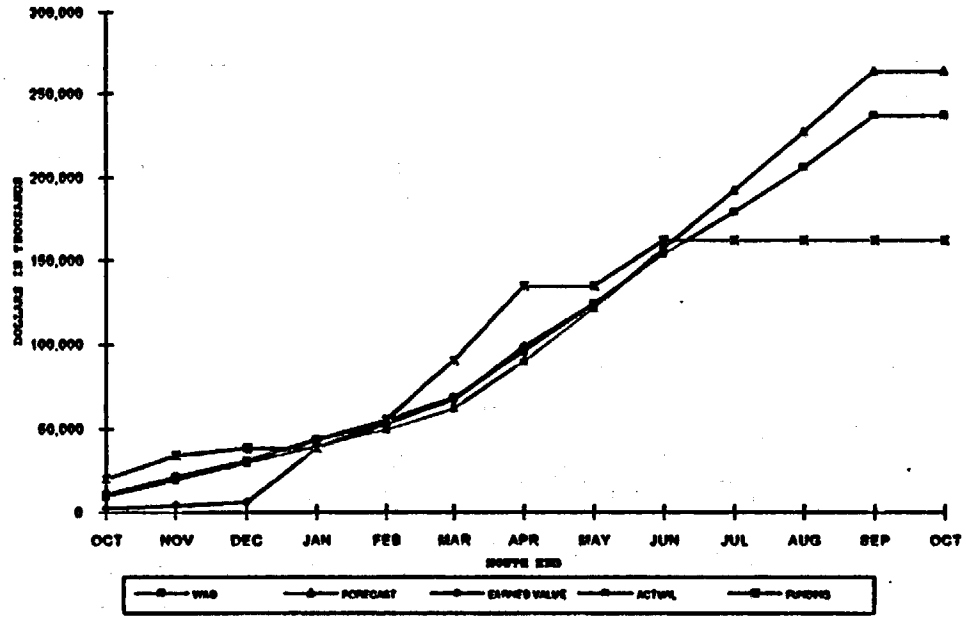
3.1.4.2 Issues and Concerns

- None.

3.1.4.3 Variances

- All variances are within tolerance.

CWBS 1.2 YUCCA MOUNTAIN SITE-CHARACTERIZATION PROJECT (YMP)

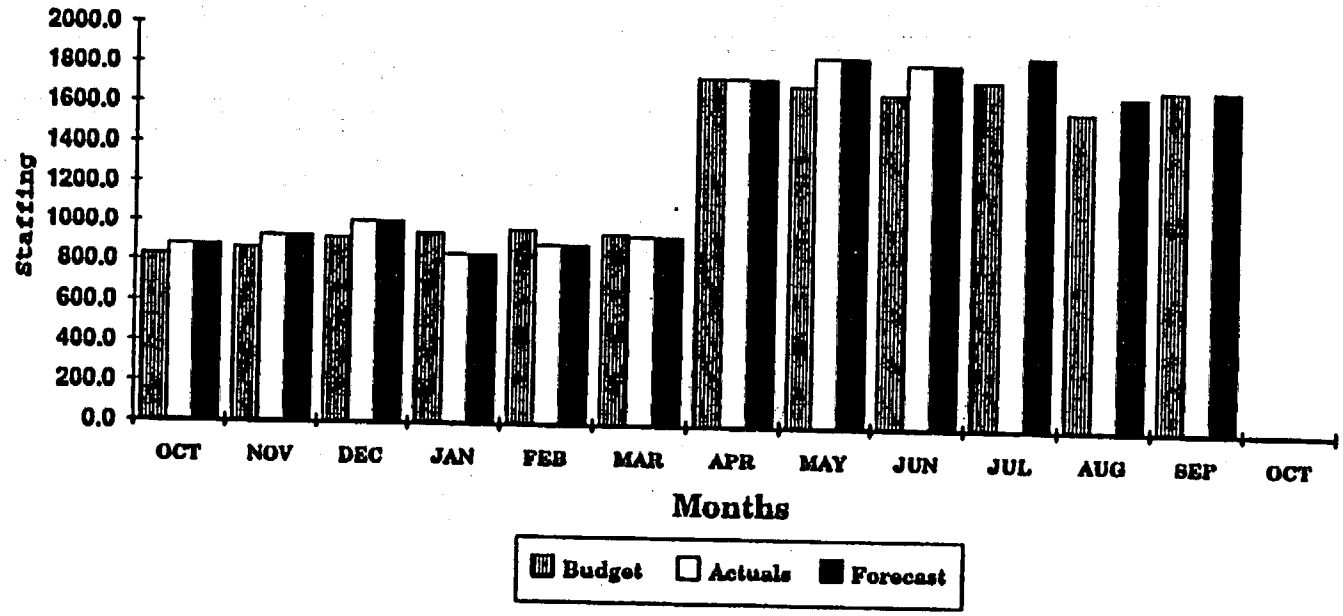


		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	10,591	10,616	9,823	12,165	11,523	13,301	27,399	28,716	29,370	25,436	27,034	31,337	0
	FORECAST	9,472	9,763	10,639	9,409	10,240	12,291	26,195	31,310	35,794	34,721	35,142	36,384	2
	EARNED VALUE	2,121	1,839	1,976	22,835	13,922	14,100	31,898	25,105	30,431				
	MONTH ACTUAL	9,472	9,763	10,639	9,409	10,240	12,291	26,195	31,310	35,794				
	VAR/SCH	(8,470)	(9,777)	(7,847)	20,630	2,399	799	4,497	(3,605)	1,061				
	VAR/COST	(7,351)	(7,924)	(8,663)	23,426	3,682	1,810	3,701	(6,205)	(5,363)				
CUM	WAD	10,591	21,207	31,030	43,216	54,739	68,039	95,438	124,148	153,518	178,954	205,988	237,325	237,325
	FORECAST	9,472	19,235	29,894	39,303	49,543	61,824	90,019	121,329	157,123	191,844	226,986	263,370	263,372
	EARNED VALUE	2,121	3,960	5,936	28,771	42,693	56,793	88,688	123,794	154,225				
	ACTUAL	9,472	19,235	29,894	39,303	49,543	61,824	90,019	121,329	157,123				
	VAR/SCH	(8,470)	(17,247)	(25,094)	(4,444)	(2,045)	(1,246)	3,231	(354)	707				
	VAR/COST	(7,351)	(15,275)	(23,938)	(532)	3,150	4,969	8,670	2,465	(2,898)				
FUNDING	FY95 FUNDING	20,000	34,055	34,055	34,055	50,916	66,165	130,269	130,269	157,716	157,716	157,716	157,716	157,716
	PREV. FUNDED	0	0	4,360	4,360	4,360	4,360	4,360	4,360	4,360	4,360	4,360	4,360	4,360
	TOTAL FUNDING	20,000	34,055	38,415	38,415	55,176	70,525	134,649	134,649	162,076	162,076	162,076	162,076	162,076

Figure 1. Yucca Mountain Financial Status

Actuals Thru 6/30/1995

CWBS 1.2 YUCCA MOUNTAIN SITE-CHARACTERIZATION PROJECT (YMP)



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Forecast	877.2	929.3	1005.4	838.2	893.2	940.7	1744.3	1860.3	1831.1	1876.3	1677.6	1717.4	0.0
Budget	829.0	864.6	922.0	946.8	966.9	951.8	1747.2	1711.4	1678.1	1749.3	1599.3	1713.4	0.0
Actuals	877.2	929.3	1005.4	838.2	893.2	940.7	1744.3	1860.3	1831.1	0.0	0.0	0.0	0.0

Figure 2. Yucca Mountain Staffing

Figure 3. Yucca Mountain Key Milestone Schedule

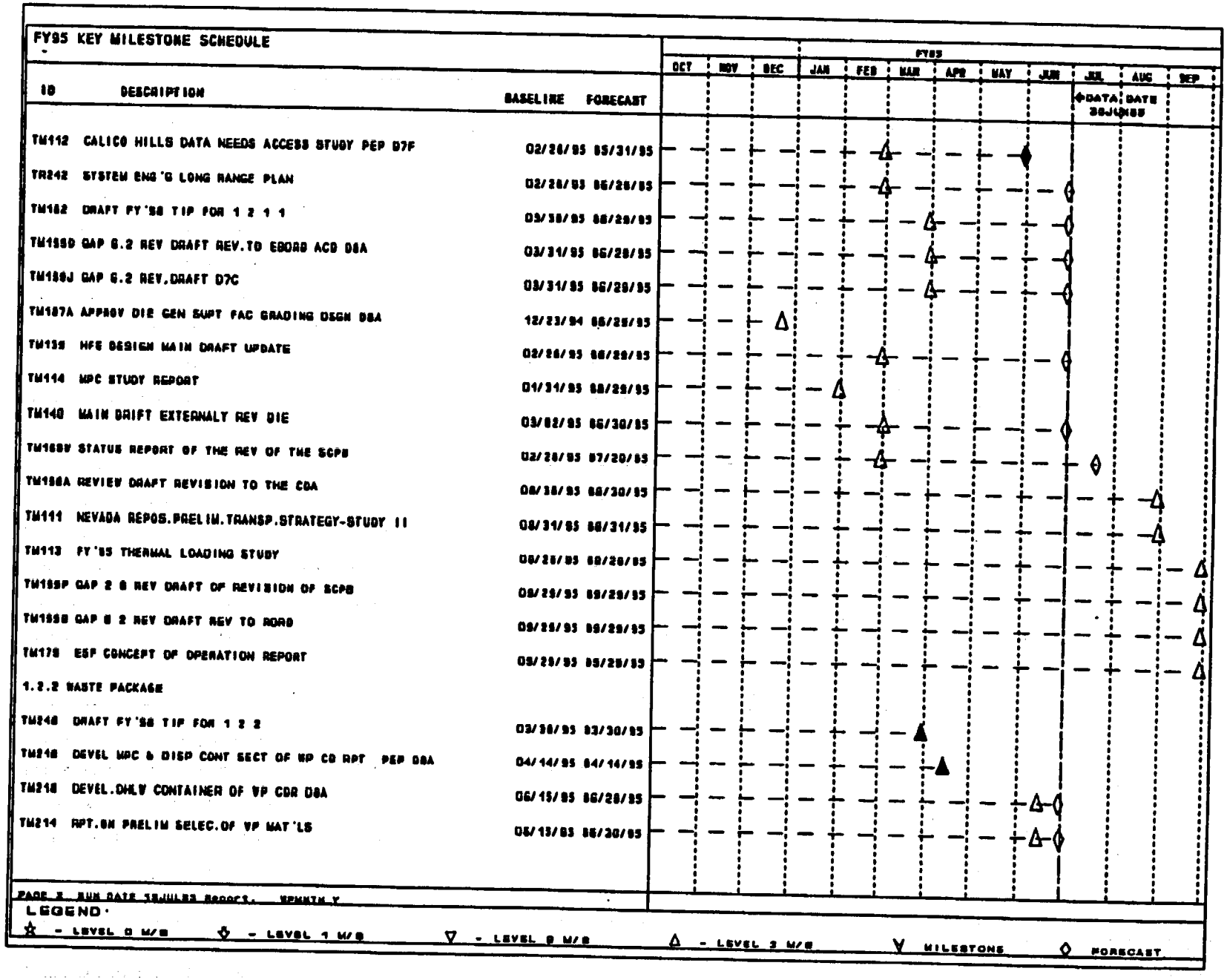


Figure 3. Yucca Mountain Key Milestone Schedule (Continued)

Figure 3. Yucca Mountain Key Milestone Schedule (Continued)

Figure 3. Yucca Mountain Key Milestone Schedule (Continued)

Figure 3. Yucca Mountain Key Milestone Schedule (Continued)

INTENTIONALLY LEFT BLANK

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 related to development of the Multi-Purpose Canister (MPC) Subsystems and Dry Transfer System (DTS). 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 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

- Completed reviews and accepted or approved the following four contract deliverables: 1) Westinghouse Milestone Schedule Plan, 2) Sub-Tier Subcontract Management Plan, 3) Revised Quality Assurance (QA) Plan, and 4) Project Management Plan. Provided the Burnup Credit Topical report to the supplier and conducted a meeting providing overviews on the methods contained in the topical report. In addition, held the first Westinghouse, DOE, and Nuclear Regulatory Commission (NRC) meeting on June 8, 1995. Westinghouse held a second meeting with the NRC staff on June 29, 1995, to discuss proprietary design information for the MPC.

- Participated with Quality Assurance Technical Services Support (QATSS) in QA audit scoping visits of the Westinghouse GESCO, Sunnyvale, CA; Westinghouse Science Engineering Group (SEG), Oak Ridge, TN; and Chem-Nuclear, Columbia SC. Also participated with QATSS in Westinghouse SEG's QA audit of Westinghouse Energy Systems Business Unit (ESBU) in Pittsburgh, PA.

- Began preparation of the DOE/NRC QA management meeting scheduled for July 13, 1995. This meeting with the NRC will outline DOE's management of the MPC contract and Quality Assurance responsibilities.

- Provided MPC Subsystem presentation to Nuclear Waste Technical Review Board (NWTRB) on the proposed Westinghouse design.

- Initiated and completed the burnup credit worth study "Benefits of Full Versus Partial Burnup Credit" for RW-46. The study evaluated potential benefits of full and partial burnup credit for transportation, storage, and disposal. The study provides a best estimate of potential benefits to be gained by pursuing full "actinide and fission product" burnup credit.

It also provides burnup credit package loading restriction results based on the actinide-only topical report.

- Completed and submitted the Evaluation of the Use of Dual-Purpose Canisters in the CRWMS deliverable to RW-46. The report concludes a Dual-Purpose Canister system has a higher life cycle cost than the MPC system.

- Provided cost scenarios for Independent Storage Facility (ISF) in support of RW-1 and RW-2 requests to RW.

- Reviewed and provided comments on the "Disposal Criticality Analysis Technical Report" by D.A. Thomas.

- Provided a Hybrid Dose Case comparison for RW-46. Provided support to MPC Basket and Shell Activation Analysis. Completed confirmation of Full versus Partial Burnup Credit loading curves. Supported drafting of Control Inserts Alternatives Development Plan. Began review of MGDS Surface Facilities MPC Streaming Analysis and conclusions.

- Presented a paper on Burnup Credit Topical Report at the American Nuclear Society annual meeting in Philadelphia.

Regulatory

- Developed the RW-1 statement for the record for the NRC Commissioners.

- Developed and coordinated the agenda for the June 2, 1995, NRC/DOE bi-monthly management meeting with NRC staff and sponsored the DOE Dry-run.

- Sponsored a planning meeting for the July 13, 1995, DOE NRC management meeting.

- Completed and delivered the Technical Document Preparation Plan (TDPP) for the MPC Part 60 Design Considerations Report.

- Developed a presentation for RW-46 staff to present to the 36th annual Institute of Nuclear Materials Management meeting. The presentation discusses MPC certification and the MPC Part 60 Design Considerations Report.

Environmental, Safety and Health

- Sent the MPC EIS Implementation Plan (IP) through the DOE Environmental Safety and Health Management (EH), General Council (GC), and RW-front offices for concurrence signoff. GC and RW have agreed on alternatives and schedule (Argonne National Laboratory's [ANL's] request for December 15, 1995, Draft Environmental Impact Statement publication). IP's publication in Federal Register will occur after June 30, 1995, but before July 21, 1995.

- Senior ANL management and selected RW-45, and M&O personnel reviewed the MPC Preliminary Draft EIS June 22, 1995, through June 30, 1995, at ANL-Chicago. Review by full M&O support team scheduled for July 27, 1995, to August 3, 1995.

- Attended a briefing on "Evaluation of the Use of Dual Purpose Canisters in the CRWMS." This evaluation was completed using MPC EIS support funds to provide additional alternative and logistic information to support ANL development of the MPC EIS.

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 related 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

System Engineering

- Completed the draft routing analysis of rail access to the four rail spurs under evaluation for the M&O Las Vegas. Used the INTERLINE routing code to select representative rail routes under various option selections. The results of this analysis will be included in the "Nevada Potential Repository Preliminary Transportation Strategy Study 2."

- Completed the Transportation input to the "1995 WAST Life-Cycle Cost Report." This input provided the Basis of Estimate and estimated costs for the operations of the Transportation element for 1997 to 2040, with caretaker operations extending to 2070. Presented the Transportation Life-Cycle Cost results to the Independent Cost Estimate team June 8, 1995.

Casks

- Provided continued support to RW-46 and General Atomics (GA) to develop technical approaches responding to the Nuclear Regulatory Commission comments on the GA-4 and GA-9 Cask Safety Analysis Reports. GA met with the NRC on June 27, 1995, and presented their structural criteria, analyses, methodology, and models response to the NRC comments and GA will review the structural and other design aspects and perform additional analyses to satisfy the NRC concerns and requirements. GA will formally respond to the NRC comments by December 1, 1995, (GA-4) and January 15, 1996, (GA-9) and will include the results of the scale model drop tests.

- Working on the GA-4 half-scale model fabrication. It was decided at the June 28, 1995, GA NRC meeting to make dummy fuel assemblies consisting of bundled steel and aluminum rods in each of the four cells.

- Working on the drop pad at the Maxwell Laboratories' test facility, the site selected for the GA-4 cask half-scale model regulatory testing. The steel reinforced concrete pad has been poured and cured. GA has incorporated Maxwell's input to the drop testing procedures, which are currently undergoing internal review. The procedures were submitted to RW-46

and the M&O for review. Completed an M&O checklist to evaluate GA's readiness for the GA-4 half-scale model regulatory drop tests.

- Completed the review of the "GA-9 Legal-Weight Truck (LWT) Trailer Road Profile Test and Durability Test Report." A letter is being drafted to RW-40 recommending approval of the report following incorporation of M&O's comments.

- Made a presentation to the Nuclear Waste Technical Review Board Transportation Panel on the GA legal-weight truck cask project on June 14, 1995.

Transportation Support Systems

- The Operations Team completed the draft generic site-specific servicing plan, which is currently under review. Also presented a briefing to RW-46 on the purpose of and need for the site-specific servicing plans.

- Completed the Surry Nuclear Station Barge Study. The final draft of the study will be available in early July 1995.

- Provided heavy haul transportation and intermodal transfer facility cost data in support of Intermediate Storage Facility Cost Estimates.

- Allied Signal Automotive Proving Ground (AAPG) completed brake burnish testing and drawbar tests to evaluate the brake forces for the legal-weight truck tractor and trailer. This will be followed by the dynamic brake tests, where representatives from the M&O and RW-46 are expected to visit the proving grounds to inspect the tractor and trailer and evaluate progress.

- Delivered a trip report for the Fifth Topical Meeting on Emergency Preparedness and Response. This conference covered Federal, State, and local experiences, capabilities, and intentions regarding the response to emergency conditions. Of particular interest are the application of the Federal Radiological Monitoring and Assessment Center (FRMAC), the revised Federal Radiological Emergency Response Plan (FRERP), the Federal Response Plan (FRP), and designation of Lead Federal Agency (LFA) in the event of incidents involving future OCRWM shipments of spent nuclear fuel.

Project Management

- Completed revised FY96 budget projection based on the assumption that transportation operations would commence in 1998.

- Developed cost projections to support various interim storage scenarios. Cost estimates were provided for design and engineering, operational management, heavy haul, transport operations, and cask acquisition. These estimates are undergoing continuous refinement and revision.

- Participated in an M&O transportation strategy planning session with senior transportation personnel from Yucca Mountain, Program Integration, and WAST.

Environmental, Safety and Health

- Completed review of ANL's draft responses to technical reviewer comments on the RISKIND code, Revision 1 and its accompanying manual. Comments on the draft responses were transmitted to ANL. The responses by ANL indicate that they either have made or will make most of the requested changes to the code.

- Issued a revised Statement of Work (SOW) and Task Order for Sandia National Laboratory (SNL) technical support in the transportation risk assessment area for the remainder of FY95. The major activities include a review of past studies (both data and models) of rail accidents and spent fuel cask crash and fire tests, and the definition of a small set of extremely severe credible "bounding" rail accidents (based on historic rail accident databases and published rail accident reports).

- Prepared and gave a presentation on Transportation Risk Management at the NWTRB Meeting and the Transportation Coordination Group Meeting.

Institutional

- Prepared a timeline showing National Environmental Policy Act compliance and other requirements for construction of interim storage and a rail spur, as potentially mandated by the Upton-Towns Bill, HR 1020.

- Developed a budget for the environmental report and transportation institutional activities under "Scenario 425."

- Developed recommended language for inclusion in the Southern States Energy Board's "Spent Fuel and High-Level Radioactive Waste Transportation," which would correct errors in the section of this handbook concerning liability; submitted it to RW-45.

- Delivered the Final Notice of Inquiry, Supplemental Information on Section 180(c) Policy and Procedures. Document is now in RW concurrence. The document will form a basis for the Notice of Proposed Section 180(c) Policy and Procedures to be published in early 1996.

- Received the OCRWM Transportation Report from the Government Printing Office and distributed copies at the Transportation Coordination Group (TCG) meeting.

3.2.2.2 Issues and Concerns

- Acceptable responses to the NRC questions on the structural analyses of the GA-4 and GA-9 casks are being developed, but the schedule for receiving the Certificates of Compliance may be delayed. No impact is expected on the capability to use the GA-4 cask to support an Interim Storage Facility.

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 Accountability (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

Standard Contract Modifications

- Prepared a white paper on providing guidance to utilities on DOE's plans and requirements for verification of SNF through a contracting officer letter rather than through a separate rulemaking process.

- Began preparing a summary of the potential implications of the various legislative initiatives on the Standard Contract provisions and activities including the planned rulemaking.

- Provided briefing materials for RW-44 to brief RW-2 on a meeting with three utilities (Florida Power and Light, Commonwealth, and Northern States Power) to discuss Alternative Dispute Resolution (ADR). Prior to this utility meeting, attended a meeting with RW-44 to brief RW-2 on ADR and additional background.

Pre-Acceptance Operations

- Delivered Delivery Commitment Schedule (DCS) submittal Status Report to RW-44.

- Provided the M&O-coordinated final Draft Verification Plan to RW-44 for comment and review.

Waste Acceptance Criteria

- Attended Nuclear Waste Technical Review Board and repository task team meetings at Idaho National Engineering Laboratory.

- Delivered Waste Acceptance (WA) comments on DOE Environmental Management's (EM) Integrated SNF Database System.

- Attended WA-Technical Review Group meeting and supported review of Defense Waste Processing Facility Waste form Qualification Report.

- Delivered the Final Waste Acceptance Criteria Management Plan.

High-Level Waste (HLW) Generator Agreement

- Supported evaluating previous drafts of proposed Memorandum of Agreement (MOA) language and identifying and addressing issues associated with establishing an MOA for DOE wastes. Also supported several meetings with RW-44 on this subject and on preparation of materials for briefings to RW-2.

- Began investigating alternative methods for determining an Metric Tons of Uranium (MTU)-equivalence for DOE EM wastes. Supported preparation of materials addressing issues and concerns associated with these alternative methods.

Waste Acceptance Operations

- Prepared a draft report on International Atomic Energy Agency (IAEA) criteria for input to the Transportation Status Database.

- Initiated a QA Review and preparation of the Integrated Safeguards and Security Requirements Analysis.

- Continued resolution of YMSCO comments on Safeguards and Security Regulatory model.

- Identified minimum data requirements from purchasers for Multi-Element Containers loaded before initiation of IAEA safeguards. Queried NRC to define verification approach for containers loaded before initiation of IAEA safeguards.

- Received, via NRC, a copy of the Department of State letter to IAEA officially transmitting the questions regarding international safeguards for MPCs, which were informally tabled during the US IAEA Discussions in Vienna, Austria, on March 23, 1995.

Logistics and Systems Planning

- Completed the Technical Document Preparation Plan (TDPP) for the Integrated Safeguards and Security Requirements Analysis (ISSRA).

- Developed an internal draft version of the Technical Document Preparation Plan (TDPP) for the WA-Design Requirements Document (DRD).

- Completed the QAP-2-0 analyses of the ISSRA and the Acceptance, Transportation, and Disposal Scheduling (ATDS) procedure.

Project Management

- Supported preparation of the RW-44/M&O FY Annual Plan.

- Supported RW-44 preparation for the June 22, 1995, Director's Program Review.

- Revised criteria for the WA Performance Evaluation Plan.

Economic Analysis

- Investigating alternative methods for establishing appropriate fees for EM wastes including evaluation of past methods developed, which includes the methodology published in the Federal Register in 1987. Supported several meetings with RW-44 on this subject.

Nuclear Fuel Data

- Completed and delivered the report summarizing the validation and verification findings of drafts 1 and 2 of the 1994 RW-859 data set. Transferred the third draft of the 1994 RW-859 Database from the DOE/(EIA) mainframe and began the validation. Attended a meeting with DOE EIA and Z. Inc. to discuss the plans for software development dealing with the revisions to the RW-859 forms.

Energy and Spent Fuel Discharge Projections

- Attended a meeting with RW-44, DOE EIA, David Andress and Assoc., and Z. Inc. to discuss the methodology used in the projections database and how to document the year-to-year variations in the projection database.

Spent Fuel Storage Requirements Report

- Completed the "Camera Ready Copy" of the 1994 Spent Fuel Storage Report and delivered it to RW-44 for printing.

Unified DataBase System

- Completed the UDB Phase I Data Evaluation and Collection Plan and delivered it to RW-40. Met with RW-44 to review the FY96-97 plan for delivering and deploying an operational Phase I Unified Database.

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

- Updated the WAST Project Summary Schedule (PSS). Changed forecast dates for all tasks affected by the extended NRC review schedule for the MPC, prepared a Baseline Change Proposal (BCP) for Project Office Baseline Change Control Board (POBCCB) review and added significant new data to the PSS. Project Integration assisted the Department in obtaining the first signed summary schedule (RW-40, 44, 45, and 46) for the WAST Project.

- Revised the Project Work Breakdown Structure (PWBS) index and dictionary and distributed a draft for internal review. After incorporation of comments, it will be submitted to the POBCCB for review and approval.

- Updated the Directors' Resource Book, the first in a series of quarterly updates to ensure the availability of accurate data for the Director's testimony and responses to Congressional queries.

- Conducted an internal M&O review of the proposed revised milestone levels and the milestones associated with them. A final recommended list will be forwarded to the DOE as a follow up to the M&O's May 19, 1995, letter to RW-30.

- Finalized charts and held the Director's Program Review (DPR) as planned June 22, 1995. Copies of the WAST Project Schedule showing the revised NRC-review schedule in the forecast were available for use at the DPR.

- Conducted a briefing for members of RW-35 describing our approach in developing the Incident Review Board, Office of Management and Budget, and Congressional budget submittals using PC-based software instead of the BARS system.

Project Systems Engineering

- Coordinated WAST inputs to the Total System Life-Cycle (TSLCC) analysis, developed draft TSLCC report, briefed the TSLCC Independent Cost Estimate (ICE) Review Team on the WAST Project portion of the TSLCC, and responded to ICE Review Team questions.

- Prepared and submitted a BCP to the WAST Project POBCCB revising the WAST Project Levels 0, 1, and 2 milestones in the Project Cost and Schedule Baseline and the Program Plan. This BCP revises milestones to reflect the currently projected NRC schedule for review and certification of the MPC System.

- Prepared and submitted a BCP to revise M&O WAST Project Level 3 milestones in the Program Plan that was approved by the M&O WAST Project BCCB. An IOC signed by the WAST BCCB Chairperson was issued to document approval to direct specific implementation actions. This BCP revises Level 3 milestones to reflect the current plans and workscope.

3.2.4.2 Issues and Concerns

- None.

3.2.4.3 Variances

- **System Engineering** - The cumulative cost variance of ($62K/19%) is due primarily to the Analytical Studies effort being more complex than anticipated. This task is now complete. Additionally, RTDA Report Support is slightly overrun due to unanticipated justification and backup for cost models required for the ICE Review. This B&R is expected to complete within budget.

- **Systems Casks** - The cumulative cost variance of $501K/20% is due primarily to FY95 Sandia billing lags and to late booking of FY94 carryover costs. The variance is not anticipated to impact the overall cost and schedule of the project; however, some costs may not book this fiscal year.

- **Support Systems** - The cumulative cost variance of $527K/39% is due primarily to late booking of FY94 carryover costs. The variance is not anticipated to impact the overall cost and schedule of the project; however, some costs may not book this fiscal year.

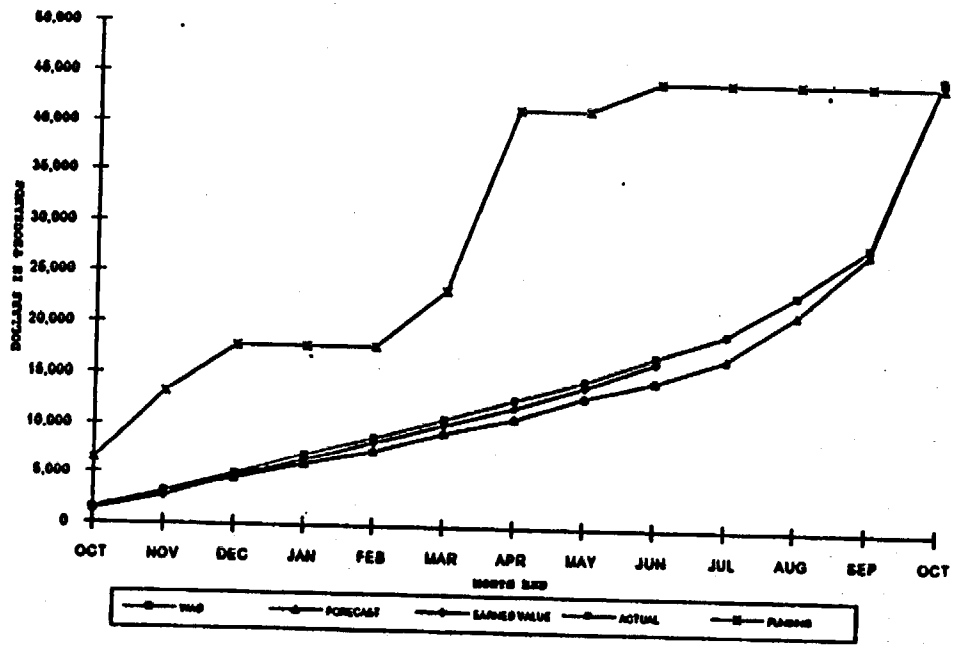
- **Regulatory** - The cumulative cost variance of $54K/73% is due to personnel budgeted for this work being reassigned to higher priority tasks. Temporary labor has been acquired at a cost less than budgeted. An underrun at complete is anticipated.

- **Quality Assurance** - The cumulative cost variance of $14K/10% is attributed to late booking of FY94 carryover costs. No impact to the project is anticipated, and no corrective action is required.

- **Information Management** - The cumulative cost variance of $31K/91% is attributed to less than anticipated need for management review of data-related tasks fiscal year-to-date.

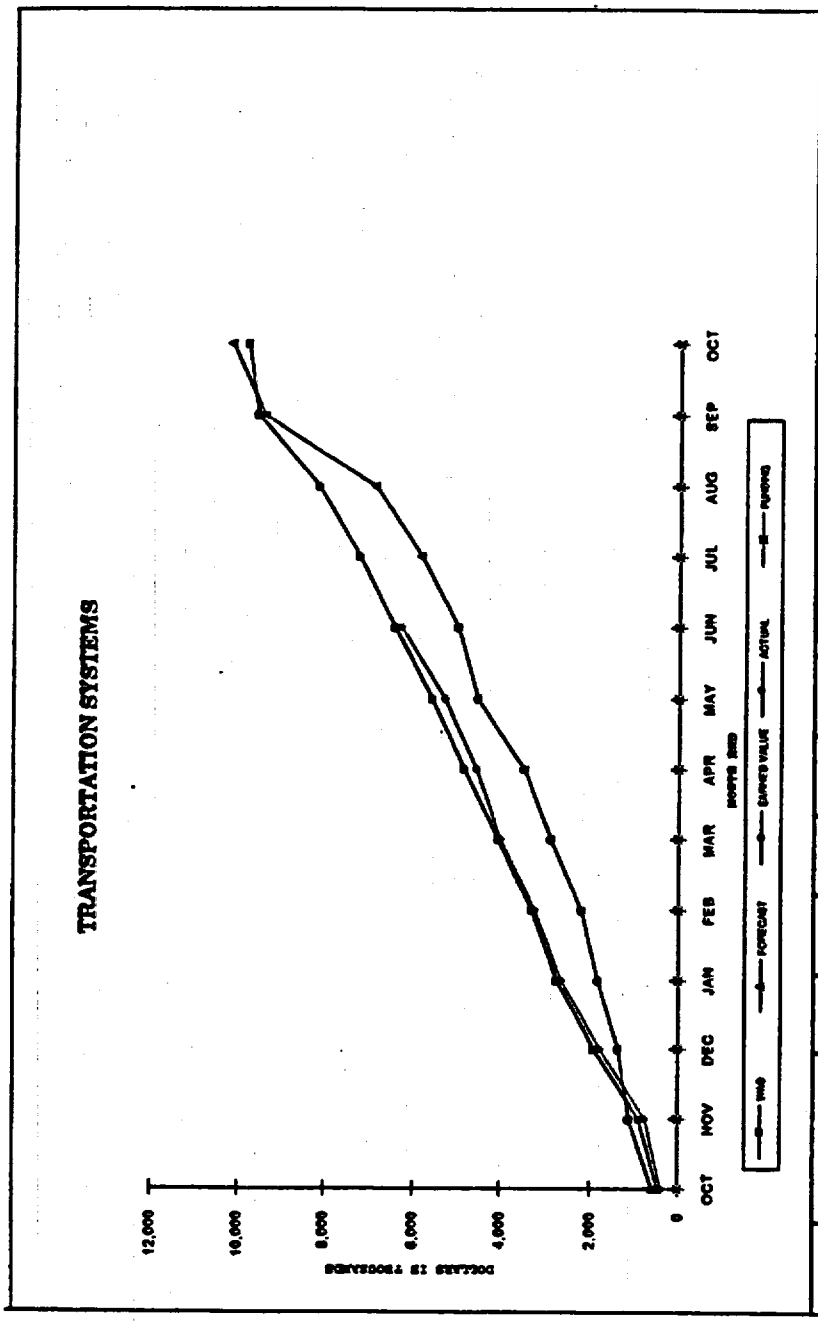
- **Environment, Safety, and Health** - The cumulative cost variance of $290K/47% is attributed primarily to billing lags for work performed at ANL and LLNL and to late booking FY 94 carryover costs.

CWBS 3.0 WASTE ACCEPTANCE, STORAGE & TRANSPORTATION (WAST) PROJECT



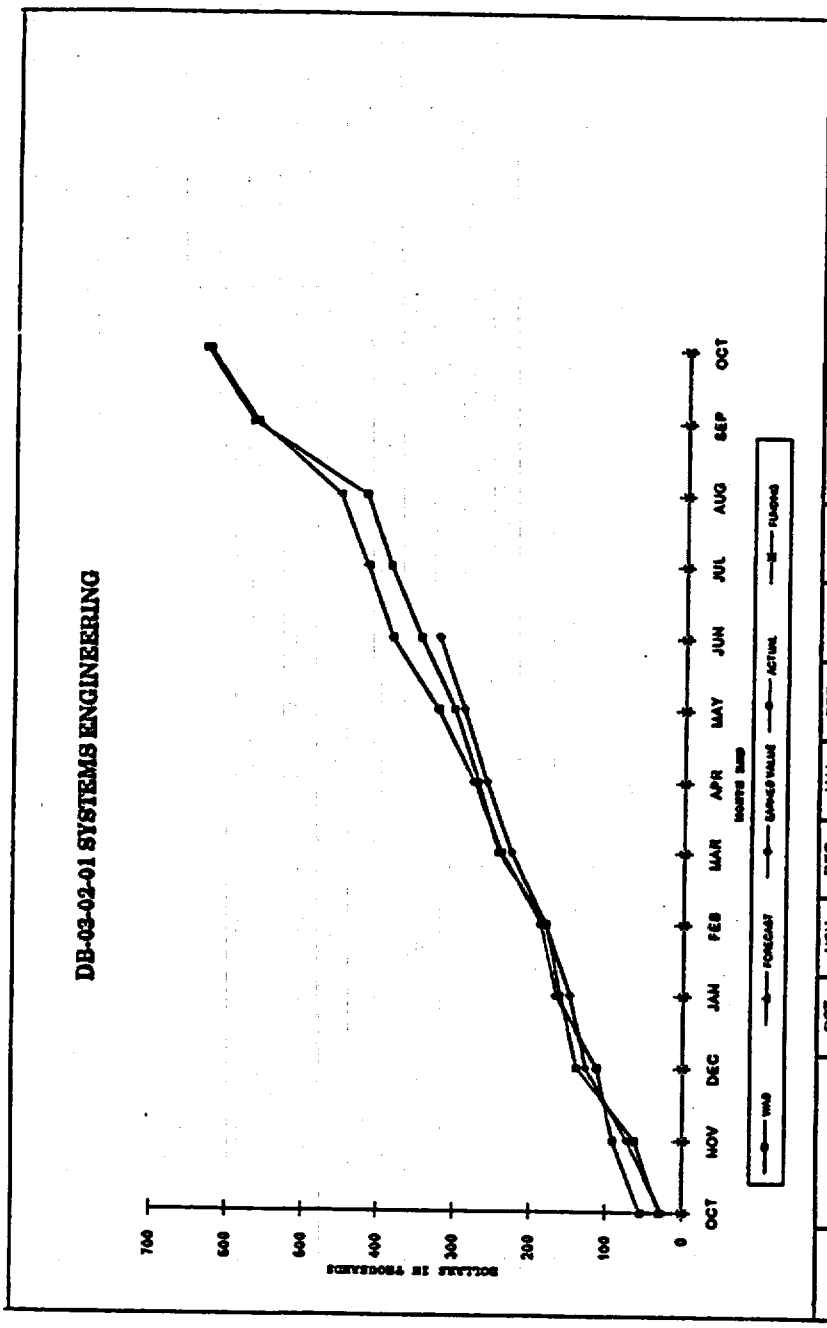
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	1,343	1,718	1,985	1,995	1,766	1,960	1,984	1,976	2,428	2,272	4,016	4,819	17,029
	FORECAST	1,480	1,627	1,371	1,607	1,346	1,916	1,524	2,239	1,574	2,368	4,341	6,281	17,607
	EARNED VALUE	1,258	1,383	2,074	1,759	1,823	1,889	1,900	2,120	2,493				
	MONTH ACTUAL	1,480	1,627	1,371	1,607	1,346	1,916	1,524	2,239	1,574				
	VAR/SCH	(85)	(332)	89	(236)	57	(71)	(184)	145	65				
	VAR/COST	(222)	(244)	703	152	477	(27)	276	(119)	919				
CUM	WAD	1,343	3,058	5,043	7,038	8,804	10,764	12,748	14,723	17,151	19,423	23,439	28,258	45,287
	FORECAST	1,480	3,107	4,478	6,085	7,431	9,347	10,871	13,110	14,684	17,052	21,393	27,674	45,281
	EARNED VALUE	1,258	2,641	4,715	6,474	8,297	10,186	11,986	14,106	16,599				
	ACTUAL	1,480	3,107	4,478	6,085	7,431	9,347	10,871	13,110	14,684				
	VAR/SCH	(85)	(417)	(328)	(564)	(507)	(578)	(782)	(617)	(552)				
	VAR/COST	(222)	(466)	237	389	866	839	1,115	996	1,915				
FUNDING	FY95 FUNDING	5,000	11,786	11,786	11,786	11,786	17,423	35,551	35,551	38,412	38,412	38,412	38,412	38,412
	PREV. FUNDED	1,439	1,439	5,997	5,997	5,997	5,997	5,997	5,997	5,997	5,997	5,997	5,997	5,997
	TOTAL FUNDING	6,439	13,225	17,783	17,783	17,783	23,420	41,548	41,548	44,409	44,409	44,409	44,409	44,409

Figure 4. WAST Project Financial Status



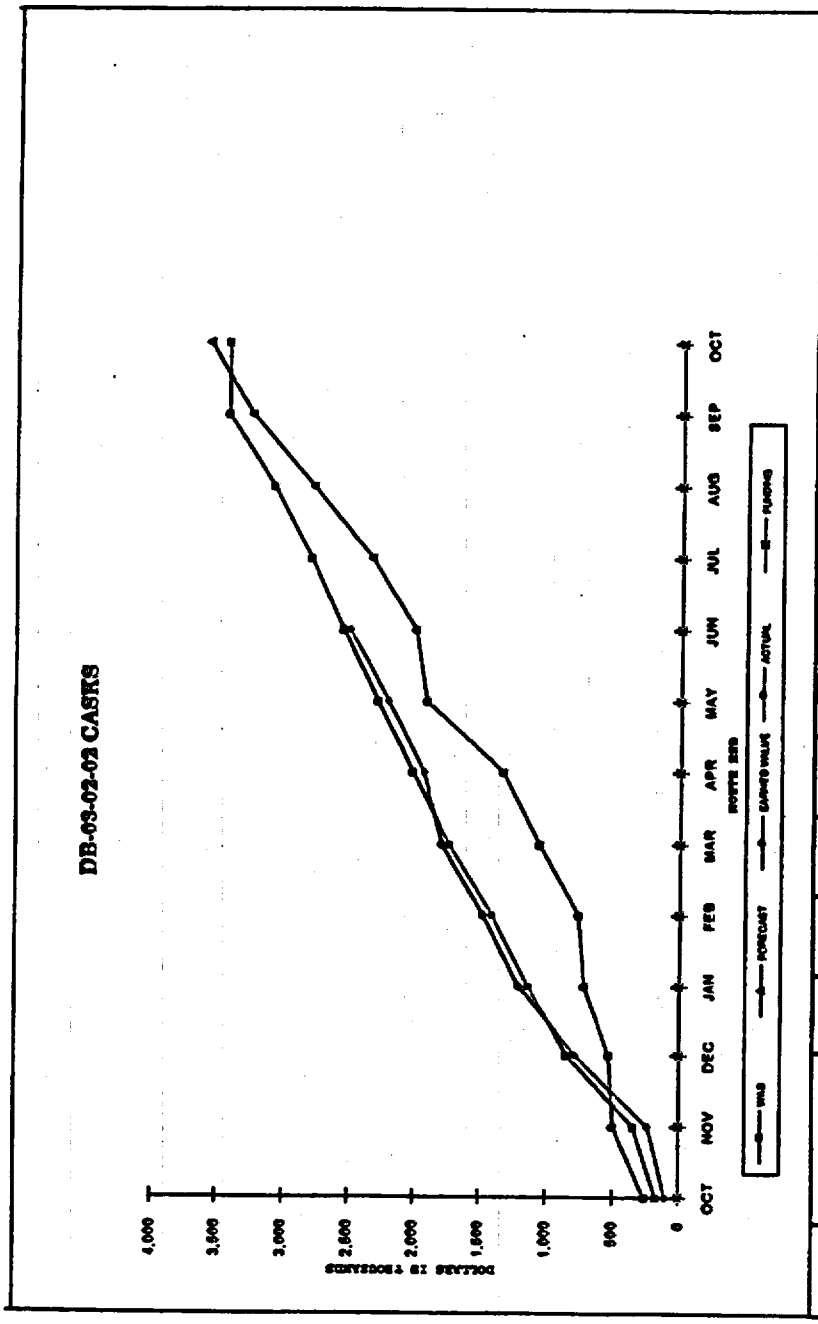
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	456	445	1,000	843	560	752	771	746	635	796	912	1,416	241
	FORECAST	568	526	254	467	398	604	988	1,041	465	652	1,045	2,542	746
	EARNED VALUE	368	539	1,040	878	588	703	963	739	997				
	MONTH ACTUAL	968	529	254	467	396	694	988	1,041	465				
	VARSCH	(68)	(95)	10	35	26	11	(206)	(01)	142				
	VARCOST	(200)	(187)	786	411	202	69	(25)	(302)	532				
CUM	WAD	456	901	1,911	2,754	3,314	4,066	4,837	5,583	6,440	7,236	8,150	9,566	9,807
	FORECAST	568	1,094	1,348	1,815	2,201	2,895	3,453	4,524	4,989	5,641	6,686	8,428	10,174
	EARNED VALUE	368	727	1,767	2,645	3,233	3,936	4,899	5,298	6,295				
	ACTUAL	968	1,094	1,348	1,815	2,201	2,895	3,453	4,524	4,989				
	VARSCH	(60)	(154)	(144)	(109)	(81)	(70)	(270)	(267)	(149)				
	VARCOST	(200)	(367)	419	830	1,032	1,101	1,076	774	1,306				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 5. Transportation Systems Financial Status



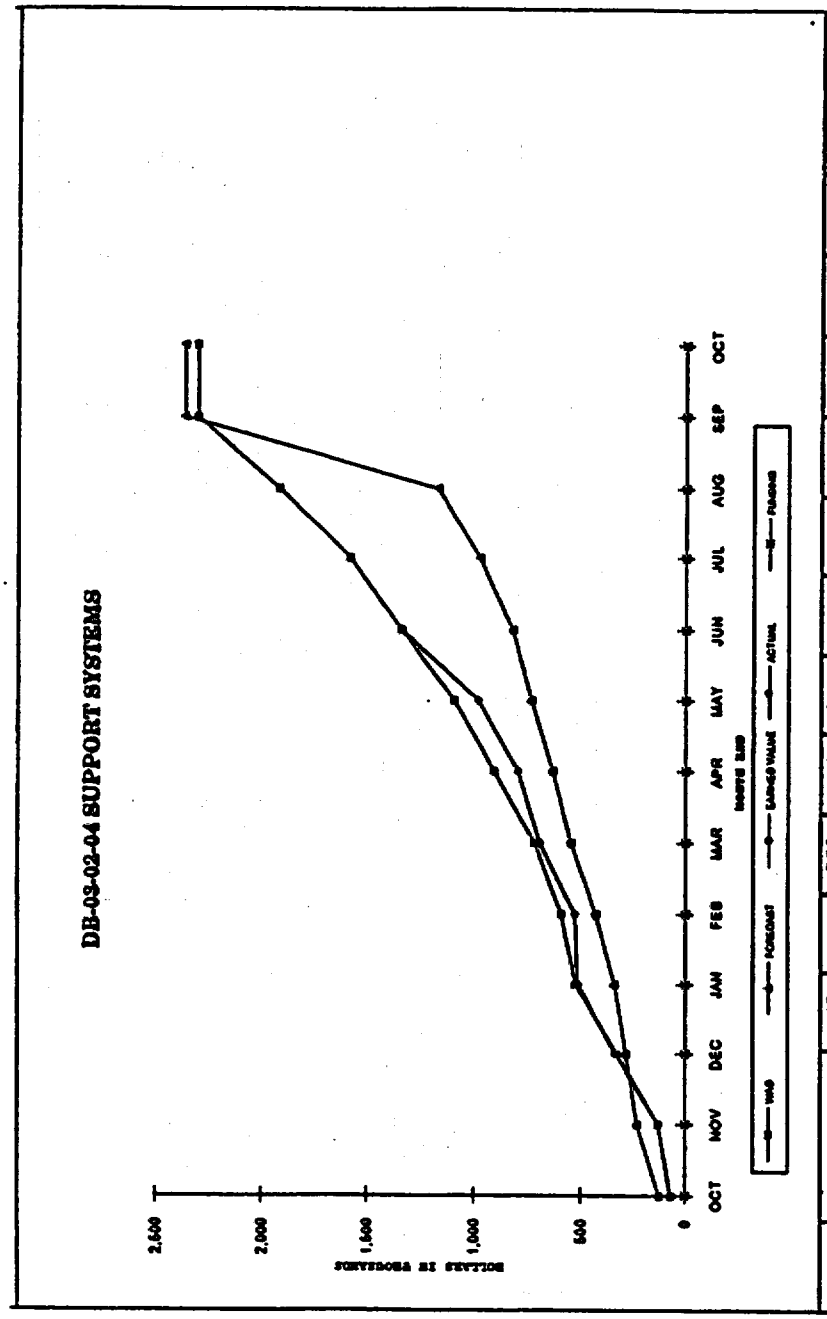
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	28	33	78	22	18	64	27	32	45	40	32	152	63
	FORECAST	53	38	81	84	20	53	37	48	61	32	36	113	63
	EARNED VALUE	25	46	68	21	32	46	33	31	33				
	MONTH ACTUAL	53	38	81	84	20	53	37	48	61				
	VAR/SCH	(3)	13	(22)	(1)	14	(18)	6	(1)	(12)				
	VAR/COST	(28)	8	35	(33)	12	(7)	(4)	(17)	(28)				
CUM	WAD	28	61	139	161	179	243	270	302	347	387	419	571	634
	FORECAST	53	91	112	166	186	239	276	324	385	417	453	566	629
	EARNED VALUE	25	71	127	148	180	226	259	290	323				
	ACTUAL	53	91	112	166	186	239	276	324	385				
	VAR/SCH	(3)	10	(12)	(13)	1	(17)	(11)	(12)	(24)				
	VAR/COST	(28)	(20)	15	(18)	(6)	(13)	(17)	(34)	(62)				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 6. Systems Engineering Financial Status



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	169	169	811	285	271	333	276	276	257	250	297	344	0
	FORECAST	255	242	34	188	47	289	270	367	92	337	443	470	318
	EARNED VALUE	101	127	857	415	276	318	138	274	297				
	MONTH ACTUAL	253	242	34	188	47	289	270	367	92				
	VAR/SCH	(68)	(42)	40	130	6	(14)	(140)	(2)	49				
	VAR/COST	(154)	(115)	823	227	229	31	(132)	(312)	205				
CUM	WAD	169	338	849	1,134	1,405	1,738	2,016	2,292	2,549	2,799	3,096	3,430	3,430
	FORECAST	255	497	531	719	766	1,054	1,324	1,691	2,003	2,340	2,783	3,253	3,571
	EARNED VALUE	101	228	785	1,200	1,476	1,795	1,933	2,207	2,504				
	ACTUAL	253	497	531	719	766	1,054	1,324	1,911	2,003				
	VAR/SCH	(68)	(110)	(64)	66	71	57	(65)	(85)	(46)				
	VAR/COST	(154)	(269)	254	481	710	741	609	296	501				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

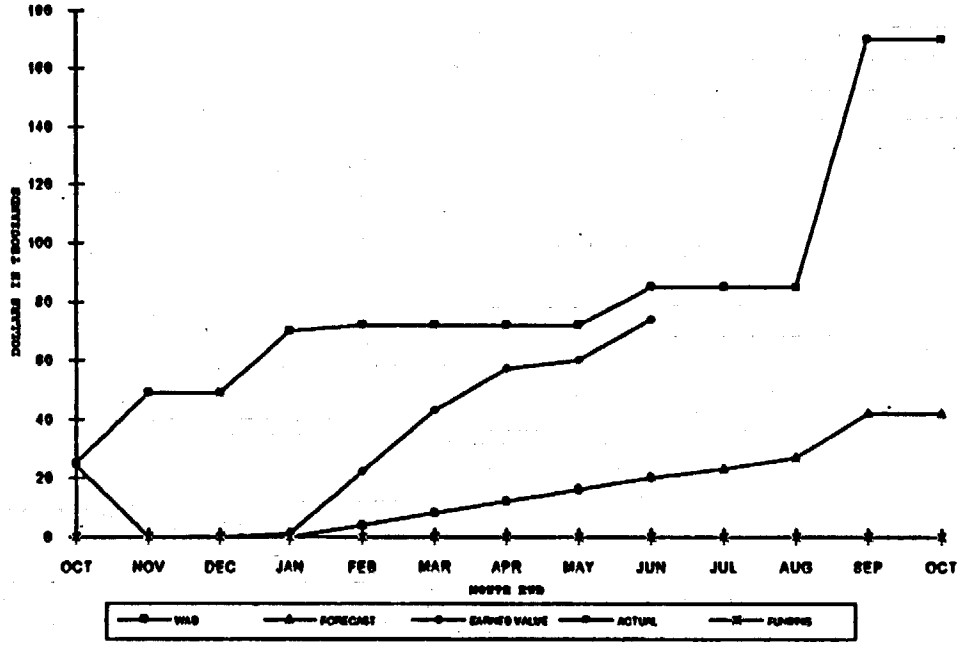
Figure 7. Casks Financial Status



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	65	80	202	196	65	123	194	189	246	241	339	397	0
	FORECAST	122	106	54	85	80	116	82	100	87	162	194	1,187	0
	EARNED VALUE	66	56	213	173	17	159	103	191	360				
	MONTH ACTUAL	122	106	54	85	80	116	82	100	87				
	VAR/SCH	1	(1)	11	(23)	(48)	36	(61)	2	114				
	VAR/COST	(56)	(49)	159	116	(73)	43	21	91	273				
CUM	WAD	65	125	327	523	588	711	905	1,094	1,340	1,581	1,919	2,306	2,306
	FORECAST	122	230	284	339	420	545	627	727	814	976	1,170	2,367	2,367
	EARNED VALUE	66	125	338	511	528	687	790	881	1,241				
	ACTUAL	122	230	284	339	420	543	627	727	814				
	VAR/SCH	1	0	11	(12)	(80)	(24)	(115)	(113)	1				
	VAR/COST	(56)	(105)	54	172	89	142	163	254	527				
FUNDING	EXISTING FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 8. Support Systems Financial Status

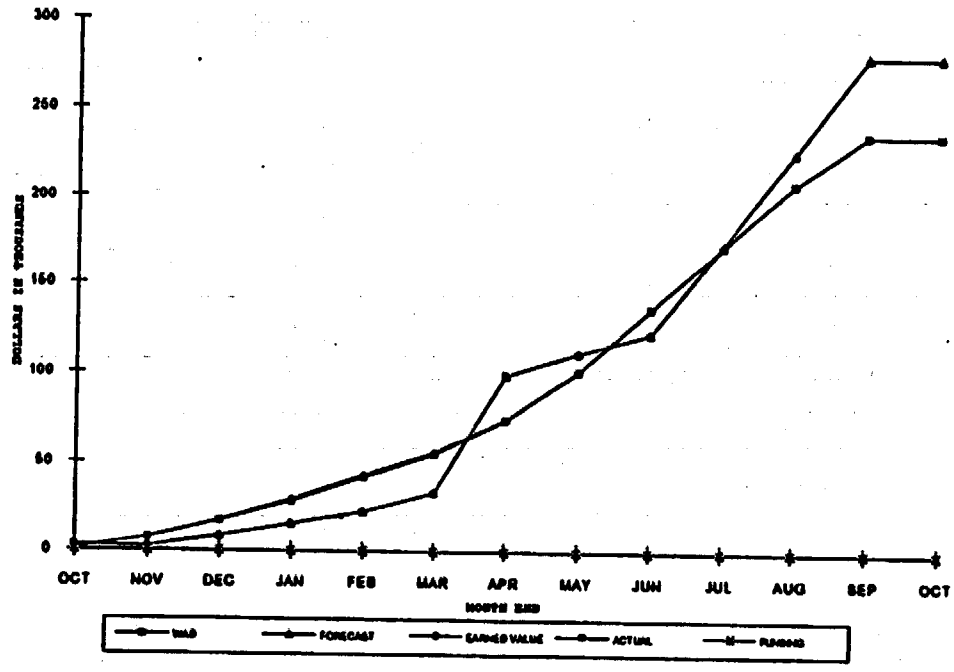
DB-03-02-05 REGULATORY



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	25	24	0	21	2	0	0	0	13	0	0	85	0
	FORECAST	0	0	0	0	4	4	4	4	4	3	4	16	0
	EARNED VALUE	24	(24)	0	1	21	21	14	3	14				
	MONTH ACTUAL	0	0	0	0	4	4	4	4	4				
	VAR/SCH	(1)	(49)	0	(20)	19	21	14	3	1				
	VAR/COST	24	(24)	0	1	17	17	10	(1)	10				
CUM	WAD	25	49	49	70	72	72	72	72	85	85	85	170	170
	FORECAST	0	0	0	0	4	8	12	16	20	23	27	42	42
	EARNED VALUE	24	0	0	1	22	43	57	60	74				
	ACTUAL	0	0	0	0	4	8	12	16	20				
	VAR/SCH	(1)	(49)	(49)	(69)	(50)	(29)	(15)	(12)	*(11)*				
	VAR/COST	24	0	0	1	18	35	45	44	*54*				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

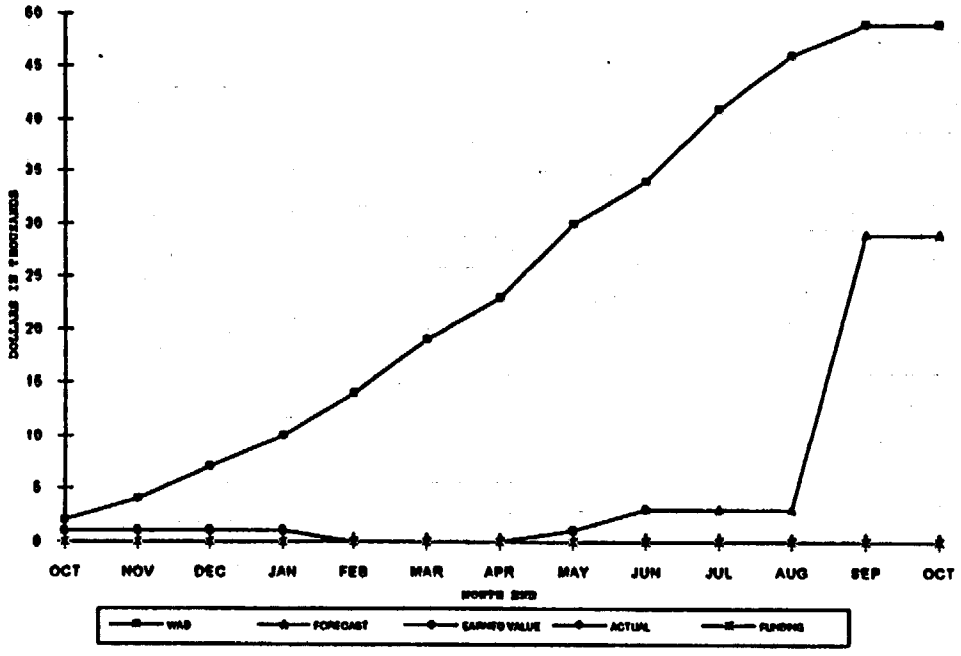
Figure 9. Regulatory Financial Status

DB-03-02-11 QUALITY ASSURANCE



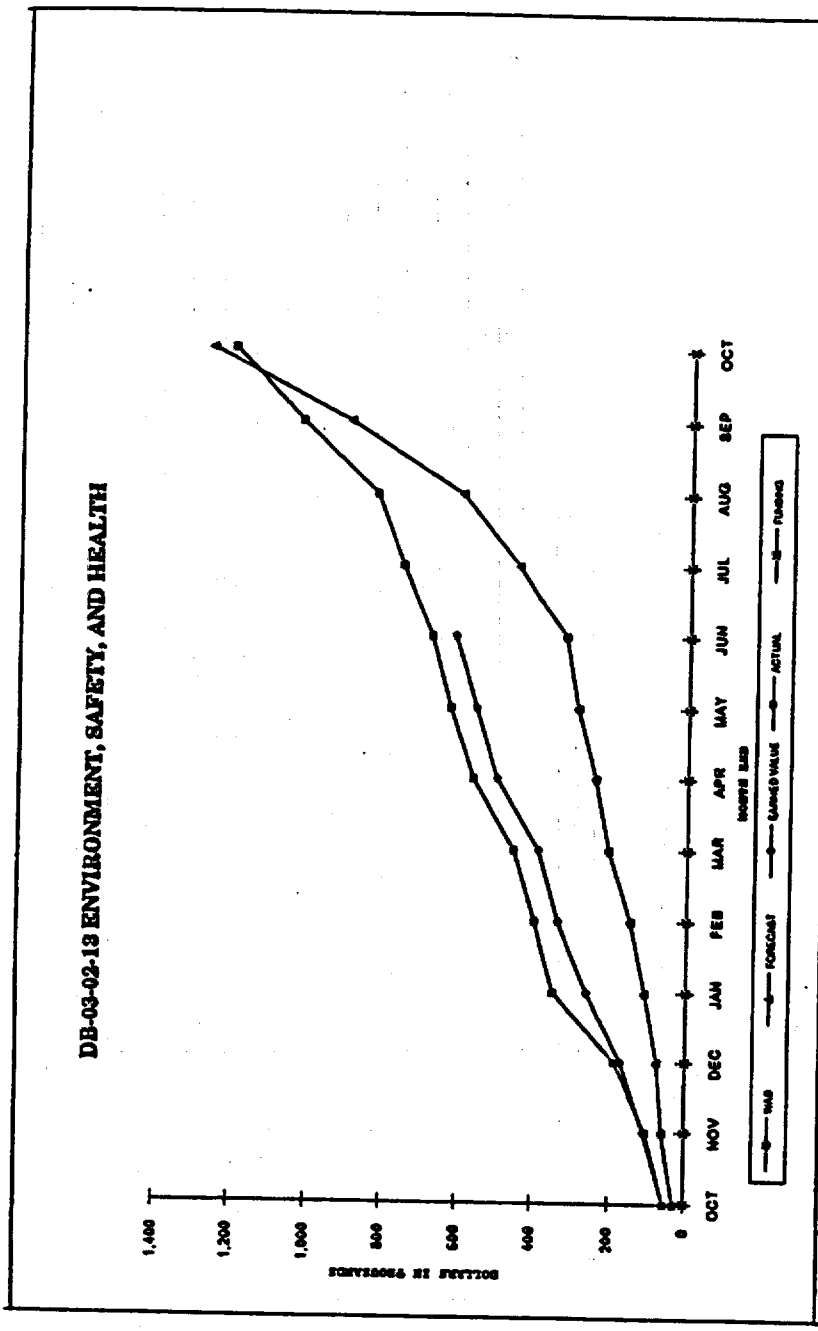
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	1	6	10	11	14	13	19	27	36	35	36	28	0
	FORECAST	3	(1)	6	7	7	11	66	13	11	50	53	54	0
	EARNED VALUE	1	6	10	12	14	13	18	27	36				
	MONTH ACTUAL	3	(1)	6	7	7	11	66	13	11				
	VAR/SCH	0	0	0	1	0	0	(1)	0	0				
	VAR/COST	(2)	7	4	5	7	2	(48)	14	*25*				
CUM	WAD	1	7	17	28	42	55	74	101	137	172	208	236	236
	FORECAST	3	2	8	15	22	33	99	112	123	173	226	280	280
	EARNED VALUE	1	7	17	29	43	56	74	101	137				
	ACTUAL	3	2	8	15	22	33	99	112	123				
	VAR/SCH	0	0	0	1	1	1	0	0	0				
	VAR/COST	(2)	5	9	14	21	23	(25)	(11)	*14*				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 10. Quality Assurance Financial Status



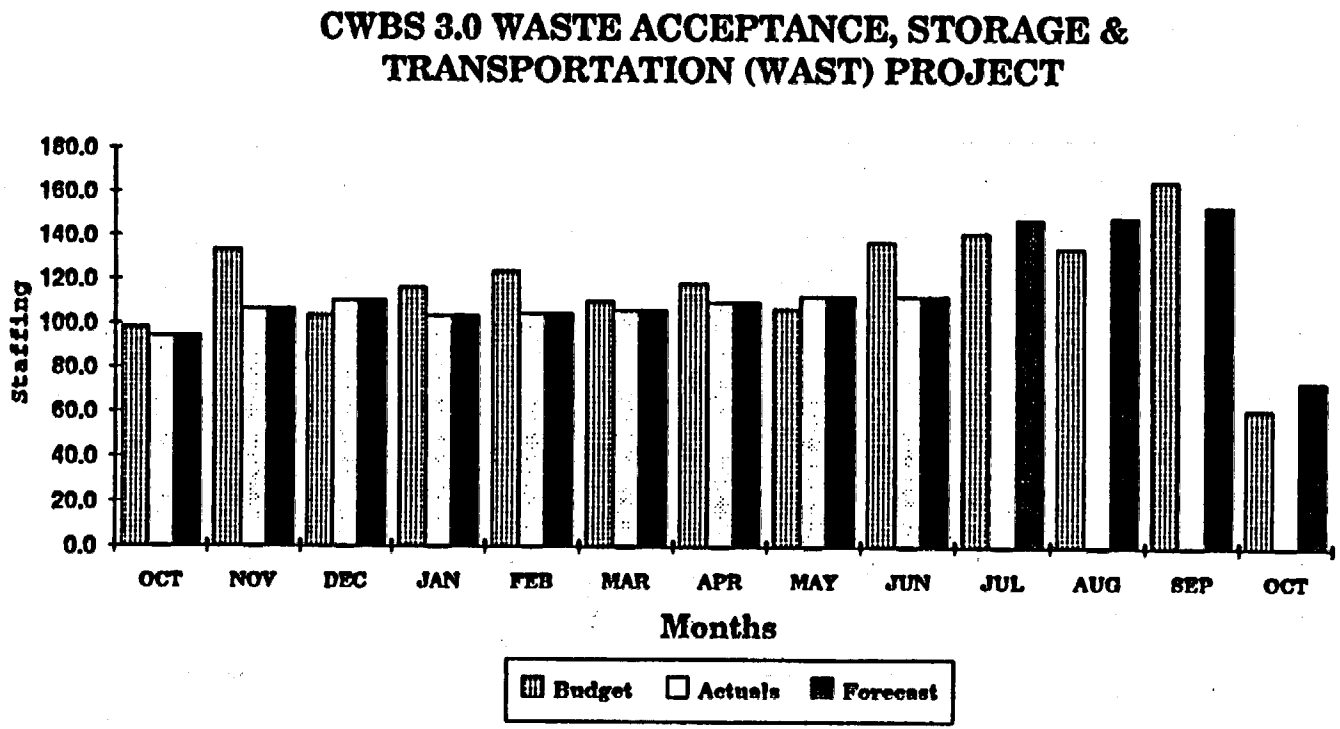
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	2	2	3	3	4	5	4	7	4	7	5	3	0
	FORECAST	1	0	0	0	(1)	0	0	1	2	0	0	26	0
	EARNED VALUE	2	2	3	3	4	5	4	7	4				
	MONTH ACTUAL	1	0	0	0	(1)	0	0	1	2				
	VAR/SCH	0	0	0	0	0	0	0	0	0				
	VAR/COST	1	2	3	3	5	5	4	6	2				
CUM	WAD	2	4	7	10	14	19	23	30	34	41	46	49	49
	FORECAST	1	1	1	1	0	0	0	1	3	3	3	29	29
	EARNED VALUE	2	4	7	10	14	19	23	30	34				
	ACTUAL	1	1	1	1	0	0	0	1	3				
	VAR/SCH	0	0	0	0	0	0	0	0	0				
	VAR/COST	1	3	6	9	14	19	23	29	31				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 11. Information Management Financial Status



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	51	52	84	162	48	57	111	61	50	78	71	200	178
	FORECAST	29	32	16	33	41	50	37	47	34	123	183	295	366
	EARNED VALUE	51	56	62	83	78	80	114	65	59				
	MONTH ACTUAL	29	32	16	33	41	59	37	47	34				
	VAR/SCH	0	4	(22)	(69)	28	(7)	3	(4)	8				
	VAR/COST	25	24	46	66	35	(9)	77	8	24				
CUM	WAD	51	103	187	349	397	454	565	626	676	754	825	1,025	1,203
	FORECAST	29	58	74	107	148	207	244	291	325	449	601	896	1,262
	EARNED VALUE	51	107	169	252	330	388	502	567	615				
	ACTUAL	29	58	74	107	148	207	244	291	325				
	VAR/SCH	0	4	(18)	(87)	(59)	(65)	(63)	(62)	(61)				
	VAR/COST	25	49	95	145	190	181	258	266	290				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 12. Environment, Safety, and Health Financial Status



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Forecast	94.4	106.7	110.5	103.6	104.7	106.5	109.9	112.4	112.4	147.9	148.6	153.9	73.9
Budget	98.1	133.5	103.8	116.2	123.8	110.6	118.4	107.0	137.4	141.5	134.7	165.7	61.3
Actuals	94.4	106.7	110.5	103.6	104.7	106.5	109.9	112.4	112.4	0.0	0.0	0.0	0.0

Figure 13. WAST Project Staffing

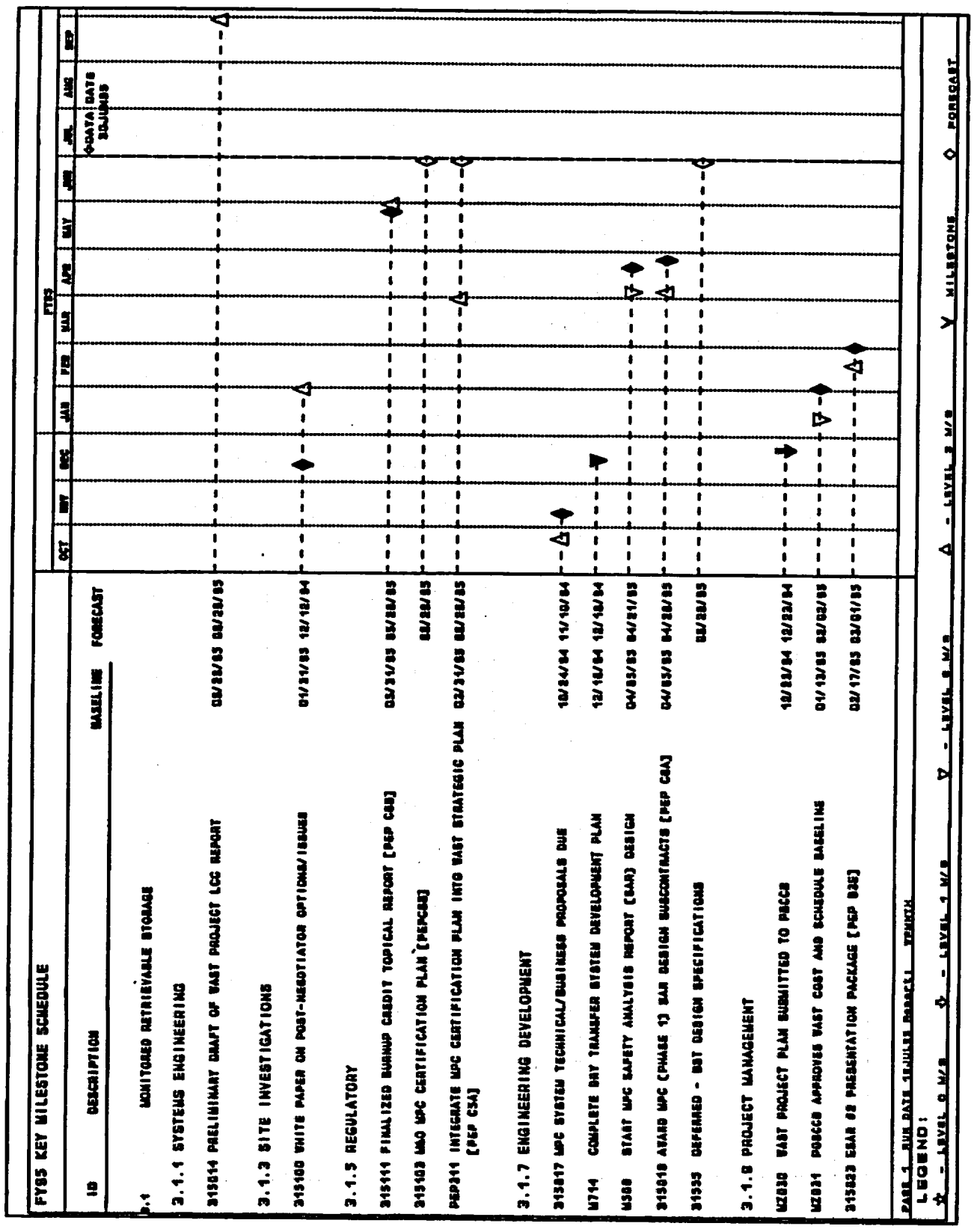


Figure 14. WAST Project Key Milestone Schedule

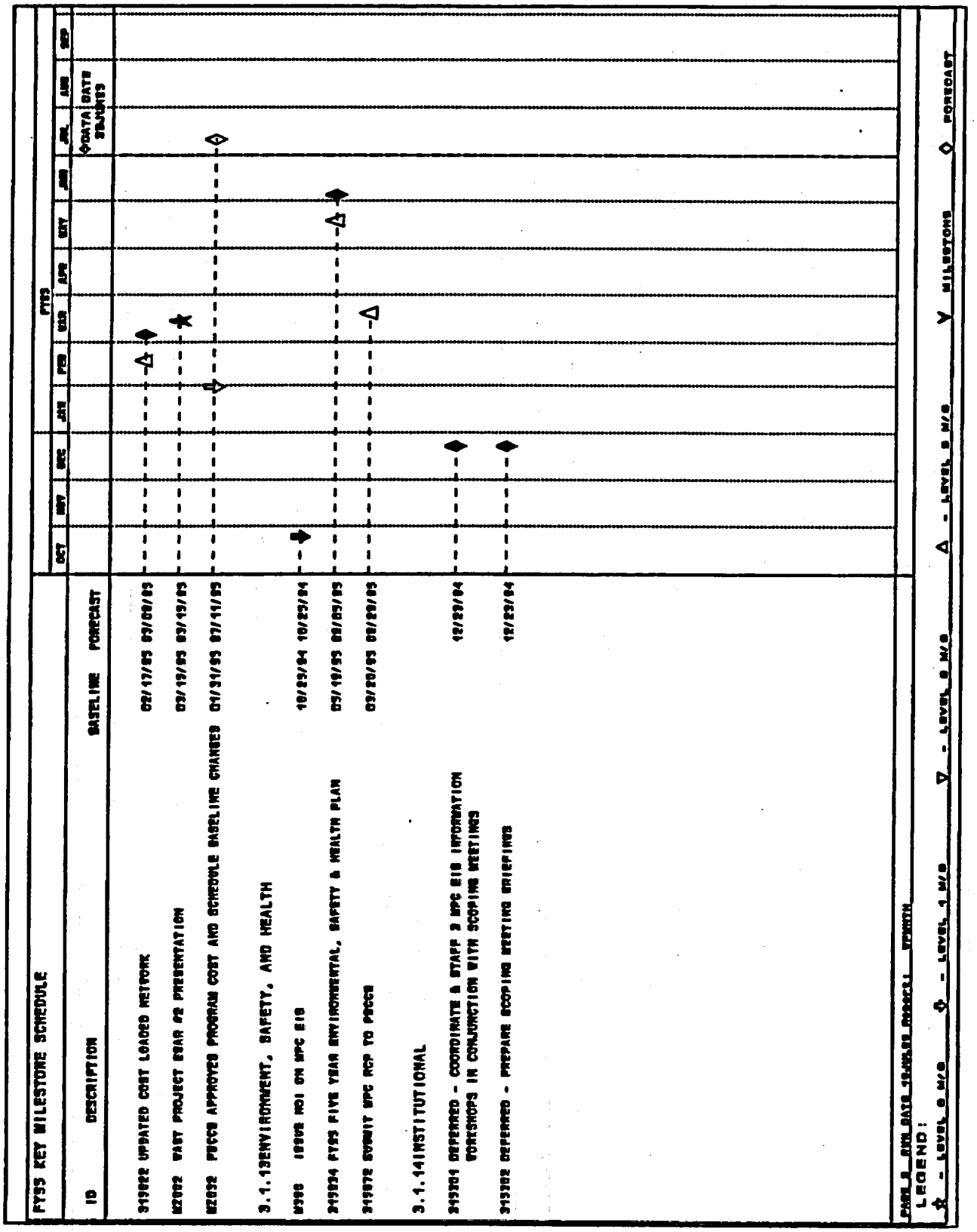


Figure 14. WAST Project Key Milestone Schedule (Continued)

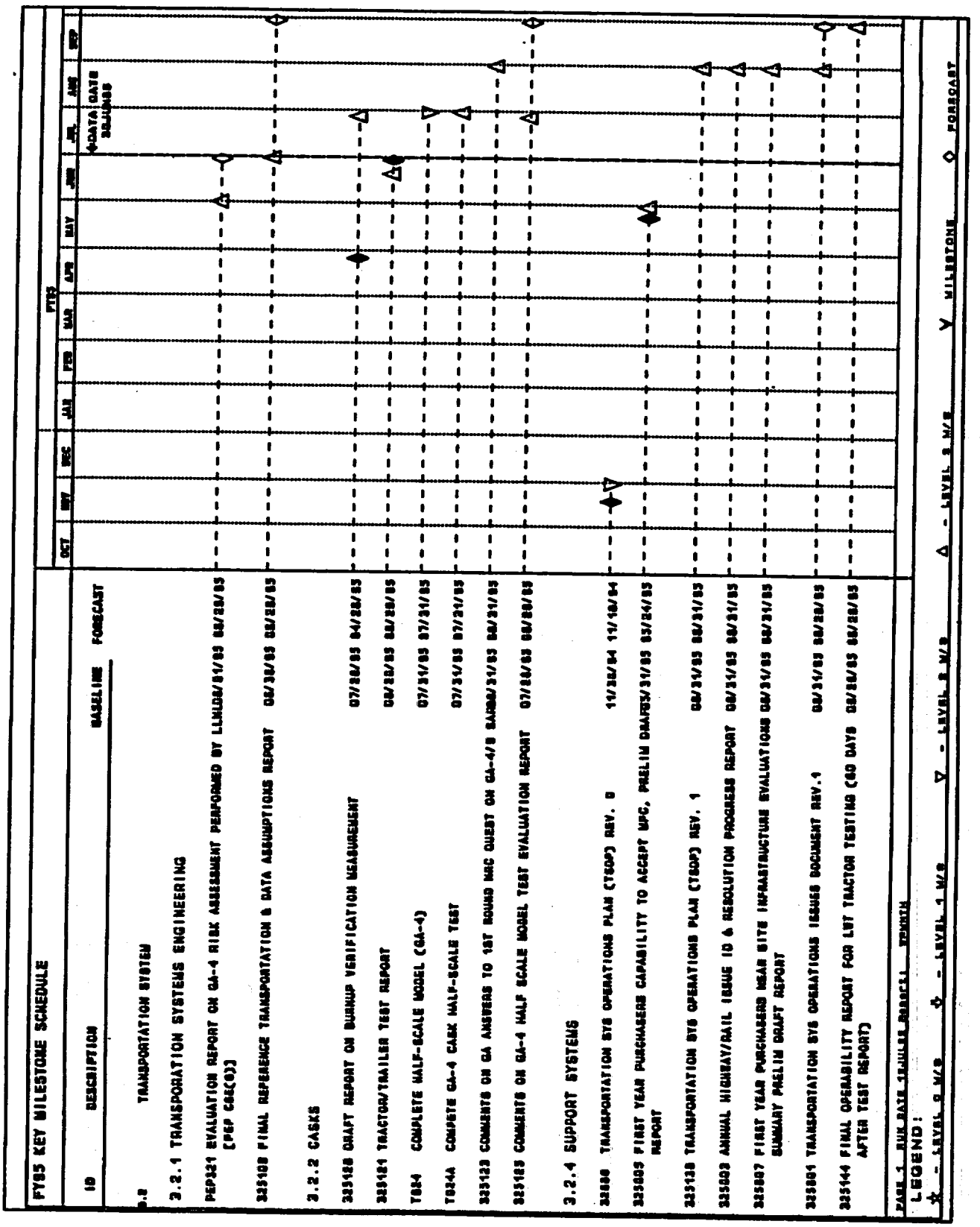
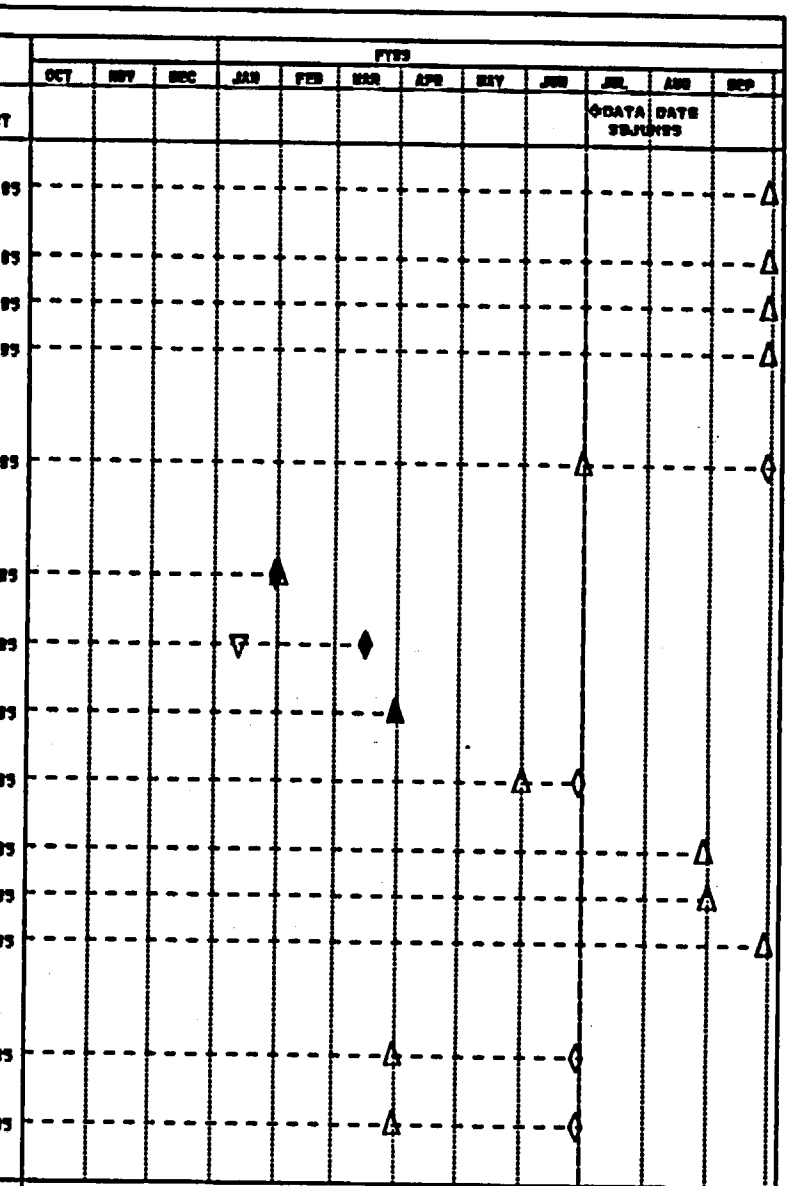


Figure 14. WAST Project Key Milestone Schedule (Continued)

FY95 KEY MILESTONE SCHEDULE

ID	DESCRIPTION	BASELINE	FORECAST
325145	RESULTS OF THE HUMAN FACTORS ENG DATA FROM LVT TRACTOR TEST(120 D AFTER TEST REPORT)	09/29/95	09/29/95
325253	125T MPC EMERG RESPONSE & RECOVERY STUDY	09/29/95	09/29/95
325254	125T MPC RAIL TRANSPORTATION TESTING NEEDS STUDY	09/29/95	09/29/95
325255	125T MPC TRANSPORTATION RAIL CAR OPTIONS REPORT	09/29/95	09/29/95
3.2.5	REGULATORY		
325157	REGULATORY IMPACTS ON THE TRANSPORTATION RISK MGT STRATEGY	08/30/95	09/29/95
3.2.13	ENVIRONMENT, SAFETY, AND HEALTH		
PEP322	DRAFT WHITE PAPER ON IMPACT OF 125T MPC'S ON RAIL NETWORKS [PEP CSE(2)]	02/01/95	01/31/95
32000	OCRWM TRAN RISK MGT PROG STRATEGIC PLAN PRELIM DRAFT [PEP CSE(1)]	01/19/95	03/19/95
325185	OCRWM TRANSPORTATION RISK MGT PROGRAM STRATEGIC PLAN FINAL DRAFT [PEP CSE(4)]	03/31/95	03/31/95
PEP323	COMPLETE INTALLATION OF RADSF MODULES ON TRANSNET [PEP CSE(7)]	08/01/95	08/29/95
325188	RISKINO EVALUATION REPORT [PEP CSE(8)]	08/30/95	08/30/95
PEP324	COMPLETE RISKINO TRAINING MODULE [PEP CSE(8)]	09/01/95	09/01/95
325187	OCRWM RISK MGT STRATEGY IMPLEMENTATION PLAN FINAL	09/29/95	09/29/95
3.2.14	INSTITUTIONAL RELATIONS		
PEP325	RECOMMEND APPROACH FOR DOE POLICY DEALING WITH 180(C) [PEP CSC]	03/31/95	08/29/95
PEP328	CRITERIA STRAWMAN FOR DSD ON THE ROUTING STRATEGY [PEP CSC]	03/31/95	08/29/95



PAGE 2 RUN DATE 12/05/94 REPORT: 9PMKTH

LEGEND:

☆ - LEVEL 0 M/S ⊕ - LEVEL 1 M/S ▽ - LEVEL 2 M/S △ - LEVEL 3 M/S ▼ MILESTONE ◇ FORECAST

Figure 14. WAST Project Key Milestone Schedule (Continued)

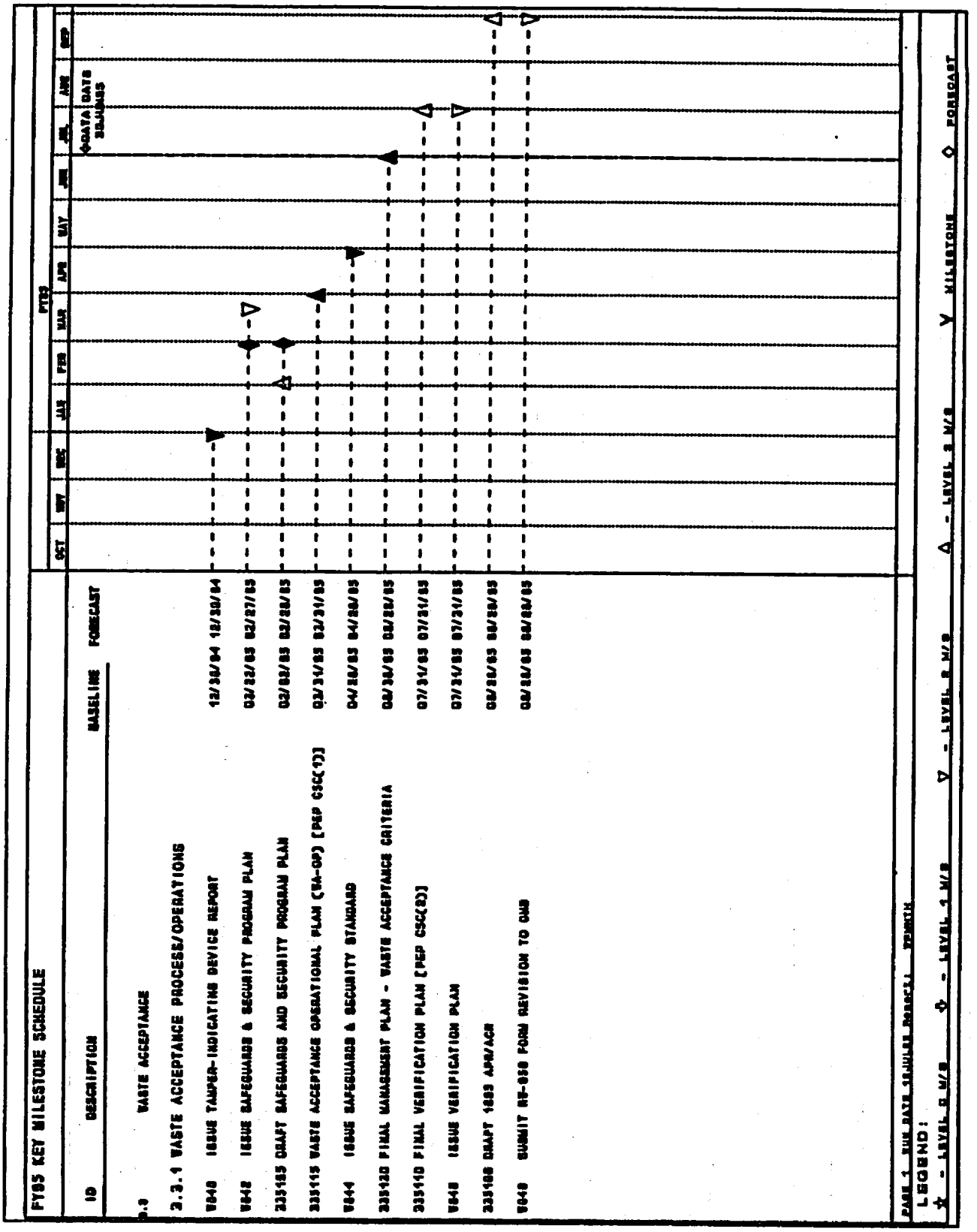


Figure 14. WAST Project Key Milestone Schedule (Continued)

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 OCRWM Program Quality Assurance Requirements and Description (QARD) requirements and is maintained through surveillances and reviews of all CRWMS M&O quality-affecting activities.

4.1.1 Progress During Report Period

Las Vegas

- Set an effective date for QAP-12-1 Revision 1. Provided concurrence on QAP-3-4, Revision 2, and formal comment resolution to QAPs-SIII-1 and SIII-2. Procedures submitted for formal review include QAP-4-1, Revision 3 (cancellation), and QAP-7-1 Revision 3 (cancellation). The Quality Review Board (QRB) completed the reviews on QAP-7-0, QAP-7-2, QAP-7-3, QAP-7-4, and QAP-7-6. Problems exist relating to the level of detail, clarity, interface, and process flow.

- Procedures reviewed outside of the QRB include Nevada Line Procedure (NLP)-2-4 "Borehole Protection and Access;" NLP-3-25 Revision 0, "Configuration/Change Control;" NLP-3-28, Revision 0, "Checklist for Design Products;" NLP-SIII-4, Revision 0, "Scientific Investigation Control;" SP 1.25, Revision 10, Draft A "Acceptance of Hardware and Services;" SP 1.28, Revision 10, Draft A "Procurement of Quality Affecting Hardware and Services;" and Technical and Management Support Systems (T&MSS)/93-002, Revision 1, "Quality Assurance Program Overview." Drafted procedure NLP-6-2 "Control of Vendor Technical Manuals and Information." Approved NLP-SIII-2, Revision 0, "Work Program."

- Surveillance Reports issued include 95-NSS-25 "Drill and Blast Analysis," 95-NSS-29 "T&MSS Procurement," 95-NSS-30 "Swellex Rockbolts," 95-NSS-32 "Control of Drawings," 95-NSS-33 "Geophysical Logging of C-Hole Complex C-3," 95-NSS-35 "Steel Set Design Analysis," and 95-NSS-36 "Alcove 2 - Drill and Blast."

- Approved the following Nevada Work Instructions (NWI): NWI-DE-002Q Revision 0, "Field Drilling Engineer Support Activities;" NWI-MET-001Q, Revision 0, "Tests, Checks, and Performance Audits of Meteorological Equipment;" NWI-MET-002Q, Revision 0, "Routine Operations and Maintenance of Meteorological Equipment;" NWI-MET-006Q, Revision 0, "Meteorological Monitoring: Reporting Formats;" NWI-MET-009Q Revision 0, "Calibration of Environmental Field Program Division (EFPD) Measuring and Test Equipment;" NWI-MET-010Q, Revision 0, "Special Meteorological Field Measurements;" MET-011Q, Revision 0, "Acquisition and Analysis of Regional Meteorological Data;" and RED-006Q, Revision 0, "Control of R/EFPD Measuring and Test Equipment."

- Performed field verification of drilling and associated activities at the following boreholes: SD-7, SD-12, UZ-7a, ONC-1, NRG-4, NRG-7, NRG-6, UZ-4, UZ-5 and C-Hole Complex. Verified that tracer gas was used in accordance with the State-approved injection permit and U.S. Geological Survey (USGS) technical procedure. Also, resolved comments and received approval for the following Field Verification Plans: "UE-25 UZ#5 Workover and Instrumentation/Stemming Program;" "UE-25 UZ#4 Workover and Instrumentation/ Stemming Program;" and " "Underground - Southern Nevada - Waste" (USW) SD-12 Drilling Work Program."

- Performed an interdiscipline review and final QA check and approval for Revision 01 of the classification analysis covering Exploratory Studies Facility (ESF) ground support systems. Also reviewed 10 analyses and 6 Determination of Importance Evaluations, 7 non-Q subsurface electrical and Integrated Data Control System (IDCS) interface drawings, and an analysis entitled "QA Classification Analysis of the Starter Tunnel portion of Portals. Backchecked 1E non-Q Summary Work Package Specification.

- Reviewed Package 1E drawings: BABBXX00-01717-2100-24012, Revision 01; -24033 Revision 00; -24041, Revision 04; -24045, Revision 00; - 24051, Revision 02; -24060, Revision 04; -24072; Revision 04; - 24200, Revision 03; BABBDA000-01717-2100-29050, -29051, -29052, -29053, -29055, -29056, -29057, -29058, Revision 00; YMP-025-1-7007-EL 102, Revision 02; -EL 104, Revision 03; and -EL 109, Revision 04; also reviewed specifications: BABBDA000-01717-6300-15483, Revision 00 and BAB000000-01717-6300-01018, Revision 00 and analysis BABBDA0000-01717-0200-00008, Revision 01.

- Approved work program YMP/WP/95-12, Revision 0 UE-25 WT #12 Workover/Pump Test.

- Reviewed and approved a Compliance Demonstration Checklist prepared by the Technical Assessment Team for work associated with qualification of borehole geophysical logs and surveys.

- Coordinated, resolved comments, and obtained QA Manager's approval for work program YMP/WP/95-02, Revision 1, USW UZ-7a Borehole Drilling Program. Submitted comments to Drilling Engineering on work program YAP/WP/95-07, Revision 0, Draft A, USW SD-12 Borehole Drilling Program.

- Presented QAP-10-1 Briefing for "Certification of Inspection Personnel."

- Developed and presented three briefings on NLP-5-1, Revision 0, "Preparation of M&O Nevada Work Instructions."

Vienna

- Reviewed the M&O's QA Plan for overview of the Westinghouse Multi-Purpose Canister (MPC) contract, its organizational structure and relationship with subtier subcontractors and recommend areas for review and control by M&O QA. Completed review of internal processing of Westinghouse QA deliverables. Provided recommendations to WAST MPC

Project personnel regarding traceability of review records for QA deliverables and records to meet QAP requirements.

- The M&O Quality Assurance Department reviewed and approved the GESCO Quality Assurance Program. The review and approval has been conducted per the requirements of M&O Quality Administrative Procedure (QAP)-7-1. The review determined that the Westinghouse GESCO QA Program complies with the Nuclear Regulatory Commission (NRC)-approved Sub-part H of 10 CFR Part 71, Sub-part G of 10 CFR Part 72, and the QARD.

- Developed a joint OCRWM M&O presentation to be given to the NRC in mid-July. The presentation will discuss the oversight role of the Westinghouse GESCO Quality Assurance Program and its interrelationship with the various sub-tier contractor QA programs in relation to the MPC contract. The presentation will also focus on OCRWM and M&O oversight of these organizations to ensure compliance with the MPC contract.

- Surveillance Reports issued include: 95-VIS-23 "Design Analysis Preparation and Review Process," 95-VIS-25 "Source Evaluation of MPC Procurement," 95-VIS-26 "Preparation of Quality Administrative Procedures," and 95-VIS-27 "Procedure Action Requests."

- Met with three Quality Assurance Technical Services Support (QATSS) representatives and M&O personnel to discuss QATSS' plan for an August audit of the Characteristics Database (CDB). The OCRWM audit schedule indicated that the audit will be conducted at the Energy Information Administration, Oak Ridge, and Vienna.

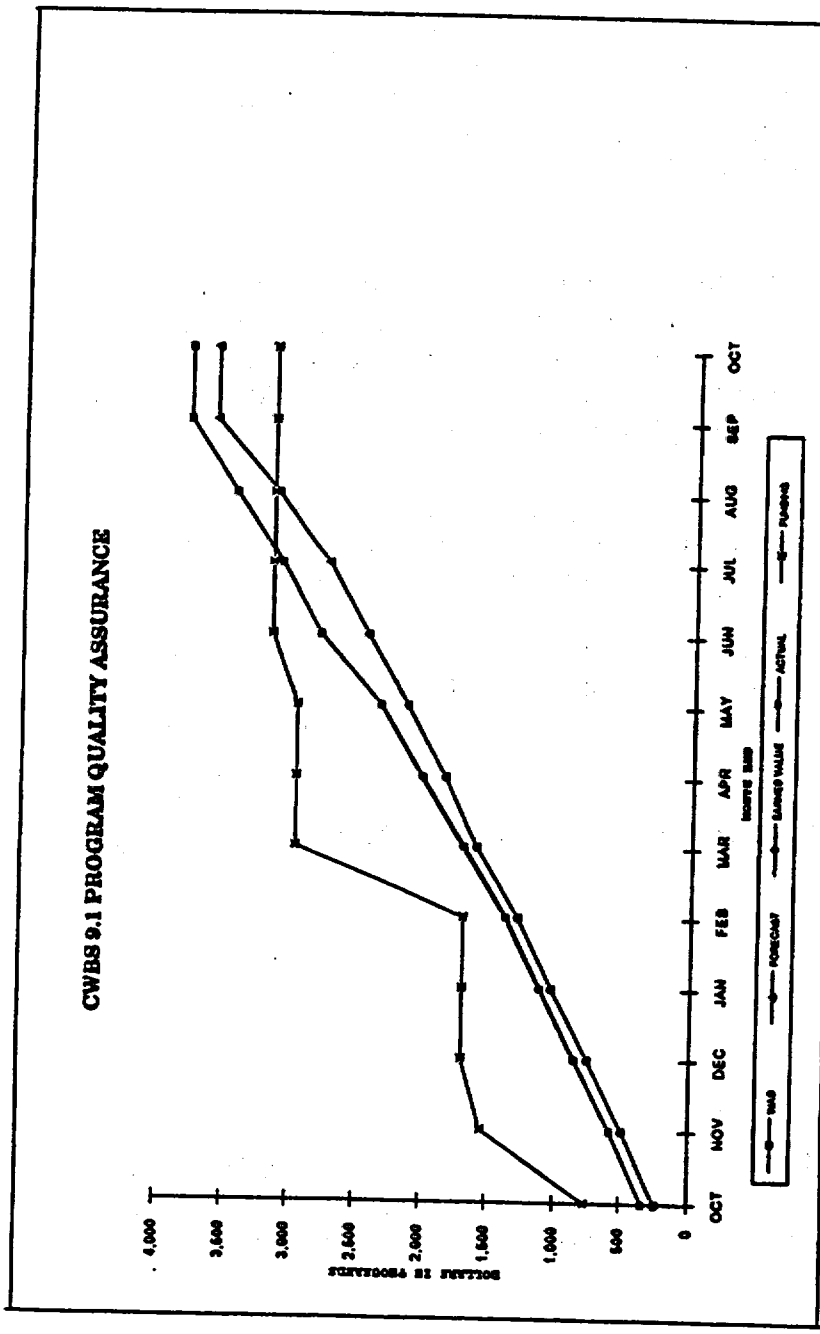
- Completed and submitted the Final Status Report for Phase II Reengineering of QA Transition Plan to Office of Quality Assurance (OQA).

4.1.2 Issues and Concerns

- None.

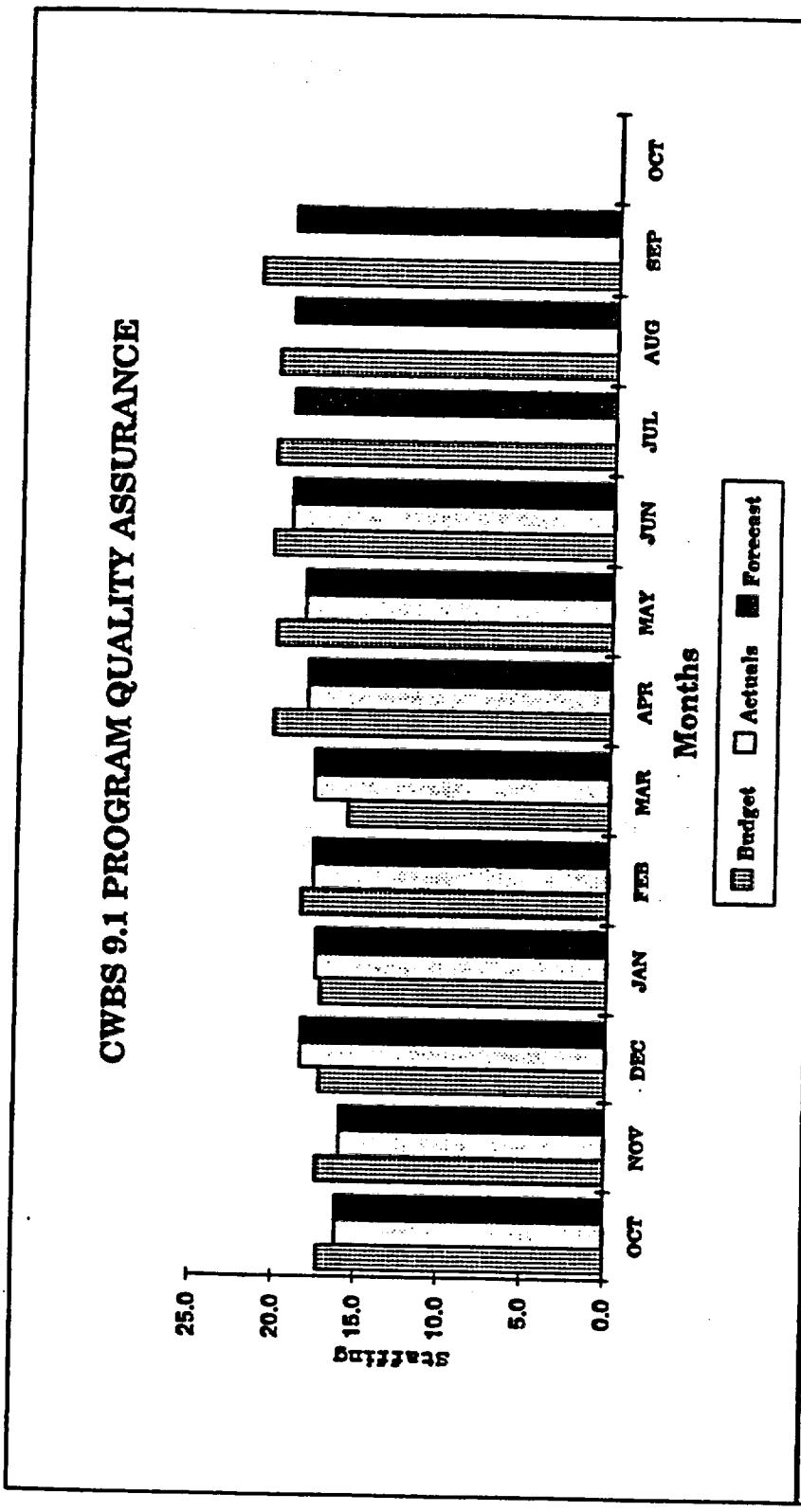
4.1.3 Variances

- The cumulative cost variance of $348K/12 is due to underruns in labor and associated travel and relocation as a result of the audit function transfer in January to OCRWM, the deletion of MPC potential vendor reviews, and the departure of one individual without replacement. There are no program impacts, and no corrective action is required.



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	323	254	282	259	253	322	325	324	452	300	356	332	0
	FORECAST	228	257	273	278	253	311	247	292	308	298	399	475	0
	EARNED VALUE	325	255	284	259	254	324	326	314	452				
	MONTH ACTUAL	228	257	273	278	253	311	247	292	308				
	VARSCH	2	1	2	1	1	2	1	(10)	0				
	VARCOST	97	(2)	11	(17)	1	13	79	22	144				
CUM	WAD	323	577	859	1,117	1,370	1,692	2,017	2,341	2,793	3,093	3,451	3,803	3,803
	FORECAST	228	485	758	1,034	1,287	1,598	1,845	2,137	2,445	2,733	3,132	3,607	3,607
	EARNED VALUE	325	580	864	1,123	1,377	1,701	2,027	2,341	2,793				
	ACTUAL	228	485	758	1,034	1,287	1,598	1,845	2,137	2,445				
	VARSCH	2	3	5	6	7	9	10	0	0				
	VARCOST	97	95	106	89	90	103	182	204	348				
FUNDING	FY95 FUNDING	768	1,540	1,540	1,540	1,540	2,815	2,815	2,815	3,015	3,015	3,015	3,015	3,015
	PREV. FUNDED	0	0	150	150	150	150	150	150	150	150	150	150	150
	TOTAL FUNDING	768	1,540	1,690	1,690	1,690	2,965	2,965	2,965	3,165	3,165	3,165	3,165	3,165

Figure 15. Program Quality Assurance Financial Status



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Forecast	16.2	16.0	18.4	17.6	17.8	17.8	18.3	18.5	19.4	19.4	19.5	19.5	0.0
Budget	17.3	17.4	17.3	17.3	16.5	15.8	20.3	20.2	20.5	20.4	20.3	21.5	0.0
Actuals	16.2	16.0	18.4	17.6	17.8	17.8	18.3	18.5	19.4	0.0	0.0	0.0	0.0

Figure 16. Program Quality Assurance Staffing

INTENTIONALLY LEFT BLANK

4.2 PROGRAM MANAGEMENT AND INTEGRATION CWBS 9.2.1, 9.2.2, 9.3.2, 9.3.3, 9.3.5

4.2.1 Systems Integration

MANAGER: J. J. Miller

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

Systems Planning and Integration

- Participated in the Tunnel Boring Machine (TBM) System Safety Analysis (SSA) walk-down at site. The walk-down was to identify changes in the TBM configuration and verify that hazard mitigation features defined in the initial SSA have been implemented.

- Completed the preliminary draft of the Concept of Operations (CONOPS) and submitted it for internal review and comment.

- Provided responses to additional comments from RW-37 on the System Engineering Management Plan. Submitted preliminary draft of revised Section 4 of the plan to M&O project System Engineering personnel in OWAST and Las Vegas.

- Briefed the Nuclear Waste Technical Review Board (NWTRB) Transportation and Systems Panel on program safety and human factors activities supporting TBM operations in Las Vegas.

- Continued to develop the MGDS Transportation Interface Control Document (ICD). The MGDS/MPC Transportation and MGDS/non-MPC Transportation interface task teams are continuing to make significant progress on Configuration Item (CI) decomposition, attribute identification, and attribute value identification. The interface task team was identified and CI decomposition and interface identification have begun for the WA/MGDS ICD.

- The Program Interface Control Working Group (ICWG) met on June 27, 1995, and reviewed Revision 1 of the Charter. Comments were then incorporated into the Charter and sent to the ICWG members and alternates for final concurrence.

- Presented an overview of Criticality Control Strategy being developed by the Program Integration Group to M&O senior management. Development of the position paper outlining

strategy for early MPC loading operations continues with Revision 0 scheduled for early July 1995.

- Delivered "Working in Hot Environments" paper to DOE for distribution to the NWTRB.

Systems Engineering Requirements and Design

- Initiated weekly "other DOE waste" integration teleconferences on June 12, 1995. Participants included M&O representatives from various organizations in Las Vegas and Vienna. Regular weekly meetings will provide status updates and highlight breaking issues.

- Submitted comments to DOE Office of Environment Management (EM) on the Defense Waste Processing Facility (DWPF) Waste Form Qualification Report Volume 2, DWPF Product Chemical Composition. This review supports RW-37 on the EM Waste Acceptance Technical Review Group.

- Supported WAST effort relating to the Dual-Purpose Canister (DPC) concept. Requirements were identified from both the Transportation and Storage System Requirements Documents (SRDs) and provided to WAST. Provided preliminary requirements identification for WAST representatives and advised them of need for DPC Concept of Operations and an approved Program Baseline Change Proposal (BCP) prior to any change in the Program SRDs.

- Prepared and submitted a paper to RW-37 that provides guidance for implementing WA SRD requirement 3.7.3.2.1.C. The paper provides background on the WA-SRD requirement, identifies the basis for radiotoxicity listing, describes how to use the A-values in 49CFR173.435 to determine radionuclide order, and provides an implementation example. This paper was developed for RW-37 to provide to EM-323.

- Prepared and presented to RW-30 an alternate approach to address Manage System Operations functions and their allocation to the respective System Elements, a principal effort for this period. This proposal includes an alternative to the functions described in BCP-0095-0009.

- Submitted draft briefing to RW-2 and EM-30 for a planned management meeting on the DOE Spent Nuclear Fuel Steering Group. The briefing summarized the Steering Group process, discussed Task Team activities, and identified issues needing management attention.

- Initiated QAP-3-1 technical review of the DOE Spent Nuclear Fuel (SNF) Requirements Report on June 7, 1995. Reviewers were nominated by the respective RW divisions and fall within RW, EM, Lockheed Idaho, M&O, and Weston.

- Incorporated review comments into the Comment Response Document (CRD) Revision 02B (concurrence review draft), a major effort this period. Continued to resolve QAP-3-1 review comments on Revision 2 of the CRD, with 503 of 512 mandatory comments now resolved. The nine open comments relate to system level and Waste Acceptance functions, which are the focus of several actions by Systems Engineering management. Submitted draft to reviewers for comment and concurrence.

- Delivered the Configuration Information System (CIS) Level 3 software for beta testing to Las Vegas. Provided a demonstration, reviewed requirements, and identified modifications and corrections needed. Part of turnover included the Action Items database, a new TBX with enhancements, and final reports.

- Obtained RW-30 approval of the OCRWM Baseline Management Guideline for Configuration Audit. The document was distributed on June 9, 1995.

- Prepared the Detailed Impact Analysis Record Disposition Recommendation and Comment Response Sheets for BCP-00-95-0014, Initial Baselining of the OCRWM Test and Evaluation Master Plan (TEMP), for transmittal to the Program Baseline Change Control Board members. The required approval date for this BCP is July 10, 1995.

- Completed drafts of Functional Requirements Document and Software Requirements Specification for CIS support to the YMSCO Level 2 Baseline Change Control Board and submitted them for internal review.

- Prepared the Preliminary Design Package for CIS YMSCO Level 2 support and conducted design review on June 28, 1995.

- Completed the OCRWM Drafting Symbols Document, Revision 00, and submitted it to OCRWM RW-30 for review and approval.

- Submitted a preliminary draft of the OCRWM Baseline Management Procedure for Document Identifiers, Revision 2, to RW-37.

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

Regulatory Policy and Requirements

- Submitted comments to RW-36 on the DOE Waste Management Programmatic Environmental Impact Statement (WM PEIS) by EM.

- Submitted "NEPA Documents of Interest to OCRWM" to the RW and M&O revised distribution list.

- Prepared a request to provide a standard categorical exclusion from the DOE NEPA requirements for the purchase, lease, or other use any commercially available NRC certified cask. This request will be submitted by the OCRWM NEPA Compliance Officer to the Director, Office of NEPA Guidance and Assistance. Incorporated RW-36 comments in the revised request.

- Reviewed comments on Repository Environmental Impact Notice of Intent provided by EH-421 and provided suggested responses to RW-36.

- Attended the June 21, 1995, comment resolution workshop on Chapters 2 and 3 of the Long-Term Storage and Disposition of Weapons Usable Fissile Materials Programmatic Environmental Impact Statement. All RW-36 comments were accepted.

- Reviewed Draft DOE 451, NEPA Compliance Program, for impact on the OCRWM NEPA Procedures Guidance Document and the role of the OCRWM NEPA Compliance Officer.

- Submitted comments to RW-36 on the Summary Volume of the Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste.

Working Group and Committee Support

- Attended the Waste Reduction Steering Committee meeting at DOE in support of RW-36.

Regulatory Compliance and Guidance Support

- Reviewed and updated papers for the Director's Resource Book.

Regulatory Integration

- Participated in a DOE NRC technical exchange regarding DOE's petition for a rulemaking regarding exemption from the double containment requirement for vitrified High-Level Waste (HLW) canisters. The NRC stated that they would prefer to treat it as an application for "determination for exemption" under 10 CFR 71.63(b)(3) rather than a rulemaking proceeding. Their reasoning is that the "determination " process would be faster than a rulemaking, even though they have never done a " determination" process to date. It is for DOE to decide on how they wish to proceed.

- Completed incorporating Weston comments in the consolidated YMSCO M&O (LV/DC) review of the NRC Proposed Revisions to 10 CFR Part 60, Design Basis Events. Provided a revised letter and comments to RW-36 for concurrence by YMSCO and General Council (GC). Comments were delivered to the NRC by June 20, 1995.

Programmatic Regulatory Integration Activities

- Responded to a Rapid Response Request on June 19, 1995, from RW-36 to answer NRC's query regarding penetration of the Paintbrush Tuft nonwelded stratigraphic unit by TBM. The NRC wanted to know when the top of the Paintbrush Tuft nonwelded stratigraphic unit had been penetrated, and when the entire the Paintbrush Tuft nonwelded stratigraphic unit was anticipated to be penetrated.

External Integration

- Attended the bi-monthly DOE NRC management meeting. Provided all the necessary support to RW-2 and RW-36 to prepare for the meeting.

- In support of the accelerated directives reduction effort ensured that the Energy Facility Contractor (EFCOG) participants received the draft DOE orders developed within the Office of Environmental Management. Made arrangements with the EFCOG participants to receive their comments from review of these draft orders in order to consolidate the comments for submission to DOE.

- Completed the Director's statements for the record and briefing book in support of his briefings to the NRC on June 9, 1995. The first briefing presented a status of the HLW Program; the second briefing focused on the MPC Project.

- Comments on NRC Proposed Revisions to 10 CFR Part 2, Petition for Rulemaking, Procedure for Submission, were submitted to the NRC by DOE on June 9, 1995, upon concurrence from GC and YMSCO.

- Attended a briefing by the NRC staff to the Commission on June 21, 1995, relating to the staff's views on the use of expert elicitation in high-level waste performance assessments. This issue will continue to be an important means of addressing uncertainties throughout the licensing process.

4.2.2.2 Issues and Concerns

- None.

4.2.3 Strategic Planning
CWBS 9.3.2

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

- Supported RW-34 efforts to prepare for Congressional hearings June 28 and 30, 1995. Hearings on the Central Storage Facility before the Subcommittee on Energy and Power were held on June 28, 1995. The primary thrust of M&O support was to evaluate several scenarios based on a fully-funded H.R. 1020 approach including one with a budget constraint of $425 million per year.

  - Provided support to RW-35 to derive the dollar requirements in constant-year dollars, budget authorization required by year, and the yearly spend plan for the above scenarios. These options were used by RW-35 to prepare for the June 28, 1995, hearing.

  - Provided support to RW-34 for the hearing on June 30, 1995, which was focused on the repository. Support included answering questions dealing with reprocessing and updating fact sheets for the Director's briefing book.

4.2.3.2 Issues and Concerns

- None.

4.2.4 International Waste Management Technology CWBS 9.3.3

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

- Participated in the Swedish Geochemistry Workshop, and the Swedish Groundwater Flow and Transport Task Force, which are related to the DOE Swedish Nuclear Fuel and Waste Management Co. Hard Rock Laboratory agreement.

- Participated in international program reviews at Lawrence Berkeley Laboratory (LBL), and Lawrence Livermore National Laboratory (LLNL) to determine progress and status of international tasks being conducted at both institutions.

- Prepared and submitted records of presentations made by East European countries during the High-Level Radioactive Waste (HLRW) Management Conference.

4.2.4.2 Issues and Concerns

- None.

4.2.5 Program Control and Administration CWBS 9.3.5

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

OBJECTIVE(S): Provide Program Control and Administrative support to OCRWM by implementing and maintaining a Program Control System (PCS) for the program and program support elements. Prepare Monthly Program Status Reports and Charts and bi-monthly Director's Program Reviews (DPRs). Develop the FY95 Total System Life-Cycle Cost (TSLCC) analysis; maintain the Program Cost and Schedule Baseline (PCSB) and WBS dictionaries; and publish weekly and bi-weekly reports from the Management Tracking System (MTS) and Operations Management Tracking System (OMTS) databases.

4.2.5.1 Progress During Report Period

- Reviewed sections on performance measurement, financial reporting, and Contract Funds Status Reports to be included in the Management and Technical Support Services Contract Request for Proposal (RFP) with RW-14.

- Completed a position paper on the elements of the program cost baseline to resolve an issue regarding "contingency budget" for the WAST Project baseline. Reviewed the paper with RW-35 and Weston.

- Completed a matrix identifying control and reporting levels for both Planning and Control System (PACS) and Financial Information System (FIS) that is applicable to all program participants. Delivered it to RW-35.

- Drafted and coordinated as additional third level WBS for Information Management (IM). WBS, 9.3.4 will become HQ IM WBS and 9.3.5 will become M&O IM. Amended FY96 WBS to reflect the change. Supported the M&O review with the IM manager. Met with RW-35 finance to discuss correct M&O fee to withhold for FY96 costs.

- Provided additional support to RW-14 on the proposed reporting criteria for the Support Services contract RFP.

- Reviewed the final structure of the revised B&R codes. Completed the matrix showing program-wide reporting requirements both PACS and FIS for FY96. Provided the Matrix to RW-14 for inclusion in the Support Services contract RFP.

- Created and tested the COBRA-to-PACS conversion utility for the M&O FY96 Annual Work Plan (AWP).

- Added a chart to the Director's Program Status Report showing out-months Program Plan milestones with forecast dates different than the baseline dates.

- Applied the milestone criteria to the RW-3 and RW-30 workscope to develop a proposed list of Levels 0, 1, and 2 milestones to include in the M&O recommendation to RW-30. Upon

completion of M&O review, updates will be made to the Program Cost and Schedule Baseline document that incorporates the Program Support component of the WBS.

- Reviewed baseline management approach with Weston representatives. The Weston annual performance measurement baseline spans all of FY95, although the contract period of performance is through June, 1995. The pending contract extension will be based on forecast at complete for FY95 and will be incorporated in the PACS forecast. The baseline totals will remain static, but Weston has the flexibility to re-profile the budget plan beyond the freeze period.

- Reviewed duplication of Uniform Reporting System requirements and PACS Management Reporting requirements for the QATSS contract with representatives from RW-14, RW-3, and QATSS. It was agreed that the PACS monthly reports would satisfy Uniform Reporting System (URS) requirements for the Cost Performance Report and Labor Management Report. Currently coordinating task order/WBS alignment, PACS workstations installation, and training requirements.

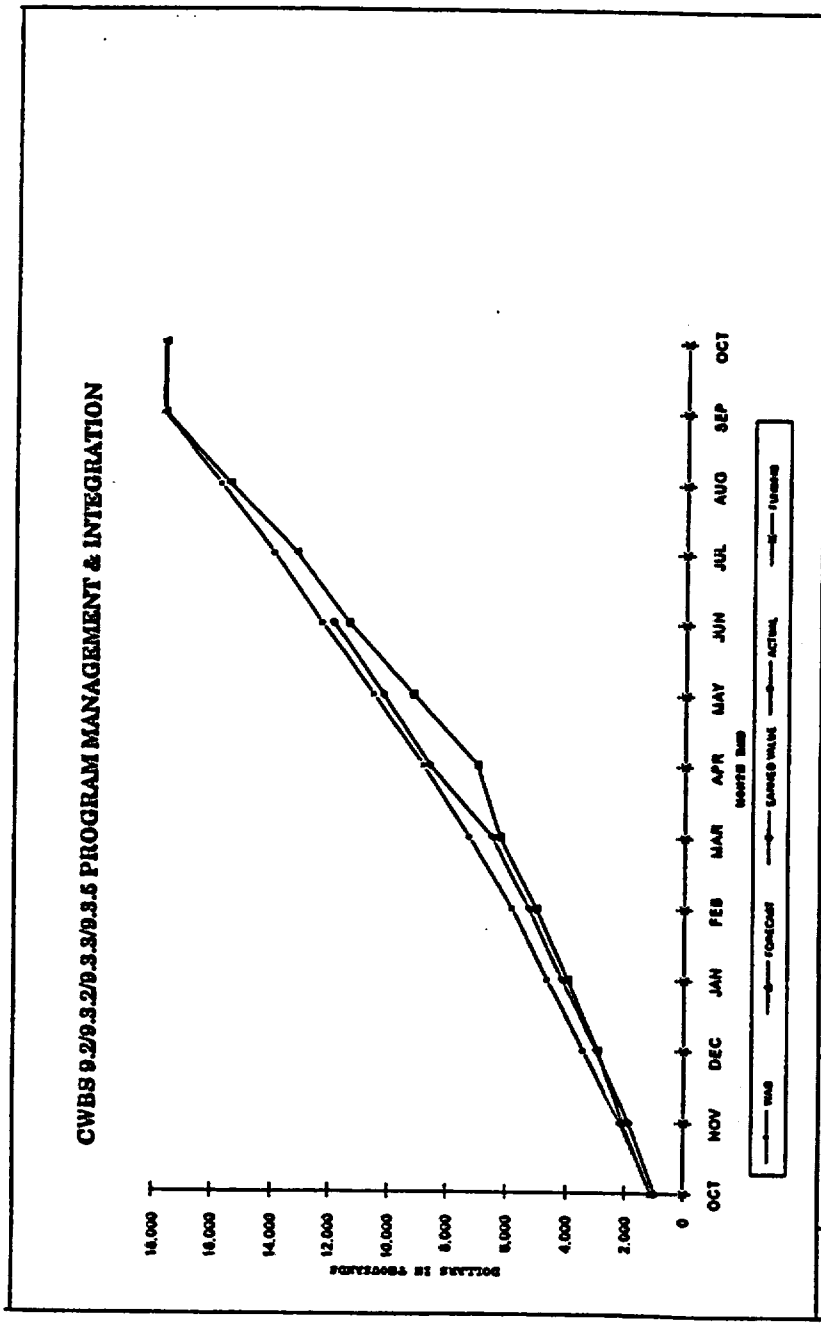
- Participated in the Independent Cost Estimate review of the Program Support element of the Total System Life-Cycle Cost.

4.2.5.2 Issues and Concerns

- None.

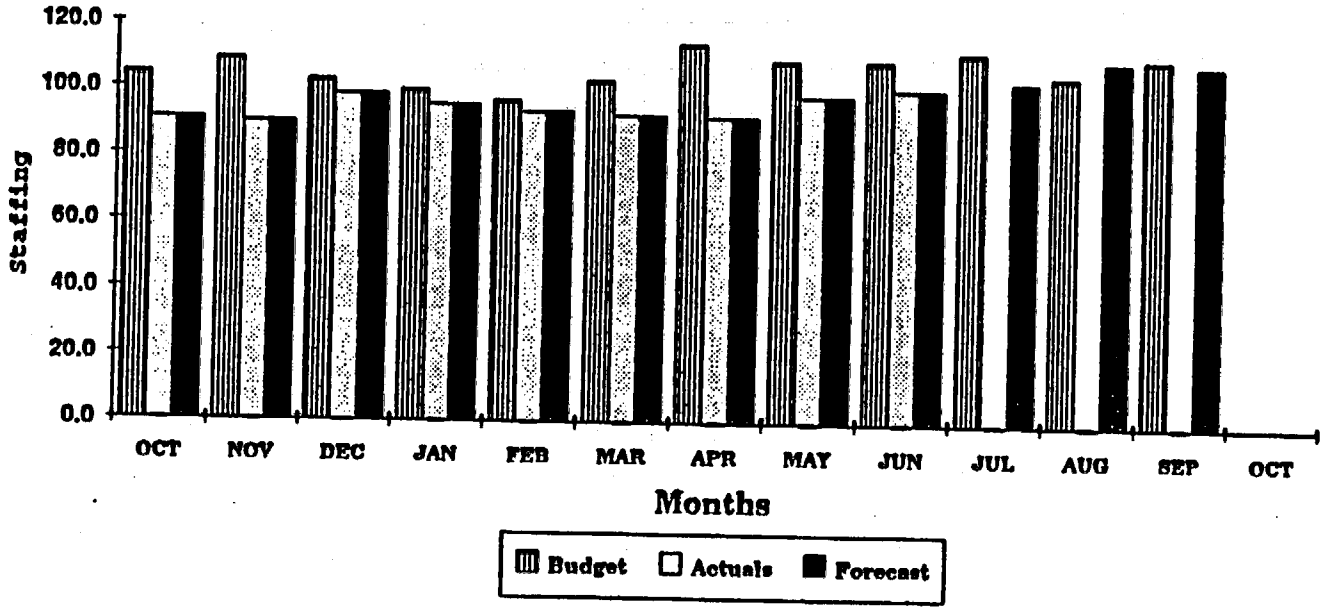
4.2.6 Program Management and Integration Variances

- All variances are within tolerance.



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	1,075	1,133	1,233	1,214	1,170	1,452	1,602	1,693	1,775	1,840	1,906	1,951	0
	FORECAST	1,091	1,005	861	1,010	1,060	1,215	775	2,202	2,216	1,761	2,270	2,186	0
	EARNED VALUE	847	919	1,133	1,163	1,118	1,220	2,159	1,377	1,705				
	MONTH ACTUAL	1,091	1,005	861	1,010	1,060	1,215	775	2,202	2,216				
	VAR/SCH	(128)	(214)	(100)	(51)	(54)	(232)	557	(119)	(70)				
	VAR/COST	(144)	(86)	272	153	58	5	1,384	(825)	(511)				
CUM	WAD	1,075	2,208	3,441	4,655	5,825	7,277	8,879	10,572	12,347	13,967	15,793	17,744	17,744
	FORECAST	1,091	2,096	2,957	3,967	5,027	6,242	7,017	9,219	11,435	13,226	15,496	17,682	17,682
	EARNED VALUE	847	1,766	2,899	4,162	5,279	6,499	8,657	10,034	11,739				
	ACTUAL	1,091	2,096	2,957	3,967	5,027	6,242	7,017	9,219	11,435				
	VAR/SCH	(128)	(342)	(442)	(493)	(547)	(778)	(222)	(338)	(400)				
	VAR/COST	(144)	(230)	42	195	251	256	1,640	1,015	504				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 17. Program Management and Integration Financial Status



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Forecast	90.7	90.0	98.4	95.5	93.4	92.6	92.2	98.6	100.7	103.2	109.6	108.8	0.0
Budget	104.4	108.8	102.6	99.7	96.8	102.9	114.3	109.2	109.5	112.1	105.1	110.9	0.0
Actuals	90.7	90.0	98.4	95.5	93.4	92.6	92.2	98.6	100.7	0.0	0.0	0.0	0.0

Figure 18. Program Management and Integration Staffing

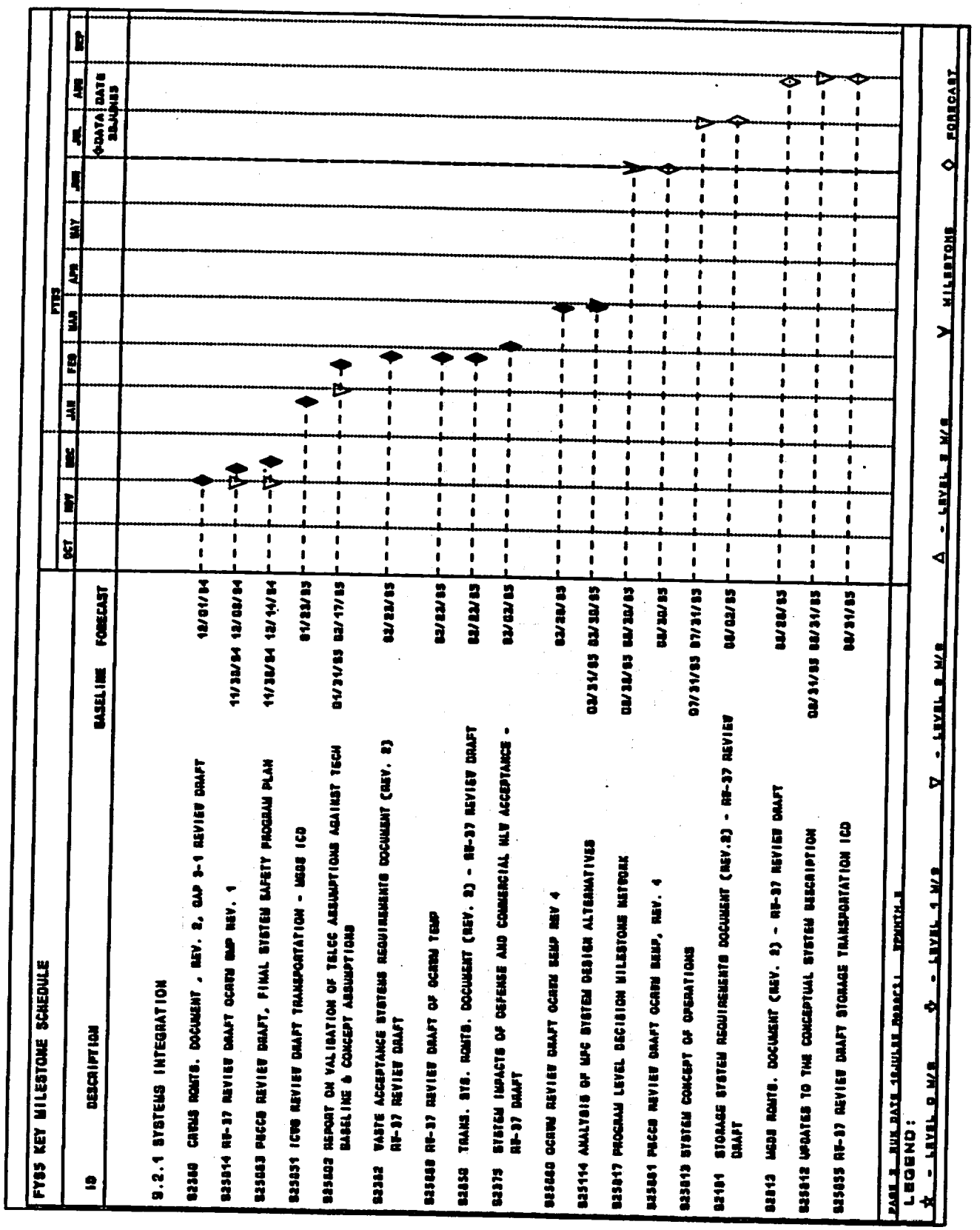
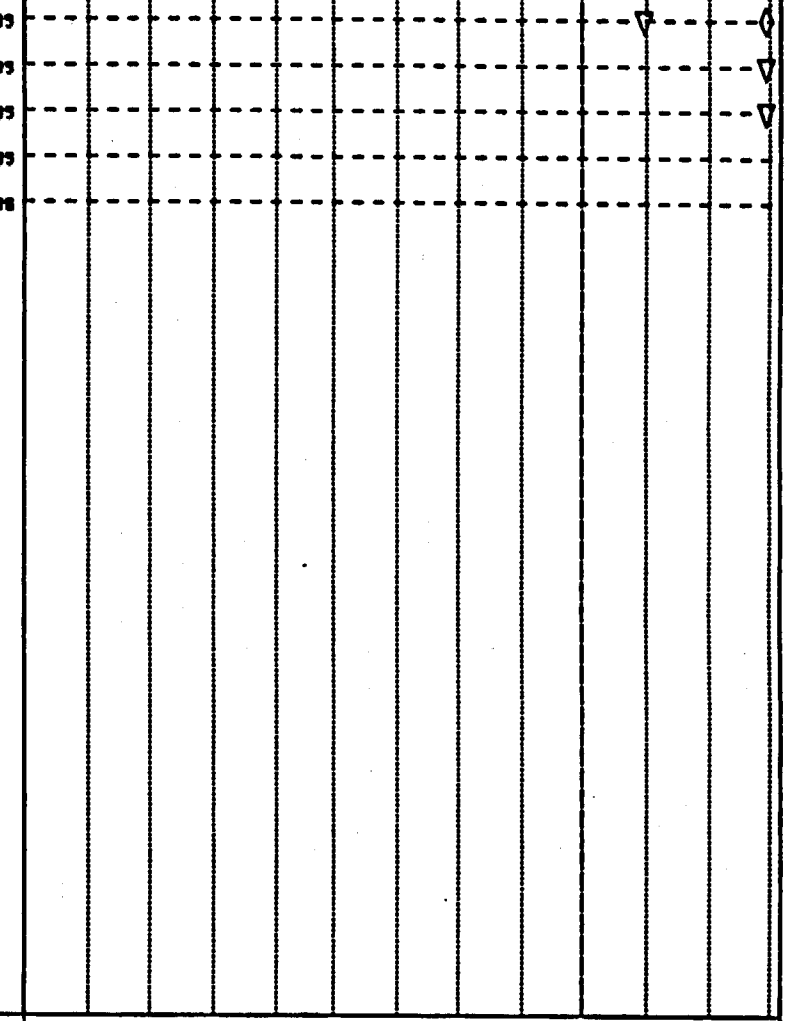


Figure 19. Systems Integration Key Milestone Schedule

FY95 KEY MILESTONE SCHEDULE

ID	DESCRIPTION	BASELINE	FORECAST
025005	EVALUATION OF ALTERNATIVE STORAGE STRATEGIES	07/31/95	09/29/95
025008	DEVELOPMENT OF INTEGRATED DESIGN BASIS FUEL DESCRIPTION	09/29/95	09/29/95
025020	PROGRAMMATIC RISK ANALYSIS	09/29/95	09/29/95
025027	CIS PHASE 3 ACCEPTANCE TEST	10/31/95	10/31/95
025028	CIS PHASE 3 OPERATIONAL [PEP 398]	02/16/96	02/16/96



PAGE 2 RUN DATE 19-MAR-95 Report: 9FMONTH_2

LEGEND:

☆ - LEVEL 0 M/S ⊕ - LEVEL 1 M/S ▽ - LEVEL 2 M/S △ - LEVEL 3 M/S ▼ MILESTONE ◇ FORECAST

Figure 19. Systems Integration Key Milestone Schedule (Continued)

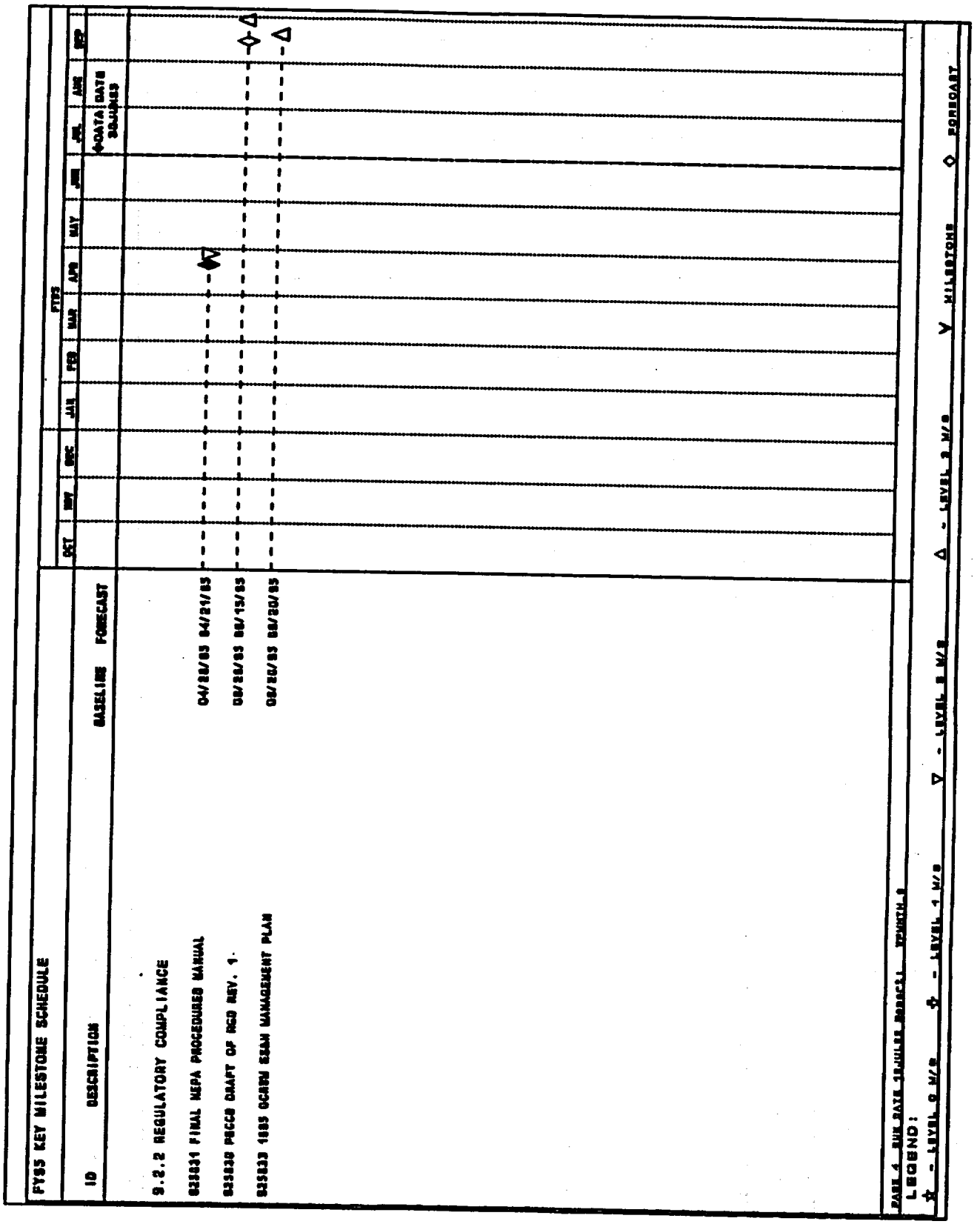


Figure 20. Regulatory and Licensing Key Milestone Schedule

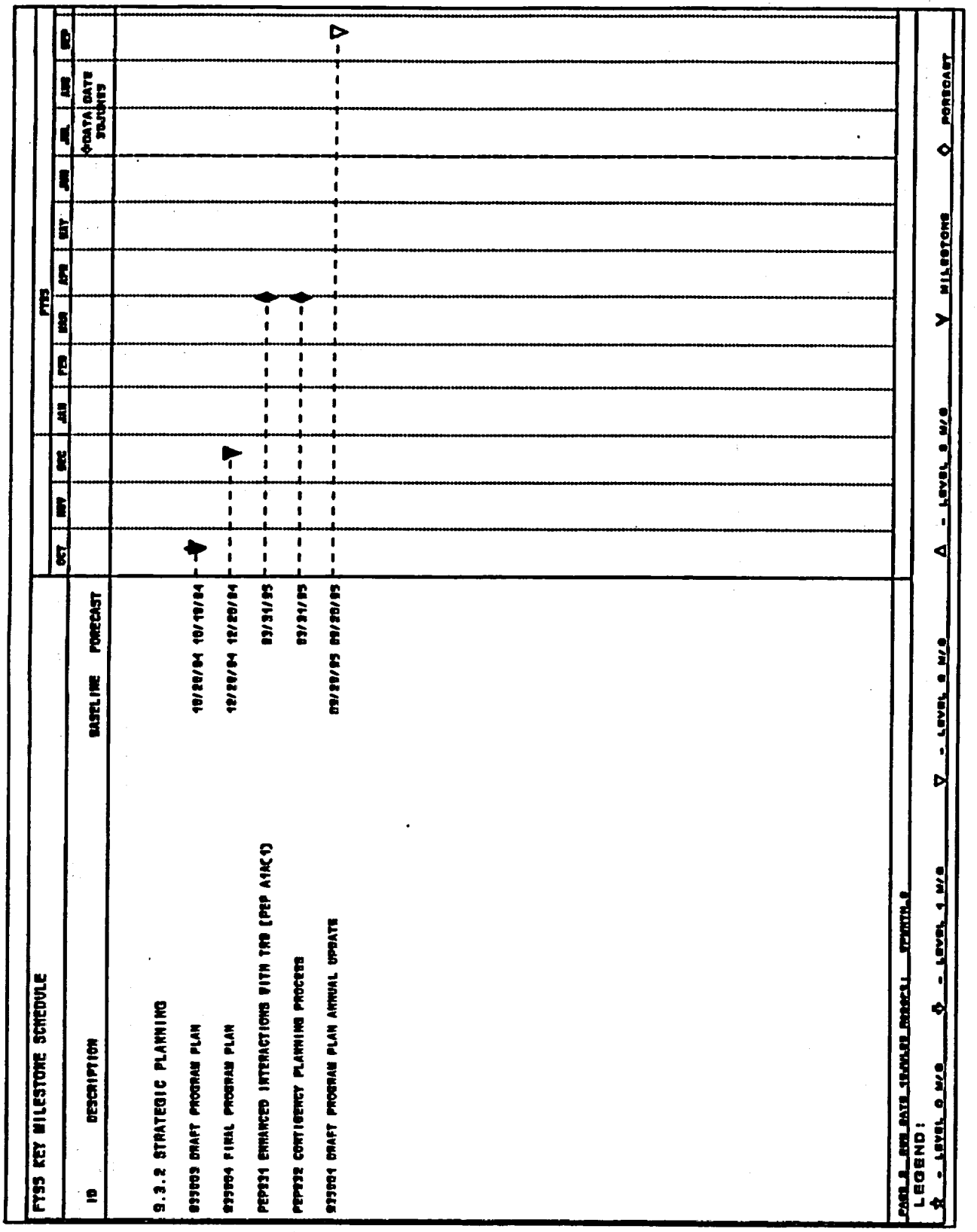


Figure 21. Strategic Planning Key Milestone Schedule

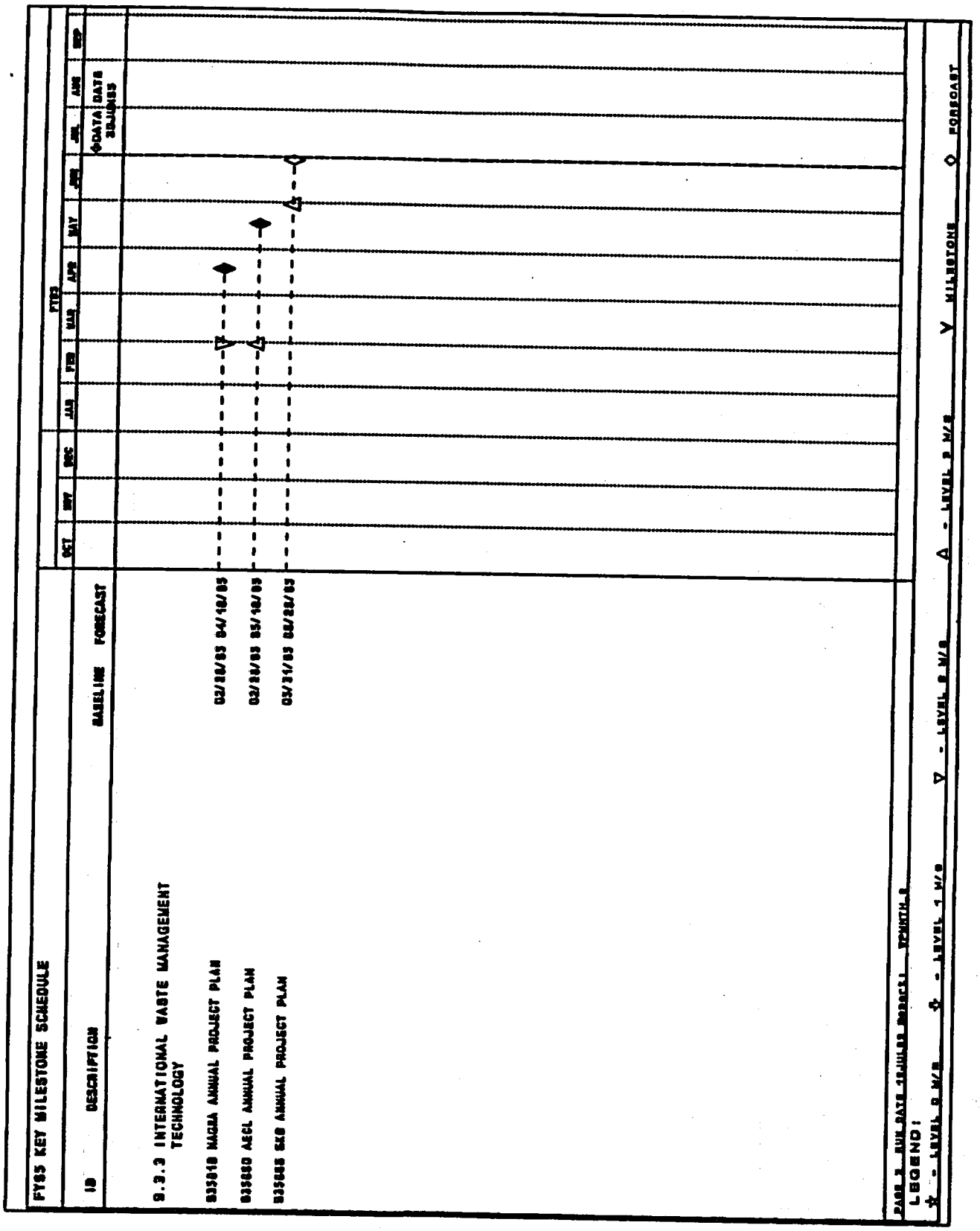


Figure 22. International Waste Management Technology Key Milestone Schedule

FY95 KEY MILESTONE SCHEDULE

FY95: OCT, NOV, DEC, JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP

◇DATA SOURCES

ID	DESCRIPTION	BASELINE	FORECAST
9.3.5	PROGRAM CONTROL AND ADMINISTRATION		
939217	DESCRIPTION OF PROGRAM ASSUMPTIONS to RV-35	11/09/94	11/09/94
939213	DELIVER DRAFT COST LOADED OPEN TO RV-35	02/15/95	02/15/95
939211	DELIVER DRAFT PMSM TO RV-35	02/27/95	02/24/95
939218	INTERIM LIFE CYCLE COST ESTIMATES TO RV-35	01/27/95	03/27/95
939220	REVISED VRB RECOMMENDATION TO RV-35	03/10/95	04/07/95
939219	FINAL PRELIMINARY DRAFT TSLCC REPORT TO RV-35	04/29/95	04/11/95
939225	DRAFT PROJECT COST & SCHEDULE BASELINE (PCSB) MRB/MPC	02/09/95	08/29/95
939228	DRAFT PCSB (YWP)	08/15/95	08/30/95
939210	DELIVERY DRAFT PCSB TO RV-35	08/30/95	07/28/95
939224	DRAFT FEE ADEQUACY REPORT	08/28/95	07/31/95
939229	DRAFT TSLCC REPORT TO RV-35	08/10/95	08/08/95
939227	SUBMIT DRAFT PROJECT DECISION SCHEDULE (PDS) TO RV-35	08/14/95	08/15/95
939221	DRAFT TSLCC NOTEBOOK TO RV-35	08/10/95	08/10/95
939007	REPORT ON LIFE CYCLE COST DRIVER MITIGATION	12/15/94	08/29/95

PAGE 8 RUN DATE 19-MAR-95 PROGRAM: SPMNTH_8

LEGEND:
☆ - LEVEL 0 M/S ◇ - LEVEL 1 M/S ▽ - LEVEL 2 M/S △ - LEVEL 3 M/S ▼ MILESTONE ◇ FORECAST

Figure 23. Program Control and Administration Key Milestone Schedule

INTENTIONALLY LEFT BLANK

4.3 EXTERNAL RELATIONS AND INFORMATION RESOURCE MANAGEMENT CWBS 9.3.4, 9.3.6

4.3.1 External Relations CWBS 9.3.4

MANAGER: K. H. Whitney

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

Communications Integration

- Participated in M&O communications integration meeting with YMSCO and RW-40 institutional staff to improve efficiency, cost effectiveness, and cooperation.

Public Information

- Prepared visuals and briefing to be presented at the University of Virginia by RW-45; shipped 155 publications to the University in support of the presentation.

- Wrote and edited drafts of all articles for the Summer 1995 "OCRWM Bulletin". Topics include OCRWM Home Page accessibility and several multi-purpose canister and transportation-related stories.

- Delivered the National Information Center Development Plan.

- Continued development and implementation of the OCRWM Home Page. Worked with KENROB personnel to post new information including descriptions of the Transportation External Coordination and Transportation Coordination working groups; OCRWM calendar through August; "1994 Annual Report to Congress," a transportation report and contingency plan; and four speeches. During the month of June, the OCRWM Home Page was accessed via the Internet a total of 9,911 times. Drafted a memo for RW-1 announcing the activation of the OCRWM Home Page and procedures for submitting products. It was approved and distributed. Incorporated final RW-15 comments on Home Page Management and Operations Plan.

- Met major milestone and deliverable dates for testing the Digital Media Database. Conducted the first Digital Media Database (DMD) Natural Working Group meeting for Graphic Designers.

- Distributed 7,948 copies of OCRWM publications from the warehouse; continued activities to transition warehouse operations from Oak Ridge, TN, to Beatty, NV; prepared draft timeline and assisted with scoping logistics and equipment requirements; and recommended recycling of more than 250,000 obsolete OCRWM documents prior to relocation.

- Provided visual images supporting of several requests including YMSCO's request for 420 images and RW-1/2's request for source book and congressional briefings.

Education Programs

- Revised and edited all four units of the OCRWM resource curriculum "Science, Society, and America's Nuclear Waste" for publication in July. Editing includes deleting references to a Monitored Storage Retrievable storage system, obtaining appropriate reviews from the YMSCO on repository descriptions, incorporating the multi-purpose canister concept, and developing a lesson on the multi-purpose canister system.

Utility Outreach

- Prepared draft letter to accompany latest video work update and brochure mailings to key contacts at 77 nuclear information centers and 33 universities with nuclear programs.

International

- No significant activity to report.

4.3.1.2 Issues and Concerns

- None.

4.3.2 Information Management Services
CWBS 9.3.6

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, maintain, and provide enhancements to 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

Records Data Management System (RDMS)

- Continued operation of the RDMS at both LV and Vienna facilities with daily scanning of documents and storage on optical disk. Implemented daily backup and journaling procedures. Completed final security requirements in Las Vegas and submitted a letter acknowledging completion to the YMSCO Security Manager. Also issued Computer Protection Plan security certification of the RDMS for operational use within M&O Vienna. A problem (hang) with the optical commit process occurred, and fixes installed to eliminate the problem are currently being tested. Continuing support for the installation of the RDMS CD-R test system (for remote site distribution of images). The CD generation process is being documented for user training.

- Conducted initial management review of RDMS 96 plans which include a proposed architecture for RDMS that will provide a flexible user interface without requiring the same level of current vendor support. Briefed M&O LV Information Resources Management (IRM) personnel (V. Rochester and J. Low) on RDMS 96 architectural details.

Licensing Support System (LSS)

- Participated in the Licensing Support System Advisory Review Panel's (LSSARP's) Technical Working Group (TWG) review of the LSS Requirements Document (Level 2), which was delivered to YMSCO IRM on June 2, 1995. The document was very well received. Updated the Level 2 Requirements document for the July 6-7, 1995, LSSARP meeting based on the TWG comments.

- Met with NRC to discuss LSS milestones schedule. Development of the milestone schedule was a caveat to the NRC's agreement on the LSS Design and Development Memorandum Of Understanding (MOU), the first of four MOU's between OCRWM and the NRC.

Integrated Tracking System

- Deployed the Integrated Tracking System (ITS) pilot to OCRWM. This first phase of ITS provides a single integrated read-only summary view of the entries in the Correspondence Tracking System (CTS), OMTS, and RW-Tracker action item tracking systems. ITS was demonstrated to RW-1, was well received, and OCRWM will continue to use it to track all overdue actions within RW. Although ITS is available only to the OCRWM Front Office at present, plans are to deploy to all RW offices after further operational testing.

Digital Media Database (DMD)

- Deployed the DMD to the first "general user," ahead of a planned end-June date. DMD will be deployed first to graphic artists, then to members of the Rapid Response Team (RRT), and then to general users. The National Information Center (NIC) is updating the data maintained by the DMD prior to making the system available to more members of the RRT.

ARMS/CIS

- Held the ARMS/CIS Quarterly Review (WAD deliverable), and sent a formal deliverable letter to the client. Distributed the CIS Phase 3 Level 2 Functional Requirements Document (FRD) for internal review. Held the CIS Level 2 Preliminary Design working group videoconference on June 28, 1995.

NRC Observation Audit of M&O Vienna Records

- Received a letter from NRC concerning the observation audit conducted in February 1995; the NRC staff concluded that Vienna M&O Records is effective in the implementation of QA Programmatic Element 17, Records Control.

VTEL

- The Capital Gallery VTEL system is installed and functional for point-to-point videoconferences, and cables are being ordered to split screens so the projection screen and white board are more accessible. Remaining activities include registering the system with AT&T for multipoint conferencing, profiling the system for easier access to other OCRWM systems, and training Capital Gallery personnel.

OCRWM IRM Planning

- Attended an OCRWM Information Management (IM) offsite meeting for multi-year program planning at George Washington University Decision Support Center. The session provided valuable insights and laid out the foundation objectives and actions for a 5-year IM program plan.

DOE Strategic Alignment Implementation Initiative Support

- Participating in a DOE Strategic Alignment Implementation Initiative to establish a corporate information management program. Participated in the development of a preliminary action business plan addressing immediate corporate information management needs. Attended the Strategic Alignment Implementation review for DOE on June 21, 1995.

DOE Office of Information Technology Conference Presentations

- Finalized two presentations for DOE's Office Information Technology conference in July. One presentation will be on AFS (Automated Forms System) and the other on our Computer-Based Training (CBT) development efforts.

Computer-Based Training Products Demonstration

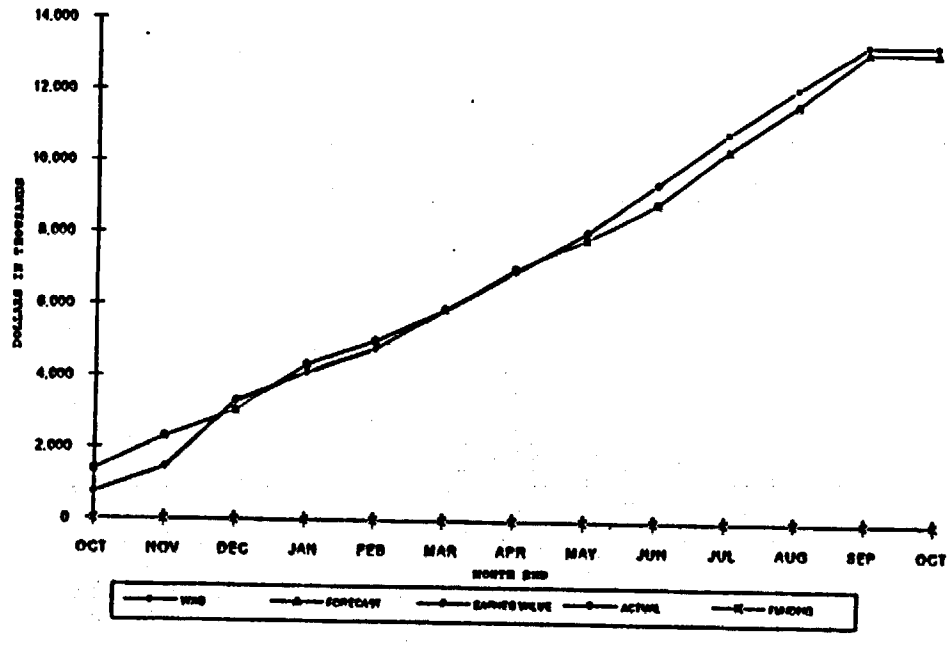
- Provided a demonstration of our CBT products to the Defense System Management College, (DSMC) who requested the presentation through the TRW Department of Defense (DOD) Omnibus Program. DSMC is interested in exploring potential applicability of the CBT technology to its training courses. RW-15, approved the presentation.

4.3.2.2 Issues and Concerns

- None.

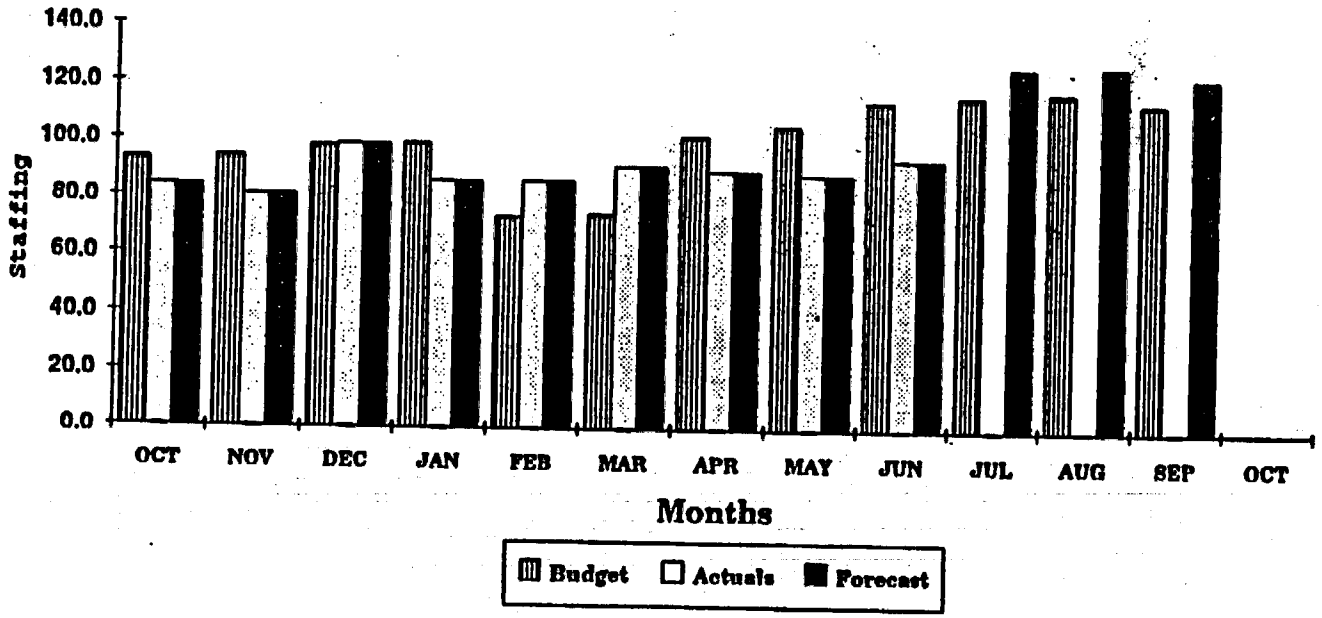
4.3.3 External Relations and Information Resource Management Variances

- All variances are within tolerance.



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	724	706	1,080	790	868	1,084	1,092	1,129	1,358	1,461	1,269	1,236	0
	FORECAST	1,366	935	765	1,265	842	897	1,159	814	994	1,537	1,334	1,479	0
	EARNED VALUE	730	712	1,095	797	874	1,093	1,066	1,107	1,358				
	MONTH ACTUAL	1,366	935	765	1,265	842	897	1,159	814	994				
	VARSCH	6	6	15	7	6	9	(26)	(22)	0				
	VARCOST	(636)	(223)	1,130	(468)	32	196	(93)	293	365				
CUM	WAD	724	1,430	2,510	4,190	4,788	5,852	6,944	8,073	9,432	10,893	12,162	13,400	13,400
	FORECAST	1,366	2,301	3,066	4,331	4,993	5,890	7,049	7,863	8,857	10,394	11,728	13,207	13,207
	EARNED VALUE	730	1,442	2,537	4,194	4,868	5,961	6,967	8,074	9,433				
	ACTUAL	1,366	2,301	3,066	4,331	4,993	5,890	7,049	7,863	8,857				
	VARSCH	6	12	27	34	40	49	23	1	1				
	VARCOST	(636)	(859)	271	(217)	(185)	11	(82)	211	576				
FUNDING	FY95 FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0
	PREV. FUNDED	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL FUNDING	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 24. External Relations/Information Resource Management Financial Status



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Forecast	84.2	80.9	98.9	86.1	86.4	91.6	89.9	88.9	94.3	126.7	127.4	123.9	0.0
Budget	93.2	94.3	98.3	99.3	73.7	74.9	102.5	106.4	114.9	117.1	118.3	114.9	0.0
Actuals	84.2	80.9	98.9	86.1	86.4	91.6	89.9	88.9	94.3	0.0	0.0	0.0	0.0

Figure 25. External Relations/Information Resource Management Staffing

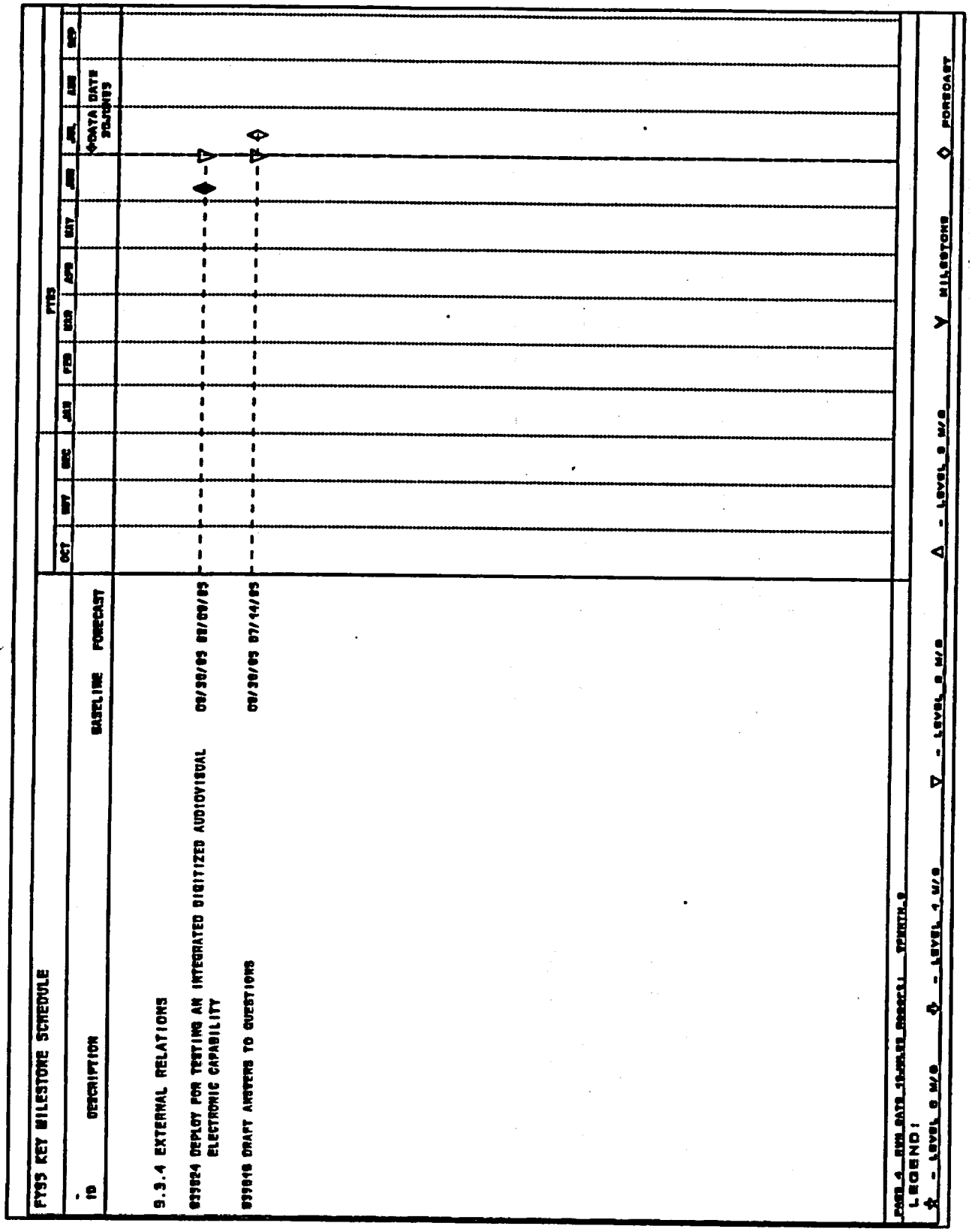


Figure 26. External Relations Key Milestone Schedule

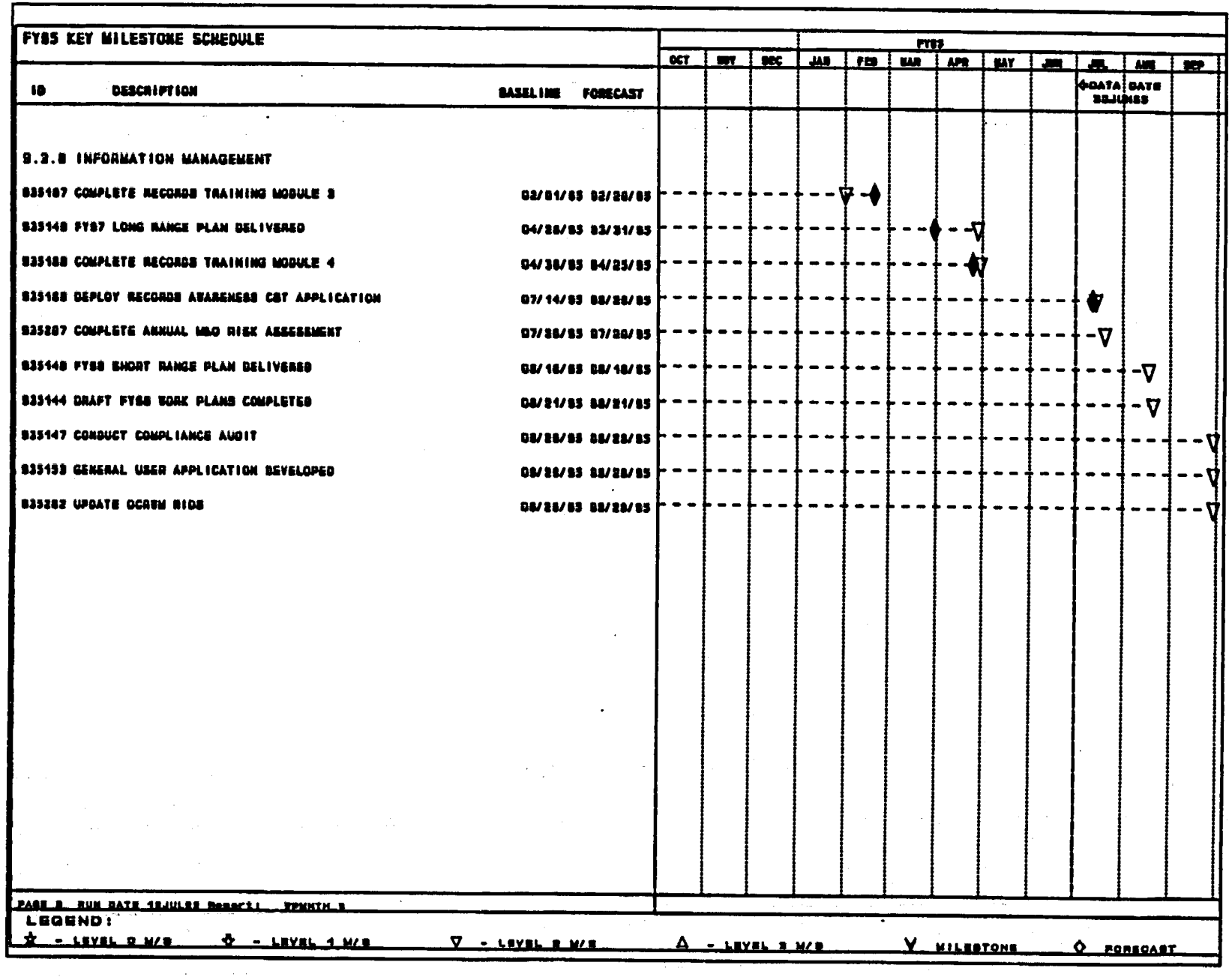


Figure 27. Information Management Key Milestone Schedule

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

- Addressed existing Mixed Oxide (MOX) Reactors comments received from the PEIS Contractor, who requested the Greenfield Glass report take priority over the MOX corrections.

- Submitted Greenfield Glass PEIS input report to the PEIS Contractor on June 30, 1995. Feedback received from the PEIS Contractor concerning the report is favorable. Use of reference (or baseline) data for comparisons is being debated within RW. The information may need to be removed from this PEIS to avoid conflicts with the Repository Environmental Impact Statement (EIS), which is just getting underway.

- A condition exists under which the Greenfield Glass configuration has the potential to violate the NRC prescribed Keff value of 0.95. The issue was discussed with the Immobilization Alternative Team. Additional meetings are being scheduled to discuss the issue further.

- Completed Greenfield Ceramic throughput, waste package design, as-fabricated criticality, shielding, thermal, structural, and performance assessment analyses. The PEIS for the Greenfield Ceramic case is still scheduled for the end of July.

- Analyzed as-fabricated criticality for the Evolutionary MOX reactor. Results indicate only about 4 Pressurized Water Reactors can be accommodated per MPC cask, versus 21 for the UO_2 spent fuel case. Initiated new throughput rates and shielding, thermal, and structural analyses for the derated case.

- Participated in the Reactor Alternative Team meeting on June 28 and 29, 1995, in Dallas, Texas. Defined input needs and initiated data collection.

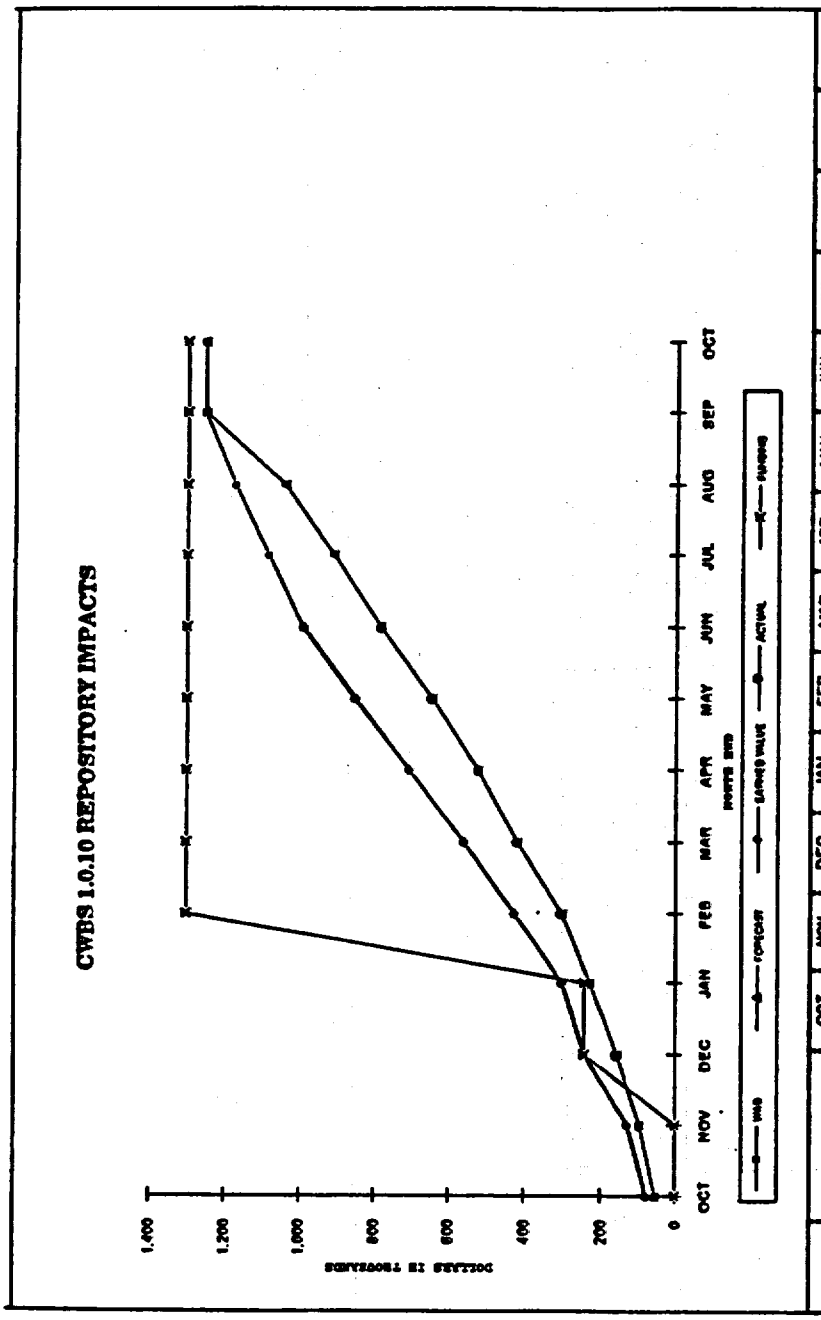
- Participated in the June 1 and 2, 1995, and June 23, 1995, Immobilization Alternative Team meetings in Livermore, CA. Presented the Greenfield Glass data to the Team in mid-June; Greenfield Ceramic data will be available the end of July. Briefed the Team on the glass form potential criticality issue.

4.4.2 Issues and Concerns

- Incomplete data for several options are being evaluated, and simultaneous development of the PEIS and Phase 2 technical summary data continue to cause schedule concerns. Developed a recovery plan and presented it to the Alternative Team.

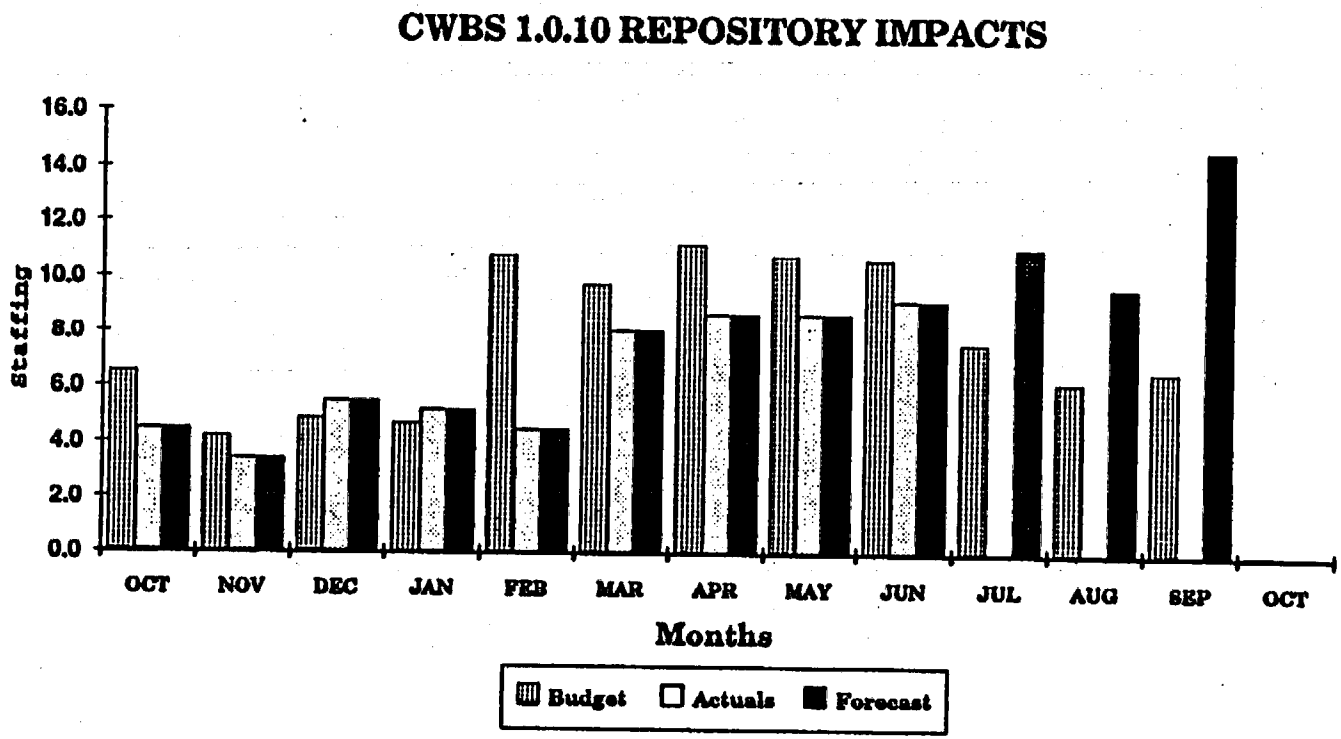
4.4.3 Variances

- Delayed data is being analyzed on several Repository Impacts task options resulting in the cumulative cost variance of $205K/21%. Based on the current schedule for the PEIS development, only the Existing Reactor, Greenfield Glass, and Greenfield Ceramic options will be analyzed for repository impacts. The M&O and PEIS contractor are working together to establish dates for submission of the analyses.



		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
MONTH	WAD	79	50	114	88	127	134	144	150	158	91	90	82	0
	FORECAST	85	43	80	72	71	116	104	122	140	126	131	211	8
	EARNED VALUE	80	50	112	58	126	134	148	144	158				
	MONTH ACTUAL	85	43	80	72	71	116	104	122	140				
	VARSCH	1	0	(2)	0	(1)	0	4	(6)	0				
	VARCOST	25	7	52	(14)	55	18	44	22	(2)				
CUM	WAD	79	129	243	301	428	562	706	856	994	1,085	1,175	1,257	1,257
	FORECAST	85	85	165	230	301	419	523	645	785	911	1,042	1,253	1,258
	EARNED VALUE	80	130	242	300	426	560	706	852	990				
	ACTUAL	85	85	165	230	301	419	523	645	785				
	VARSCH	1	1	(1)	(1)	(2)	(2)	2	(4)	(4)				
	VARCOST	25	32	84	70	125	141	165	207	205				
FUNDING	FY95 FUNDING	0	0	0	0	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060
	PREV. FUNDED	0	0	243	243	243	243	243	243	243	243	243	243	243
	TOTAL FUNDING	0	0	243	243	1,303	1,303	1,303	1,303	1,303	1,303	1,303	1,303	1,303

Figure 28. Repository Impacts Financial Status



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Forecast	4.5	3.4	5.5	5.2	4.5	8.1	8.7	8.7	9.2	11.1	9.7	14.7	0.0
Budget	6.5	4.2	4.9	4.7	10.8	9.8	11.2	10.8	10.7	7.6	6.2	6.6	0.0
Actuals	4.5	3.4	5.5	5.2	4.5	8.1	8.7	8.7	9.2	0.0	0.0	0.0	0.0

Figure 29. Repository Impacts Staffing

APPENDIX B

M&O Monthly Progress/Update Summary ($K) as of JUNE 30, 1995

B&R	B&R Title	0 Total Budget FY95/Defer/Commit	1 Cum to Date Budget/FY95/Defer/Commit	2 Cum to Date Forecast/FY 95 Defer/Commit	3 Cum to Date Actuals	2-3 Variance (Fore-Act)	4 Total Funding-FY 95 & Previously Funded	1-3 Variance (Cum Budget - Act)	0-3 Variance (Total Budget - Act)
DB0102010	YMP Systems Engineering	8,724	6,850	5,393	5,393	0	0	1,457	3,331
DB0102020	YMP Waste Package	9,716	7,235	5,569	5,569	0	0	1,666	4,147
DB0102030	YMP Site Investigations	44,935	28,223	28,954	28,954	0	0	-731	15,981
DB0102040	YMP Repository	8,931	6,694	5,443	5,443	0	0	1,251	3,488
DB0102050	YMP Regulatory	22,897	16,332	14,476	14,476	0	0	1,856	8,421
DB0102060	YMP Exploratory Studies Fac.	77,204	43,586	51,833	51,833	0	0	-8,247	25,371
DB0102070	YMP Test Facilities	9,129	5,695	6,277	6,277	0	0	-582	2,852
DB0102090	YMP Project Management	11,460	8,074	8,513	8,513	0	0	-439	2,947
DB0102130	YMP Environ., Safety & Health	16,882	11,787	12,024	12,024	0	0	-237	4,858
DB0102140	YMP Institutional	4,711	3,271	2,903	2,903	0	0	368	1,808
DB0102150	YMP Support Services	9,157	6,313	6,627	6,627	0	0	-314	2,530
DB0102160	YMP Quality Assurance	5,828	3,769	3,673	3,673	0	0	96	2,155
DB0102170	YMP Information Management	7,749	5,691	5,438	5,438	0	0	253	2,311
	Total YMP	237,523	153,520	157,123	157,123	0	162,078	-3,603	80,200
	% of YMP			102.35%	102.35%	0.00%		-2.35%	
DB0301010	MRS Systems Engineering	954	661	520	520	0	0	141	434
DB0301030	MRS Site Investigations	43	34	10	10	0	0	24	33
DB0301040	MRS MRS Facility	0	0	0	0	0	0	0	0
DB0301050	MRS Regulatory	1,953	1,339	1,243	1,243	0	0	96	710
DB0301070	MRS Engineering Development	24,173	3,179	3,012	3,012	0	0	167	21,161
DB0301090	MRS Project Management	1,804	1,309	1,094	1,094	0	0	215	710
DB0301110	MRS Quality Assurance	194	133	128	128	0	0	5	66
DB0301120	MRS Information Management	0	0	0	0	0	0	0	0
DB0301130	MRS Environ., Safety & Health	1,474	1,054	932	932	0	0	122	542
DB0301140	MRS Institutional	821	533	289	289	0	0	244	532
DB0301150	MRS Support Services	0	0	0	0	0	0	0	0
	Total MRS	31,416	8,242	7,228	7,228	0	0	1,014	24,188
	% of MRS			87.70%	87.70%	0.00%		12.30%	
DB0302010	Trans. Systems Engineering	633	346	385	385	0	0	-39	248
DB0302020	Trans. Casks	3,431	2,549	2,004	2,004	0	0	545	1,427
DB0302040	Trans. Support Systems	2,307	1,341	814	814	0	0	527	1,493
DB0302050	Trans. Regulatory	169	85	20	20	0	0	65	149
DB0302090	Trans. Project Management	734	543	526	526	0	0	17	208
DB0302110	Trans. Quality Assurance	235	136	123	123	0	0	13	112
DB0302120	Trans. Info Management	48	34	4	4	0	0	30	44
DB0302130	Trans. Environ., Safety & Health	1,203	676	326	326	0	0	350	877
DB0302140	Trans. Institutional	1,047	731	787	787	0	0	-56	260
DB0302150	Trans. Support Services	0	0	0	0	0	0	0	0
	Total Transportation Systems	9,807	6,441	4,989	4,989	0	0	1,452	4,818
	% of TRANS. SYS.			77.46%	77.46%	0.00%		22.54%	

NOTE: FIS actuals may not agree with contractual actuals since the FIS cumulative-to-date actuals include depreciation costs. Contractual cumulative-to-date costs reflect total outlays of cash for capital and expenses only. As a result, these two methods of financial reporting may not necessarily agree.

Figure B-1. Monthly Progress/Update Summary

M&O Monthly Progress/Update Summary ($K) as of JUNE 30, 1995

B&R	B&R Title	0 Total Budget FY95/Defer/Commit	1 Cum to Date Budget/FY95/Defer/Commit	2 Cum to Date Forecast/FY 95 Defer/Commit	3 Cum to Date Actuals	2-3 Variance (Fore-Act)	4 Total Funding-FY 95 & Previously Funded	1-3 Variance (Cum Budget - Act)	0-3 Variance (Total Budget - Act)
DB0303010	Waste Accept Process/Oprtns	2,942	1,991	1,953	1,953	0	0	38	989
DB0303020	Waste Acceptance Econ. Stud.	128	49	57	57	0	0	-8	71
DB0303030	Waste Acceptance Data Collect.	993	428	456	456	0	0	-28	537
	Total Waste Acceptance	4,063	2,468	2,466	2,466	0	0	2	1,597
	% of WA			99.92%	99.92%	0.00%		0.08%	
	TOTAL 3.0 WAST PROJECT	45,286	17,151	14,683	14,683	0	44,409	2,468	30,603
DB0910030	Program Quality Assurance	3,802	2,793	2,444	2,444	0	3,165	349	1,358
	% of PQA			87.50%	87.50%	0.00%		12.50%	
DB0920011	Systems Engineering	6,523	4,816	4,326	4,326	0	0	490	2,197
DB0920012	Systems Planning & Integration	0	0	0	0	0	0	0	0
DB0920013	Configuration Management	1,208	851	897	897	0	0	-46	311
	Total Systems Integration	7,731	5,667	5,223	5,223	0	6,737	444	2,508
DB0920021	Regulatory Policy & Requirements	695	502	515	515	0	0	-13	180
DB0920022	Regulatory Integration	1,663	1,158	1,128	1,128	0	0	30	535
	Total Regulatory & Licensing	2,358	1,660	1,643	1,643	0	2,431	17	715
	% of R & L			98.98%	98.98%	0.00%		1.02%	
DB0932000	Strategic Planning	1,369	992	936	936	0	1,117	56	433
DB0933000	Int'l Waste Management Tech.	4,311	2,512	2,427	2,427	0	574	85	1,884
	Total Strategic Planning & Int'l Waste	5,680	3,504	3,363	3,363	0	1,691	141	2,317
	% of SP & IW			95.98%	95.98%	0.00%		4.02%	
GA0101011	Repository Impacts	1,257	994	786	786	0	1,503	208	471
	% of RI			79.07%	79.07%	0.00%		20.93%	
DB0934000	External Relations	2,339	1,716	1,385	1,385	0	1,845	331	954
	% of ER			80.71%	80.71%	0.00%		19.29%	
DB0935000	Program Control & Admin.	1,975	1,516	1,207	1,207	0	2,496	309	768
	% of PC&A			79.62%	79.62%	0.00%		20.38%	
DB0936010	Information Mgmt Services	11,081	7,716	7,472	7,472	0	9,800	244	3,589
	% of IMS			96.84%	96.84%	0.00%		3.16%	
DB0937000	Contract Business Mgmt	15,279	6,248	5,179	5179	0	15,088	1,069	10,100
	% of CBM			82.89%	0.83	0.00%		17.11%	
	M&O Totals	334,091	202,485	200,508	200,508	0	250,878	1,977	133,583
	M&O Total % of WAD			99.02%	99.02%	0.00%		0.98%	
	M&O Total % of NB&R			60.02%	60.02%	0.00%		0.59%	

NOTE: FIS actuals may not agree with contractual actuals since the FIS cumulative-to-date actuals include depreciation costs. Contractual cumulative-to-date costs reflect total outlays of cash for capital and expenses only. As a result, these two methods of financial reporting may not necessarily agree.

Figure B-1. Monthly Progress/Update Summary (Continued)

EG&G ENERGY MEASUREMENTS
Las Vegas Area Operations
EG&G ENERGY MEASUREMENTS, INC., P.O. BOX 1912, LAS VEGAS, NEVADA 89125

QA: NA
WBS 1.2.5

L-9729/9

August 10, 1995
NV-95-496

Mr. Wesley Barnes, Project Manager
Department of Energy
Yucca Mountain Site Characterization Project Office
101 Convention Center Drive
Las Vegas, NV 89109

JULY 01, 1995 - July 31, 1995, PROGRESS REPORT - EG&G/ENERGY MEASUREMENTS, REMOTE SENSING LABORATORY SUPPORT TO THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

Enclosed is a progress report on the EG&G Energy Measurements, Inc. (EG&G/EM) Remote Sensing Laboratory (RSL) support to the Yucca Mountain Site Characterization Project (YMP) for July 01, 1995 through July 31, 1995.

The progress report for EG&G/EM RSL support to YMP includes the following sections:

- Work Accomplished
- Expenditures
- Status of Deliverables

If you have any questions, please contact Elaine Ezra at (702) 794-7449.

James Michael, Manager
NV Program

CE:ns

Enclosures
1. Progress Report
2. Maps

3/5
Dijn W/ Ryder W
Dyer W/ Sullivan W
Hardy W/ Tynan W
Gil W/ Williams, D W
Jenkins W/ Wilson W
Spence W/ Hartz
W/O { CPA / Crowe
Grossman / Jones, S }

RECD 8/14/95

ENCLOSURE 2

cc w/Encl 1

S. Ronshaugen, DOE/NV EMD
W. Dixon, DOE/YMSCO
M. Dockter, DOE/NV
R. Dyer, DOE/YMSCO
D. Foust, M&O/TRW (Encls 1 & 2)
J. Gandi, DOE/YMSCO
A. Gil, DOE/YMSCO
C. Newbury, DOE/YMSCO (Encls 1 & 2)
M. Ryder, DOE/YMSCO
T. Statton, M&O/WCFS
T. Sullivan, DOE/YMSCO
M. Tynan, DOE/YMSCO (Encls 1 & 2)
D. Williams, DOE/YMSCO
W. Wilson, DOE/YMSCO (Encls 1 & 2)
J. Younker, M&O/TRW

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.3 SITE INVESTIGATIONS

WBS 1.2.3.9.5 SPECIAL STUDIES: THREE-DIMENSIONAL SITE MODEL

SA OE395A95L INTEGRATED 3-D MODEL

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: David Jefferis

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. A 3-D geologic model consisting of three zones: 1) surface to base Paintbrush Group, 2) base Paintbrush Group to base Prow Pass, and 3) base Prow Pass to Top Paleozoic was constructed. The purpose of this modeling exercise was to inspect the resulting fault geometry produced by extending the YMP.R2 fault model to and through the Paleozoic section. This modeling effort was possible due to the receipt of the top of the Paleozoic generated by the USGS Branch Geophysics (V. Langenheim and D. Ponce) via the USGS Yucca Mt. Branch (R. Spengler).

2. In support of the Geophysical Data Integration Project (GDIP) and the 3-D Site Model, a two map set of geophysical data was created. The first set was a montage consisting of a topographic map, isostatic gravity map, top Paleozoic basement map (based on gravity), and an isochore from the surface to the top of the Paleozoic. The other set consisted of the same series of maps, except for the isochore, which was replaced by profiles (North/South and West/East) of the isostatic gravity, topography, and top Paleozoic through borehole 'p#1'.

   A request has been made to DOE/NV for various cross-sections, geologic maps, geophysical, and borehole data in support of the GDIP. This request has been forwarded to International Technology Corp. (IT). A meeting is planned for early August to facilitate the fulfillment of the request.

   Following the GDIP coordination meeting on July 25, EG&G received gravity (station) data from D. Ponce, USGS, the next day. Work remains on getting the aeromagnetic flight-line data from the USGS.

3. D. Jefferis attended the 1995 AAPG Rocky Mountain Section Meeting in Reno, Nevada, July 16-19.

4. In support of the M&O planning effort in regard to WBS 1.2.3.9.5, a document outlining the proposed workscope for fiscal year 1996 was developed. Following the review of the first draft, a meeting was held at the Remote Sensing Laboratory with C. Rautman, R. Spengler, and R. Clayton to discuss the interplay between SNL, USGS, EG&G, and M&O in terms of critical paths and deliverables. The final report was delivered to M&O.

5. EG&G received a copy of the M&O Lynx Model YMP.M02 from R. Elayer. This model will be installed into the Numerical Model Warehouse next month. Various files will be extracted (repository and ESF design) and incorporated into the Site Area Geologic Model.

6. The following products were generated as level of effort activities:

   NR95071003 Map showing faults to be used in creating Site Area Geologic Model. For B. Zelinski, SNL.

   NR95072801 Geophysical map showing isostatic gravity, topography, top Pz, and isochore between surface and Pz.

MAJOR PROBLEMS AND CORRECTIVE ACTION: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Pull Repository and ESF design from the M&O Lynx Model YMP.MO2 and the vitric/zeolitic transition zone from USGS YMP.R2 and incorporate them into the EV YMP.R2 3D model. Write a report on the methodology and procedures used to preprocess2 a flow/transport model for LANL.

2. Continue development of the Site Area Geological Framework model, Version 1.0. The model will be comprised of faults, top Paleozoic Basement, and topography. Develop a new fault model based on current mapping by USGS.

3. Resume work on the Numerical Model Warehouse in preparation of transition of EG&G 3-D modeling workscope to TRW.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.3 SITE INVESTIGATIONS

WBS 1.2.3.9.5 SPECIAL STUDIES: THREE-DIMENSIONAL SITE MODEL

SA OE395B95L REMOTE SENSING MAPPING APPLICATION

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: David Brickey

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD: None.

MAJOR PROBLEMS AND CORRECTIVE ACTION: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Final output of enhanced satellite imagery and satellite image maps.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.3 SITE INVESTIGATIONS

WBS 1.2.3.9.5 SPECIAL STUDIES: THREE-DIMENSIONAL SITE MODEL

SA OE395E95 3-D AND NUMERICAL MODELING QA

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: David Jefferis

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. Software qualification of the EarthVision software has been completed. Only documentation of results (i.e., Test Results Report) and archiving data files and results remain to be done.

MAJOR PROBLEMS AND CORRECTIVE ACTION: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Complete qualification of the EarthVision software and issue Test Results Report.

2. Archive project data, results, and documentation.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.3 SITE INVESTIGATIONS

WBS 1.2.3.9.5 SPECIAL STUDIES: THREE-DIMENSIONAL SITE MODEL

SA OE395G95 STUDY PLAN FOR INTEGRATED GEOLOGY OF SITE AREA

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: David Jefferis

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. Project Office reviews of SCP Study Plan 8.3.1.4.2.3 *Geological Framework and Integrated 3-D Site Model* have been completed. Comments by the reviewers have been delivered to the Principal Investigator for resolution.

MAJOR PROBLEMS AND CORRECTIVE ACTION: None

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Review and resolve comments and generate revised Study Plan.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.3 SITE INVESTIGATIONS

WBS 1.2.3.9.5 SPECIAL STUDIES: THREE-DIMENSIONAL SITE MODEL

SA OE395L95 COMPUTER SUPPORT

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: David Jefferis

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD: None.

MAJOR PROBLEMS AND CORRECTIVE ACTION: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD: None.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 REGULATORY

WBS 1.2.5.3.5 GEOGRAPHIC NODAL INFORMATION STUDY AND EVALUATION SYSTEM (GENISES)

SA OE535L94 TECHNICAL DATABASE INPUT

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: Jim Beckett

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. PACS deliverable OE04 was transmitted to YMSCO on July 5. This deliverable was met with a letter describing the status of EG&G submittals to the YMP Technical Database during the period April 1 through June 30, 1995.

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. The Environmental Sciences Department continues processing of data acquired from on-going activities.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 REGULATORY

WBS 1.2.5.3.6 GEOGRAPHIC NODAL INFORMATION STUDY AND EVALUATION SYSTEM (GENISES)

SA OE536A95 GENISES TECHNICAL DATABASE

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: J. Beckett

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. PACS deliverable OE08 was transmitted to YMSCO on July 5. This deliverable was met with a report describing the status of technical data submittals to the YMP Technical Database for the period April 1 through June 30.

2. A meeting was held on July 10 to discuss procedures for processing of socioeconomic data. In attendance were John Carlson and John Raines (SAIC), and Jim Beckett. The SAIC socioeconomic group would like to have data, acquired from the city of Las Vegas and Clark County, processed into the YMP database. Much of the data is copy-write protected and must be controlled. Jim Beckett was able to process the data into the current system and provided ArcView sessions for the SAIC group.

3. On July 27, the Technical Database staff was audited to the YMP procedures which govern the management of technical data. Several packages were provided the auditor.

4. Work on the YMP Technical Database Data Distribution System CD-ROM is in the final phase. The "master" for the first standard format beta CD-ROM with data from the geological theme of the database is currently being created and should be available by the middle of August. It contains tabular as well as spatial data sets. It will also include all current on-line applications for real-time access to the YMP Technical Database.

5. The following technical data submittals were received during this period:

GS930708312272.006 -	PERMEABILITY AND FLUID CHEMISTRY STUDIES OF THE TOPOPAH SPRING MEMBER OF THE PAINTBRUSH TUFF, NEVADA TEST SITE: PART II, BY D.E. MOORE, C.A. MORROW, AND J.D. BYERLEE. RECEIVED BY THE TDB ON 05-JUL-1995.
LA000000000123.002 -	THERMODYNAMICS OF HYDRATION OF NA-, K-, AND CA- CLINOPTILOLITE. RECEIVED BY THE TDB ON 17-JUL-1995.
GS940708314225.001 -	COMBINED ANALYSIS OF SURFACE REFLECTION IMAGING AND VERTICAL SEISMIC PROFILING, BY T.M. DALEY, E.L. MAJER, AND E. KARAGEORGI. RECEIVED BY THE TDB ON 17-JUL-1995.
GS950508312312.004 -	WATER-LEVEL ALTITUDE DATA FROM THE CONTINUOUS NETWORK, 1994. RECEIVED BY THE TDB ON 17-JUL-1995.
GS931208315215.036 -	STABLE ISOTOPE COMPOSITION OF SOIL CO2, MARCH 93 - SEPT. 93. RECEIVED BY THE TDB ON 17-JUL-1995.
TM00121361T1EC.002 -	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT SOCIOECONOMIC MONITORING PROGRAM QUARTERLY EMPLOYMENT DATA REPORT JANUARY 1995 THROUGH MARCH 1995. RECEIVED BY THE TDB ON 17-JUL-1995.
GS950483115221.001 -	TEMPERATURE LOG DATA OBTAINED IN WELL USW G-2, FEBRUARY, 1995. RECEIVED BY THE TDB ON 18-JUL-1995.
GS950531174101.002 -	1994 - 1995 YUCCA MOUNTAIN GEODETIC MEASUREMENTS. RECEIVED BY THE TDB ON 18-JUL-1995.
GS950508312134.001 -	GEOHYDROLOGY AND EVAPOTRANSPIRATION AT FRANKLIN LAKE PLAYA, INYO COUNTY, CALIFORNIA, BY JOHN B. CZARNECKI. THESE DATA SUPERSEDE DATA PREVIOUSLY IDENTIFIED BY GS910408312141.001. RECEIVED BY THE TDB ON 18-JUL-1995.

GS950308312231.002 - LABORATORY MEASUREMENTS OF BULK DENSITY, POROSITY, AND WATER CONTENT FOR USW SD-12 FROM 19 MARCH 94 TO 11 AUGUST 1994, AND FOR RADIAL BOREHOLES FROM 11 APRIL TO 6 FEBRUARY 1995.
RECEIVED BY THE TDB ON 18-JUL-1995.

GS930808314212.010 - GRAVITY AND MAGNETIC DATA OF MIDWAY VALLEY, SOUTHWEST NEVADA, BY D. A. PONCE, V.E. LANGENHEIM, AND R.F. SIKORA.
RECEIVED BY THE TDB ON 24-JUL-1995.

GS930808314212.011 - GRAVITY AND MAGNETIC STUDY OF YUCCA WASH, SOUTHWEST NEVADA, BY V.E. LANGENHEIM, D.A. PONCE, H.W. OLIVER, AND R.F. SIKORA.
RECEIVED BY THE TDB ON 24-JUL-1995.

GS941108312242.002 - PROTOTYPE PERCOLATION TEST: BASIC DATA REPORT ON WELDED TUFF CORE EXPERIMENTS, BY MAREK CIESNIK, JENNIFER CURTIS, ALAN FLINT, DAVID HAMPSON AND FALAH THAMIR.
RECEIVED BY THE TDB ON 26-JUL-1995.

GS950308312213.004 - CUMULATIVE INFILTRATION AND SURFACE FLUX RATES CONDUCTED IN FORTYMILE WASH AND NEAR UE-25 UZN#7, CALCULATED FROM RAW MILLIVOLT READINGS.
RECEIVED BY THE TDB ON 31-JUL-1995.

GS911008315215.014 - ANALYTICAL RESULTS OF URANIUM AND URANIUM ACTIVITY RATIOS IN WELDED TUFF AND QUATERNARY ALLUVIUM AQUIFERS.
RECEIVED BY THE TDB ON 31-JUL-1995.

GS950108314222.001 - FRACTURE MAPPING AT FRAN RIDGE, PAVEMENT P2001, BY DONALD S. SWEETKIND.
RECEIVED BY THE TDB ON 31-JUL-1995.

GS930408312134.001 - LATE-WISCONSIN PALEOHYDROLOGY OF THE WEST-CENTRAL AMARGOSA DESERT, NEVADA, U.S.A., BY HANS C. CLAASEN.
RECEIVED BY THE TDB ON 31-JUL-1995.

5. The following technical data submittals were processed into the TDB during this period:

GS950408312312.003-	WATER-LEVEL ALTITUDE DATA FROM THE PERIODIC NETWORK, FIRST QUARTER 1995. PROCESSING COMPLETED ON 06-JUL-1995.
GS941108314211.058-	X-RAY FLUORESCENCE ELEMENTAL COMPOSITIONS ACQUIRED 4-26-94 - 8-16-94 PROCESSING COMPLETED ON 07-JUL-1995.
SNF29041993002.018-	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT CORE HOLE ROCK STRUCTURAL DATA SUMMARY FOR HOLE UE25 NRG-2B. PROCESSING COMPLETED ON 11-JUL-1995.
SNF29041993002.017-	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT ESTIMATED ROCK MASS QUALITY INDICES BASED ON CORE LOG DATA FOR HOLE USW NRG-7/7A. PROCESSING COMPLETED ON 13-JUL-1995.
SNF29041993002.019-	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT ESTIMATED ROCK MASS QUALITY INDICES BASED ON CORE LOG DATA FOR HOLE UE25 NRG-2B. PROCESSING COMPLETED ON 13-JUL-1995.
SNF29041993002.057-	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT ROCK MASS MECHANICAL PROPERTIES ESTIMATES FOR TOPOPAH SPRING, MIDDLE NONLITHOPHYSAL ZONE (BASED ON ESTIMATES FOR USW NRG-6 & 7/7A, SD-9 & SD-12). PROCESSING COMPLETED ON 13-JUL-1995.
SNF29041993002.058-	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT RANK-ORDERED ROCK MASS QUALITY INDICES Q AND RQD FOR BOREHOLES NRG-6, NRG-7/7A, SD-9 AND SD-12, REV. 0. PROCESSING COMPLETED ON 13-JUL-1995.
GS950208319211.001-	INAA ELEMENTAL ANALYSES OF TIVA CANYON TUFF (UPPER CLIFF AND CAPROCK ZONES). PROCESSING COMPLETED ON 13-JUL-1995.

GS920908312132.005-	WATER LEVEL AND HYDROCHEMICAL DATA FOR WELLS GS-15, GS-16, GS-17. PROCESSING COMPLETED ON 13-JUL-1995.
GS930608312272.002-	PERMEABILITY AND PORE-FLUID CHEMISTRY OF THE BULLFROG TUFF IN A TEMPERATURE GRADIENT: SUMMARY OF RESULTS PROCESSING COMPLETED ON 13-JUL-1995.
SNF29041993002.016-	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT CORE HOLE ROCK STRUCTURAL DATA SUMMARY FOR HOLE USW NRG-7/7A PROCESSING COMPLETED ON 14-JUL-1995.
GS940508314212.002-	DENSITY AND MAGNETIC SUSCEPTIBILITY DATA; BARE MOUNTAIN SAMPLES. JANUARY 1, 1994 - MARCH 30, 1994 PROCESSING COMPLETED ON 17-JUL-1995.
GS941108314211.057-	X-RAY FLUORESCENCE ELEMENTAL COMPOSITIONS ACQUIRED 7-13-93 TO 3-22-94 PROCESSING COMPLETED ON 17-JUL-1995.
GS930708312272.006-	PERMEABILITY AND FLUID CHEMISTRY STUDIES OF THE TOPOPAH SPRING MEMBER OF THE PAINTBRUSH TUFF, NEVADA TEST SITE: PART II, BY D.E. MOORE, C.A. MORROW, AND J.D. BYERLEE. PROCESSING COMPLETED ON 17-JUL-1995.
TM000000SD12RS.007-	USW SD-12 AND IS LOCATED IN THE RECORDS PACKAGE FOR THE NAMED BOREHOLE. PROCESSING COMPLETED ON 18-JUL-1995.
GS930731174101.004-	GEODETIC LEVELING AND QUADRILATERAL SURVEYS (GPS OBSERVATIONS) 1990-1991: FINAL DATA ACQUISITION REPORT, BOOK 1, GARY C. PERASSO, P.I. - L.I. NEIFERT, LEVEL OBSERVER. PROCESSING COMPLETED ON 19-JUL-1995.
GS950408318523.001-	TEMPERATURE, THERMAL CONDUCTIVITY, AND HEAT FLOW NEAR YUCCA MOUNTAIN, NEVADA: SOME TECTONIC AND HYDROLOGIC IMPLICATIONS, BY J.H. SASS, A.H. LACHENBRUCH, W.W. DUDLEY, JR., S.S. PRIEST, AND R.J. MUNROE

	PROCESSING COMPLETED ON 20-JUL-1995.
SNF29041993002.055-	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT CORE HOLE ROCK STRUCTURAL DATA SUMMARY FOR HOLE USW SD-12, REV. 0. PROCESSING COMPLETED ON 20-JUL-1995.
GS911008315215.013-	87SR/86SR ANALYSIS OF BAILED WATER SAMPLE FROM DRILL HOLE UE25#1, YUCCA MOUNTAIN NEVADA. PROCESSING COMPLETED ON 20-JUL-1995.
GS931008314211.035-	GRAPHICAL LITHOLOGIC LOG OF DRILL HOLE RF-8 (UE-25 RF #8), VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931008314211.038-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE NRG-2A (UE-25 NRG#2A), VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931008314211.037-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE NRG-3 (UE-25 NRG#3), VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931008314211.039-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE NRG-2 (UE-25 NRG#2), YUCCA MOUNTAIN, NEVADA: VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931008314211.045-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE USW NRG-6, VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931108314211.041-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE NRG-2B (UE-25 NRG #2B), YUCCA MOUNTAIN, NEVADA: VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931108314211.042-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE NRG-4 (UE-25 NRG#4), VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.

GS931108314211.043-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE NRG-5 (UE-25 NRG#5), VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931208314211.046-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE UE-25 NRG#1, VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS931208314211.047-	GRAPHICAL LITHOLOGIC LOG OF BOREHOLE UE-25 UZ #16, VERSION 1.0 PROCESSING COMPLETED ON 24-JUL-1995.
GS940108314211.001-	TABLE OF BASAL CONTACTS FROM CORE IN BOREHOLES USW UZ-14 AND USW NRG7/7A BY BUESCH, MOYER, AND GESLIN PROCESSING COMPLETED ON 24-JUL-1995.
TM0000000SD7RS.001-	USW SD-7 SHIFT DRILLING SUMMARIES (51.0' TO 890.7'), STRUCTURAL LOGS (48.5' TO 653.6') AND LITHOLOGIC LOGS (50.2' TO 875.0'). PROCESSING COMPLETED ON 29-JUL-1995.
SNT02012894001.001-	GEOLOGIC CORE LOGS FOR USW SD-12 PROCESSING COMPLETED ON 31-JUL-1995.

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN: None

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. The on-line access to the TAB databases located in the GENISES system will be ready for distribution by August 15, 1995. The application is part of the CD-ROM Data Distribution system. It provides the user with browse capability from the GENISES file server with the ability to copy data from the CD-ROM.

2. Processing of submittal data will continue.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 REGULATORY

WBS 1.2.5.3.6 GEOGRAPHIC INFORMATION STUDY AND EVALUATION SYSTEM (GENISES)

SA OE536B4 GIS DATABASE, SITE ATLAS, ARCVIEW AND GIS DATA CATALOG

REPORT PERIOD: July 1 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: S. Ross

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. 190 copies of the 1995 second quarter GIS data Catalog were delivered to YMSCO on July 12.

2. Compilation of ARC/INFO coverage metadata into standardized formats continued in support of the Federal Spatial Data Transfer Standard.

3. Work continues on the FY95 Site Atlas.

4. Support for the Preliminary Transportation Strategy Study 2 continued. EG&G is producing manuscript map overlays for use by TRW, MK, SAIC and DRI. Once these organizations have completed their interpretations regarding landuse conflicts, infrastructure and the proposed transportation corridor alignment, EG&G will automate the mapped features. 134 map sheets have been provided. Automation of the manuscript maps has been initiated, including digitization and generation of editplots for 73 maps. Twenty-five maps are planned as a final product for this effort, to be included in the Transportation Strategy Study 2, due on August 31.

5. On July 21, Elaine Ezra met with John Raines and John Carlson (SAIC) to discuss processing of GIS datasets required to support their socioeconomic studies and the use of a YMPSAS ArcView2 system for data review.

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Processing and verification of GIS data continues in support of the third quarterly update of the GIS Data Catalog and the 1995 Site Atlas.

2. Data entry will continue for GIS baseline coverage to implement the Spatial Data Transfer Standards (SDTS).

3. Automation and editplot generation/verification of the Preliminary Transportation Strategy Study 2 manuscript maps will continue.

4. Data verification for the 1995 Site Atlas, Volume 1 will continue.

5. Reproduction of the 1995 Site Atlas, Volumes 1 and 2 will continue.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 REGULATORY

WBS 1.2.5.3.6 GENISES

SA OE536C95 GIS, MAPPING AND ANALYSIS SUPPORT

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: Jeff Donovan

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. GIS map products were generated to support project participants and are detailed in the "Deliverables" section of this report.

2. The following photo products were generated:

NR95071201	One 8"x10" print of EG&G Negative #90A0031L was provided to Carma Hernandez (SAIC) on July 14.
NR95062206	One 3'x4' color print of YMP-95-452.0 was provided to Carma Hernandez (SAIC) on July 18.
NR95071010	One 8.5"x11" color print of 24 slides were provided to Tim Lindemann (EGG/ESD) on July 19.
NR95071008	One contact mylar print of the 1:6,000 scale orthophoto sheets 10 and 16 and associated topographic contour sheets were provided to Rick Spengler (USGS) on July 19.
NR95070701	One 36" color print of EG&G Negative #9010682L was provided to Mary Margaret Coates (USGS) on July 20.
NR95071401	One 9"x9" contact print of frames 1-71 from Perf#6615 was provided to Terry Crump (TRW) to complete an NRC request on July 21.
NR95071824	One duraflex print of MRSD 91273.01 and MRSD 90137.01 was provided to Pat McKinley (USGS) on July 26.

3. The following digital data transfers were provided:

YMP-95-479.0	One 3.5" disk with the ESF Ramps coverage in ARC Export format was provided to Jim Hartley (SAIC) on July 6.
YMP-95-484.0	One QIC tape containing the streams coverage was provided to Bill Davies (USGS) on July 10.
YMP-95-483.0	Three 3.5" disks containing DXF formatted digital version of the compilation map of known and suspected quaternary faults within 100 km of Yucca Mountain were provided to Mary Margaret Coates (USGS) on July 11.
YMP-95-489.0	One 3.5" disk in ASCII format containing core recovery data for G-1, G-4, and GU-3 was provided to Susan Altman (SNL) on July 17.
YMP-95-481.0	One QIC tape containing an ASCII file of the x,y coordinates of all vertices of the Scott and Bonk preliminary geologic map of YMP - alluvium/bedrock contact, was provided to Winnie Zhang (LBL) on July 17.
YMP-95-497.0	One 3.5" disk in ASCII format containing groundwater data from DTN#GS931008312132.004 was provided to Steve Bodnar (TRW) to complete a Nye County request on July 20.
YMP-95-492.0	One 3.5" diskette containing a digital copy of all meteorological data for NT60 was provided to John Fortkamp (M&O/PA) on July 27.
YMP-95-505.0	One 3.5" disk in WordPerfect 5.1 format containing all of the data associated with GS940708312261.005, GS941208312261.008 and GS931008312261, was provided to Steve Bodnar (TRW) to complete a Nye County request on July 28:

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Continued level-of-effort.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 REGULATORY

WBS 1.2.5.3.6 GENISES

SA OE536E95 COMPUTER SUPPORT

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: TBD

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD: None

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD: None

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 REGULATORY

WBS 1.2.5.3.6 GENISES

SA OE536G95 CAPITAL EQUIPMENT

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: Elaine Ezra

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD: None.

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN:

1. FY95 capital equipment items will not be purchased by EG&G/EM.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD: None.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 REGULATORY

WBS 1.2.5.3.6 GENISES

SA OE536D95 PROJECT MANAGEMENT

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: Elaine Ezra

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

Reporting/Tracking/Planning

1. EG&G/EM RSL June Progress report was compiled and submitted to YMSCO (NV-95-430).

2. June PACS input was compiled (ATP-95-077) and submitted to Robert Spiro (M&O).

3. EG&G/EM prepared a technical transition plan outlining recommended actions required to transition the EG&G workscope under WBS 1.2.3 and 1.2.5 to TRW. Development of the plan was coordinated with Steve Bodnar (TRW). The draft plan was provided to Nat Hodgson (TRW) at a transition planning meeting on July 24.

Meetings/Briefings/Tours:

1. A transition meeting was held on July 13 with Charles Stafford and Jim Lowe (TRW) and Elaine Ezra to discuss ADP transition issues. It was agreed that computer resources would not be moved until after October 1 to allow EG&G to complete their FY95 deliverables.

2. A transition meeting was held on July 24 with the following attendees: Nat Hodgson, Don Schutt, John Gauthier, Steve Bodnar (TRW), Carl Moore (SAIC), Tom Edwards, Gene Sasso, Kent Ostler, Elaine Ezra, Bob Meibaum and Dick Reed (EG&G/EM). Schutt reviewed the results of the briefing provided to YMSCO, as follows:

- Ken Powers (DOE/NV) verbally gave approval to proceed with the TRW assimilation.

- All YMP purchased equipment will be transferred to TRW. All NTS equipment that is used 100% by YMP will be transferred to TRW. Shared resources not purchased by YMP will stay where they are. Maintenance of equipment will continue to go through NTS (cars, tractors, etc.).

- TRW will post all EG&G YMP positions. Offers would be expected to be made at the end of August. Positions would be effective October 1, 1995. The number of offers made will be contingent upon the budget for FY96.

- Additional funding will not be made available to accomplish the transition. It was acknowledged that existing funds will need to be used to transition, and that FY95 workscope will be impacted.

- The decision to assimilate the workscope is a TRW business decision. DOE/NV cannot assure costs. Since TRW cannot obtain fixed costs from DOE/NV, they cannot continue to work with the RSL.

3. A transition meeting was held on July 31 with Magdeline Hannigan (TRW) and Elaine Ezra to discuss facilities. It was agreed that no office moves would be made until after the September 30 transition.

Training/Conferences: None.

Employee Actions:

1. A listing of current EG&G/EM job descriptions supporting WBS 1.2.5 was provided to Steve Bodnar on July 5 (letter Ezra to Bodnar, YMSO-95-156) in preparation for the possible assimilation by TRW of EG&G's work scope.

ES&H: None.

Quality Assurance:

1. An audit, which was not announced to EG&G, of the GENISES Technical Database was conducted by the Project Quality Assurance Team on July 24. No deficiencies or conditions adverse to quality were identified.

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN:

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Transition activities will be initiated.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.5 SITE INVESTIGATIONS

WBS 1.2.5.3.7 SPECIAL STUDIES: TRACERS, FLUIDS AND MATERIALS

SA OE394A TRACERS, FLUIDS AND MATERIALS

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: Jim Beckett

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. PACS deliverable OE903 was transmitted on July 5 (letter Ezra to Newbury - YMSO-95-148). This deliverable was met with a quarterly report describing the status of the WBS 1.2.5.3.7 Tracers, Fluids and Materials Database for the period January 1 through March 31.

2. PACS deliverable OE905 was transmitted on July 5 (letter Ezra to Newbury - YMSO-95-151). This deliverable was met with a quarterly report describing the status of the WBS 1.2.5.3.7 Tracers, Fluids and Materials Database for the period April 1 through June 30.

3. The YMP TFM Reporting and Management Procedure, YMP-2.8 was approved on July 17. Modifications to the revised TFM database and the on-line application are complete. It will be included in the GENISES CD-ROM for installation by project personnel.

4. A meeting was held on July 13 between Norman Bartley (M&O/TRW) and Jim Beckett. The subject of the meeting was the verification and acceptance of the Los Alamos TFM Database. Norman indicated he would provide a letter from Chris Breeds documenting that the data had been verified and was ready for inclusion into the GENISES TFM Database. Jim Beckett indicated that the letter was sufficient to accept the data.

5. There were no TFM data received and processed during this period.

6. On July 28, the TFM Database staff was audited to the current TFM procedures. As no data has been received since the effective date of the procedure, there were no data packages for the auditor to review.

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN:

A list of approved TFM's are currently submitted to the TFM DBA on a DIE form with a cover letter. In early July, the TFM DBA was notified that the formal submittal process would be terminated in lieu of the controlled document DIE. This was acceptable to the DBA at the time. However, concurrent to the change of procedures, the DIE form which listed the TFM data and their controls was eliminated from the controlled document DIE's. This means that the TFM DBA will be required to review and interpret TFM information from text. This is unacceptable. The DIE documents do not provide a set format for receiving the data and information must be interpreted in the text. The TFM DBA will provide a letter requesting corrective action.

The installation of the communications software required to access GENISES (TCP/IP) is being installed on the YMP communications backbone. The installers estimated it will take one year to complete the installation. Access to the TFM database will not be possible without this software.

The YMP TFM procedure only affects data provided after the approval of the procedure. All data provided prior to this procedure will have to be reformatted and input into the new data files. The reformatting of the existing data in the TFM database will require extensive interpretation to allow an accurate transfer. All of theses will have to be reverified. This is an extensive effort and will require an estimated 90 days to complete.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. A plan needs to be created for the transition of the existing data to the new files. This plan will be generated by the M&O/TRW.

2. TFM data will continue to be processed.

PROGRESS REPORT FOR EG&G/EM RSL SUPPORT TO YMP
Work Accomplished

WBS 1.2.12 RECORDS MANAGEMENT

SA OEC23A95 RECORDS MANAGEMENT

REPORT PERIOD: July 1, 1995 - July 31, 1995

REPORT DATE: August 11, 1995

RESPONSIBLE INDIVIDUAL: J. Wiggins

SUMMARY OF WORK ACCOMPLISHED DURING REPORT PERIOD:

1. 1161 non-quality record packages were processed into the YMP Records Center.
2. 33 quality assurance record packages were processed into the YMP Records Center.

MAJOR PROBLEMS AND CORRECTIVE ACTION UNDERTAKEN: None.

ANTICIPATED SIGNIFICANT EVENTS PLANNED DURING NEXT REPORT PERIOD:

1. Complete processing of the 1994 record packages.
2. Complete processing of the 1995 record packages.
3. Audit EG&G/EM and project controlled documents.
4. Archive color infrared originals.

STATUS OF DELIVERABLES FOR EG&G/EM RSL SUPPORT TO YMP
July 1, 1995 through July 31, 1995

GIS MAP SUPPORT

Description	Requested by/ Organization	Date Sent	Size	No. of Copies
YMP-95-040.0 Existing and Planned Boreholes	Azar/EG&G/EM	7/3/95	Full	4
YMP-95-040.0 Existing and Planned Boreholes	Lindenburg/YMSCO	7/3/95	Full	2
YMP-95-040.0 Existing and Planned Boreholes	Wagner/WCFS	7/5/95	Full	1
YMP-95-455.0 Map 54 - Aeromag and First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1
YMP-95-456.0 Map 54 - First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1
YMP-95-457.0 Map 55 - Aeromag and First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1
YMP-95-458.0 Map 55 - First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1
YMP-95-459.0 Map 56 - Aeromag and First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1
YMP-95-460.0 Map 56 - First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1
YMP-95-461.0 Map 57 - Aeromag and First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1

YMP-95-462.0 Map 57 - First Derivative Aeromag (1:12,000)	Day/USGS	7/5/95	Full	1
YMP-95-463.0 Aeromag in Vicinity of Yucca Mountain (1:24,000)	Day/USGS	7/5/95	Full	1
YMP-95-464.0 First Derivative Aeromag in Vicinity of Yucca Mountain (1:24,000)	Day/USGS	7/5/95	Full	1
YMP-95-051.4 Legal Weight Truck Highway Map	Ross/EG&G/EM	7/6/95	Full	1
YMP-95-052.5 High Level Waste 75/125 Ton Rail Map	Ross/EG&G/EM	7/6/95	Full	1
YMP-95-014.1 Preliminary Surficial Deposits Map	Lundstrom/USGS	7/6/95	Full	3
YMP-95-040.0 Existing and Planned Boreholes	Azar/EG&G/EM	7/6/95	Full	6
YMP-95-014.1 Preliminary Surficial Deposits Map	Matthusen/WCFS	7/6/95	Full	3
YMP-95-426.0 Restricted Access Federal Lands Adjacent to the YMP	Inglett/SAIC	7/6/95	Full	3
Transportation Study Maps YMP-95-467.0 Klondike, NV YMP-95-468.0 Carvers, NV YMP-95-469.0 High Peak, NV YMP-95-470.0 Stewart Valley, NV YMP-95-471.0 Sixmile Spring, NV YMP-95-472.0 Nopah Peak, NV YMP-95-473.0 Lone Mountain, NV YMP-95-474.0 Frenchie Peak, NV YMP-95-475.0 Dunphy, NV	Gehner/TRW	7/6/95	Full	9
YMP-95-044.2	Hennessy/USGS	7/7/95	Page	1
YMP-95-052.4	Hennessy/USGS	7/7/95	Page	1
YMP-95-166.0	Hennessy/USGS	7/7/95	Page	1

YMP-95-167.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-211.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-212.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-232.2	Hennessy/USGS	7/7/95	Page	1
YMP-95-242.2	Hennessy/USGS	7/7/95	Page	1
YMP-95-252.2	Hennessy/USGS	7/7/95	Page	1
YMP-95-261.3	Hennessy/USGS	7/7/95	Page	1
YMP-95-267.2	Hennessy/USGS	7/7/95	Page	1
YMP-95-365.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-366.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-367.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-368.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-370.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-371.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-373.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-374.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-375.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-377.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-378.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-379.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-381.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-382.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-383.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-384.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-385.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-386.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-388.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-389.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-390.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-391.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-392.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-394.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-398.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-399.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-402.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-423.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-424.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-425.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-427.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-429.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-430.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-431.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-432.0	Hennessy/USGS	7/7/95	Page	1
YMP-95-433.0	Hennessy/USGS	7/7/95	Page	1

YMP-95-434.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-435.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-436.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-437.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-438.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-439.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-440.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-441.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-442.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-443.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-444.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-449.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-450.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-454.0		Hennessy/USGS	7/7/95	Page	1
YMP-95-233.2		Hennessy/USGS	7/7/95	Page	1
YMP-95-466.0	Vegetation Map, Sheet 27	Lyon/EG&G/EM	7/11/95	Full	2
YMP-95-486.0	NTS Road Map	Newbury/YMSCO	7/13/95	Full	1
				Page	1
YMP-95-044.2	Plate 3: Rail Corridors, Northern Route	Newbury/YMSCO	7/13/95	Full	12
YMP-95-044.2	Plate 4: Rail Corridors, Las Vegas and Southern Route	Newbury/YMSCO	7/13/95	Full	12
YMP-95-447.0	Base Map for Accident Analysis - YMP Area	Fortkamp/INTERA	7/13/95	Full	1
YMP-95-084.0	Thermal-Mechanical Model	Westcamp/SAIC	7/13/95	Page	1
YMP-95-487.0	Location Map	Bjerstedt/DOE	7/13/95	Full	3
YMP-95-044.2	Plate 3: Rail Corridors, Northern Route	Hernandez/SAIC	7/14/95	Full	1
YMP-95-045.1	Plate 4: Rail Corridors, Las Vegas and Southern Route	Hernandez/SAIC	7/14/95	Full	1

YMP-95-150.0 Surface-Based Testing Activities w/Geologic Structure Sheet 15	Azar/EG&G/EM	7/17/95	Full	1
YMP-95-151.0 Surface-Based Testing Activities w/Geologic Structure Sheet 16	Azar/EG&G/EM	7/17/95	Full	1
YMP-95-319.0 Existing Boreholes with Geologic Structure	Datta/WCFS	7/17/95	Page	1
YMP-95-320.0 Legend	Datta/WCFS	7/17/95	Page	1
YMP-95-053.1 Southern Nevada Legal Weight Truck, Heavy Haul	Hernandez/SAIC	7/18/95	Full	1
YMP-95-052.5 High Level Waste 75 ton/125 ton Rail Map	Hernandez/SAIC	7/18/95	Full	1
YMP-95-051.4 Legal Weight Truck Highway Map	Hernandez/SAIC	7/18/95	Full	1
YMP-95-044.2 Plate 3: Rail Corridors, Northern Route	Hernandez/SAIC	7/18/95	Full	1
YMP-95-040.0 Existing and Planned Boreholes	Howell/Duke Eng.	7/18/95	Full	1
YMP-95-370.0 Aerial View of Yucca Mountain, NV Area	Edwards/USGS	7/20/95	Page	2
YMP-95-014.1 Preliminary Surficial Deposits	McKinnon/TRW	7/24/95	Full	9
YMP-95-493.0 Las Vegas Valley Traffic Analysis Zones with Census Tracts	Carlson/SAIC	7/25/95	Full	5
YMP-95-494.0 Las Vegas Valley Traffic Analysis Zones with Street Center Lines	Carlson/SAIC	7/25/95	Full	5

YMP-95-495.0 Las Vegas Valley Traffic Analysis Zones	Carlson/SAIC	7/25/95	Full	1
YMP-95-502.0 Las Vegas Valley Census Tracts	Carlson/SAIC	7/25/95	Full	1
YMP-95-378.0 Transportation Study Map Overlay for 15 Minute Quadrangle, Cresent Valley, NV	Gehner/TRW	7/26/95	Full	1
YMP-95-379.0 Transportation Study Map Overlay for 15 Minute Quadrangle, Beowawe, NV	Gehner/TRW	7/26/95	Full	1
YMP-93-028.0 Test and Waste Isolation Evaluation Zone (Rev. 0)	Agnew/WCFS	7/26/95	Page	1
YMP-92-156.1 Regional Investigations and Earthquake Epicenter	Phillips/SAIC	7/28/95	Page	1
YMP-95-218.0 DIE General Reference	McKinley/USGS	7/31/95	Full	1
YMP-93-151.0 Southern Great Basin Digital Seismic Network Planning Map	McKinley/USGS	7/31/95	Full	1
YMP-95-052.5 High Level Waste 75ton/125ton Rail Map	McKinley/USGS	7/31/95	Full	1
YMP-95-052.4 High Level Waste 75ton/125ton Rail Map	McKinley/USGS	7/31/95	Full	1
YMP-94-331.0 Far Field Radiological Environmental Monitoring Station Locations	McKinley/USGS	7/31/95	Full	1
YMP-95-383.0 Proposed Transportation Corridor, Carlin Route	McKinley/USGS	7/31/95	Full	1
YMP-95-040.0 Existing and Planned Boreholes	McKinley/USGS	7/31/95	Full	1

YMP-95-045.4 Proposed Rail Routes through Nellis Air Force Range	McKinley/USGS	7/31/95	Full	1
YMP-94-241.0 Regional Site Location Map	McKinley/USGS	7/31/95	Full	1
YMP-92-089.4 Flood Prone Areas	McKinley/USGS	7/31/95	Full	1
YMP-95-206.0 Preliminary Geologic Map of YM, Nevada	McKinley/USGS	7/31/95	Full	1
YMP-95-230.1 Transportation Study Map Overlay for 7.5 Minute Quadrangle Frenchman Mtn, NV	McKinley/USGS	7/31/95	Full	1
YMP-95-374.0 Geologic Cross-Sections Main Drift of Exploratory Studies Facility	McKinley/USGS	7/31/95	Full	1
YMP-95-085.0 W to E Cross Section along N765350 through Thermal Mechanical Model	McKinley/USGS	7/31/95	Full	1
YMP-94-019.4 Trench Log from the Northern Bow Ridge Fault	McKinley/USGS	7/31/95	Full	1

TOTAL MAPS 188

TOTAL NEW MAPS 27

Lawrence Livermore National Laboratory

LLYMP9507133
July 27, 1995

QA: N/A

L. Dale Foust
Technical Project Officer
CRWMS-M&O
101 Convention Center Drive, M/S 423
Las Vegas, NV 89109

Subject: Lawrence Livermore National Laboratory (LLNL) Monthly Status Report (WBS 1.2.9)

Dear Dale:

I am pleased to submit the LLNL monthly report under our status as a CRWMS-M&O teammate.

If you require further information, please contact James Blink at (702) 794-7157.

Sincerely yours,

for Willis L. Clarke
LLNL-CRWMS Manager

WLC/JAB/cjp

Enclosure

cc/enc: See Attached Distribution List
LLNL-CRWMS LRC

Recycled

Lawrence Livermore National Laboratory • University of California • P.O. Box 808 Livermore, CA 94551-9900 • Telephone (510) 422-1100 • Twx 910 386 8339 UCLLL UNIV

ENCLOSURE 3

LAWRENCE LIVERMORE NATIONAL LABORATORY
(LLNL)
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
(YMP)
STATUS REPORT

June 1995

EXECUTIVE SUMMARY

WBS 1.2.2.4.1, Spent Fuel:

1) Results of solution analyses were received for the ten year samples taken from the UO_2 drip tests in progress at Argonne National Laboratory (ANL) under LLNL sponsorship. Current levels of uranium release from the samples were comparable to those from previous test intervals completed over the last several years. Sample reactions during the past decade are characterized by a rapid uranium release period between one and two years, followed by relatively low amounts of release over the last eight years. Surface area normalized uranium release rates were also similar to previous tests. Cation analyses indicate continued depletion of alkali, alkaline earths, and silicon from the EJ-13 leachant after its contact with the UO_2 pellets. Previous scanning electron microscopy energy disbursive x-ray spectroscopy (SEM/EDS) investigations have revealed that these elements are being incorporated into secondary uranyl phases on the sample surfaces, with the uranium being derived from the dissolution of the UO_2 pellets. The present ten year solutions display a moderate depletion of most cation elements relative to last years sample results.

2) A series of UO_2 dissolution experiments initiated early last month were completed and an analysis of the results is in progress. Acquisition of two more UO_2 dissolution rates at room temperature and 8 ppm dissolved oxygen (equivalent to 1 atm of air) provided rate data for this oxide at the same conditions as had recently been measured for U_3O_8 and $UO_3 \cdot H_2O$. There is now a full data set for the three oxides at high and low carbonate, pH, and temperature values, at 8 ppm dissolved oxygen.

WBS 1.2.2.4.2 Borosilicate Glass

The N2 unsaturated (drip) tests on actinide- and technetium-doped Defense Waste Processing Facility (SRL 165) glass, at Argonne National Laboratory (ANL) under LLNL sponsorship, have been ongoing for 113 months, and were sampled this month. Analyses and interpretation of the data from the tests are in progress. Generally, the elements in the test vessel acid strip solution are present at very low concentrations relative to the leachate except for the actinides plus iron, nickel, and chromium (from the stainless steel test vessel itself). Neptunium, plutonium, and americium concentrations in the acid strip have been monitored by high-resolution alpha spectroscopy since the tests were initiated and these data have been reported. The uranium concentration in the acid strip was not amenable to the alpha spectroscopy procedure, and has only recently become available using inductively coupled plasma mass spectrometry (ICP-MS). An apparent difference exists in

the distribution of the uranium between sorption onto the stainless steel and dissolution into the vessel rinse depending on the interval between sampling. For the 26-week sampling interval data, nearly three times as much uranium appeared in the acid strip as in the vessel rinse, indicating substantial sorption onto the stainless steel. During a previous 210-week interval substantially less of the total uranium sorbed onto the stainless steel, suggesting that the sorption may reach a saturation, after which further uranium goes into solution. The total release rates for the different sampling intervals are roughly the same.

WBS 1.2.2.5.1, Metallic Barriers:
Scoping corrosion experiments on candidate basket materials were initiated. Materials that have been tested include Boral, Boralyn, Zr Alloy 702, copper-boron, 1100 aluminum-aluminum boride, GlidCop Al-15 +1.5% boron, 6061 aluminum-aluminum boride, 6351 aluminum-aluminum boride, and boron carbide-aluminum ceramic. Samples were exposed for 96 hours to a test solution at 90°C, containing formate, oxalate, nitrate, chloride and hydrogen peroxide (species expected to be present in irradiated air-vadose water systems). The initial pH of this solution at room temperature was buffered at pH 4 by oxalic and formic acids and their salts. Initial observations are that the aluminum-based and copper-based materials underwent interaction. Pitting was observed on some of the aluminum-based samples, and the solution rapidly turned blue in color when copper-based samples were exposed. Weight loss determinations, microscopic examinations of the samples, and chemical analysis of the solutions are planned.

WBS 1.2.3.12.2, Hydrologic Properties of the Waste Package Environment:
Using the V-TOUGH and NUFT codes, numerical model calculations of the coupled transport of water, vapor, air, and heat in the unsaturated and saturated zones at Yucca Mountain were conducted. With respect to the thermal-hydrological effects of decay heat, two thermal loading strategies were identified. A minimally heated (MH) repository strategy attempts to minimize heat-mobilized moisture transport and relies on performance attributes other than decay heat (such as high-performance waste package materials and capillary/diffusion barriers in the engineered and natural systems) to address the impact of high RH and fast fracture flow. A constructively heated (CH) repository strategy attempts to use decay heat constructively to substantially reduce relative humidity and fracture flow near waste packages. This second strategy relies on demonstrating that heat, vapor, and liquid flow (including heterogeneous fracture flow) near waste packages are dominated by heat conduction and are therefore very predictable.

Approaches to implementing a CH strategy can range from an extended dry-out (ED) approach, using a high areal mass loading (AML >60 MTU/acre) to drive a large fraction of the pore water from the vicinity of the repository, to a localized dry-out (LD) approach, that maintains a temperature gradient away from the waste package using low-to-intermediate AMLs (<55 MTU/acre). The LD approach attempts to minimize far-field thermal-hydrological effects (as in the MH strategy) and allows condensate to drain through the repository; neither of these results is readily achieved with the ED approach. The LD approach can be implemented by a wide range of thermal design options, ranging

from those that never cause above-boiling rock temperatures to those in which the boiling zones marginally coalesce between the drifts (as in the ED approach).

A reduction in relative humidity between the drift wall and the waste package (called the "local-ΔRH effect") arises from the temperature difference (ΔT) between these locations. This effect occurs in addition to any reduction in *RH* resulting from rock dry-out. A persistent ΔT in the drift can be obtained by isolating each row of waste packages in the LD approach using large drift spacing thereby having two-dimensional comparted to the one-dimensional heat transfer in the ED approach. A high ΔT can be obtained using low-thermal-conductivity granular backfill in the drift (applicable to either the LD or ED approach). Calculations have shown that ΔT in the backfill can result in relative humidity on the waste package below 70% for 10,000 yr, even for AMLs that result in negligible rock dry-out.

WBS 1.2.3.12.3, Mechanical Attributes of the Waste Package Environment:
A series of laboratory compression tests on irradiated and non-irradiated core samples to determine if radiation affects mechanical properties were initiated. Thirty core samples of Topopah Spring tuff from the Fran Ridge site have been prepared and irradiated using a Cobalt 60 radiation source. Twenty one of the samples have been tested, and data reduction is underway. The remaining nine samples will be tested in early July and the results will be reported in an upcoming milestone.

WBS 1.2.3.12.4, Engineered Barrier System (EBS Field Tests:
1) X-ray imaging was used to measure the drying of a sample, previously saturated with water, in the fracture flow vs. matrix imbibition test. As the sample continued to dry-out, the x-ray images were still slowly changing. A more accurate determination of the saturation field has been obtained by normalizing each image based on the image of an aluminum step wedge installed on the sample holder of this experiment.

2) The measurement of relative humidity as a function of moisture content in a Topopah Spring tuff core was initiated. An intact core sample (6.95 cm in diameter and 14 cm in length) was machined from one of the small blocks collected from the LBT site. The average porosity of the core is about 8%. A small hole was drilled in the middle of the core for housing the Humicap, which measures relative humidity. The sample and the Humicap were placed in an air-tight sample holder. The core sample was dried in a vacuum oven. When the sample was dry, the relative humidity reading was about 0.08%. This reading was constant regardless of the temperature variation in the room. Water was then added to the sample to raise the water saturation to approximately 2%. The relative humidity continues to increase, but has not reached a steady value.

DELIVERABLES

LLNL Deliverables Met
(June 1995)

Milestone	WBS 1.2.	Planned Date	Completion Date	Description
MOL242	2.5.1	6/30/95	6/28/95	Status Rpt, Fracture Mech Crack Growth Tests
MOL123	3.10.2	6/30/95	6/26/95	Prelim. Rpt-Impact of Precip/Dissol Kinetics
MOL124	3.10.2	6/30/95	6/27/95	Prelim Rpt-Rock/Water Interaction, Topopah Springs
MOL128	3.12.5	6/29/95	6/29/95	Prelim. Rpt on Historical Analogs
MOL201	5.3.5	6/30/95	6/26/95	Status Rpt of Data Submittals to TDB

LLNL Delayed Deliverables
(June 1995)

Milestone	WBS 1.2.	Planned Date	Projected Date	Description	Comment
MOL122	3.10.1	6/30/95	8/01/95	Prelim. Rpt-Results of Simulation of Coupled Processes	
MOL154	3.10.2	6/30/95	7/10/95	Respond to Study Plan Comments	Completed 7/11/95
MOL136	3.10.3.1	6/30/95	8/14/95	Revised SIP for Integrated Tests & Models	
MOL206	3.12.1	4/07/95	8/01/95	Evaluation of the Thermodynamic Databases	Note 1

Note 1: The delay of this deliverable was verbally acknowledged by the WBS Manager. A draft letter was prepared for the WBS Manager to issue.

LLNL Deliverables Scheduled for the Next Reporting Period
(July 1995)

Milestone	WBS 1.2.	Planned Date	Description
MOL272	11.1	7/17/95	QA Quarterly Report #3
MOL181	2.5.1	7/31/95	Degradation Mode Survey on Monel 400
MOL189	2.5.1	7/31/95	Report - Pitting Corrosion Model Development
MOL267	3.12.2	7/31/95	EBS Field Test Calculations
MOL98	3.12.3	7/31/95	Prelim. Rpt on the Effects of Radiation on Rock
MOL138	5.4.2	7/31/95	EBS/NFE Subsystem Analyses for Prelim TSS

ISSUES AND CONCERNS

None at this time.

TECHNICAL SUMMARY

1.2.2. WASTE PACKAGE

1.2.2.4 Waste Form

1.2.2.4.1 Spent Fuel

Spent Fuel Dissolution

The DOE/NRC Technical Exchange on EBS Release Rates and Waste Form Testing was held on June 28-29, 1995. LLNL participants made three presentations on the approach towards compliance with the controlled release requirement for spent fuel and the plans mfor future work. Technical presentations on UO_2 and spent fuel dissolution included both the testing and modeling efforts.

D-20-43, Unsaturated Dissolution Tests with Spent Fuel

Spent fuel is being tested under unsaturated conditions at 90°C to evaluate its long-term performance in the potential repository at Yucca Mountain. The tests monitor the leach/dissolution behavior of the spent fuel; in particular, the dissolution rate of the fuel matrix, the release rate of individual radionuclides, the form in which the radionuclides are released, and the mode of reaction.

Two irradiated PWR fuels, ATM-103 and ATM-106, are being tested in three types of unsaturated tests. The surrogate water, EJ-13, came from well J-13 and was equilibrated with volcanic tuff for approximately 80 days at 90°C. The fuel in the tests had undergone 33 months of reaction at 90°C by the end of June.

Effort this month was devoted to the following:

1) Aliquots from leachate samples removed at the 747-769 day and the 924-935 day test intervals were submitted for inductively coupled plasma/mass spectrometry (ICP-MS) analysis,
2) results for some of the aliquots submitted for alpha and gamma analysis were received, and
3) analysis of ICP-MS data for test intervals less than 747days continued.

Analysis of the actinide data for those intervals was completed.

D-20-43. Unsaturated Dissolution Tests with UO_2

The objective of this program is to evaluate the reaction of UO_2 pellets after exposure to dripping EJ-13 water at 90°C using the unsaturated test method. More specifically, these tests are designed to examine the dissolution behavior of UO_2, formation of alteration phases, rates and mechanisms of uranium release, and serve as a pilot study for drip tests with spent nuclear fuel.

Solution analytical results were received from the ten year UO_2 drip test samples supported by teflon stands. Current levels of uranium release from the samples were comparable to those from previous test intervals completed over the last several years. Sample reactions during the past decade are characterized by a rapid uranium release period between one and two years, followed by relatively low amounts of release over the last eight years. Surface area normalized uranium release rates were also similar to previous tests. Sample PMP8U-3 (geometric surface area = 0.049 m^2) has a normalized uranium release rate of 0.016 $mg/m^2/day$. This result is consistent with previous test intervals, with this sample displaying the lowest overall normalized release rate from all of the original eight tests. Sample PMP8U-6 (surface area = 0.002 m^2) has a uranium release rate of 0.440 $mg/m^2/day$. This sample has continued to display a gradual increase in uranium release over the last three years, from 0.093 $mg/m^2/day$ to the present value. Sample PMP8U-7 has a uranium release rate of 0.072 $mg/m^2/day$, a value that is ~40% of the previous year's result.

Analysis of size fractioned uranium release trends indicates that less than 2% of the released uranium is recovered from a 5 nm filtered solution, whereas between 1 to 12% of the uranium is present in solution in particulates >5 nm in size. The remainder, between 87 and 99% of the total uranium released from the samples is recovered from a solution aliquot obtained after a 10 minute dilute nitric acid soak of the inside of the test vessel. These trends indicate that the majority of the uranium released from the UO_2 samples is sorbed or precipitated on the stainless steel test vessel walls and the teflon support stand.

Cation analyses indicate continued depletion of alkali, alkaline earths, and silicon from the EJ-13 leachant after its contact with the UO_2 pellets. Previous scanning electron microscopy energy diffraction spectroscopy (SEM/EDS) investigations have revealed that these elements are being incorporated into secondary uranyl phases on the sample surfaces, with the uranium being derived from the dissolution of the UO_2 pellets. Magnesium is generally depleted to the greatest extent, with leachate concentrations typically reduced to ~10% of the initial EJ-13 values. Calcium and potassium are depleted to ~30% of the original EJ-13 compositions, while Si is depleted to a level that is within 50 to 60% of the original EJ-13 composition. Sodium concentrations are similar to those in the starting EJ-13 solution, a finding consistent with that of the absence of any discrete sodium uranyl phases on the UO_2 pellet surfaces. The present ten year solutions display a moderate depletion of most cation elements relative to last year's sample results.

D-20-53(a), Flow-Through Dissolution Testing of UO_2

The ultimate objective of this activity at LLNL is to generate analytical data on the dissolution rate of the UO_2 matrix of spent fuel for use in the performance assessment modeling and for direct use in licensing. As part of this task, the flow-through tests on uranium oxides are designed to measure the dissolution rates of the oxides and to determine the rate dependence on several parameters, such as solution pH, temperature, oxygen fugacity, flow rate and solution anions, particularly carbonate species. These tests are not intended to simulate the repository conditions but rather to provide basic rate constant information.

The series of experiments initiated early last month were completed, and an analysis of the results is in progress. Acquisition of two more UO_2 dissolution rates at room temperature and 8 ppm dissolved oxygen (equivalent to 1 atm of air) provided rate data for this oxide at the same conditions as had recently been measured for U_3O_8 and $UO_3 \cdot H_2O$. There is now a full data set for these three oxides at high and low carbonate, pH, and temperature values, at 8 ppm dissolved oxygen. The two sets of dissolution conditions were at pH=8 and 10^{-4} molar carbonate, and pH=10 and 10^{-2} molar carbonate. Four experiments were run, using two new UO_2 samples, as well as two old samples used at 75°C with the same leaching solution compositions. This duplication allows examination of the effect of sample history, as well as variances in estimated sample surface area. An additional room-temperature, 8 ppm dissolved oxygen, dissolution experiment with $UO_3 \cdot H_2O$ was run at a pH of 9 and 10^{-2} molar carbonate to compare with existing data for UO_2, U_3O_8 and spent fuel at that condition.

1.2.2.4.2 Borosilicate Glass

D-20-27, Unsaturated Testing of WVDP and DWPF Glass

The N2 unsaturated (drip) tests on actinide- and technetium-doped SRL 165 glass have been ongoing at ANL for approximately 113 months, and were sampled this month as scheduled. The sampling went well, and in addition to the analyses required by the procedure, sequential filtering of the leachate solution was done for the N2 #9 and N2 #10 samples. Colloidal samples for analytical transmission electron microscopy were also prepared for the N2 #9 and N2 #10 samples.

Analyses and interpretation of the data from the tests are ongoing. Analyses by inductively coupled plasma mass spectrometry (ICP-MS) of the test vessel acid strip solution have been collected since the December 1993 sampling. Generally, the elements in the acid strip are present at very low concentrations relative to the leachate, except for the actinides plus iron, nickel, and chromium (from the stainless steel test vessel itself). Neptunium, plutonium, and americium concentrations in the acid strip have been monitored by high-resolution alpha spectroscopy since the tests were initiated and these data have been reported. The uranium concentration in the acid strip was not amenable to

the alpha spectroscopy procedure, and has only recently become available with the ICP-MS data. Table 1 summarizes the results of the uranium release rate. There is an apparent difference in the distribution of the uranium between sorption onto the stainless steel and dissolution into the vessel rinse depending on the interval between sampling. The first three columns in Table 1 give the release rates for uranium (averaged over the three ongoing tests) during the 26-week intervals since regular sampling resumed in 1993. Note that nearly three times as much uranium appeared in the acid strip as in the vessel rinse, indicating substantial sorption onto the stainless steel. The fourth through sixth columns of Table 1 give the uranium release rates (also averaged over the three ongoing tests) during the 210-week interval from 5/90 to 12/93 when there were no samples taken; substantially less of the total uranium sorbed onto the stainless steel, suggesting that the sorption may reach a saturation, after which further uranium goes into solution. Note that the total release rates for the different sampling intervals are roughly the same.

Table 1. Total Release Rates for Uranium from the N2 Tests, including Acid Strip of Test Vessel

Average N2 Uranium Release Rates during 26-Week Intervals since 7/93 (ng/day)			Average N2 Uranium Release Rates during 210-Week Interval 5/90 to 12/93 (ng/day)		
Vessel Rinse	Acid Strip	Total	Vessel Rinse	Acid Strip	Total
2.5	7.8	10.3	12.6	1.06	13.7

The N3 unsaturated tests, performed at ANL on actinide- and technetium-doped West Valley ATM-10 glass, were last sampled on 1/12/95. They have been ongoing for 95 months, and are next scheduled for sampling on July 13. Normalized release rates, averaged over the three ongoing tests in each series, are given in Table 2 for the elements lithium, boron, and neptunium from both the N2 and N3 test series. These elements serve as benchmarks of glass corrosion, as they are not expected to form secondary phases or substantially sorb onto stainless steel. Note the excellent agreement among the data. These data are normalized to the elemental concentrations in the respective glasses and to surface areas of the monoliths.

Table 2. Normalized Release Rates for Li, B, and Np from the N2 and N3 Tests

N2 Release Rates ($mg/m^2/day$)			N3 Release Rates ($mg/m^2/day$)		
Li	B	Np	Li	B	Np
3.1	2.4	2.1	4.8	3.8	1.7

D-20-31, Studies of Glass Surface Layers and Precipitation

Sixteen tests continue, with some in progress for up to ~8 years. Within the past six months, all of these tests have been sampled, and the data are being compiled. It has been determined that these tests can be upgraded to quality-affecting, which will require an amendment to the existing Activity Plan and revision of the Test Plan.

D-20-70, Parametric Studies of WVDP and DWPF Glass

Tests at ANL on a variety of glasses exposed to 60 and 95% relative humidity at 70°C continue. No test terminations have been done for several years and none are planned for this year.

1.2.2.5 Waste Package Materials Testing and Modeling

1.2.2.5.2 Basket Materials

Scoping corrosion experiments on candidate basket materials have begun. Materials that have been tested include Boral, Boralyn, Zr Alloy 702, copper-boron, 1100 aluminum-aluminum boride, GlidCop Al-15 + 1.5% boron, 6061 aluminum-aluminum boride, 6351 aluminum-aluminum boride, and boron carbide-aluminum ceramic. Still to be tested are borated stainless steel, boron carbide, gadolinium monazite, hafnium oxide, zircon, and zirconolite.

The samples are exposed at 90°C for 96 hours in a solution with the following initial composition:

- 0.01 formal formic acid
- 0.01 formal sodium formate
- 0.02 formal sodium oxalate
- 0.01 formal nitric acid
- 0.01 formal sodium chloride
- 0.01 formal hydrogen peroxide

The initial pH of this solution at room temperature is buffered at pH 4 by oxalic and formic acids and their salts. Initial observations are that the aluminum-based and copper-based materials underwent interaction. Pitting was observed on some of the aluminum-based samples, and the solution rapidly turned blue in color when copper-based samples were exposed. Weight loss determinations, microscopic examinations of the samples, and chemical analysis of the solutions are planned. Fabrication of the ceramic samples, by hot pressing, is now in progress.

1.2.3 SITE INVESTIGATIONS

1.2.3.11 Integrated Geophysical Testing for Site Characterization

1.2.3.11.1 Systematic Acquisition of Surface Based Borehole Geophysical Logging Data

A downhole camera run was conducted in USW-SD-9 by LLNL Geotechnical Engineering under the direction of SAIC. Crane hoisting assistance was also provided during contractor logging activities on June 1, 2, 8, 9 and 10.

1.2.3.11.3 Geophysics—ESF Support, Subsurface Geophysical Testing

The LLNL Geotechnical Engineering Group purchased a gamma ray logging tool from Auslog Company for future use in the ESF.

1.2.3.12 Waste Package Environment Testing and Modeling

1.2.3.12.2 Hydrologic Properties of the Waste Package Environment

Modeling Results

Localized Dry-Out: An Approach for Managing the Thermal-Hydrological Effects of Decay Heat at Yucca Mountain

Geological nuclear waste isolation at Yucca Mountain is affected by three key considerations:

1) ambient conditions are very high relative humidity ($RH \approx 99\%$) and therefore corrosive for most candidate waste package (WP) materials,
2) ambient fracture flow is highly variable in space and time, and
3) decay heat significantly affects fluid flow for any practical areal mass loading (AML).

Using the V-TOUGH and NUFT codes, we have conducted numerical model calculations of the coupled transport of water, vapor, air, and heat in the unsaturated and saturated zones at Yucca Mountain. With respect to the thermal-hydrological effects of decay heat, we have identified the two thermal loading strategies (a minimally heated repository and a constructively heated repository) described below.

Minimally Heated (MH) Repository - The AML and thermal load distribution are selected to minimize heat-mobilized moisture transport. This approach relies on performance attributes other than decay heat (such as high-performance WP materials and capillary/diffusion barriers in the engineered and natural systems) to address the impact of high *RH* and fast fracture flow.

Constructively Heated (CH) Repository - The AML and thermal load distribution are selected to use decay heat constructively to substantially reduce *RH* and fracture flow near WPs. This approach relies on demonstrating that heat, vapor, and liquid flow (including heterogeneous fracture flow) near WPs are dominated by heat conduction (and possibly vapor diffusion) and are therefore very predictable.

Our modeling studies have identified two fundamental CH approaches:

1) Extended dry-out (ED) approach: A high AML (>60 MTU/acre) is used to drive a large fraction of the initial pore water from the vicinity of WPs (and the repository itself). The overall high thermal flux density creates a thick

superheated dry-out zone and maintains above-boiling (and low *RH*) WP conditions for thousands of years.

2) Localized dry-out (LD) approach: Maintain a temperature gradient away from the WP that is steep enough to reduce *RH* on the WP. The LD approach is generally applicable to low-to-intermediate AMLs (<55 MTU/acre).

There are two major issues for the high-AML ED approach:

1) The effect of condensate and infiltration flux that is held up by the coalesced boiling zone above the repository horizon,
2) The effect of thermal-hydrological changes in the far field. Of particular concern are:
   a) alteration of the Paintbrush Tuff (PTn) unit that may affect its ability to attenuate net infiltration to the repository and,
   b) alteration of the basal vitrophyre (TSw3) that may influence perched water and may decrease the mechanical stability of the repository.

Far-field thermal-hydrological effects must be addressed regardless of AML. The LD approach attempts to minimize far-field thermal-hydrological effects (as in the MH approach) and allows condensate to drain through the repository; neither of these results is readily achieved with the ED approach. The LD approach can be implemented by a wide range of thermal design options. Five major categories of the LD approach have been identified, ranging from those that never cause above-boiling rock temperatures to those in which the boiling zones coalesce between the drifts (as in the ED approach). To map the boundaries between these LD categories (with respect to thermal design parameters), our modeling study considered AMLs of 6 to 120 MTU/acre, drift spacings of 25 to 400 m, and lineal mass loadings of 0.25 to 1.25 MTU/m, averaged along the emplacement drift. An oldest fuel first (OFF) receipt scenario with 26-yr-old spent nuclear fuel (SNF) was assumed, and the effect of aging the 26-yr-old SNF to ages of 40, 60, 100, and 200 yr was also considered. Cases were also compared in which backfill was emplaced in the drift at 100 yr with those that were never backfilled.

A reduction in *RH* between the drift wall and the WP (called the "local-ΔRH effect") arises from the temperature difference (ΔT) between these locations. This effect occurs in addition to any reduction in *RH* resulting from rock dry-out. Assuming uniform absolute humidity in the drift, the *RH* on the WP, RH_{wp}, is given by .

$$RH_{wp} = RH_{dw} \frac{P_{sat}(T_{dw}, S_{dw})}{P_{sat}(T_{wp})} \qquad (1)$$

where RH_{dw} is the *RH* at the drift wall, P_{sat} is the local saturated vapor pressure, T_{dw} and T_{wp} are the drift wall and WP temperatures, and S_{dw} is the liquid saturation at the drift wall. For example, if T_{dw} = 80°C and T_{wp} = 100°C and the drift wall is at ambient *RH* (98.4%), then RH_{wp} = 46%.

A persistent high ΔT in the drift can result from rows of WPs acting like thermally isolated line-loads. Thermal isolation is facilitated by wide drift spacing (applicable to the LD approach). Low-thermal-conductivity granular backfill in the drift (applicable to either the LD or ED approach)also increases the ΔT in the drift. Our calculations show that ΔT in the backfill can result in *RH* on the WP below 70% for 10,000 yr, even for AMLs that result in negligible rock dry-out. Proving that heat flow in the backfill is dominated by conduction establishes that ΔT in the drift is very predictable. Note that *RH* on the WP calculated from Eq. (1) is applicable to the situation of thermodynamic and capillary pressure equilibrium between the drift and host rock. Nonuniform rewetting of the drift (particularly that caused by nonequilibrium fracture flow) may locally (or temporarily) invalidate this assumption in regions of high (or focused) liquid flux.

A range of potential natural system parameters, focusing on those that have the greatest influence on the direction and magnitude of vapor flow and on condensate generation, were also considered. Numerical models included all major hydrostratigraphic units in the UZ. Drift-scale behavior is represented by a two-dimensional model that averages the WP heat load along the axis of the drift and that incorporates the geometric details of the WPs and emplacement drifts in a cross section orthogonal to the drift axis. A three-dimensional drift-scale model was used to include the effect of finite-length WPs and the effect of heating heterogeneity along the drift. A hybrid mountain-scale/drift-scale model was used to investigate the edge-cooling effect and the influence of mountain-scale, buoyant gas-phase convection. A wide range of values of bulk permeability k_b was considered in order to identify the k_b range in which advective dry-out is throttled and the k_b range in which buoyant gas-phase convection significantly affects vapor and heat flow. A wide range of values of binary gas-phase diffusion tortuosity factor t_{eff} was considered to investigate the potential role of vapor diffusion on heat, vapor, and liquid flow near WPs.

Laboratory Tests

Characteristic Curves of Tuff

For the experiment of determining moisture retention curve and one-dimensional imbibition using G-4 core, we continued the moisture retention experiments at high temperatures. The measurement of the drying phase at 80°C was completed. An additional sample will be added to the group and measurements of the wetting phase at 50°C will begin.

The Effect of Confining Pressure on Fracture Healing

The results of our previous experiments indicate that fracture healing can occur at low pressures. It has been determined that in order to properly test the effect of confining pressure on the fracture healing process, samples with the same fracture "freshness" must be used at various confining pressures. To obtain suitable samples for this experiment, several small blocks containing a single natural fracture were collected from the LBT site and shipped to LLNL. Core samples will be prepared from the same fracture in one of the

blocks. Each one of these cores will be used in the fracture healing experiment at one level of confining pressure. The machining of core samples will begin in July.

Electrical Properties of Tuff as a Function of Saturation

The measurements on six LBT samples at room temperature continue. The saturation level is at approximately 70%.

1.2.3.12.3 Mechanical Attributes of the Waste Package Environment

The objective of this task is to characterize the geomechanical response of the rock in the near-field to the changing conditions expected to occur over the lifetime of the repository. This includes providing data from laboratory, field and modeling investigations that can be used to support technical site suitability and a high level finding for rock properties. Particular emphasis is on coupled processes and behavior at elevated temperatures and at long times. Work conducted on this task May and June is described below.

Laboratory

Radiation Tests

Testing to determine the effect of radiation consists of a series of laboratory compression tests on irradiated and non-irradiated core samples to determine if radiation affects mechanical properties. Thirty core samples of Topopah Spring Tuff from the Fran Ridge site have been prepared and irradiated using a Cobalt 60 radiation source. Twenty one of the samples have been tested and data reduction is underway. The remaining nine samples will be tested in early July and the results of this study will be reported in milestone MOL98.

Rock Mass Testing

This effort includes tests on 0.5 m scale blocks to determine rock mass behavior and properties at a scale intermediate between core samples and the large block. Fixtures were designed for attaching transducers for velocity measurement at elevated temperature as a function of stress; fabrication of the fixtures is 50% complete. A heater apparatus for testing at elevated temperatures was designed and fabrication is nearly complete.

Modeling

The purpose of the modeling is to evaluate several different constitutive thermal-mechanical models for applicability in simulation of geomechanical behavior in the near-field, and to develop coupled models for rock behavior at elevated temperature. During the reporting period, the FLAC code was used to simulate the small block tests described above. The power needed from the heaters, the location of the heaters, and the rock deformation were estimated. The FLAC code is capable of treating both mechanical and

thermally induced stresses and deformations. It is a two-dimensional code in which materials are represented by arbitrarily-shaped quadrilateral zones. It is based on a Lagrangian scheme and is capable of using several built-in material models, including the ubiquitous joint model that has previously been used to simulate thermal-mechanical behavior in tuff.

Support of the Large Block Test

Laser Extensometer

Preliminary design for a prototype laser multiple point extensometer was completed, and an upgraded laser distance measuring unit for use in the extensometer was received and tested.

Fracture Monitors

Locations for several of the fracture monitors on the surface of the Large Block Test were determined, and slots for many of the monitors were cut.

1.2.3.12.4 Engineered Barrier System (EBS) Field Tests

Comment resolution for Study Plan 8.3.4.2.4.4, Engineered Barrier System Field Tests, was completed.

The P.I. participated in the design and plan of the ESF thermal test.

Large Block Test

Revision of the Large Block Test Activity Plan (LBT-AP-01) and the LBT Engineering Plan continued. The revised Scientific Investigation Plan (SIP-NF-02) is now in the LLNL internal review process.

Field testing of techniques to determine the best way of mounting electrodes for electrical resistivity tomography (ERT) in the LBT was completed. The testing was constructed in two holes drilled on the north wall at Fran Ridge.

Drilling Horizontal Holes

Drilling of the horizontal holes located more than 2 m from the top of the block was completed. The horizontal holes at higher elevations will be drilled next month.

Guard Heater Zones

The guard heaters have been designed and purchased. The software to control the guard heaters is being developed.

Heat Exchanger Test

A laboratory test of the heat exchange system continued. The heat exchanger will be used to control the temperature at the top of the large block. A hardware interface between the heat exchanger and the computer was purchased. The heat exchanger control software has been developed and will be tested next month.

Small Block Tests in the Laboratory

Fracture Flow vs. Matrix Imbibition

X-ray imaging continued to determine the drying of the sample previously saturated with water in the fracture flow vs. matrix imbibition test. As the sample continued to dry out the sample images were still slowly changing. To standardize each image, we performed a normalization based on the image of an aluminum step wedge, which was installed on the sample holder. This enables a more accurate calculation of the saturation field. Preliminary results indicate that this method of normalization is promising.

Relative Humidity as a Function of Saturation

The measurement of relative humidity as a function of moisture content in a Topopah Spring tuff core was initiated. An intact core sample 6.95 cm in diameter and 14 cm in length was machined from one of the small blocks collected from the LBT site. The average porosity of the core is about 8%. A small hole about 1.4 cm in diameter and 7.1 cm deep was drilled in the middle of the core to house the Humicap, which measures relative humidity. The sample and the Humicap were placed in an air-tight sample holder. The core sample was dried in a vacuum oven. Water will be added to the sample for various levels of water saturation. When the sample was dry, the relative humidity reading was about 0.08%. The reading was constant regardless of the temperature variation in the room. Water was added to the sample to raise the water saturation to approximately 2%. The relative humidity continues to increase but has not reached a steady value.

Condensation Along A Fracture

Installation of instruments has begun in the sample prepared for the one-dimensional vapor condensation along a fracture. The sample is a core about 30 cm in length and 5 cm in diameter, with a longitudinal saw cut in the middle.

Permeability of the Matrix

A sample of intact tuff from the LBT has been prepared for determining permeability at high pressures and temperatures. The sample has been jacketed with Viton, and a leak check of the sample assembly has been completed. The measurement of water permeability in the intact core has started. The sample was saturated with J-13 water,

under a confining pressure of about 5 MPa, up-stream pore pressure of about 1.9 MPa, and down-stream pressure of about 0.003 MPa. The flow rate of the water through the sample continues to be measured using an automated balance.

Flow on Fracture Surfaces

X-ray scans will be used to observe the flow process of water on a real fracture surface. Machining of a fractured sample from the LBT small blocks has started.

Pre-test Calculation

A 3-dimensional model of the large block has been constructed using the NUFT code, and calculations were initiated to predict the 3-D thermal-hydrological response of the block to thermal loading.

LLNL PROJECT STATUS REPORT EXTERNAL DISTRIBUTION
June 1995

R. Andrews
M&O/INTERA
Suite 300, M/S 32
6850 Austin Ctr. Blvd,
Austin, Texas 78731

W. Barnes
YMSCO
Department of Energy
101 Convention Center Dr.
Las Vegas, Nevada 89109

Dr. J. Bates
Chemical Technology
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, Illinois 60439

H. Benton
M&O, M/S 423
101 Convention Center Drive
Las Vegas, NV 89109

A. Berusch (RW-20)
OCRWM
Forrestal Building
Washington, DC 20585

K. Bhattacharyya
M&O
101 Convention Center Dr., M/S 423
Las Vegas, Nevada 89109

J. Blink
LLNL/Las Vegas
101 Convention Center Drive, Suite 880
Las Vegas, NV 89109

B. Bodvarsson
LBL/Earth Sciences
Bldg. 50 E
1 Cyclotron Road
Berkeley, CA 94720

S. Brocoum
YMSCO
101 Convention Center Dr.
Las Vegas, NV 89109

H. Cadoff
OCRWM
RW-37 R5A085
1000 Independence Ave., SW
Washington, DC 20585

J. Canepa
Los Alamos National Laboratory
P.O. Box 1663/N-5, MS J521
Los Alamos, NM 87545

P. Cloke
Science Applications Int'l Corp.
101 Convention Center Dr., #407
Las Vegas, NV 89109-2005

C. Conner
DOE, RW-133
1000 Independence Ave., SW
Washington, DC 20585

L. Costin
Sandia National Laboratories
M/S 1333
P.O. Box 5800
Albuquerque, NM 87185-1333

R. Craun
YMSCO
P.O. Box 98518
Las Vegas, NV 89193-8518

C. DiBella
NWTRB
1100 Wilson Blvd., Suite 910
Arlington, VA 22209

T. Doering
M&O
101 Convention Center Dr., MS 423
Las Vegas, NV 89109

D. Dresser
Roy F. Weston, Inc.
955 L'Enfant Plaza, SW
8th Floor
Washington, DC 20024

R. Dyer
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

R. Einziger
Battelle-Pacific Northwest
P.O. Box 999/MS P714
Richland, WA 99352

J. Farrell
M&O TRW
M/S 423, TES1/3573
2650 Park Tower Drive
Vienna, VA 22180

R. Fish
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

T. Geer
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

A. Gil
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

R. Green
Southwest Research Institute
6220 Culebra Rd.
San Antonio, TX 78238-5166

S. Hanauer
OCRWM
RW-2 R5A085
1000 Independence Ave., SW
Washington, DC 20585

L. Hayes
U.S. Geological Survey
Box 25046/MS 425
Denver Federal Center
Denver, CO 80225

R. Hughey
Nuclear Energy Division
US DOE/OAK
1301 Clay St., Rm. 700-N
Oakland, CA 94612

C. Johnson
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

N. Jones
M&O
101 Convention Ctr. Dr., M/S 423
Las Vegas, Nevada 89109

S. Jones
YMSCO
Department of Energy
101 Convention Center Dr.
Las Vegas, NV 89109

H. Kalia
Los Alamos National Laboratory
101 Convention Center Dr., Suite 820
Las Vegas, NV 89109

S. Kennedy
OCRWM
Forrestal Bldg.
Wash., D.C. 20585

O. Lev
M&O TRW
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

S. Marschman, P7-14
Battelle, Pacific Northwest
P.O. Box 999
Richland, WA 99352

S. Nelson
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

S. Rindskopf
M&O TRW
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

R. Robertson
TRW-Metro Place
2650 Park Tower Dr., Suite 800
Vienna, VA 22180

D. Rogers
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

S. Saterlie
M&O LV
101 Convention Center Dr., M/S 423
Las Vegas, Nevada 89109

D. Schutt
M&O LV
101 Convention Center Dr., M/S 423
Las Vegas, Nevada 89109

A. Segrest
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

M. Sellers
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

A.Simmons
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

E. Smistad
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

M. Smith
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, Nevada 89193-8518

L. Snow
Roy F. Weston, Inc.
955 L'Enfant Plaza, SW
Washington, DC 20024

H. Spicker
M&O
101 Convention Ctr Dr., M/S 423
Las Vegas, NV 89109-2005

N. Sridhar
CNWRA
6220 Culebra Rd.
San Antonio, Texas 78238-5166

D. Stahl
M&O/B&W
101 Convention Ctr. Drive, M/S 423
Las Vegas, NV 89109

T. Statton
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

R. Strickler
M&O/TRW
101 Convention Ctr. Drive, M/S 6
Las Vegas, NV 89109

D. Stucker
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

A. Van Luik
M&O
101 Convention Ctr. Dr., M/S 423
Las Vegas, NV 89109

G. Vawter
M&O/TRW
101 Convention Center Dr.
Las Vegas, NV 89109

M. Voegele
M&O/SAIC
101 Convention Center Dr., #407
Las Vegas, NV 89109-2005

M. Weaver
M&O
101 Convention Center Drive, M/S 423
Las Vegas, Nevada 89109

N. White (3)
Nuclear Regulatory Commission
301 E. Stewart Ave. #203
Las Vegas, NV 89101

D. Williams
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, Nevada 89193-8518

J. Younker
M&O/TRW
101 Convention Center Dr.
Las Vegas, NV 89109

P. Zielinski
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, Nevada 89193-8518

Lawrence Livermore National Laboratory

LLYMP9508070
August 28, 1995

QA: N/A

L. Dale Foust
Technical Project Officer
CRWMS-M&O
101 Convention Center Drive, M/S 423
Las Vegas, NV 89109

Subject: Lawrence Livermore National Laboratory (LLNL) Monthly Status Report (WBS 1.2.9)

Dear Dale:

I am pleased to submit the LLNL monthly report under our status as a CRWMS-M&O teammate.

If you require further information, please contact James Blink at (702) 794-7157.

Sincerely yours,

For Willis L. Clarke
LLNL-CRWMS Manager

WLC/JAB/cjp

Enclosure

cc/enc: See Attached Distribution List
LLNL-CRWMS LRC

Recycled

ENCLOSURE 4

LAWRENCE LIVERMORE NATIONAL LABORATORY
(LLNL)
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
(YMP)
STATUS REPORT

July 1995

EXECUTIVE SUMMARY

WBS 1.2.2.4.1 Spent Fuel:
Analysis of inductively coupled plasma-mass spectrometry (ICP-MS) data was completed for the first four test intervals of the high drip rate tests, on ATM-103 and ATM-106 fuel fragments, in progress at Argonne National Laboratory. Both the fraction and the rate (fraction/day) for Sr-90, Tc-99, I-129, Cs-137 and U-238 releases were reported. The results indicate that the releases from Sr, Tc, and I are not congruent with those from uranium for either fuel, all have much larger fractional releases. The strontium and cesium release rates are similar for both fuels. For technetium, the release rates for the two fuels are quite different, varying by at least two orders of magnitude for the first three test intervals and becoming comparable at the high rate only at the fourth test interval. This may indicate that oxidative reaction, which was slower for the ATM-106 fuel has a significant effect on technetium release. The iodine release rate decreased slightly at the fourth test interval for both fuels. The data represent the results from the first 581 days of testing. The tests have now been in progress for over 1000 days and in the time period between 581 days and present, considerable alteration of the fuel has occurred. The data for the more recent test periods are being compiled.

WBS 1.2.2.4.2 Borosilicate Glass:
The N3 unsaturated (drip) tests, performed at Argonne National Laboratory, on actinide- and technetium-doped West Valley ATM-10 glass, were sampled this month. Release rates for selected elements have been calculated for the N3 tests through the January 1995 samplings. The normalized release rates of boron and lithium are comparable at all test times, while the release of uranium is typically an order of magnitude lower and that of thorium (measured only since January 1994) is lower still.

WBS 1.2.2.5.1 Metallic Barriers:
1) The draft report on the degradation mode survey of Monel 400-class nickel-copper alloys was completed by Iowa State University. The general corrosion data for Hastelloy G, Monel 400-class nickel-copper alloys, Alloy 825 and carbon steel in steam environments suggest that the addition of chromium provides the greatest improvement in materials performance. Chromium-bearing Alloy (Hastelloy G) and Alloy 825 provided the greatest corrosion resistance, while the chromium-free Alloy 400 was superior to carbon steel. The performance of the Alloy G was fundamentally the same as Alloy 825 in all environments with the Alloy G providing superior pitting resistance in steam environments. From the data identified in the literature, it appears that Alloy 825 provides

superior pitting and aqueous corrosion performance when compared with Alloy 400. Galvanic corrosion results are dependent upon the galvanic couple and aqueous media employed in the test. In general, the high-chromium alloys (Alloy 825 and Alloy G) are the least susceptible to galvanic corrosion. Alloy 400 also exhibited exceptional galvanic corrosion resistance in a majority of the corrosion couples, especially when coupled with carbon steel specimens.

2) Parameter sensitivity studies were performed using recent version of the stochastic pitting model to assess the sensitivity of the computed pit depth distribution, or "damage function," evolution on a variety of important input parameters. The general shapes of the distributions during various stages of evolution were found to be most sensitive to the relative values of the pit growth and permanent pit cessation probabilities, g and h. These parameter sensitivity studies also revealed that the birth probability decay rate, controlled by the constant a, and the exponent controlling the increase in individual pit depth with time, p, have relatively little influence on the general shape of the damage functions. This finding holds so long as the variations in a and p are not too large.

3) A method of including "extreme-value statistics" (EVS) analysis within the "PIGS" model has been developed. The EVS method is commonly employed in the analysis of experimental pit depth data and has been shown to be a valuable method for predicting the future probability of deep pits occurring, the time to penetration of a component by a pit, and the effects of specimen or service component surface area on the probability of pits reaching a certain depth. Given the utility and wide acceptance of EVS to analyze pitting damage, it is useful to determine if this method is consistent with the stochastic pitting models. If the "PIGS" model is consistent with the EVS methodology, then a considerable simplification in the experimental program to supporting pitting corrosion modeling might be achieved.

WBS 1.2.3.12.2 Hydrologic Properties of the Waste Package Environment:
As part of the experiment, utilizing G-4 core, to determine the moisture retention curve and one-dimensional imbibition, LLNL initiated wetting phase measurements at 50°C. Testing of the G-4 core samples at high-temperatures continued and a report, summarizing the results to-date, has been completed.

WBS 1.2.3.12.3 Mechanical Attributes of the Waste Package Environment:
LLNL completed testing, to determine the effect of radiation on Topopah Spring tuff. This testing consisted of a series of laboratory compression tests on irradiated and non-irradiated core samples to determine if radiation affects mechanical properties. Thirty core samples were prepared and irradiated using a Cobalt 60 radiation source, and then tested in uniaxial compression. Results reported indicate that for homogeneous, uncracked samples of Topopah Spring Tuff (Tsw2), exposure to gamma radiation had no discernible effect on the unconfined compressive (peak) strength or the Young's modulus. However, results for samples that contained partially open pre-existing vertical or subvertical cracks indicate that radiation may cause significant degradation of the strength and Young's modulus. A possible explanation of the observed behavior is that exposure to radiation

weakened the cementing material in the cracks and fractures in these samples, leading to the lower values of peak strength and Young's modulus. These results, and two possible mechanisms that can be postulated to cause weakening of the cementing material by radiation exposure, are presented in a report (LLNL Milestone MOL98) that was submitted to YMSCO.

DELIVERABLES

LLNL Deliverables Met
(July 1995)

Milestone	WBS 1.2.	Planned Date	Completion Date	Description
MOL272	11.1	7/17/95	7/12/95	QA Quarterly Report #3
MOL181	2.5.1	7/31/95	7/27/95	Degradation Mode Survey on Monel 400
MOL189	2.5.1	7/31/95	7/27/95	Report - Pitting Corrosion Model Development
MOL154	3.10.2	6/30/95	7/11/95	Respond to Study Plan Comments
MOL120	3.12.2	8/01/95	7/28/95	Report on Lab Tests Drying/Rewetting of Intact Rock
MOL98	3.12.3	7/31/95	7/31/95	Prelim. Rpt on the Effects of Radiation on Rock
MOL138	5.4.2	7/31/95	7/28/95	EBS/NFE Subsystem Analyses for Prelim. TSS

LLNL Delayed Deliverables
(July 1995)

Milestone	WBS 1.2.	Planned Date	Projected Date	Description	Comment
MOL122	3.10.1	6/30/95	8/01/95	Prelim. Rpt-Results of Simulation of Coupled Processes	
MOL136	3.10.3.1	6/30/95	8/14/95	Revised SIP for Integrated Tests & Models	
MOL206	3.12.1	4/07/95	8/01/95	Evaluation of the Thermodynamic Databases	Note 1
MOL267	3.12.2	7/31/95	8/31/95	EBS Field Test Calculations	Note 1

Note 1: The delay of this deliverable was verbally acknowledged by the WBS Manager. A draft letter was prepared for the WBS Manager to issue.

LLNL Deliverables Scheduled for the Next Reporting Period
(August 1995)

Milestone	WBS 1.2.	Planned Date	Description
MOL236	3.12.3	8/04/95	Preliminary Rpt. on Analysis of Large Block Test
MOL100	3.12.3	8/15/95	Revise Study Plan
MOL266	3.12.5	8/15/95	Complete Study Plan Review Process
MOL203	3.12.3	8/18/95	Results of Geomechanical measurements
MOL132	3.12.5	8/28/95	Rpt. on Material Ident. Cate., and Evaluation
MOL105	2.4.2	8/30/95	Int. Rpt. HLW Glass Unsat. Testing
MOL108	2.4.2	8/30/95	Int. Rpt, HLW Glass Model Dev.
MOL116	3.12.2	8/30/95	Pre-Test Large Block Test Analysis
MOL264	3.12.2	8/30/95	Respond toStudy Plan (Rev 1) Comments
MOL141	5.4.2	8/30/95	EBS/NFE Model Qualification Status Report
MOL186	2.5.1	8/31/95	Status of 5-year Omnibus Corrosion Tests
MOL241	2.5.1	8/31/95	Rpt on Technical for MIC Measurement
MOL192	2.5.2	8/31/95	Rpt on Basket Materials Scoping Tests
MOL205	3.10.1	8/31/95	Status of Data Water Chemistry/Secondary Mineral
MOL207	3.12.1	8/31/95	Field-Based & Laboratory-Based Measurements
MOL263	3.12.1	8/31/95	Complete Study Plan Review Process
MOL29	3.12.2	8/31/95	Submit Updated Code Version for V-Tough
MOL113	3.12.2	8/31/95	Submit NUFT Code Individual Software Plan
MOL121	3.12.2	8/31/95	Summary of Pre and Post-Processors for V-Tough
MOL135	3.10.3	8/31/95	Report on Strategies for Integrated Testing
MOL172	3.10.3	8/31/95	Test Plans for Transport Studies in Unsat. Mtls.
MOL243	3.12.4	8/31/95	Progress Report on Small Block Tests
MOL256	3.12.4	8/31/95	Data Acquisition System
MOL163	3.10.3	8/31/95	Rpt of Lab Measurements of Thermodynamic Data
MOL165	3.10.3	8/31/95	Develop Ni & Zr Thermodynamic Databases
MOL170	3.10.3	8/31/95	US Contributions to NEA Tech Volume on Np/Pu
MOL171	3.10.3	8/31/95	US Contribution to Peer Review, NEA Tech Vol. on Tc
MOL125	3.12.5	8/31/95	Activity Plans
MOL126	3.12.5	8/31/95	Prog. Rpt. Dev., Computer Modeling Modules
MOL129	3.12.5	8/31/95	Continuous Swipe Tests in the ESF #1
MOL103	3.4.2	8/31/95	Prelim. Rpt. on Dev. of EQ3/6
MOL104	3.4.2	8/31/95	Annual Summary Rpt on EQ3/6 V&V Activities
MOL102	3.4.2	8/31/95	Update Versions of Datao and Gembochs
MOL208	3.4.2	8/31/95	Complete Development of Facet

ISSUES AND CONCERNS

None at this time.

TECHNICAL SUMMARY

1.2.2. WASTE PACKAGE

1.2.2.4 Waste Form

1.2.2.4.1 Spent Fuel

The ultimate objective of this activity is to generate analytical data on the dissolution rate of the UO_2 matrix of spent fuel for use in performance assessment modeling and for direct use in licensing. As part of this task, the flow-through tests on uranium oxides are designed to measure the dissolution rates of the oxides and to determine the rate dependence on several parameters, such as solution pH, temperature, oxygen fugacity, flow rate, and solution anions, particularly carbonate species. These tests are not intended to simulate the repository conditions but rather to provide parametric rate constant information.

Spent Fuel Dissolution

D-20-43, Unsaturated Dissolution Tests with Spent Fuel

Spent fuel is being tested under unsaturated conditions at 90°C at Argonne National Laboratory to evaluate its long-term performance in the potential repository at Yucca Mountain. The tests monitor the leach/dissolution behavior of the spent fuel, in particular, the dissolution rate of the fuel matrix, the release rate of individual radionuclides, the form in which the radionuclides are released, and the mode of reaction.

Effort this month was devoted to the following:

1) A draft of a paper for Migration '95 was completed and submitted for internal review.
2) The test plan addendum for additions to the spent fuel test matrix was completed and submitted to LLNL for review.
3) Analysis of inductively coupled plasma/mass spectrometry (ICP-MS) data for Sr-90, Tc-99, and I-129 for the first four test intervals was completed.

Two irradiated fuels, ATM-103 and ATM-106, are being tested in three types of unsaturated tests. The surrogate water, EJ-13, came from well J-13 and was equilibrated with volcanic tuff for approximately 80 days at 90°C. The fuel in the tests had undergone slightly more than a thousand days of reaction at 90°C by the end of July.

Table 1 lists both the fraction and the rate (fraction/day) for Sr-90, Tc-99, and I-129 releases for the first four test intervals of the high-drip-rate tests with ATM-103 and ATM-106 fuel fragments. For comparison, the release fractions and rates for Cs-137 and U-238 are also listed. The releases from Sr, Tc, and I are not congruent with those from uranium for either fuel, all have much larger fractional releases. The strontium and cesium

release rates are similar for both fuels. For technetium, the release rates for the two fuels are quite different, varying by at least two orders of magnitude for the first three test intervals and becoming comparable at the high rate only at the fourth test interval. This may indicate that oxidative reaction, which was slower for the ATM-106 fuel has a significant effect on technetium release. The iodine release rate decreased slightly at the fourth test interval for both fuels. Note, the data represent the results from the first 581 days of testing. The tests have now been in progress for over 1000 days and in the time period between 581 days and present, considerable alteration of the fuel has occurred. The data for the more recent test periods are being compiled.

Table 1. Fractional Release of Radionuclides from ATM-103 an ATM-106

	ATM-103			ATM-106	
Reaction Time (d)	Interval Fraction	Rate (frac/d)	Reaction Time (d)	Interval Fraction	Rate (frac/d)
Cs-137					
120	7E-4	1E-5	113	4E-5	1E-6
275	2E-4	1E-6	271	2E-3	1E-5
482	9E-5	4E-7	482	1E-3	5E-6
581	2E-4	2E-6	581	2E-4	2E-6
U-238					
120	5E-5	4E-7	113	2E-5	2E-7
275	5E-6	3E-8	271	1E-4	9E-7
482	8E-6	4E-8	482	7E-6	4E-8
581	2E-5	2E-7	581	1E-6	1E-8
Sr-90					
120	2E-2	2E-4	113	4E-4	3E-6
275	4E-4	2E-6	271	3E-3	2E-5
482	9E-4	4E-6	482	9E-5	4E-7
581	3E-4	3E-6	581	2E-4	2E-6
Tc-99					
120	4E-2	3E-4	113	7E-5	6E-7
275	1E-2	1E-4	271	9E-4	6E-6
482	5E-2	2E-4	482	4E-4	2E-6
581	6E-2	6E-4	581	1E-2	1E-4
I-129					
120	9E-2	8E-4	113	1E-1	9E-4
275	5E-2	3E-4	271	2E-1	1E-3
482	2E-3	1E-5	482	1E-3	6E-6
581	2E-3	2E-5	581	4E-3	4E-5

D-20-43, Unsaturated Dissolution Tests with UO_2

The objective of this project is to evaluate the reaction of UO_2 pellets after exposure to dripping EJ-13 water at 90°C using the Unsaturated Test Method. More specifically, these tests are designed to examine the dissolution behavior of UO_2, formation of alteration phases, release rates and mechanisms of uranium release, and serve as a pilot study for similar tests with spent nuclear fuel.

There was no sampling at ANL scheduled for this month. Work continues on analyzing and compiling previous results.

1.2.2.4.2 Borosilicate Glass

D-20-27, Unsaturated Testing of WVDP and DWPF Glass

The N2 unsaturated (drip) tests on actinide- and technetium-doped Savannah River Laboratory (SRL) 165 glass have been ongoing for approximately 490 weeks, and were last sampled on June 19. They are next scheduled to be sampled in December of this year.

The N3 unsaturated tests, performed on actinide- and technetium-doped West Valley ATM-10 glass, were sampled this month at ANL on July 13. In addition to the analyses specified in the procedure, sequential filtering was done on leachate from the N3#10 and N3#12 tests, and samples of the leachate were prepared for examination by analytical transmission electron microscopy(AEM). For the first time, the visual examination of the glass/stainless steel waste package assemblages (WPAs) was enhanced by use of a video-microscope. The visual observations and verbal comments were thereby captured on videotape. Still photos from this videotape will be prepared for the records file and the annual report.

Release rates for selected elements have been calculated for the N3 tests through the January 1995 samplings. The normalized release, that is, $N_i = M_i / (\Delta t \bullet c_i \bullet A)$, for some of the elements are shown in Figure 1, where M_i and c_i are the mass and concentration of element i in the leachate solution, Δt is the time interval between tests, and A is the surface area of the glass monolith. Note that the normalized release rates of boron and lithium are comparable at all test times, while the release of uranium is typically an order of magnitude lower and that of thorium (measured only since January 1994) is lower still. Data from replicate tests are shown on the plot as individual symbols.

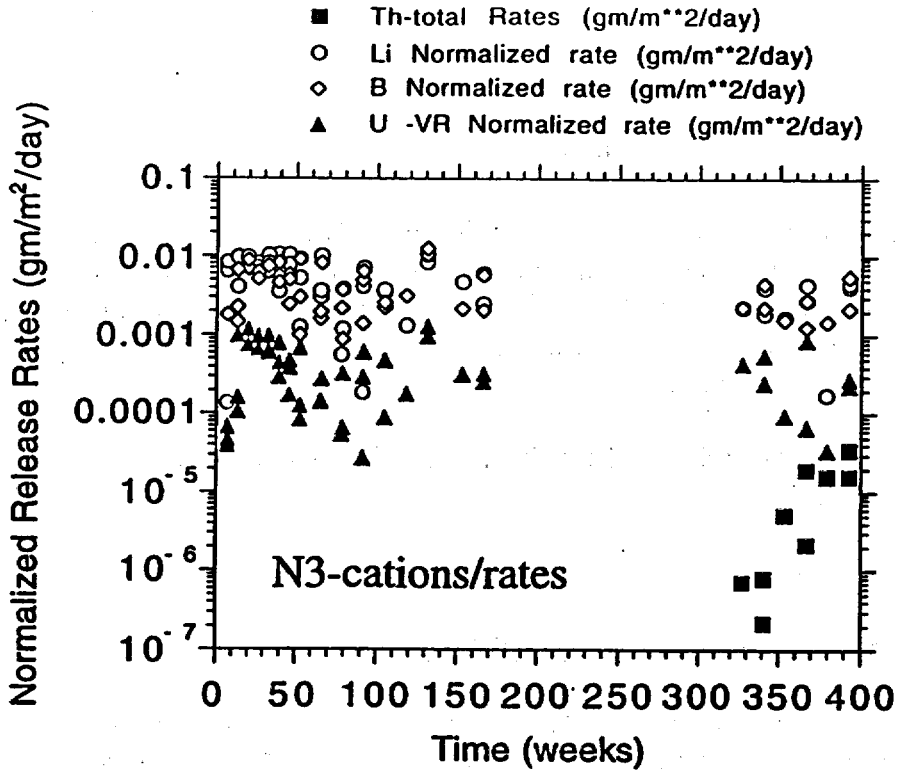


Figure 1. Normalized Release Rates for Selected Elements from the N3 Tests as a Function of Elapsed Time.

D-20-70, Parametric Studies of WVDP and DWPF Glass

Sixteen tests have continued at ANL, with some in progress for up to ~8 years. Within the past six months, all of these tests have been sampled and the data are being compiled.

It has been agreed that these tests can be upgraded to quality-affecting, which will require an amendment to the existing activity plan and revision of the test plan. The test plan revision for these tests has been completed and submitted for review.

Tests on a variety of glasses exposed to 60 and 95% relative humidity at 70°C continue. No test terminations have been done for several years and none are planned for this year.

1.2.2.5 Waste Package Materials Testing and Modeling

1.2.2.5.1 Metallic Barriers

The purpose of the metallic barrier task is to characterize the behavior and determine the corrosion rates and corrosion mechanisms of metallic barriers, including the interaction with the surrounding environment. Tests and modeling are performed to determine this behavior. Conceptual models of corrosion processes are developed for use in evaluating waste package performance. This task provides considerable input on materials properties to the waste package and repository design tasks and to the performance assessment task.

Activities discussed in this report reflect progress for June and July.

The draft white papers on "Waste Containment and Isolation" were reviewed by LLNL staff. The papers were prepared by E. Taylor, J. Docka, and L. Rickertson for the five key strategy elements discussed in the Program Plan and include a status of what we know today and what we will know in the next 3-5 years in preparing for the license application. Containment and engineered barriers figure prominently in the strategy. E. Taylor (TRW/Vienna), visited LLNL on June 28 to discuss the implication of a high thermal load strategy on waste package containment and D. McCright attended an M&O meeting, July 18-19 in Las Vegas, on the white papers to present LLNL review comments.

Task Management and Quality Assurance

D. McCright attended the Geochemical Integration Workshop on June 1 & 2 in Las Vegas and gave a presentation on the corrosion products that will form after degradation of the disposal container. These products will condition the ground water and influence the rate of radionuclide release. The morphology of corrosion degradation in the container will influence the pathway for water entry and radionuclide release. The work to support these studies is described under Metallic Barrier Activity E-20-88.

LLNL staff have begun the revised QA grading for the Metallic Barrier activities currently in progress and those expected to start in the next few months.

Degradation Mode Surveys (PACS OL251LGI, Activity E-20-32)

The purpose of this work is to present a literature review of the potential degradation modes for moderately corrosion resistant nickel copper and nickel based candidate materials that may be applicable as alternate barriers for the advanced conceptual design (ACD) systems in the Yucca Mountain environment. This work reviewed the corrosion of nickel-copper alloys, summaries of experimental evaluations of oxidation and atmospheric corrosion in nickel-copper alloys, views of experimental studies of aqueous corrosion in nickel copper alloys, a brief review of galvanic corrosion effects and a summary of stress corrosion cracking in these alloys.

The draft report by Iowa State University on the degradation mode survey of Alloy 400 was completed and submitted to YMSCO as milestone MOL181. Following technical and programmatic review, it is planned to publish this report to complete the series of degradation mode surveys on all of the current candidate materials.

The general corrosion data for Hastelloy G and Alloy (Monel 400) nickel-copper alloys, Alloy 825 and carbon steel in steam environments suggest that the addition of chromium provides the greatest improvement in materials performance. Chromium-bearing Alloy (Hastelloy G) and Alloy 825 provided the greatest corrosion resistance, while the chromium-free Alloy 400 was superior to carbon steel. The performance of the Alloy G was fundamentally the same as Alloy 825 in all environments with the Alloy G providing superior pitting resistance in steam environments.

From the data identified in the literature, it appears that Alloy 825 provides superior pitting and aqueous corrosion performance when compared with Alloy 400. Galvanic corrosion results are dependent upon the galvanic couple and aqueous media employed in the test. In general, the high-chromium alloys (Alloy 825 and Alloy G) are the least susceptible to galvanic corrosion. Alloy 400 also exhibited exceptional galvanic corrosion resistance in a majority of the corrosion couples, especially when coupled with carbon steel specimens.

A ranking of the overall corrosion performance of the materials investigated in this study from the most corrosion resistant to the least corrosion resistant is provided below.

1) Alloy 825 and Alloy G
2) Alloy 400
3) Carbon Steels and Low Alloy Steels

Since the materials to be employed in the Advanced Conceptual Design (ACD) waste package are considered to be somewhat corrosion resistant materials, Alloy 400 should not be precluded as candidates for the outer containment barrier in a wet repository environment. Based upon the corrosion data available for Alloy 400, this material may be suitable for use in a moderately aggressive repository corrosion environment. However, care must be taken to evaluate all potential galvanic effects for specific waste package designs and applications.

Model Development (PACS OL251LGK, Activity E-20-80)

Parameter sensitivity studies were performed using recent version of the stochastic pitting model to assess the sensitivity of the computed pit depth distribution, or "damage function," evolution on a variety of important input parameters. The general shapes of the distributions during various stages of evolution were found to be most sensitive to the relative values of the pit growth and permanent pit cessation probabilities, γ and η. The parameter sensitivity studies also revealed that the birth probability decay rate, controlled by the constant α, and the exponent controlling the increase in individual pit depth with time, p, have relatively little influence on the general shape of the damage functions. This finding holds so long as the variations in α and p are not too large.

Description of the New Pitting Modeling Code

The method of "extreme-value statistics" (EVS) is commonly employed in the analysis of experimental pit depth data (Refs.1-4). It has been shown that this method is valuable for predicting the future probability of deep pits occurring, the time to penetration of a component by a pit, and the effects of specimen or service component surface area on the probability of pits reaching a certain depth.

Given the utility and wide acceptance of EVS to analyze pitting damage, it is useful to determine if this method is consistent with the stochastic pitting models. Further, Aziz (Ref. 1) suggested that the experiments used in conjection with EVS analyses are

considerably simpler to perform than those in which the entire damage function is measured, while providing much of the same critical information. If this is true, and if the "PIGS" model is consistent with the EVS methodology, then a considerable simplification in the experimental program to supporting pitting corrosion modeling might be achieved. Therefore, a method of including EVS analysis within the PIGS model has been developed.

The method of including this EVS analysis within the PIGS code follows from the actual experimental procedure described by Aziz (Ref. 1). First, each individual test coupon is simulated by a single PIGS run using a unique "seed" value to initiate the random number generator. Using a single set of input parameters, an N-run simulation is performed in which each run begins with a different random number seed. This procedure corresponds to the exposure of multiple, identical test coupons to the same corrosive environment. Analogous to the experiments, the surface area "tested" is proportional to the number of runs in the simulation, since one PIGS run considers a unit surface area. Following each PIGS run within a single N-run simulation, the maximum computed pit depth is stored. Once all the runs have been completed, these values are sorted in ascending order, providing "data" analogous to that described by Aziz (Ref. 1). Using this methodology, a new version of the PIGS program was written and verified.

Consistency between PIGS and the EVS method in indicated if the "EVS plot" predicted by the stochastic model is linear. The "EVS plot" refers to a plot of the "reduced variate," y, vs. the maximum pit depth, d_{max}. The reduced variate is defined as

$$y = -\ln\{-\ln(\phi_m)\}, \tag{1}$$

where

$$\phi_m = m / (N+1), \tag{2}$$

N is the number PIGS runs in a simulation (analogous to the number of replicate specimens in an actual experiment), and m refers to the mth deepest pit out of the N maximum pit depths recorded from each run.

In general, the stochastic model is fairly consistent with the EVS theory. For example, Fig. 2 shows the results of a 50-run simulation in which each run consisted of 500 time steps of exposure. The consistency between the PIGS simulation (solid circles) and the linear least squares fit (solid line) is typical of that observed in actual experiments by Aziz for Al in tap water (Ref. 1). The quality of the fit in Fig. 2 is quantified by a fairly large correlation coefficient, R = 0.94796. However, in some cases the stochastic model predicts a concave upward curvature to the EVS plot, as shown in Fig. 3. The reason for this deviation from the EVS theory is still under investigation.

The EVS method allows for predictions of the influence of specimen or component surface area on the probability of a pit reaching a given depth within a given period of time. The EVS analysis and a variety of data (e.g. 1) suggest that the observed maximum pit depth increases logarithmically with the surface area of metal exposed to a corrosive

environment. The surface area "exposed" in a PIGS simulation is proportional to the number of runs in the simulation, since one PIGS run considers a unit surface area. Thus, by performing simulations with identical input parameters and varying the numbers of runs, the effect of surface area on maximum pit depth can be predicted by the stochastic model. The results of such a calculation are shown in Fig. 4. With a high degree of correlation (R = 0.99102), the stochastic model predicts the expected logarithmic dependence of d_{max} on the exposed surface area (i.e. the number of runs).

In his experimental work, Aziz (Ref. 1) showed how the EVS plot evolves with increasing exposure time for Al in tap water. A series of simulations with the stochastic model were performed to determine of it predicts a similar evolution. Figure 5 presents the results of four 50-run simulations using identical input parameters except for the exposure time; exposures of 50, 100, 500, and 1000 steps were simulated. First, note the excellent straight line behavior predicted for exposures up to 1000 time steps. (At 4000 time steps, however, the EVS plot was concave upward, similar to that shown in Fig. 3). Figure 5 also shows that the EVS line is translated to larger pit depths as the exposure time increases, though its rate of translation decreases with increasing exposure time due to the use of the relationship:

$$d = A \bullet t^{p} \; ; p < 1, \qquad (3)$$

where d is pit depth, t is pit age, and A and p are constants (see the May 1995 report). These results are consistent with the data of Aziz (Ref.1). Finally, Aziz noted that the slope of the EVS line decreases significantly as exposure time increases. Although it is not clear from Fig. 4, the stochastic model predicts such a trend, albeit less dramatic than that observed by Aziz. In order of increasing exposure time, the slopes of the lines in Fig. 5 are: 6.23, 5.17, 5.46, and 4.67.

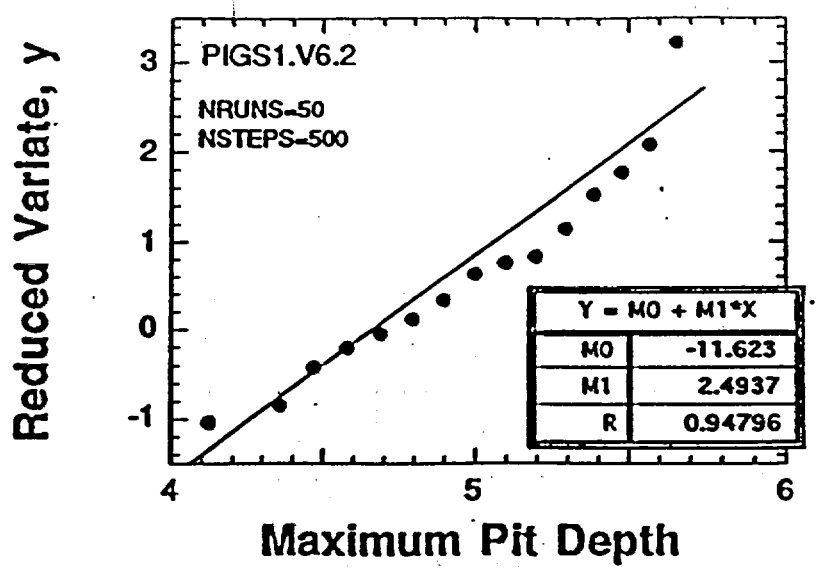


Figure 2. The reduced variate as a function of d_{max} (arbitrary units) computed by PIGS (solid circles) is compared with the liinear least squares fit (solid line) for a 50-run simulation with 500 time steps per run.

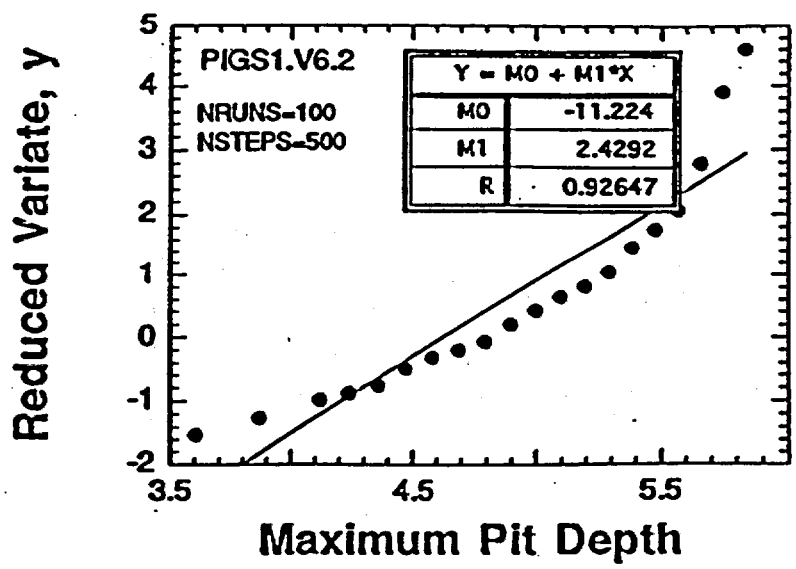


Figure 3. The reduced variate as a function of d_{max} (arbitrary units) computed by PIGS (solid circles) is compared with the linear least squares fit (solid line) for a 100-run simulation with 500 time steps per run.

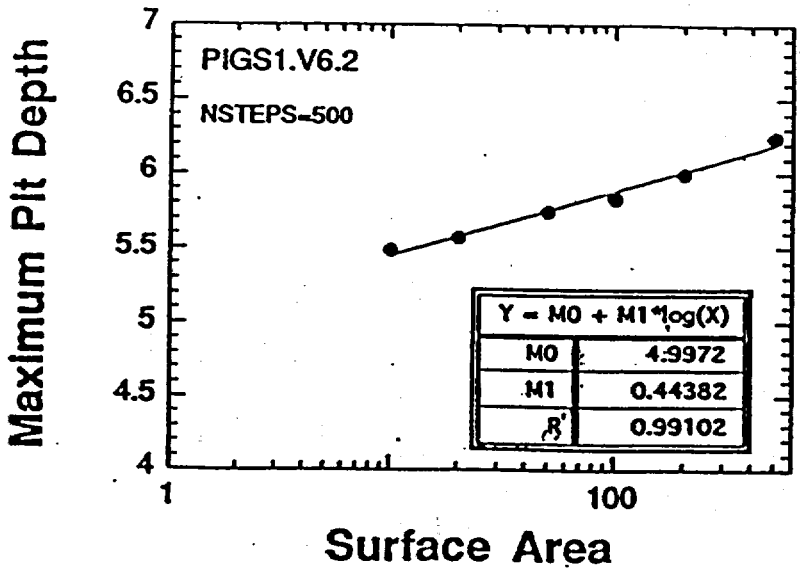


Figure 4. The maximum pit depth as a function of the exposed surface area (equal to the number of runs per simulation) predicted by the stochastic model. Both maximum pit depth and surface area are in arbitrary units.

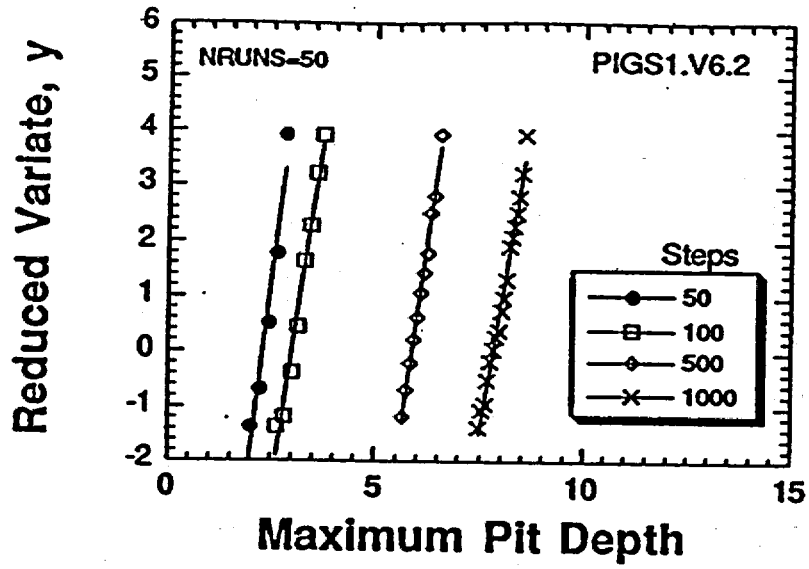


Figure 5. The reduced variate as a function of maximum pit depth for 50-run simulations with exposures of 50, 100, 500, and 1000 steps.

Thermogravimetric Analysis (PACS OL251LGM, Activity E-20-97)

The laboratory housing the thermogravimetric analysis (TGA) unit has been equipped with an air conditioning (AC) system to reduce the temperature fluctuation that produced spurious cyclical weight during the TGA tests. Earlier observations showed room temperature fluctuations of 6°C could affect the weight measurement by 140 mg. The room temperature fluctuation has been narrowed to less than +/- 1°C following the AC installation. TGA weight measurements now decline only 30 mg over a 4-day period and no spurious cycling of weight data is observed with the tighter temperature control.

The software that controls the temperature for TGA testing, up to 120°C using 0.5-1.0°C/minute ramps, has been installed and is being evaluated. Preliminary results indicate temperature inside the glass assembly, where a specimen is exposed to water vapor, tracks the programmed temperature profile closely. Further testing at higher temperatures is in progress.

A layout has been completed that will couple the MKS, Inc. vaporizer to the existing glass assemblies housed on the TGA apparatus. In another change, it will be possible to monitor humidity on both the tare and sample sides with an added humidity sensor. This revised layout is being reviewed before proceeding with complete drawings.

G. Gdowski submitted the final draft of the activity plan for the TGA experiments. The document has been internally reviewed and accepted.

Long-Term Corrosion Tests (PACS OL251LGJ, Activitiy E-20-50

A purchase requisition has been submitted for 12 vessels, to contain the long-term corrosion test specimens. The vessels are to be made of a fiberglass-type material for containment of J-13 and enhanced impurities J-13 water at 60-90°C. The vessel lid accessories drawings are complete and fabrication quotes have been requested. The accessories include access ports for solution withdrawal, heater port cover plates, and mixer port cover plates. A formal request for quote has also been submitted for 65 specimen racks, 15 rectangular port covers and 80 gaskets. Preliminary pricing information for the fiber-reinforced polymer-matrix composite racks came in at about $900.00 each. Competitive bids are due in mid-August.

G. Gdowski has submitted a J-13 well-water preparation-plan for the long-term corrosion test, with 6 options ranging from using strictly synthetic J-13 water to ground or perched water from Yucca Mountain with natural rock placed in the bottom of the vessels. Microbial effects and precipitation of various constituents are addressed in these different environmental scenarios. After comment by the task members and the geochemistry group, a suitable method for preparation of "J-13"-like water will be selected and a Technical Implementation Procedure (TIP) prepared.

Microbiologically-Influenced Corrosion, (PACS OL251LGN, Activity E-20-60)

On June 15, 1995, a coordination meeting was held at the University of Nevada, Las Vegas (UNLV) between representatives of UNLV, University of Nevada-Reno (UNR), and LLNL to discuss microbiologically-induced corrosion (MIC) of candidate waste container materials.

Based on these discussions it was agreed that Professors D. Jones (UNR) and P. Amy (UNLV) would develop a joint proposal to examine MIC of candidate container materials. A draft test plan, for FY96 funding consideration, will be prepared to address the following experimental parameters:

1) Materials to test will include Titanium Grade 12, Haynes Alloy C22, CDA 715 (Cu-30% Ni) Copper Alloy, Alloy 825 Ni-Cr-Fe Alloy, and ASTM A516 Grade 55 C-Mn Steel. Both unwelded and welded samples of each material will be tested.
2) Test temperatures will be 60°C and 90°C, with a few scoping tests using mild steel at room-temperature.
3) Microbial types are selected from those obtained from the site, which include:
   a. sulfate reducing bacteria (SRB) - 1 type;
   b. exo-polymer producers (EPS) - 12 types;
   c. iron-oxidizers - 1 type; and
   d. acid-producers - up to 12 types.

Characterization of the specific make-ups of these microbical-samples is under way and will be reported in an upcoming monthly report.

4) There will be three replications per test-condition to permit simple statistical analyses, together with a control sample.
5) The test duration will be 6 months.
6) Data to be collected and sampling interval:
   a. pH and E_h will be sampled weekly;
   b. physical changes during exposure will be sampled as they occur;
   c. weight change will be tested at the end of the exposure; and
   d. surface-characterization of selected samples; including optical microscopy, "wet" scanning electron microscopy, and scanning augel microprobe will be performed.

A cell for electrochemical measurements has been designed and fabricated from off-the-shelf components. A mixed culture of aerobic and sulfate reducing bacteria grows in the cell on a carbon steel sheet electrode. A computerized electrochemical measuring system has been taken from UNR to UNLV, and electrochemical corrosion-rate measurements will be initiated in cells with growing bacteria.

Crack Growth Tests (PACS OL251LGO, Activity E-20-55)

The purposes of this research activity are (1) to determine the susceptibility of candidate waste container materials for the Yucca Mountain Program to stress corrosion cracking (SCC) and (2) to provide experimental data base for predictive models for SCC in the environment. Research activities deal with fracture mechanics crack-growth-rate determinations on types 304L and 316L stainless steels, Incoloy 825, Titanium Grade 12, Hastelloy C-4, and Hastelloy C-22. Crack growth rate (CGR) tests using standard compact tension (CT) fracture mechanics specimens have been conducted on types 304L and 316L stainless steels and Incoloy 825 in the earlier phase of the program. Additional tests were initiated on Ti Grade 12, Hastelloy C-4, Hastelloy C-22, and on a new heat of Incoloy 825 in FY 1994.

Argonne National Laboratory Activities

Crack growth rate tests are performed for standard 1" thick compact tension (1T CT) specimens under a cyclic load with triangular loading waveform (loading time of 2-9990 s and unloading time of 1 s) and various load ratios, in a simulated J-13 well water environment at 93°C. The simulated J-13 well water was prepared from deionized high-purity water and reagent-grade-purity salts of $CaSO_4$, $Ca(NO_3)_2$, $CaCl_2$, $FeCl_2$, Li_2SO_4, $MgSO_4$, $MnSO_4$, $AlCl_3$, Na_2CO_3, $NaHCO_3$, $KHCO_3$, Na_2SiO_3, and HF. The pH value of the feed water is in a range of 6-8. The specimens have been fatigue-cracked in air at room temperature for a pre-crack length of 1.9 mm under a cyclic load with triangular load shape, load ratio of R=0.1-0.25, and a loading frequency of 1 Hz, to introduce a sharp starter crack before crack growth rate tests. Tests have been completed for Titanium Grade 12 (specimen No. T16-01) under a load ratio of R=0.5, and maximum stress intensity of 26-41 $MPa \cdot m^{1/2}$. The test results were presented in the May 1995 monthly report. These crack growth rate tests are continuing for Titanium Grade 12 (Specimen No. T16-01), Hastelloy C-22 (Specimen No. 227-01) and Hastelloy C-4 (Specimen No. 245-02) under load ratio of R=0.7.

LLNL Activities

A recent proposal (Ref. 5), presenting a detailed test plan to evaluate the susceptibility of candidate waste package container materials to stress corrosion cracking (SCC), would involve a major modification of the existing Type 316 stainless steel autoclave systems that contain the compact tension specimens. Because the existing systems utilize a manually operated weight elevator to apply the tensile load to the CT specimens it is possible that the loads may fluctuate, resulting in non-reproducible data. In view of this drawback, the proposal recommended that the current deadload system be replaced by a servohydraulic system to generate reliable crack growth rate data under a controlled loading condition. However, modification of the existing system would require substantial resources. Accordingly, the following two alternate test methods, prescribed by the National Association of Corrosion Engineers (NACE) (Ref. 6) are being proposed.

Double-Cantilever-Beam (DCB) Method

The double-cantilever-beam (DCB) test is a crack-arrest type of fracture mechanics test for measuring the resistance of metallic materials to propagation of SCC, expressed in terms of "critical stress intensity of SCC", K_{ISCC}. The susceptibility to SCC will be evaluated by stressing a DCB specimen (Figure 6a) by inserting a double taper wedge (Figure 6b). The wedge is made of the same material as the test material. Machining of the side grooves must be done carefully to avoid overheating and cold working. The DCB specimen will be fatigue-precracked under load-control, at 30 Hz, with load varying from 70 to 700 lbs. To avoid residual compressive stress, the peak K_I during precracking should not exceed 70% of the expected initial K_I imparted by the wedge. The thickness of the wedge will be determined by the desired amount of arm-displacement of the DCB specimen.

A total of four specimens per candidate material will be placed vertically in a rack made of insulating material, which will then be contained in the existing Type 316 stainless steel autoclave containing the desired test solution. The test specimens will be totally immersed into the solution, the autoclave lid will be closed, the desired temperature will be set, and the test will start. Testing will be conducted for a maximum period of four months, with an option of periodic withdrawal of specimen at the end of each month. Since the autoclave is about 19 inch high, a second rack containing four more specimens made of a similiar material may be placed on top of the bottom rack. This would enable testing of two different materials in the same solution for an identical period. At the end of each month, all specimens will be visually examined, followed by microscopic examination. At the conclusion of each one-month test, a specimen per material will be taken to out of the autoclave for evaluation of crack extension, while the remaining specimens will be left in the rack for further testing, and the equilibrium wedge load will be measured by applying a separating force to the specimen arms in a mechanical testing machine. The specimens will then be split open, and crack length will be measured on both faces of the specimen. Knowing the specimen dimensions, the equilibrium wedge load and the crack length, the stress intensity for SCC can be computed.

$$K_{ISCC} = \frac{Pa(2\sqrt{3} + 2.38h/a)(B/B_n)^{1/\sqrt{3}}}{Bh^{3/2}} \qquad (4)$$

where:

K_{ISCC}	=Threshold stress intensity for SCC
P	=Equilibrium wedge load, measured in the loading plane
a	=Crack length
h	=Height of each arm
B	=Specimen thickness
B_n	=Web thickness

By measuring crack length at the conclusion of each one-month test, crack growth rate (da/dt) can be computed, and be plotted as a function of K_I to determine K_{ISCC}.

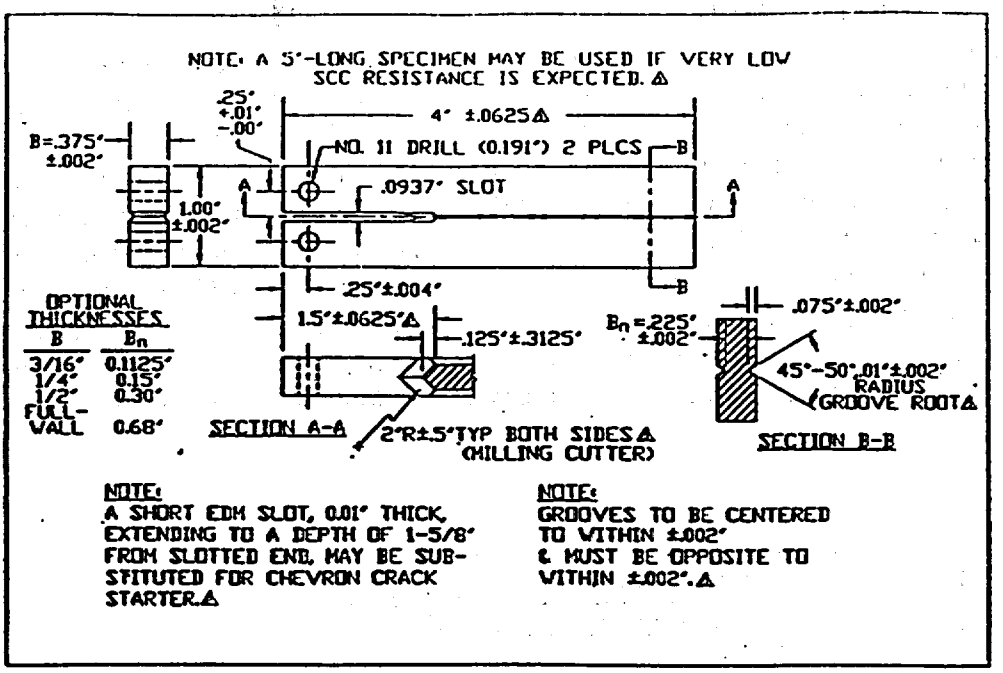


Figure 6a. DCB Specimen

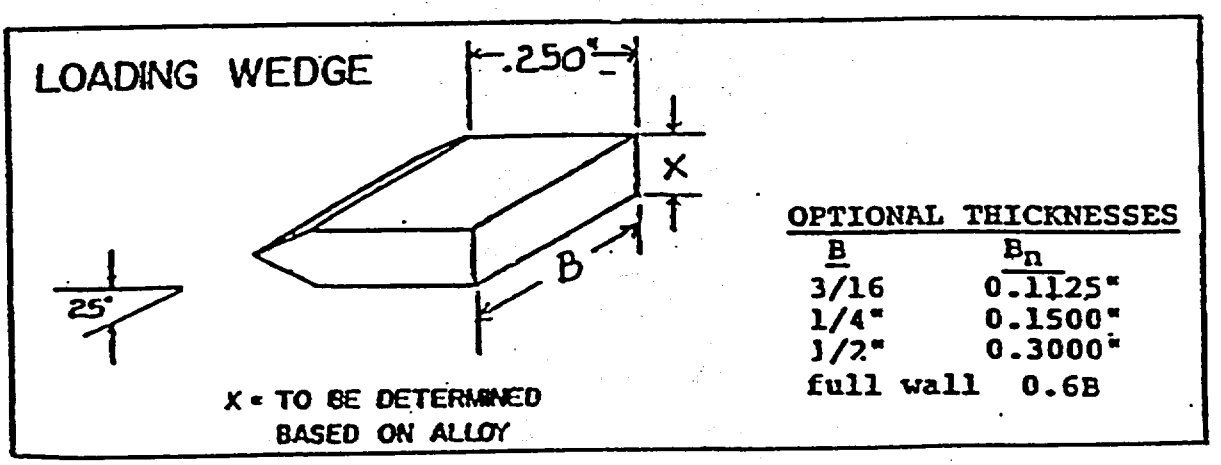


Figure 6b. Double Taper Wedge

Standard Tensile Test

Using this method, the susceptibility to SCC can be evaluated by incorporating stressed smooth tensile specimens immersed in aqueous environments of interest, both at ambient and elevated temperatures. The tensile specimen will be loaded by use of a load versus deflection curve for a proving ring, where relaxation in the fixture or specimen will result in a very small decrease in the applied load. The specimen configuration, and the type of test unit are shown in Figures 7 and 8, respectively. The test method consists of loading the specimen to a certain percentage of the yield strength, and recording the time to failure. A threshold stress for SCC can be determined as the highest stress that a given material can sustain in a specific environment for a specified duration without failure. Negotiations are in progress to procure tensile specimens for evaluating the room temperature mechanical properties of candidate waste package container materials..

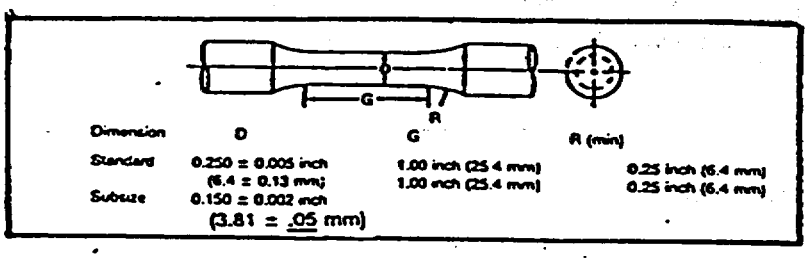


Figure 7. Dimensions of Tensile Specimen

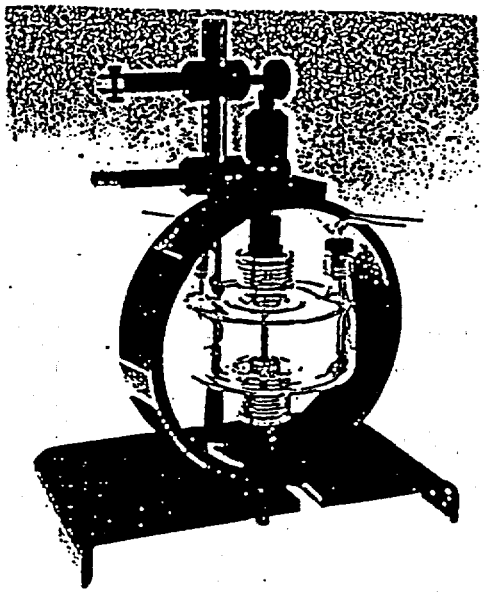


Figure 8. Sustained Loading Device (Proof Ring)

References

1. P. Aziz, "Application of the Statistical Theory of Extreme Values to the Analysis of Maximum Pit Depth Data for Aluminum", Corrs. 12, 495-506 (1956)

2. J. Strutt, J. Nicholls, and B. Barbier, "The Prediction of Corrosion by Statistical Analysis of Corrosion Profiles", Corrs. Sci 25, 305-315 (1985)

3. H. Finley, "An Extreme-Value Statistical Analysis of Maximum Pit Depths and Time to First Perforation", Corrs. 23, 83-87 (1967)

4. G. Eldredge, "Analysis of Corrosion Pitting by Extreme-Value Statistics and its Application to Oil Well Tubing Caliper Surveys", Corros. 13, 51-60 (1957)

5. A. Roy, "Evaluation of Environment-Assisted Cracking Susceptibility of Waste Package Container Materials", Test Proposal, May 1, 1995.

6. NACE Standard Tm0177-90 on Standard Test Method

1.2.3 SITE INVESTIGATIONS

1.2.3.11 Integrated Geophysical Testing for Site Charactgerization

1.2.3.11.1 Systematic Acquisition of Surface Based Borehole Geophysical Logging Data

A six-arm caliper tool was run in Army Well #1 on July 10. A color camera run was conducted at USW SD7 on July 19 to determine why a bridge plug was hanging up in the hole.

1.2.3.11.3 Geophysics - ESF Support, Subsurface Geophysical Testing

SNL color camera runs were conducted in Alcove #2 holes F1, F-2, F-4, F5, F-5B, F-5C, P-1, P-2, P-3, P-4, and P-5 by the Geotechnical Engineering Group under the direction of LANL. The camera runs were conducted in order to make before and after blast comparisons of Alcove #2 rock formation.

An operational check of the newly acquired and inventoried Auslog gamma ray tool will be conducted in August. The tool will be used in the ESF.

The Technical Implementation Procedure (TIP-NV-2) for ESF logging work is now in the LLNL internal review process.

1.2.3.12 Waste Package Environment Testing and Modeling

1.2.3.12.2 Hydrologic Properties of the Waste Package Environment

Laboratory Tests

Characteristic Curves of Tuff

For the experimental determination of the moisture retention curve and one-dimensional imbibition using G-4 core, LLNL continued the moisture retention experiments at high temperatures, and the measurement of the wetting phase at 50°C was started. A report summarizing the laboratory results on the moisture retention curves obtained to date was completed. This report completes Milestone MOL120.

Electrical Properties of Tuff as a Function of Saturation

The measurements on six LBT samples at room temperature continue with the wetting phase measurements being completed and the drying phase measurement having begun.

1.2.3.12.3 Mechanical Attributes of the Waste Package Environment

The objective of this task is to characterize the geomechanical response of the rock in the near-field to the changing conditions expected to occur over the lifetime of the repository. This includes providing data from laboratory, field and modeling investigations that can be used to support technical site suitability and a high level finding for rock properties. Particular emphasis is on coupled processes and behavior at elevated temperatures and at long times. Work conducted on this task during the month of July is listed below.

Laboratory

Radiation Tests

Testing, to determine the effect of radiation on Topopah Spring tuff, was completed and a report documenting the results was prepared and submitted to the project office (MOL98). This testing consisted of a series of laboratory compression tests on irradiated and non-irradiated core samples to determine if radiation affects mechanical properties. Thirty core samples were prepared and irradiated using a Cobalt 60 radiation source, and then tested in uniaxial compression. Results reported indicate that for homogeneous, uncracked samples of Topopah Spring Tuff (Tsw2), exposure to gamma radiation had no discernible effect on the unconfined compressive (peak) strength or the Young's modulus. However, results for samples that contained partially open pre-existing vertical or subvertical cracks indicate that radiation may cause significant degradation of the strength and Young's modulus.

A possible explanation of the observed behavior is that exposure to radiation weakened the cementing material in the cracks and fractures in these samples, leading to the lower

values of peak strength and Young's modulus. The cementing material is thought to be largely composed of carbonates. The report discusses two possible mechanisms that can be postulated to cause weakening of the cementing material by radiation exposure. Based on these results additional testing to determine the effect of radiation is recommended.

Rock Mass

This subtask includes tests on 0.5 m scale blocks (small blocks) to determine rock mass behavior and properties at a scale intermediate between core samples and the large block. Previous monthly reports have presented preliminary results of uniaxial tests performed on a small block sample earlier this FY and additional data from these tests was reduced this month. Results show that for this specimen of fractured welded tuff, total deformation can be decomposed into two components, i.e., deformation of fractures and deformation of matrix material. Additional results will be reported in milestone report MOL203, to be submitted in August.

Fixtures for attaching velocity transducers, for velocity measurement as a function of stress at elevated temperatures, were fabricated as were the heaters for testing at these elevated temperatures. Instrumentation for measuring deformation in 3 directions was also mounted on the surface of the small block.

Fractures were mapped on a second block of Topopah Spring tuff obtained from the Fran Ridge site. This block contains a through-going fracture that is partially cemented. The purpose of the fracture mapping is to provide a digital input for numerical modeling of the small block test. Fracture maps are in digital form and will be included in the milestone (MOL203) report.

Modeling

The purpose of the modeling is to evaluate several different constitutive thermal-mechanical models for applicability in simulation of geomechanical behavior in the near-field, and to develop coupled models for rock behavior at elevated temperature. During the reporting period FLAC, a two-dimensional code, and ABAQUS, a 3-dimensional code, were used to simulate the heat-up phase of the Large Block Test. Preliminary analysis of results indicate that the thermal regime predicted by these geomechanical models is similar to that predicted by the hydrologic modeling. Detailed analysis of the modeling results is currently under way, including estimates of the stress and displacement fields as a function of time, and will be presented in a future deliverable report.

1.2.3.12.4 Engineered Barrier System (EBS) Field Tests

Large Block Test (LBT)

The revised Large Block Test Scientific Investigation Plan (SIP-NF-02) is in the review process and revision of the LBT Activity Plan (LBTl-AP-01) continued at LLNL. The

LBT Engineering Plan was accepted by YMSCO. The design of the retention system continued. Information from the as-built survey of the boreholes in the large block will be needed to complete this effort.

Drilling Horizontal Holes

Drilling of the horizontal holes was almost completed, one last hole remains to be drilled next month.

Guard Heater Zones

The guard heaters have been designed and purchased. Development of the software to control the guard heaters continued and the guard heater assembly procedures are being developed.

Heat Exchanger Test

A laboratory test of the heat exchange system was continued. The heat exchanger will be used to control the temperature at the top of the Large Block. The testing of the heat exchanger unit with an automated control is near completion.

Small Block Tests in the Laboratory

Fracture Flow vs Matrix Imbibition

X-ray imaging continued to determine the drying of the sample previously saturated with water in the fracture flow vs. matrix imbibition test. As the sample continued to dry-out, the sample images showed little change. The temperature at the bottom of the block will be increased to about 97°C (from about 94°C) in an attempt to increase the dry-out rate. Each image was normalized (to calculate the saturation field) based on the image of a continuous aluminum wedge, installed on the sample holder of this experiment. Preliminary results indicate that this method of normalization is better than the step wedge used previously.

Relative Humidity as a Function of Saturation

The measurement of relative humidity as a function of moisture content in a Topopah Spring tuff core continued. Following the sample preparation, described in the June 1995 monthly report, water was added to the sample to raise the water saturation to approximately 2%. The relative humidity has increased continuously and is currently at about 13%, although the rate of increase has slowed as expected.

Condensation Along A Fracture

The sample for the one-dimensional vapor condensation along a fracture has been prepared. The sample is a core about 30 cm in length and about 5 cm in diameter, with a longitudinal saw cut in the middle. Gold electrodes were mounted along the outer edges of the saw cut and the core/electrode assembly was being dried to determine the dry weight of the assembly. Next month, water will be added to the core to obtain a saturation level of about 65 to 70 %.

Permeability of the Matrix

A sample of intact tuff from the LBT has been prepared for determining permeability at high pressures and temperatures. The sample has been jacketed with Viton and a leak check of the assembly has been completed. The measurement of water permeability in the intact core continued. The sample was saturated with J-13 water, under a confining pressure of about 5 MPa. Up-stream pore pressure was increased from about 1.9 MPa to about 2.4 MPa in order to increase the flow rate. The flow rate seemed to approach a steady state. An initial estimate of the permeability at a differential pressure of about 1.9 MPa was approximately $0.12 \times 10^{-18}\ m^2$.

Flow on Fracture Surfaces

X-ray scan will be used to observe the flow process of water on a real fracture surface. A core of about 15 cm in diameter including a longitudinal fracture was drilled from a small block. The fracture in the core was opened and the machining of a slab containing the fracture was started.

Pre-test Calculation

A 3-dimensional model of the Large Block has been constructed using the NUFT code and calculations continue to predict the 3-D thermal-hydrological response of the block to thermal loading.

LLNL PROJECT STATUS REPORT EXTERNAL DISTRIBUTION
August 1995

R. Andrews
M&O/INTERA
Suite 300, M/S 32
6850 Austin Ctr. Blvd,
Austin, Texas 78731

W. Barnes
YMSCO
Department of Energy
101 Convention Center Dr.
Las Vegas, Nevada 89109

Dr. J. Bates
Chemical Technology
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, Illinois 60439

H. Benton
M&O, M/S 423
101 Convention Center Drive
Las Vegas, NV 89109

A. Berusch (RW-20)
OCRWM
Forrestal Building
Washington, DC 20585

K. Bhattacharyya
M&O
101 Convention Center Dr., M/S 423
Las Vegas, Nevada 89109

J. Blink
LLNL/Las Vegas
101 Convention Center Drive, Suite 880
Las Vegas, NV 89109

B. Bodvarsson
LBL/Earth Sciences
Bldg. 50 E
1 Cyclotron Road
Berkeley, CA 94720

S. Brocoum
YMSCO
101 Convention Center Dr.
Las Vegas, NV 89109

H. Cadoff
OCRWM
RW-37 R5A085
1000 Independence Ave., SW
Washington, DC 20585

J. Canepa
Los Alamos National Laboratory
P.O. Box 1663/N-5, MS J521
Los Alamos, NM 87545

P. Cloke
Science Applications Int'l Corp.
101 Convention Center Dr., #407
Las Vegas, NV 89109-2005

C. Conner
DOE, RW-133
1000 Independence Ave., SW
Washington, DC 20585

L. Costin
Sandia National Laboratories
M/S 1333
P.O. Box 5800
Albuquerque, NM 87185-1333

R. Craun
YMSCO
P.O. Box 98518
Las Vegas, NV 89193-8518

C. DiBella
NWTRB
1100 Wilson Blvd., Suite 910
Arlington, VA 22209

T. Doering
M&O
101 Convention Center Dr., MS 423
Las Vegas, NV 89109

D. Dresser
Roy F. Weston, Inc.
955 L'Enfant Plaza, SW
8th Floor
Washington, DC 20024

R. Dyer
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

R. Einziger
Battelle-Pacific Northwest
P.O. Box 999/MS P714
Richland, WA 99352

J. Farrell
M&O TRW
M/S 423, TES1/3573
2650 Park Tower Drive
Vienna, VA 22180

R. Fish
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

T. Geer
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

A. Gil
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

R. Green
Southwest Research Institute
6220 Culebra Rd.
San Antonio, TX 78238-5166

S. Hanauer
OCRWM
RW-2 R5A085
1000 Independence Ave., SW
Washington, DC 20585

L. Hayes
U.S. Geological Survey
Box 25046/MS 425
Denver Federal Center
Denver, CO 80225

R. Hughey
Nuclear Energy Division
US DOE/OAK
1301 Clay St., Rm. 700-N
Oakland, CA 94612

C. Johnson
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

N. Jones
M&O
101 Convention Ctr. Dr., M/S 423
Las Vegas, Nevada 89109

S. Jones
YMSCO
Department of Energy
101 Convention Center Dr.
Las Vegas, NV 89109

H. Kalia
Los Alamos National Laboratory
101 Convention Center Dr., Suite 820
Las Vegas, NV 89109

S. Kennedy
OCRWM
Forrestal Bldg.
Wash., D.C. 20585

O. Lev
M&O TRW
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

S. Marschman, P7-14
Battelle, Pacific Northwest
P.O. Box 999
Richland, WA 99352

S. Nelson
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

S. Rindskopf
M&O TRW
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

R. Robertson
TRW-Metro Place
2650 Park Tower Dr., Suite 800
Vienna, VA 22180

D. Rogers
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

S. Saterlie
M&O LV
101 Convention Center Dr., M/S 423
Las Vegas, Nevada 89109

D. Schutt
M&O LV
101 Convention Center Dr., M/S 423
Las Vegas, Nevada 89109

A. Segrest
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

M. Sellers
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

A.Simmons
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

E. Smistad
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

M. Smith
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, Nevada 89193-8518

L. Snow
Roy F. Weston, Inc.
955 L'Enfant Plaza, SW
Washington, DC 20024

H. Spicker
M&O
101 Convention Ctr Dr., M/S 423
Las Vegas, NV 89109-2005

N. Sridhar
CNWRA
6220 Culebra Rd.
San Antonio, Texas 78238-5166

D. Stahl
M&O/B&W
101 Convention Ctr. Drive, M/S 423
Las Vegas, NV 89109

T. Statton
M&O
101 Convention Center Dr., M/S 423
Las Vegas, NV 89109

R. Strickler
M&O/TRW
101 Convention Ctr. Drive, M/S 6
Las Vegas, NV 89109

D. Stucker
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

A. Van Luik
M&O
101 Convention Ctr. Dr., M/S 423
Las Vegas, NV 89109

G. Vawter
M&O/TRW
101 Convention Center Dr.
Las Vegas, NV 89109

M. Voegele
M&O/SAIC
101 Convention Center Dr., #407
Las Vegas, NV 89109-2005

M. Weaver
M&O
101 Convention Center Drive, M/S 423
Las Vegas, Nevada 89109

N. White (3)
Nuclear Regulatory Commission
301 E. Stewart Ave. #203
Las Vegas, NV 89101

D. Williams
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, Nevada 89193-8518

J. Younker
M&O/TRW
101 Convention Center Dr.
Las Vegas, NV 89109

P. Zielinski
YMSCO
Department of Energy
P.O. Box 98518
Las Vegas, Nevada 89193-8518

I-372623

Cy w/att:
G. Bovarddson, LBL, Berkeley, CA
M. Chisholm, M&O/TRW, Vienna, VA
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
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
M.D. Voegele, SAIC, Las Vegas, NV
D.R. Williams, YMSCO, Las Vegas, NV
G.A. Bussod, EES-13, MS J521
N.Z. Elkins, EES-13/LV, MS J900/527
S.H. Klein, EES-13, MS J521
K. West, EES-13, MS J521
A.L. Thompson, EES-13/LV, MS J900/527

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

ENCLOSURE 5

Los Alamos Highlights for June 1995

WBS 1.2.3.2.1.1.1 Transport Pathways. D. Vaniman presented a paper titled "Actinide Microautoradiography and the Characterization of Sorption by Clay Minerals" at the 32nd Annual Meeting of the Clay Minerals Society on 6 June. This paper described the application of microautoradiography to understanding Pu behavior in transport scenarios at Yucca Mountain. Microautoradiography was used to investigate the mineral-specific distribution of the alpha-emitting actinide element Pu. Vaniman's conclusions were that clay textural data, as well as abundance data, are important in modeling relative partitioning of Pu sorption between zeolites and clays.

Milestone 4078, a letter report titled "Testing and Quantification of Microautoradiography in the Mapping of Actinide Retardation," was completed. This report describes the use of microautoradiography, based on microscopic analysis of photoemulsion images generated by a particles from transuranic elements sorbed on rock thin sections, in mapping radionuclide distributions in samples from Yucca Mountain. Electron microprobe linescans across radiographic emulsions for Ag abundances, which scale directly with α activity and hence with actinide-element abundance, provide a mappable, microquantitative method for precisely locating sorptive phases. Such mapping is important in relating the more accurate methods of sorption analysis (e.g., batch sorption measurements) to the real, in situ distributions of sorptive minerals—particularly where sorptive phases are variable in composition, may be passivated by microchemical surface effects, and may or may not be effective as fracture coatings. Potential complications in thin-section preparation of clay-rich samples, in which exposure to either alcohol or kerosene might be expected to alter the behavior of swelling clays (smectites), were tested and found not to be a significant factor in Pu microautoradiography. Electron microprobe data indicate that the smectite/zeolite Pu retention factor in a zeolitized sample from the Calico Hills Formation is ~ 80, a number that is probably a minimum value because of the large (10 μm) electron beam size relative to the size of the clay bodies being analyzed and because of the incorporation of epoxy into parts of the thin section that had been occupied by clay.

Staff will continue to use this important technique, microautoradiography, in studies that will address fracture flow in radionuclide transport models. Their objective is to provide maps of radionuclide distributions to compare with (1) batch sorption results that provide quantitative retardation factors for the minerals and mineral mixtures that constitute the

fracture walls and the matrix beneath the fractures and (2) results of fracture flow experiments that provide the dynamic context of radionuclide interactions with the fracture walls and determine the effective transport of radionuclides across the fracture face and into the rock matrix. Microautoradiography can be used to target the specific minerals in the fracture and the matrix that account for the geochemical component of radionuclide transport retardation. Ultimately, the results of microautoradiography studies can be used in conjunction with the batch sorption data and quantitative mineral abundances to determine whether (1) a simple mineral-abundance-scaled retardation factor is appropriate or (2) such factors need to be reduced to allow for rock fabric, passivation, or other factors that may limit mineral-radionuclide interactions.

WBS 1.2.3.2.1.1.2 Alteration History. William Carey and David Bish attended the annual meeting of the Clay Minerals Society in Baltimore. Their presentation, "Partial and Molar Enthalpy of Hydration of Clinoptilolite," addressed the thermal and hydrologic response of Yucca Mountain to the thermal energy generated by stored nuclear waste. The large amounts of clinoptilolite underlying the potential repository horizon are anticipated to affect the thermal response via the thermal energy required for dehydration. In addition, the clinoptilolite dehydration/rehydration process may affect the hydrologic response by acting as a buffer during the heating and eventual cooling periods. Calorimetric data define the partial molar enthalpy of hydration for Ca-, Na-, and K-exchanged clinoptilolite, and integration of the data yields the molar enthalpies. Preliminary results indicate partial molar enthalpies between -53 and -66 kJ/mol. The enthalpies depend on the cation, with the energetics decreasing in the order Ca-, Na-, and K-clinoptilolite. The partial molar enthalpies exceed the enthalpy of vaporization of water by as much as 50 percent. Consequently, the dehydration of clinoptilolite is expected to be an effective buffer of temperature in clinopitilolite-rich rock units at Yucca Mountain.

Giday WoldeGabriel and Schön Levy completed abstracts for the Materials Research Society Symposium V, Scientific Basis for Nuclear Waste Management XIX, to be held in Boston November 27 to December 1. WoldeGabriel abstract is titled "Ion Exchange and Dehydration Effects on the Potassium and Argon Contents of Clinoptilolite." Levy's abstract, "Alteration History studies in the Exploratory Sciences Facility, Yucca Mountain, Nevada, USA," was written with Prof. David Norman of New Mexico Tech. It describes the distribution of mordenite breccia cements and fluid-inclusion studies of calcite fault and fracture filings and pedogenic calcite.

Using scanning-electron microscopy, staff examined vapor-phase altered pumice from the Tiva Canyon tuff within the ESF north ramp starter tunnel. The yellow color of some of the altered material suggested the possible presence of sulfur-bearing minerals, a potential concern for interaction with man-made materials; however, using energy-dispersive X-ray analysis of the sample, staff did not detect sulfur.

William Carey and David Bish completed milestone 3442, "Calorimetric Measurement of the Enthalpy of Hydration of Clinoptilolite." This report, to be submitted to the *journal Clays and Clay Minerals*, expands on the abstract mentioned above and describes experimental measurements of the enthalpy of hydration/dehydration of natural cation-exchanged clinoptilolites. Integral enthalpies of immersion of clinoptilolite, equivalent to the enthalpy of hydration, were determined at initial water contents ranging from X=0.85 to 0.02 (where X is the fractional water content relative to saturation). The partial molar enthalpy of immersion is a function of the value of X in all cases. The integral enthalpies for Ca-clinoptilolite ranged from -7.5 (X=0.86) to -25.7 kJ/mol-water (X=0.19); values for Na-clinoptilolite ranged from -6.3 (X=0.85) to -21.8 kj/mol-water (X=0.11); and values for K-clinoptilolite ranged from -7.7 (X=0.80) to -24.6 kJ/mol-water (X=0.02). The measured enthalpy of hydration is similar to but of smaller magnitude than that determined by Carey and Bish in a study of clinoptilolite-water equilibrium by thermogravimetry. The enthalpy of hydration determined calorimetrically is believed to be more accurate. The calorimetric and equilibrium studies may be combined to calculate the amount of thermal energy released or absorbed with changes in the equilibrium state of X. The implications of the enthalpy of dehydration of clinoptilolite for the potential high-level nuclear waste repository at Yucca Mountain are considered by comparing the amount of energy consumed by dehydration of clinoptilolite with rocks lacking hydrous minerals. The extra energy consumed on heating clinoptilolite ranges between 70 and 80% in excess of that required for similar, non-dehydrating minerals on heating from 25 to 200°C. These results indicate that accurate thermo-hydrologic modeling of rock units at Yucca Mountain should consider the thermal effect of dehydration/hydration processes in clinoptilolite and other hydrous minerals, in addition to the water produced/adsorbed during heating/cooling.

WBS 1.2.3.2.1.2. Stability of Minerals and Glasses. ***Conceptual Model of Mineral Evolution.*** Work continued on thermodynamic modeling of the clinoptilolite-to-analcime reaction. Results of this research were presented at the 32nd Annual Meeting of the Clay Minerals Society, June 3-8, 1995. Estimated thermodynamic data using actual chemical formulae for a wide variety of clinoptilolites and analcimes at Yucca Mountain, NV, were

used to calculate stability diagrams in $\log[(aK+)^2/aCa2+]$ vs. $\log[(aNa+)^2/aCa2+]$ space. Assuming J-13 water as the analog water chemistry for the water in the Topopah Spring Tuff, it was found that clinoptilolite (of the chemical compositions observed at Yucca Mountain) should remain stable if temperatures in the clinoptilolite-bearing horizons do not significantly exceed 100°C. Even if temperatures rise significantly (e.g., to 150°C), not all of the clinoptilolite would alter to analcime. The temperatures that the clinoptilolite-bearing horizons would experience if a repository is emplaced into Yucca Mountain are dependent on the thermal load scenario chosen. Also, since the stability of clinoptilolite is dependent on the chemistry of the water with which it is in contact, the effects of materials used in construction of a repository may change the water chemistry locally and could affect clinoptilolite-analcime stability.

WBS 1.2.3.2.5 Volcanism. ***Eruptive Effects*** Final revisions were made to the paper titled "Entrainment of country rock during basaltic eruptions of the Lucero volcanic field, New Mexico," by G.A. Valentine and K.R. Groves. This report has already been accepted for publication in the *Journal of Geology*, and it reports the first major data set from analog studies for eruptive effects.

Staff traveled to Paricutin and Jorullo volcanoes in Mexico. These scoria cone volcanoes were born and erupted in historic times and their histories are well documented. Staff examined facies variations in eruptive deposits and with further investigation will compare these to the historic accounts.

Subsurface Effects. Work continued on numerical simulation of convection in the vadose zone in response to igneous intrusions. Yucca Mountain geometry and stratigraphy were used in the simulations. Laboratory analysis of samples from the Grants Ridge and Paiute Ridge analog sites continued. Temperatures were measured and samples taken from the hydrothermal system at Paricutin volcano for comparison with simulations.

Probability Studies. A revised probability matrix for the probability of disruption of the repository and the repository system was completed in preparation for Expert Judgment elicitations with Geomatrix. Staff evaluated six spatial and structural models, which encompass and generalize the sets of spatial and structural models presented in the volcanism status report. The recurrence rate (E1) was estimated for each spatial and structural model for the Quaternary and the Plio-Quaternary using the concept of volcanic cycles. The estimations were developed for the minimum, most likely, and maximum cases

assuming 10 and 90 percentile values for the minimum and maximum values. Estimates of bounding values (approaching the 100 percentile value) were also included to attempt to assess the possibility of undetected volcanic centers. The spatial and structural models include three sets: 1) models that intersect or include the Yucca Mountain site; 2) models that do not intersect the Yucca Mountain site but could intersect the site if the volcanic events are defined to include the subsurface feeder systems for volcanic centers (these models were subdivided into simple dike sets with half lengths of simple linear dikes (1 to 1.5 km) and dike swarms with half lengths equal to the longest cluster length in the Yucca Mountain region or 6.3 km), and 3) models that do not intersect the Yucca Mountain site when volcanic events include subsurface feeder systems.

Staff attended a two-day meeting in San Francisco at which the Expert Judgment panel conducted probabilistic volcanic hazard assessment. Formal elicitations were completed for information required to estimate the probability of magmatic disruption of the potential repository.

WBS 1.2.3.3.1.2.2. Water Movement Test. Staff issued a detailed technical procedure to use in characterizing the variability of the rock chloride-to-bromide (Cl/Br) ratio throughout the units comprising Yucca Mountain. This value must be known in order to correct chlorine-36 based groundwater travel times for any dilution by chloride released from the rock during sample collection or processing. Without such correction, calculated travel times will be older than the true value. Staff began processing several samples by this procedure in order to build a data base of the Cl/Br ratios.

Staff began processing drillcore from UZ-N55 for chlorine-36 analysis, in order to assess whether or not the elevated chlorine-36 results measured previously for the ream-bit cuttings from this hole represent in-situ conditions or contamination.

Halide analyses were completed for a suite of 12 perched water samples collected over a 2-week period from SD-7. Chloride concentrations were uniformly 4 to 5 mg/L, which is quite low for unsaturated zone waters. These low concentrations and low Cl/Br ratios support the hypothesis of water infiltrating fairly soon after intense rainfall events.

Staff completed a draft letter milestone report providing an interim update of the status of the Water Movement Test study. The report includes new chlorine-36 analyses of Yucca

Mountain cuttings samples from boreholes UZ-16 and UZ-14, as well as for perched water samples. The report is in internal technical review.

Staff made a presentation, "Isotopic dating of groundwater at Yucca Mountain," to the NWTRB Panel on Hydrogeology and Geochemistry, 27 June in San Francisco, CA, following a dry run in Las Vegas on 20 June. Two contrasting interpretations were presented of the carbon-14 and chlorine-36 data available for boreholes UZ-14 and UZ-16.

Five samples forming a transect across the Bow Ridge Fault in the ESF tunnel were requested and received from the Sample Management Facility. These represented a second sampling of the fault, because the first set was found to have been contaminated by construction water. Cl/Br analyses were begun of these samples.

WBS 1.2.3.4.1.2.2. Biological Sorption and Transport. Sample Collection in the ESF. ***Sample Collection in the ESF.*** On 20 June, staff collected samples from 8 + 26 m at the contact between Tiva Canyon Ash Flow and Tiva Canyon Bedded Tuff zones, and sent to the following four university laboratories for microbial analysis.

1. The University of Nevada, Las Vegas, NV, (Dr. Penny Amy) and New Mexico Tech, Socorro, NM, (Dr. Thomas Kieft) were conducting analyses of the heterotrophic population, including respiration, direct counts, plate counts, and metabolic activity indicators (e.g. CTC dyes). By design, these two labs are conducting overlapping studies to serve as a means of comparison of these particular results,
2. The University of Oklahoma, Norman, (Dr. Joseph Suflita) was conducting an analysis of the anaerobic microbial population within these samples, and
3. The University of Tennessee, Knoxville, (Dr. David White) was performing a series of analyses of the phospholipid fatty acid content of these samples. PLFA provides yet another tool to quantify the microbial population in Yucca Mountain.

Column Studies. As discussed in last month's report, staff was investigating the sorption and unsaturated transport of Fe(III) and siderophore chelated Fe(III) in crushed tuff to determine the extent to which bacterial siderophores affect the stability of metal cations. Iron has been used as a analog for the actinide elements in these experiments. The results discussed in last month's report were being compiled on spread sheets, and parts of the experiment were continuing.

WBS 1.2.3.4.1.3 Speciation/Solubility. ***Geochemical Modeling.*** Staff continued evaluating Np data in the standard EQ3/6 v7.2a-PC release package, which includes data sets with

R22a versions. A series of calculations were run to assist in defining sorption experiments on calcite and specifically probe interactions with selected Np species. Species distribution with respect to pH and carbonate concentrations (particularly fixed carbonate concentration and fixed fugacity of CO_2) were evaluated to define appropriate solution conditions, Np solubility limits and solubility of calcite in the solutions with characteristics of J13 and UE-25p #1. Expansion of the calculation suite to include Pu and Am was the focus of effort at the end of the month. Calculations were run to scope redox dependence of solution speciation and mineral solubility, as well as temperature dependence (25-90°C). Initial results are being compared with data from solubility experiments and other measurements.

Solubility. Experiments in which the solubility of plutonium and neptunium at three temperatures and three pHs were started this month. Using 18 cells, water was placed in polyetheretherketone (PEEK) vessels; plutonium was added to 9 of the cells and neptunium to the other 9. The temperatures chosen for the experiments were 25, 60 and 90°C. The temperature is controlled using high temperature oil, which is heated by a "water-bath" and passes through an aluminum block that holds the PEEK vessels. The aluminum block is mounted on a shaker table, and the samples are agitated at approximately 100 rpm. The pH of the solutions inside the vessels is regulated by controlling the CO_2 content of the solutions using $ArCO_2$ that control the carbonate concentration of the solutions. The pHs chosen for these experiments are approximately 6.5, 7, and 8. This month the cells were operated at constant temperature and pH. This digestion is required to let the solutions and the associated solids approach a steady state. No samples were withdrawn from the cells for analysis.

WBS 1. 2. 3. 4. 1. 4. 1 /2 Transport. To validate the microautradiography procedures used to identify sorbing minerals in the fractured coatings of Yucca Mountain tuff, staff prepared thin sections from a relatively clay-rich (9 percent smectite) portion of the zeolitic Calico Hills Formation in UE-25 UZ#16. These procedures were in question because radionuclides might sorb onto the solvents themselves instead of onto the minerals, leading to an inaccurate result. Keeping this problem in mind, staff prepared similar thin sections using water, alcohol, and kerosene as solvents. The thin sections were minimally exposed to the solvents; for the final polish (the last exposure of the surface to be used in microautoradiography), one section was exposed to water, one to alcohol, and one to kerosene. Following preparation, the thin sections were exposed to a Pu(V) solution in synthetic UE-25p #1 water and analyzed to determine whether their prior exposure to kerosene or alcohol had any affect on the results compared with water-only preparation. Initial results indicated that regardless of whether

thin sections were exposed to oil or kerosene, the distribution and abundance of Pu sorption by smectites and other minerals is the same. These results confirm the utility of microautoradiography to study radionuclide transport. This work is extremely important because they will allow this task to take credit for radionuclide sorption in fractures.

Staff began injecting tracers into the modified columns using tritium, a conservative tracer. They successfully injected tracers into four different fracture columns, proving the effectiveness of the new saturation method. Previous recoveries of tritium in fracture columns resulted in very low recoveries of only 15 - 60 percent, indicating diffusion and loss of tritium into the apparently unsaturated matrix. With successive injections, these recoveries improved progressively to a point approaching 90 percent, indicating improved saturation of the matrix and diminished loss of tritium by diffusion. With the new method, recoveries ranged from 80 to 90 percent with the first injection, indicating minimal diffusion of the tritium into the now saturated matrix. The next step will be to inject the four columns with mixed tracers. Tracer solutions of Tc-95m (non-sorbing) with Np-237 (sorbing), and tracer solutions with H-3 (non-sorbing) and U-238 and Pu-239 (both sorbing) will be used for these experiments. Staff was in the process of conducting these experiments; the fracture were apportioned based on the mineral coatings they contain to maximize the information obtained from each experiment.

WBS 1.2.3.4.1.5.1 Retardation Sensitivity. ***Site-Scale Transport Modeling.*** Staff began using new computational grids based on the USGS/LBL site-scale flow model for our flow and transport calculations with FEHM. Our first calculations with this new grid involved extracting a two-dimensional cross section from the three-dimensional hydrostratigraphic model. This cross section follows an east-west transect in the vicinity of Antler Ridge. The mesh resolution required for numerically accurate solute transport simulations is finer than that supplied by the USGS/LBL, so our automatic grid generation capabilities were used to create the appropriate mesh resolution for these simulations. The first transport simulations on this new grid involved studies of the migration of Chlorine-36 (^{36}Cl) in the unsaturated zone. Staff investigated such processes as the influence of spatially variable infiltration and the significance of variations over time of the source strength of ^{36}Cl in infiltrating water at the surface. The results of these studies have two very important implications. First, water in the Calico Hills unit younger than in the overlying Topopah Springs unit may have arrived via lateral flow for which the sources are spatially isolated regions of high infiltration. Second, high ^{36}Cl measurements at depth may indicate a stronger source at the surface thousands of years ago rather than rapid vertical movement of water with bomb-pulse ^{36}Cl over the last 40 years.

Staff also began evaluating the effects of matrix-fracture interactions on the migration of solutes with the dual-permeability model formulation in FEHM. For these studies, vertical flow and transport through a 530-m column comprising the four major hydrostratigraphic units of Yucca Mountain were simulated. The sensitivity of solute migration were evaluated with respect to infiltration rate, matrix diffusion, and fracture/matrix connectivity. These simulations demonstrated the significant role matrix diffusion plays in retarding the migration of solutes even for the case when the is flow in the fractures which can only be instigated under conditions of very high infiltration. These studies also showed that when the matrix/fracture connectivity is reduced, there is less flow of water between the two. Hence, the water travels more quickly through the fractures. However, the diffusion of solutes from the fractures into the matrix under these conditions still plays a significant role in retarding the solute migration.

C-14 Transport Analysis. A vadose-zone gas flow and ^{14}C transport model was developed to attempt to provide an explanation for the apparent discrepancy in the age measurements of ^{14}C and ^{36}Cl. A working hypothesis that explains the discrepancy is that the ^{36}Cl is a liquid-borne solute, whereas the ^{14}C travels in the gas phase with partitioning into the liquid as dissolved carbon dioxide, and bicarbonate and carbonate ions. A ^{14}C simulation for this conceptual model consists of establishing a gas flow field subject to the average temperature and pressure boundary conditions that exist at Yucca Mountain as a function of elevation. Then, ^{14}C is introduced at the surface in the gas phase. The partitioning is simulated as multiple species in the gas and liquid phases, subject to the known, temperature-dependent equilibrium constants for the carbonate system. In addition, radioactive decay of each species of ^{14}C is modeled. The resulting concentration field at steady state can then be converted simply to an apparent age at that location.

Two-dimensional simulations were carried out on a cross section at Antler Ridge. The results showed that for reasonable values of pH (held constant during the simulation) and the fracture permeabilities in the various units, ^{14}C ages of less than 40,000 years exist throughout the vadose zone. Gas phase advective transport and molecular diffusion of ^{14}C are the primary transport mechanisms in these simulations, while partitioning into an essentially immobile liquid phase serves as a retardation mechanism for transport. A series of simulations have been performed varying the permeability, fluid pH, and transport properties to examine the sensitivity of the results to these uncertain parameters. Nonetheless, it now appears that one plausible mechanism for the age discrepancy is that ^{14}C is primarily a gas-

phase transport problem, whereas ^{36}Cl measures water ages. Of course, this conclusion must be considered tentative until other alternatives and data are considered.

WBS 1.2.5.2.2 Site Characterization Program. With regard to the study plan titled "Diffusion Test in the Exploratory Studies Facility," R0 (8.3.1.2.2.5), on May 15, 1995, revision 1 was submitted to YMSCO. The screening review of this document was completed on June 12, 1995.

WBS 1.2.5.4.7 Performance Assessment Calculations. ***Code Development/Optimization.*** Work was conducted in the areas of solver technology, dual-permeability solution methods, and tabular relative permeability input. Staff installed solvers with up to six unknowns per node, conducting some minor reworking of the calling sequence to better use existing scratch storage. The dual-permeability activities involved implementing an algorithm that allows the upwinding of the full tranmissibility for the fracture-fracture and matrix-matrix connections but only upwinding the fluid terms in the fracture-matrix connections. Staff believes this is the most realistic way to model a dual-permeability system. The tabular relative permeability package developed will allow the user to implement experimental data for relative permeability and capillary pressure as functions of saturation.

Grid Generation Activity. Staff worked with USGS, Denver, building a regional saturated zone flow model. C. Faunt and John Czarnecki spent one week at Los Alamos converting a Stratamodel stratigraphic model into a FEHM grid using GEOMESH code. Preliminary saturated zone model calculations run with FEHM. Staff worked with Susan Altman (SNL) constructing computational grids using GEOMESH code. Staff constructed a stratigraphic framework model of the C-wells area for Paul Reimus. Staff received a new data set of Yucca Mountain stratigraphy from David Jefferis (EG&G); this was translated from USGS Lynx model.

Software Documentation and QA. Staff completed milestone 3470, which consists of the Verification Plan [describing a suite of problems designed to ensure that the models described in the Models and Methods Report (milestone 3471) are correctly and accurately implemented in FEHM]. Milestone 3470 also includes the Verification Report (describing the performance of FEHM on the problems described in the plan). The problems solved included known analytical solutions as well comparisons to other codes such as TOUGH2.

WBS 1.2.11.2/.3/.5 Quality Assurance. Audit reports AR-EES-13/LV/Vol-95-05 and AR-EES-13/Vol-95-06 were released. Survey SR-EES-15-95-02, which concerned determining the status of completed work, was also released. No corrective action reports were issued. The internal audits will be completed for FY95 on 31 July. Two surveys were initiated. One is to determine the status of ongoing work in the Los Alamos Genomics and Structural Biology group and the other will focus on document control. The audit report for DOE audit YM-ARC-95-11, conducted in May, was released. Performance was satisfactory for all elements examined; there were no CARs.

Los Alamos Milestone and Publication Status Report, June 1995

Milestones completed and submitted to YMSCO

4078, "Testing and Quantification of Microautoradiography in the Mapping of Actinide Retardation"

3442, "Calorimetric Measurement of the Enthalpy of Hydration of Clinoptilolite"

3470, "Verification Plan and Verification Report for FEHM"

3394, "AFM Surface Investigation of Natural Maghemite from Yucca Mountain, Implications for Sorption"

Publications submitted to YMSCO for approval

WBS 1.2.3.1.1.3, "Preliminary Libs analysis of YM Manganese-Oxide Minerals"

WBS 1.2.3.3.1.3.1, "First Passage time Modeling in Fractured Rock" (conference abstract)

WBS 1.2.3.2.5, "The Interplay Between Numerical Simulation, Field Studies, and probabilistic modeling in volcanic risk assessment" (conference abstract)

WBS 1.2.3.3.1.3.1, "Modeling of Solute transport through saturated fractured rock with flux matching at the fracture-matrix boundary" (conference abstract)

1.2.3.9.7, "ESF TCO Quality Records Management System on the YMP" (conference paper)

Presentations

To the 32nd Annual Meeting of the Clay Minerals Society, 6 June

"Actinide Microautoradiography and the Characterization of Sorption by Clay Minerals"

"Partial and Molar Enthalpy of Hydration of Clinoptilolite,"

"Thermodynamic modeling of the clinoptilolite-to-analcime reaction"

To the NWTRB Panel on Hydrogeology and Geochemistry, 27 June

"Isotopic dating of groundwater at Yucca Mountain"

YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant:	LANL		MONTHLY COST/FTE REPORT				Fiscal Month/Year June FY1995	
Date Prepared:	24-Jul-95						Page 1	
							Fiscal Year 1995	
WBS Element	Actual Costs	Participant Hours	Subcon Hours	Purchase/Subcon Commitments	Accrued Costs*	Approved Budget	Approved Funds	Cumulative Costs
1.2.1	7.5	96.8	0.0	0.0	0.0	100.0	75.0	29.6
1.2.3	887.3	5,711.2	911.3	716.8	0.0	12,764.0	7,223.0	9,809.2
1.2.5	70.5	667.0	0.0	49.1	0.0	1,544.0	1,158.0	984.7
1.2.6	175.4	1,802.2	265.8	147.8	0.0	2,423.0	2,000.0	1,129.8
1.2.9	69.9	730.4	30.3	78.3	0.0	1,103.0	828.0	646.5
1.2.11	82.2	176.0	0.0	267.8	0.0	1,300.0	975.0	839.6
1.2.12	17.3	0.0	0.0	119.5	0.0	477.0	280.0	290.8
1.2.13	1.6	0.0	0.0	11.3	0.0	111.0	85.0	28.3
1.2.15	46.3	176.0	186.4	34.6	0.0	483.0	255.0	382.2
			*** TH funding allocations received from TRW.				5,076.0	
Totals	1,358.0	9,359.6	1,393.8	1,425.2	0.0	20,305.0	17,955.0	14,140.7

Los Alamos
NATIONAL LABORATORY

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

WBS: 1.2.9.1
QA: N/A

I 32673

July 26, 1995

LA-EES-13-07-95-006

Mr. Wesley E. Barnes, Project Manager
Yucca Mountain Site Characterization Office
U. S. Department of Energy
P.O. Box 98608
Las Vegas, NV 89109-8608

Dear Mr. Barnes:

Los Alamos Monthly Highlights Report for June 1995: Highlights of Activity, PACS Monthly Cost/FTE Report, and Milestone and Publication Status Report (SCPB: N/A)

Attached is the Los Alamos Monthly Highlights Report for June 1995, which includes the Highlights of the Monthly Activity Report, PACS Monthly Cost/FTE Report, and Milestone and Publication Status Report.

The Highlights of the Monthly Activity Report is an internal document describing our technical work; however, it has 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.

The PACS Monthly Cost/FTE Report presents a monthly summary of Los Alamos' effort on the YMP. This report provides monthly totals of cost, labor person-hours, subcontractor person-hours, outstanding commitments, and accruals, all at the third level of the WBS. In addition, updated annual budget, approved funds, and annual cost values are provided.

The Milestone and Publication Status Report is an internal document used to track the status of Los Alamos milestones and publications.

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

Sincerely,

Julie A. Canepa

Julie A. Canepa

JAC/SHK/fer

Attachment: a/s

DIVERT: CRAUN -
CC: DIXON -
CC: DYER -
CC: JOHN -
CC: JONES-S -
CC: WILLIAMS-D -
CC: GIL -
CC:
CC:

8/3/95

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

w Doni
See CC list (10)
8-17-95

August 14, 1995

Vince Iorii
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, July 1995

Dear Vince:

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

It should be noted that variance at completion numbers are based on PACS budgets and do not necessarily indicate available funds. A number of Approved Funding Program changes (AFP) have been made which do not involve a change in scope of work and therefore do not require a Cost/Schedule Change Request. Reductions in USGS funding must be made based on available funds in the AFP, not the PACS budget.

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

Sincerely,

for Raye E. Ritchey
Larry R. Hayes
Technical Project Officer
Yucca Mountain Project Branch
U.S. Geological Survey

Enclosure:
cc: S. Hanauer, DOE/Forrestal
R. Dyer, DOE, Las Vegas
[illegible], 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
J. Schalling, SNL, Las Vegas
R. St. Clair, M&O, Las Vegas
G. Bodvarsson, LBL, Berkeley
M. Chornack, USGS, Denver
R. Craig, USGS, Las Vegas
L. Ducret, USGS, Denver
D. Gillies, USGS, Denver

ENCLOSURE 6

W. Day, USGS, Denver
R. Keefer, USGS,Denver
R. Luckey, USGS,Denver
B. Parks, USGS,Denver
Z. Peterman, USGS, Denver
R. Ritchey, USGS,Denver
R. Spengler, USGS,Denver
J. Whitney, USGS,Denver
R. Williams, USGS,Denver

U.S. Geological Survey
EXECUTIVE SUMMARY
July 1995

WBS 1.2.3.1 Coordination and Planning

U. S. Geological Survey-Yucca Mountain Project Branch is currently processing 207 scientific publications. These include 89 hydrologic-related reports and 104 geologic-related reports. In addition, there are 86 abstracts being processed together with 28 reports from LBL.

WBS 1.2.3.2 Geology

Geologic Framework

Preliminary hydrologic flow models, based on detailed studies of the stratigraphic relations and physical and hydrologic properties of rocks within the nonwelded and associated units of the Paintbrush Group (PTn; primarily units within the Yucca Mountain and Pah Canyon Tuffs) show that the PTn units control the lateral flow of water within the Paintbrush Group. The models also show that unit thickness within the PTn has a strong influence on lateral transmission, and that the ability of the PTn units to transmit water laterally may preclude high levels of water saturation within them. The stratigraphic framework for the preliminary models was developed from lithologic descriptions and thickness measurements of individual lithostratigraphic units in drill hole cores and surface sections, with particular emphasis given to characterizing variations in the degree of welding, secondary crystallization, alteration, weathering, and reworking. Hydrologic and physical property data include porosity, bulk density, particle density, saturated hydraulic conductivity, water content, and water potential. Hydrologic divisions within the PTn unit were evaluated using TOUGH, an integrated finite-difference code that simulates the three-dimensional coupled transport of water, vapor, air, and heat in porous and fractured media. The models help to identify the lithologic layers that control the development of high saturations and lateral diversions. Results of the preliminary modeling are described in a report "Stratigraphic relations and hydrologic properties of the Paintbrush Tuff nonwelded hydrologic unit, Yucca Mountain, Nevada."

Anomalies typically associated with subaerial basaltic volcanic centers were detected by aeromagnetic surveys over flat, alluvium-covered areas of the Amargosa Desert and Crater Flat. Of the six anomalies defined, three were resurveyed employing gravity and ground magnetic methods. The ground magnetic data suggest the sources of these anomalies are shallowly buried. However, the lack of a large gravity anomaly associated with each of the magnetic anomalies suggests that either the source rocks may be tuff rather than basalt, or the volume of the buried body is small. The latter possibility is more likely, because basalt has been found in drill holes located over two similar Amargosa Desert magnetic anomalies. Modeling of the magnetic and gravity data indicates that the estimated maximum depth to the top of the buried

sources of the anomalies is less than 300m. The modeling also helps to pinpoint the locations of boreholes that may be drilled to determine the nature and extent of the rock bodies involved. A descriptive text and appropriate maps and other graphic materials are incorporated in a report entitled "Magnetic and gravity studies of buried volcanic centers in the Amargosa Desert and Crater Flat, southwest Nevada."

As discussed in a report, "Gravity and Magnetic Investigations of the Ghost Dance and Solitario Canyon Faults, Yucca Mountain, Nevada", gravity and magnetic studies also show their usefulness in delineating major faults such as the Ghost Dance and Solitario Canyon faults, as well as minor faults such as those along the eastern flank of Yucca Mountain. The gravity and magnetic data that have been collected along traverses that cross these features were compared with geologic maps and cross sections to obtain information on the gravity and magnetic signatures of known structural features and of the various volcanic formations that are present at Yucca Mountain. In general, the gravity effect of a fault appears as a "low" over the down-thrown block and a "high" over the upthrown block. The amplitude of the anomaly is related to the amount of offset and depth of the feature, while the asymmetry of the anomaly is related to the dip of the fault plan. The magnetic effect of a fault is more complex to interpret, because of the differing magnetic properties of the various rock units involved. In studies at Yucca Mountain, the dominant magnetic signature of a normal fault has been found to be caused by the Topopah Spring Tuff. Modeling of the magnetic data combined with geologic information commonly shows the presence of a magnetic "low" over the downthrown block.

New geologic mapping and related stratigraphic studies, photolineament interpretations, and compilation of existing data emphasize the complex geometry of the dominant faults and fault zones at Yucca Mountain. Many of the faults are found to be zones of small and, locally, discontinuous fault splays that branch both vertically and along strike. Preliminary mapping of the Ghost Dance fault, for example, shows that it consists of numerous fault splays that "horse-tail" at the surface, but may become narrower at depth which, if true, will have a major impact on the volume of the useful ground at depth in the potential repository horizon within the Topopah Spring Tuff. Further mapping, as well as integration of ongoing shallow seismic studies, can help to define the geometry of this important structure.

Progress in the continuing collection, compilation, and interpretation of data designed to provide a more comprehensive understanding of the geologic framework and tectonic stability of Yucca Mountain includes:

1. Compilation of lithologic, geophysical, and petrologic data for the Bullfrog and Tram Tuffs to support the development of hydrogeologic models for the unsaturated and saturated zones.

2. Analysis of the spatial distribution of three additional lithostratigraphic units modeled in LYNX, and initiation of work to incorporate 40 measured surface sections into the LYNX database to calibrate the existing model.

3. Further processing and interpretation of seismic reflection and magnetic data. On the basis of projected contacts from borehole data, shallow strong reflections in the seismic profiles appear to result from energy return from a boundary within the Tertiary volcanic units rather than the top of the Paleozoic sequence as previously suspected.

4. Continued geologic mapping of the North Ramp, resulting in: (a) completion of full periphery field maps to station 10+70, (b) completion of detailed line surveys to station 10+81, (c) completion of stereophotography to station 10+60, (d) calculation of RQD and Q ratings to station 10+80, and (e) collection of 41 samples as part of the consolidated sampling program.

Vibratory Ground Motion

Modeling of the base case normal faulting scenarios (e.g., events involving the Paintbrush Canyon/Bow Ridge, Solitario Canyon, Rock Valley, Bare Mountain, and Furnace Creek fault systems) is nearing completion, including a ground motion modeling exercise using data from the 1992 Little Skull Mountain earthquake. Results of these combined modeling efforts are being used to make adjustments to ground motion model parameter values. An analysis of the strong motion data set in hand has been completed, but some important Italian earthquake data that have been requested have not been received. Weak motion data from the Little Skull Mountain event are being analyzed.

A summary of data needs for the expert panel involved in probabilistic analysis of ground motion and fault displacement at Yucca Mountain was prepared and forwarded to DOE.

Preclosure Tectonics

Compilation and synthesis of data and preparation of reports were the dominant activities of personnel involved in the preclosure tectonics program, including studies of (1) Quaternary faults (Bow Ridge, Paintbrush Canyon, Stagecoach Road, Ghost Dance, Solitario Canyon, Crater Flat, Windy Wash, Fatigue Wash, Sundance, and postulated Fortymile Wash) that lie within and adjacent to the potential site area; (2) the Mine Mountain, Cave Springs, Bare Mountain, Death Valley/Furnace Creek, and other fault zones that are in close proximity to Yucca Mountain; and (3) detachment faults.

Trenches were deepened at site RV-3 along the Rock Valley fault system. Trench walls were logged, and rock and soil samples collected. The new fault and stratigraphic data are important for documenting the lateral displacement component of Pleistocene faulting along this feature, and for determining the age of movement. The logging of trenches on the northern and southern segments of the Crater Flat fault continued.

During July, 1995, 127 northern Great Basin seismic events were recorded. Ten blasts related to tunnel excavation at Yucca Mountain were detected and located. The largest earthquake

occurred in the Timber Mountains on July 31, with a magnitude of 4.2. Construction of five more sites in the strong motion array was completed, and three more digital stations in the upgraded southern Great Basin Seismic Network were installed.

WBS 1.2.3.3 Hydrology

Regional Hydrology

Precipitation totals of 104 and 107 mm were measured at UE-29 UZN#91 and UE-29 UZN#92, respectively, during the 1994 water year (10/1/93-9/30/94). Approximately 90% of the precipitation fell during the period November 16 to March 29. Localized streamflow was generated in the Fortymile Wash watershed during the precipitation events, and infiltrated into the streambed materials as the flow went down the channel system. Enough streamflow infiltrated in the Pah Canyon-FortymileWash area to recharge the ground-water system as evidenced by rises in the water levels of more than 3m in well UE-29a#1, over 2m in UE-29a#2, and nearly 2m in neutron-access borehole UE-29 UZN#91. The ground-water levels steadily declined after the recharge until the end of the water year. Fortymile Wash is an ephemeral stream fed by tributaries draining the east side of Yucca Mountain, and then forms a distributory system downstream in the Amargosa Desert. Understanding how the ground-water flow system operates is important because it is a possible mechanism for radionuclide migration from the potential repository to the accessible environment.

An analytical element model has been built to study the ground-water flow in the Great Basin of Nevada, Utah, and adjacent states, and thereby establish regional boundary conditions for the site-scale saturated zone flow model at Yucca Mountain. In general, the Great Basin consists of the carbonate rock province, plus the rock formations in western Nevada. For purposes of regional modeling, however, the aquifer for the Great Basin model is assumed to consist of a single layer with a constant hydraulic conductivity and base elevation. Major surface-water boundaries are formed by the Humboldt, Sevier, Colorado, and Virgin Rivers, Carson sink, Great Salt Lake, Great Salt Lake Desert, and Death Valley. Recharge is assumed to occur at higher elevations only, including the north central part of the Great Basin and the Spring and Inyo Mountains. Specified recharge rates for these areas are 0.05 mm/day, 0.5 mm/day, and 0.02 mm/day, respectively. Rough calibration of the large regional model results in a hydraulic conductivity of 0.5 m/day. Comparisons of modeled discharges for several areas in central Nevada with published discharge data are favorable, showing that the predicted discharges (from the model) are in the same order of magnitude as the published discharges.

Unsaturated Zone

Activities associated with the preparation of a net infiltration map include:

1. Calculation of yearly infiltration fluxes at each of 90 boreholes for a 10-yr period, the data being used to estimate a multiple linear regression relationship for predicting a yearly infiltration rate for each borehole.

2. Development of an alluvial depth map using four depth units -- 0-0.5m, 0.5-3.0m, 3.0-6.0m, and > 6.0m.

3. Development of a geomorphic position map using combinations of units differentiated on preliminary surficial deposits maps, a slope map derived from a digital elevation map, and a digital line graph of drainage channels; six geomorphic positions were identified -- channel, terrace, footslope, backslope, shoulder, and ridge.

4. Compilation of an average annual precipitation map.

5. Development of a preliminary net infiltration flux map by applying the linear relationship that predicts net infiltration from alluvium depth, geometric position, and precipitation.

Based on the above, a potential fast pathways flux map is also being prepared by adding mapped faults. For this purpose, it is assumed that the faults (considered to act as fast pathways) influence net infiltration by a linear increase in rate for an area within lying 30m of the fault.

Data from the mapping, sampling, and testing of surficial materials are used to delineate infiltration - runoff map units for the Yucca Mountain area. To date, 500 samples of surficial deposits have been collected and analyzed for this purpose. Particle size and density and pH calcium carbonate content are the important parameters being measured in laboratory tests, and selected samples from various surficial units are being analyzed to determine moisture retention characteristics. These laboratory data provide significant input to the preparation of physical properties maps. These maps, in combination with the maps and information described in the above paragraph, contribute significantly to the development of conceptual models that reflect the current state of understanding of the processes and mechanisms of infiltration and net infiltration into the unsaturated zone at Yucca Mountain.

The first phase of air-permeability and hydrochemistry testing in Alcove #1 of the ESF has been completed. A report is being prepared to include results from fracture mapping, hydrochemical sampling, and air-injection testing. Preparations are under way for similar activities to be conducted in Alcove #2.

Gas phase testing of surface boreholes involves flow surveys, pumping tests, shut-in pressure tests, and temperature monitoring to establish pre-ESF excavation ambient conditions and to measure possible changes resulting from the excavation activities. Presently, boreholes NRG-2b, SD-9, and NRG-5 are being monitored for shut-in pressures. Borehole NRG-5 has been equipped with a Seamist borehole liner containing 15 ports that allow monitoring of shut-in pressures in 15 different zones. When sufficient pressure data are obtained, the zones will be pumped to collect gas chemistry samples.

Saturated Zone

In the continuation of pump tests in the c-hole complex, another test was started in well UE-25c #3 on 6/12/95; during this test, packers in wells UE-25c #1 and UE-25c #2 were inflated rather than being uninflated as they were during the earlier test. The pumping during the test that began 6/12/95 averaged 356 gpm, and this rate was maintained until 6/16/95 at which time recovery monitoring began and continued to 6/29/95. Future tests include selective pumping of "packed-off" intervals, and cross-hole hydraulic and tracer testing.

The new potentiometric surface map was prepared for publication as USGS Water Resources Investigations Report WRIR-4149, entitled "Potentiometric-surface map 1993, Yucca Mountain and vicinity, Nevada." As previously reported, water levels are contoured with a 20m contour interval, with additional 9.5m contours in the small-gradient area southeast of Yucca Mountain. Water levels range from about 728m above sea level southeast of Yucca Mountain to about 1,034m above sea level north of Yucca Mountain. In the continuing collection of water level data during 1995: (1) 19 zones in 17 wells were monitored on a monthly basis; (2) 17 zones in 12 wells were monitored on an hourly basis; and (3) continuous analog data were collected from 4 zones in 2 wells in order to monitor water-level responses to seismic events.

Activities leading to the development of saturated zone hydrologic system models include: (1) converting geologic maps into ARC/INFO coverage to provide surface geological data; (2) reviewing structure cross-sections and adding appropriate hydrogeologic data (about 70 cross-sections have been completed); (3) setting up a test problem for establishing the interface between a parameter-estimation routine (PEST) and FEHMN (ground-water flow model) through use of a simple 10X10X10 uniformly spaced grid; and (4) work (by LANL) on the linking of a strata model framework into the node framework for a FEHMN.

WBS 1.2.3.6 Climatology

Data on the stable isotopic composition of precipitation serve to constrain the modern response of ground-water isotope hydrology to climate variability by defining, (1) the isotopic signatures associated with different regional weather patterns, and (2) those weather patterns that are most conducive to infiltration and ground water recharge. Combined with reconstructions of past hydrology and climate from isotopic studies of fossils and minerals, these data provide critical input for modeling of the site (unsaturated zone infiltration, water table elevation) and of the regional (ground water travel time) hydrologic responses to future climate changes. Currently, precipitation samples are being collected at approximately 25 rain gauges in the Yucca Mountain area, and isotopic analyses are proceeding. The dataset is as yet incomplete, but as more information is obtained it will be used to define the isotopic signatures of air masses from different sources and of different trajectories that help to determine past regional climate patterns.

Studies of ostracodes and stable isotopes indicate that climatic and hydrologic conditions in the Las Vegas Valley were variable during the late Pleistocene glacial stages. Changes in the

abundance of generalized ostracode species (i.e., wetland, spring, and aquifer environments) suggest shifts in the volume and type of surface water on the valley bottom. Such changes are thought to be related to changes in climate averaged over periods of a decade or longer. The obvious difference between the modern-day climate and the conditions during the late glacial stages is that the latter supported a wetland complex. Although evaporation exceeded precipitation during that period of time, the difference was not as pronounced as it is today. Wet years were more frequent, if not the norm, and summers were much cooler and may have had modern-day, winter-like frontal precipitation patterns. In essence, polar front activity appears to have resided in the general area in both the winter and summer seasons. Comparison of the ostracode and stable isotopic data with other paleoclimate proxy data sets (e.g., diatoms, molluscs, pollen) that are currently being collected and studied will result in further definition of the climatic conditions and variables during the late Pleistocene in the Yucca Mountain region.

Paleohydrologic records in the form of soils, vein and fracture fillings, and ground-water discharge deposits reflect episodes of infiltration, deep percolation, and water-table fluctuations that provide additional evidence that present-day climatic conditions in the Yucca Mountain region may be abnormally hot and dry relative to wetter, cooler conditions typical of much of the Quaternary. About fifty opaline silica and calcite fracture fillings exhibiting late Pleistocene and older ages are interpreted to represent precipitation of secondary minerals from waters during non-extreme climate states. Results from paleodischarge sites down-gradient from the potential repository site suggest that higher fluxes of dilute water occurred throughout the late Pleistocene to as recently as 9-20Ka.

A large number of samples of silica-rich clast rinds and matrix veinlets collected from soils developed in coarse alluvial gravels and exposed in trenches in Crater Flat were analyzed with a mass spectrometer. The resulting $^{230}Th/U$ ages always showed: (1) a progression from older to younger ages when sampled across rinds, from clast rinds toward clast matrix; (2) consistency with stratigraphic order of lithologic units; (3) agreement when sampled along strike in a given lithologic unit; and (4) back-calculated initial $^{234}U/^{238}U$ within a restricted range (typically 1.65 ± 0.20) so that $^{234}U/^{238}U$ ages $\pm$ 100 kyr could be reliably dtermined for the oldest, 400-1000 Ka rinds.

WBS 1.2.13.4 Water Resources Monitoring

Ground water levels were measured at 28 sites and discharge was measured at one flowing well.

USGS LEVEL 3 MILESTONE REPORT
OCTOBER 1, 1994 - JULY 31, 1995
Sorted by Baseline Date

Deliverable	Due Date	Expected Date	Completed Date	Comments
LETTER REPORT: GAS CHEMISTRY THRU 1993 Milestone Number: 3GGP120M	12/30/94	07/05/95	07/05/95	
RPT: STRUCT/STRAT OF THE ESF - NORTH RAMP Milestone Number: 3GGF530M	01/31/95	08/31/95		
CATALOG OF SEISMIC ACTIVITY IN SGB FOR 1994 Milestone Number: 3GSM500M	03/30/95	08/31/95		
LETTER REPORT: SITE SZ CONCEPTUAL MODEL Milestone Number: 3GWM151M	03/30/95	08/31/95		
ANLYS PPR: MAG/GRAV ALONG SEISMIC PROFILE Milestone Number: 3GGU590M	03/31/95	07/31/95	07/31/95	
LTR RPT: IN-SITU BOREHOLE MONITORING DATA REPORT Milestone Number: 3GUP421M	03/31/95	08/31/95		
RPT: QUATERNARY FLTING - MINE MTN FLT SYSTEM Milestone Number: 3GTN510M	05/31/95	08/31/95		
FINAL REPORT: DETACHMENT FAULTING Milestone Number: 3GTD500M	05/31/95	08/15/95		
RPT: QUAT. FLT - POSTULATED FORTYMILE WASH FLT Milestone Number: 3GPF520M	05/31/95	08/31/95		
LTR RPT: BOW RIDGE/PAINTBRUSH CYN Milestone Number: 3GPF530M	05/31/95	08/31/95		
TECHNICAL REPORT: TECTONIC MODEL(S) Milestone Number: 3GTE500M	05/31/95	09/29/95		
LTR RPT: VERIF & ENHANCEMENT OF SCOTT & BONK Milestone Number: 3GGF500M	06/30/95	07/19/95	07/19/95	

Printed: 08/10/95 13:45

Deliverable	Due Date	Expected Date	Completed Date	Comments
RPT: STRUCT/STRAT OF THE ESF - NORTH RAMP Milestone Number: 3GGF540M	06/30/95	08/31/95		
RPT: PRECARIOUS ROCK METH.- APPLICATIONS TO YM Milestone Number: 3GSM530M	06/30/95	08/31/95		
RPT: CHAR. QUAT. FLTING - ROCK VALLEY FAULT ZONE Milestone Number: 3GTN500M	06/30/95	09/29/95		
LTR RPT: ANALYSIS OF REGIONAL AVG ANNUAL PRECIP Milestone Number: 3GMM105M	06/30/95	08/31/95		
LETTER RPT: FY93-FY94 DATA FROM FORTYMILE WASH Milestone Number: 3GRG137M	06/30/95	08/31/95		
UPDATE #1 ON C-WELLS HYDRAULIC & TRACER TESTING Milestone Number: 3GWF143M	06/30/95	07/20/95	07/20/95	
LTR RPT: ISOTOPIC ANALYSIS-MODERN PRECIPITATION Milestone Number: 3GCR510M	06/30/95	07/06/95	07/06/95	
LTR: CROSS-HOLE STUDIES COMMENCEMENT AT C-WELLS Milestone Number: 3GWF153M	07/05/95	07/20/95	07/20/95	
LTR RPT: OSTRACODE & ISOTOPIC DATA Milestone Number: 3GCL500M	07/17/95	08/08/95		
LETTER REPORT: 3RD QTR FY95 Milestone Number: 3GWR124M	07/27/95	08/03/95		
RPT: LITHOLOGY & HYDROLOGIC PROP IN THE PTn Milestone Number: 3GGU5M0M	07/31/95	07/31/95	07/31/95	
LTR RPT: GRAV/MAG INVEST LOCATE DRILL-HOLES Milestone Number: 3GGU5Q0M	07/31/95	07/31/95	07/31/95	
ANLYS PPR: QUATERNARY FLTING-AMARGOSA DESERT Milestone Number: 3GTQ500M	07/31/95	07/31/95	07/31/95	

Deliverable	Due Date	Expected Date	Completed Date	Comments
ANLYS PPR: QUATERNARY FLTING - REGIONAL FAULTS Milestone Number: 3GTQ510M	07/31/95	07/31/95	07/31/95	
RPT: QUAT. FLTING - CANE SPRING FAULT SYSTEM Milestone Number: 3GTN520M	07/31/95	09/29/95		
ANLYS PPR: QUAT FLTING-GHOST DANCE FLT Milestone Number: 3GPF510M	07/31/95	08/31/95		
LTR RPT: FAUNA & FLORA AGES Milestone Number: 3GCL510M	07/31/95	08/02/95		
LTR RPT: DATING OF CALCITE/SILICA VEIN DEPOSITS Milestone Number: 3GQH560M	07/31/95	08/02/95		
RPT: SOIL FLUID/GAS ISOTOPIC CHEMISTRY Milestone Number: 3GQH580M	07/31/95	08/15/95		
PROV RESULTS: SECONDARY MINERAL ORIGINS Milestone Number: 3GQH590M	07/31/95	08/15/95		
LTR RPT:GEOMETRY & CONTINUITY - SUNDANCE FAULT Milestone Number: 3GGF510M	08/31/95	08/31/95		
LTR RPT: VERT CONT/FRAC CHAR PAINTBRUSH GRP Milestone Number: 3GGF550M	08/31/95	08/31/95		
PROV. RESULTS: TEMP. DATA COLLECTED FROM ESF Milestone Number: 3GAT106M	08/31/95	08/31/95		
PROV RESULTS: SUMMARY OF GM MODELING RESULTS Milestone Number: 3GSA511M	08/31/95	09/29/95		
FINAL RPT: QUATERNARY ACT. - BARE MTN FAULT ZONE Milestone Number: 3GTQ530M	08/31/95	08/31/95		
RPT: QUAT. ACT. -DEATH VALLEY/FURNACE CRK FLT Milestone Number: 3GTQ540M	08/31/95	08/31/95		

Printed: 08/10/95 13:45

Deliverable	Due Date	Expected Date	Completed Date	Comments
ANLYS PPR: QUAT FLTING-SOLITARIO CYN/CRATER FLAT Milestone Number: 3GPF500M	08/31/95	09/22/95		
LTR RPT: PRELIMINARY PALEOCLIMATE SYNTHESIS Milestone Number: 3GQH570M	08/31/95	08/31/95		
LTR RPT: USGS SUP TO SURF FAC FIELD TEST & CHAR Milestone Number: 3GSR500M	08/31/95	08/31/95		

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** Royer **WBS:** 1.2.1.6

WBS TITLE: Technical Interface

P&S ACCOUNT: OG16

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
89	89	27	0.0	0.0	100.0	62	69.7	329.6	109	34	75	68.8	33	285.7

Analysis

Cumulative Cost Variance:

Not applicable.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:
Delays in staffing and less than the planned level of effort result in the positive cost variance.

Impact:
There is no impact.

Corrective Action:
Review planned work and expenditures on a monthly basis to determine whether this variance at completion is reflective of progressing work.

P&S ACCOUNT MANAGER _____ DATE _____ TPO _____ DATE _____

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** TYNAN **WBS:** 1.2.3.2.2.1.1

WBS TITLE: Vertical and Lateral Distribution of Stratigraphic Units in the Site Area

P&S ACCOUNT: OG32211

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
1980	1980	1432	0	0.0	100.0	548	27.7	138.3	2263	2131	132	5.8	1636	40.5

Analysis

Cumulative Cost Variance:

Cause:

The cost variance is primarily due to the bids for the processing portion of the seismic reflection contract coming in much lower than the budgeted amount. While $348K had been budgeted for this portion of the contract, costs to date are around $25K, resulting in a large positive cost variance. There are also smaller cost underruns in several summary accounts comprising this total.

Impact:

There is no schedule impact resulting from this cost underrun because it is due to lower than planned costs for the same work. There should be little impact to the total cost for this P&S account. Some (approximately $125K) of the positive cost variance is offset by unplanned charges incurred this fiscal year for the acquisition portion of the contract for the seismic reflection line. These costs were to allow complete coverage of the last shothole which required running the line for three additional miles covering twenty-three rather than twenty miles. Additional costs included survey costs, a water truck for dust control which earlier had been indicated was not needed, and rental of an electrical generator.

Corrective Action:

None at this time. There are some cost overruns within this P&S account, which may provide additional offset to this projected cost underrun. Analyses have indicated an underrun of approximately $200K for this P&S account, based on the planned budget. This underrun has been presented to the AM for Scientific Programs as a source of funds for the M&O/WCFS

shortfall in WBS 1.2.3.2.8.3.6, Probabilistic Seismic Hazards Analysis; an AFP change form has been submitted to transfer $180K to the M&O/WCFS for additional support to the USGS for this work. Funds are also needed for other geophysical surveys in conjunction with the seismic reflection that were underfunded due to fiscal limitations, and additional support to magnetic investigations.

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

Not Applicable.

P&S ACCOUNT MANAGER	DATE	TPO	DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** SULLIVAN **WBS:** 1.2.3.2.8.3.6

WBS TITLE: Probabilistic Seismic Hazards Analyses

P&S ACCOUNT: OG32836

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
208	209	109	1	0.5	100.5	100	47.8	191.7	247	220	27	10.9	129	34.2

Analysis

Cumulative Cost Variance:

Cause:

Costs are accruing at less than the planned rate due to delays in planned workshops. The greatest costs associated with this account are labor and travel costs for the group of experts participating in the workshops and documenting results of the workshops.

Impact:

There may be a slight underrun in this account. The workshops are taking place and costs eventually will catch up with the planned rate. Because costs are direct charged by non-YMPB staff, due to experts being called upon to support the workshop from other USGS branches, there will be some delay in cost accounting, and it is more difficult to project total costs.

Corrective Action:

None required.

Cumulative Schedule Variance:

Not Applicable.

Variance At Complete:

Not Applicable.

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS PEM: SULLIVAN WBS: 1.2.3.2.8.4.4

WBS TITLE: Quaternary Faulting Within Northeast Trending Fault Zone

P&S ACCOUNT: OG32844

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
370	281	185	-89.0	-24.1	75.9	96	34.2	151.9	370	287	83	22.4	244	87.3

Analysis

Cumulative Cost Variance:

Cause:
The positive cumulative cost variance is partly due to work costing somewhat less than planned. Also, the USGS has been unable to obtain access to the restricted part of Area 27 to collect field data resulting in lower than planned costs.

Impact:
Milestone report 3GTN520M will not be able to be completed as planned because of the inability to collect field data in Area 27.

Corrective Action:
Milestone report 3GTN520M will be prepared on the basis of presently available data. This will result in a technically incomplete report, and the deficiency will need to be made up in a revised report when funds are available.

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

See "Cumulative Cost Variance"

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** PATTERSON **WBS:** 1.2.3.3.1.1.1

WBS TITLE: Precipitation and Meteorological Monitoring for Regional Hydrology

P&S ACCOUNT: OG33111

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
268	268	131	0	0.0	100.0	137	51.1	204.6	320	302	18	5.6	156	30.4

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance is the result of two unplanned vacancies, and delay in filling a third vacancy.

Impact:

Due to staffing shortages, some of the planned work for FY1995 will not be completed. Level 3 milestones 3GMM107M, LTR RPT:Analysis Regional Storm Events, and 3GGM108M, LTR RPT:Analysis Site Meteorological Data will not be completed. Current analyes indicate this account is expected to underrun about $100K from the planned budget.

Corrective Action:

A report currently in process documents analysis of regional storm types through FY1993; analysis through FY1994 is not needed. Statistical analysis of FY1994 site meteorological data has been performed already and incorporated in a report currently in review that was intended originally to document conditions only through FY1993. An AFP change was processed transfering $91K of the projected underrun funds to the M&O for peer reviews, resulting in a final projected underrun of only about $18K.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** PATTERSON **WBS:** 1.2.3.3.1.1.3

WBS TITLE: Regional Groundwater Flow System

P&S ACCOUNT: OG33113

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
215	205	183	-10.0	-4.7	95.3	22	10.7	112.0	250	312	-62	-24.8	223	34.9

Analysis

Cumulative Cost Variance:

Not applicable.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:

The negative variance at completion results from not budgeting an MOA with the Geologic Division for $72K to analyze and log core data. Geologic Divsion personnel will compute porosity, water content, and saturation in selected boreholes using density and epithermal neutron logs; provide cross-sections of computed logs for the Wt series of holes; and provide large format plots of log, core, and computed logs for selected boreholes. A positive cost variance of $56K was previously indicated in this account, and an AFP change was processed transferring 56K to the M&O for peer reviews. The reprogramming of this $56K results in the $62K overrun now projected.

Impact:

This P&S account will overrun because funds were reprogrammed to the M&O. However, there should be adequate underruns in the saturated zone program to cover this now projected overrun.

Corrective Action:

No corrective action possible at this time. Monitor spending within the saturated zone carefully to ensure adequate underruns to cover projected overrun.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** Patterson **WBS:** 1.2.3.3.1.1.4

WBS TITLE: Regional Hydrologic System Synthesis & Modeling

P&S ACCOUNT: OG33114

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
364	353	217	-11.0	-3.0	97.0	136	38.5	162.7	450	382	68	15.1	277	58.8

Analysis

Cumulative Cost Variance:

See "Variance at Complete"

Cumulative Schedule Variance:

Not Applicable.

Variance At Complete:

Cause:

Projected variance at complete is due to awarding contract with University of Minnesota later in the year than planned. Funds were carried over from FY1994 but unable to be spent this FY. Also, staff working under MOA from WRD Research were not available to begin work on MODFLOW conversion to MODFLOWP as early as planned and budgeted.

Impact:

Contract with University of Minnesota was awarded in May. Work is proceeding. Work on MODFLOW conversion began in April and conversion was completed in late June. Work on forward calibration was emphasized and has moved ahead of schedule. No other milestones are impacted.

Corrective Action:

Monitor analytical element modeling work by University of Minnesota to ensure negotiated schedule is met.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** PATTERSON **WBS:** 1.2.3.3.1.2.4

WBS TITLE: Percolation in the Unsaturated Zone - ESF Study

P&S ACCOUNT: OG33124

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
1103	1042	843	-61	-5.5	94.5	199	19.1	123.6	1393	1241	152	10.9	1127	88.2

Analysis

Cumulative Cost Variance:

Cause:

Underspending in two of the five summary accounts encompasses over 100% of the P&S level cost variance. Underspending in summary account OG33124E97 (Air-K & Hydrochemistry Testing - North Ramp Alcoves, 164K) is due to 1) lower than expected federal labor hours for ESF alcove testing due to the current priority on testing in surface-based boreholes along the ESF alignment, and a 2 to 3 month delay in construction of alcove 2, and 2) delays in procurement of supplies and equipment to support air-K testing, gaseous hydrochemical sampling, and long-term monitoring of boreholes in ESF alcoves, especially alcove 2. Underspending in summary account OG33124A96 (North Ramp Perched Water, 50K) is due to 1) lower than expected federal labor hours for ESF testing because no perched water has been encountered in the ESF, and 2) delays in procurement of supplies and equipment to support perched-water sampling and monitoring.

Impact:

There is expected to be a cost underrun of $152K at the end of the fiscal year. Supplies and equipment originally scheduled for procurement in October and November 1994 are for testing and monitoring primarily in Alcove 2 which is delayed and Alcove 3, which is not scheduled for testing until September 1995. Delays in procurement of supplies and equipment for alcove testing did not have a serious impact because of a delay of three months in the start of testing for alcove 2, with similar delays in testing of alcove 3 expected.

Corrective Action:

Technician vacancy for ESF air-K testing was filled during second quarter FY 95. All supplies and equipment to support ESF air-K, hydrochemistry, and perched-water testing will be procured in time to accommodate ESF-testing schedules.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER	DATE	TPO	DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** Patterson **WBS:** 1.2.3.3.1.2.7

WBS TITLE: Unsaturated Zone Hydrochemistry

P&S ACCOUNT: OG33127

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
817	775	608	-42	-5.1	94.9	167	21.5	127.5	1005	905	100	10.0	788	77.4

Analysis

Cumulative Cost Variance:

Cause:

The positive cumulative cost variance results from reductions in the estimated cost of hydrochemical sample analyses due to fewer samples being available from the surface-based drilling program and ESF, and deferral in hiring of a contract hydrochemical technician for pore-water extraction.

Impact:

There is a projected cost underrun of $100K in this account. There is no schedule impact resulting from this cost underrun as the reduction in the number of pore-water and gas samples is justified given the current drilling and ESF schedules, and current staff can extract pore water as fast as current equipment configuration will allow.

Corrective Action:

Projected variance at completion is being monitored and updated monthly. An additional technician will be hired once an additional set of drainage plates is available for the load cell allowing additional production.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

See "Cumulative Cost Variance".

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** Patterson **WBS:** 1.2.3.3.1.3.1

WBS TITLE: Site Saturated Zone Ground-Water Flow System

P&S ACCOUNT: OG33131

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
1011	1013	870	2	0.2	100.2	143	14.1	116.4	1200	1162	38	3.2	1031	64.0

Analysis

Cumulative Cost Variance:

Cause:
The positive cost variance is due largely to an expensive relocation not being costed this fiscal year, and less being spent on supplies and materials than was budgeted.

Impact:
There is expected to be a small cost underrun ($38K) in this P&S account at the end of the fiscal year.

Corrective Action:
Monitor expenditures and update estimate at complete monthly.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS PEM: MORRIS WBS: 1.2.3.6.2.1.4

WBS TITLE: Paleoenvironmental History of Yucca Mountain

P&S ACCOUNT: OG36214

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
748	754	431	6	0.8	100.8	323	42.8	174.9	910	772	138	15.2	520	45.7

Analysis

Cumulative Cost Variance:

See "Variance at Complete"

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:

The positive variance at completion results in part from $185K planned for LBL to support Quaternary dating activities being carried as part of the USGS budget for geochronological studies. Additional cost variances result from work costing less than the budgeted amount in the surficial deposits mapping activity. Also, some equipment procurements were cancelled because they are not in accordance with FY1996 priorities.

Impact:

There is no expected impact resulting from this variance at completion. Work is expected to be completed.

Corrective Action:

A C/SCR and AFP change form have been submitted transferring scope and budget valued at $185K to LBL. Estimate to complete will be updated monthly to reflect actual funding underrun projection.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** MORRIS **WBS:** 1.2.3.6.2.2.1

WBS TITLE: Quaternary Regional Hydrology

P&S ACCOUNT: OG36221

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
675	665	374	-10	-1.5	98.5	291	43.8	177.8	720	562	158.0	21.9	405	29.3

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance is in summary account OG36221E95 and is due to cancellation of the lease of a mass spectrometer and automated carbonate device for small samples, originally planned for February 1995. This procurement has been cancelled because it is not in accordance with FY1996 priorities.

Impact:

There is no impact to the cancellation of procurement for the leasing contract as the existing mass spectrometer is able to handle the pre-summer season sample load. The leasing contract is cancelled because it is not in accordance with FY1996 priorities. There is a cost underrun projected in this P&S account at fiscal year end.

Corrective Action:

No corrective action is required. Existing mass spectrometer will be used to complete FY1995 samples.

Cumulative Schedule Variance:

Not Applicable.

Variance At Complete:

See "Cumulative Cost Variance"

P&S ACCOUNT MANAGER DATE PPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS PEM: Gil WBS: 1.2.5.7

WBS TITLE: Technical Evaluation

P&S ACCOUNT: OG57

FY-1995 Cumulative to Date									FY-1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
442	442	296	0	0.0	100.0	146	33.0	149.3	558	385	173	31.0	374	130.3

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance results from lower than planned spending in this level of effort account. This account needs to be reviewed regularly for planned spending for the balance of the fiscal year. To date minimal costs have been incurred in the account set up for issue resolution, and charges to the volcanic hazards account have only recently begun to occur at the planned rate.

Impact:

There is no impact to work being performed in this level of effort account. This account is currently projecting a cost underrun of about $173K at the end of the year.

Corrective Action:

Actual and planned spending will be closely reviewed on a monthly basis to update the estimate at completion to accurately reflect the underrun.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

See "Cumulative Cost Variance"

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS **PEM:** Iorii **WBS:** 1.2.9.2.2

WBS TITLE: Participant Project Control

P&S ACCOUNT: OG922

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
479	479	360	0.0	0.0	100.0	119	24.8	133.1	655	490	165	25.2	492	135.4

Analysis

Cumulative Cost Variance:

See "Variance at Complete"

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:

- The positive variance at complete is primarily due to delays in filling a planned staff position for additional support in the area of cost estimating. Part time matrix support is currently supporting this effort.

Impact:

This P&S account will underrrun at the end of the fiscal year. However, work is being accomplished through a combination of matrix support and extended hours on the part of existing staff.

Corrective Action:

No corrective action required at this time. This cost underrun is necessary to cover projected cost overruns in P&S account OG912195B.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS PEM: Dixon WBS: 1.2.13.4.7

WBS TITLE: Water Resources

P&S ACCOUNT: OGD47

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
582	586	428	4	0.7	100.7	158	27.0	136.9	977	977	0	0.0	714	71.2

Analysis

Cumulative Cost Variance:

Cause:

This account is showing a positive cumulative cost variance due to delays in procuring large value items. There is approximately $225K planned for procurements in this account, of which none has been costed.

Impact:

This account has projected an actual underrun at the end of the fiscal year of $60K. Procurements are expected to be completed. Milestones will be met, and budgeted costs less the $60K projected underrun will be incurred before fiscal year end.

Corrective Action:

None required. AFP changes were processed converting an additional $165K from operating funds to capital equipment funds, and returning the projected $60K underrun to DOE for transfer to DRI. A requisition has been prepared to procure needed equipment items.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TED DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: July 31, 1995

PARTICIPANT: USGS PEM: M. Jones WBS: 1.2.15.3

WBS TITLE: YMP Support for the Training Mission

P&S ACCOUNT: OGF3

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
248	248	183	0	0.0	100.0	65	26.2	135.5	297	243	54	18.2	219	81.7

Analysis

Cumulative Cost Variance:

Not applicable.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:

Delays in staffing and less than the planned level of effort result in the positive variance at complete.

Impact:

None.

Corrective Action:

Review planned work and expenditures on a monthly basis to determine whether this variance at complete is reflective of progressing work.

P&S ACCOUNT MANAGER DATE TPO DATE

Participant USGS

Prepared - 08/10/95:13:41:32

Yucca Mtn. Site Char. Project-Planning & Control System
PACS Participant Work Station (PPWS)
WBS Status Sheet (WBS02)

01-Jul-95 to 31-Jul-95
Page - 1
Inc. Dollars in Thousands

WBS No. - 1.2

WBS Title - Yucca Mountain Project

Parent WBS No. -

Parent WBS Title -

Element ID - 22

Statement of Work:

See the current WBS Dictionary

Cost/Schedule Performance

Id	Description	Current Period BCWS	BCWP	ACWP	SV	CV	FY1995 Cumulative to Date BCWS	BCWP	ACWP	SV	CV	FY1995 at Completion BAC	EAC	VAC
1.2.1	Systems Engineering	11	11	2	0	9	109	109	31	0	78	134	44	90
1.2.3	Site Investigations	2166	1999	2033	-167	-34	22356	21580	19076	-776	2504	26479	26036	443
1.2.5	Regulatory	113	113	96	0	17	976	976	776	0	200	1236	1012	224
1.2.9	Project Management	105	105	61	0	44	818	818	757	0	61	1091	966	125
1.2.11	Quality Assurance	157	157	134	0	23	1583	1583	1478	0	105	1900	1851	49
1.2.12	Information Management	44	44	39	0	5	441	441	371	0	70	530	480	50
1.2.13	Environment, Safety, and H	42	43	86	1	-43	667	671	514	4	157	1079	1079	0
1.2.15	Support Services	180	180	93	0	87	1819	1819	1712	0	107	2180	2166	14
Total		2818	2652	2544	-166	108	28769	27997	24715	-772	3282	34629	33634	995

Resource Distributions by Element of Cost

Fiscal Year 1995
Budgeted Cost of Work Scheduled

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	30389	31127	26931	29507	32189	33028	32802	33026	31347	31364	30757	29254	371721
LABOR	1192	1194	1020	1176	1290	1334	1314	1326	1289	1280	1263	1256	14934
SUBS	863	898	892	866	903	924	899	941	920	949	902	886	10848
TRAVEL	128	147	112	135	129	144	132	132	115	112	93	72	1451
PMDE	194	188	219	353	128	269	125	151	147	151	82	67	2074
OTHER	299	283	282	632	517	352	328	449	300	326	325	321	4414
CAPITAL	0	0	0	0	39	12	21	99	144	0	368	225	908
Total BCWS	2681	2710	2525	3162	3006	3035	2819	3098	2915	2818	3033	2827	34629

Participant USGS

Prepared - 08/10/95:13:41:32

Yucca Mtn. Site Char. Project-Planning & Control System
PACS Participant Work Station (PPWS)
WBS Status Sheet (WBS02)

01-Jul-95 to 31-Jul-95
Page - 2
Inc. Dollars in Thousands

WBS No. - 1.2 -Yucca Mountain Project

Resource Distributions by Element of Cost

Fiscal Year 1995
Actual Cost of Work Performed

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	19146	19477	17987	27965	24888	29359	23962	29636	31795	31865	0	0	255080
LABOR	679	676	787	1397	1107	1279	1046	1388	1302	1196	0	0	10857
SUBS	783	845	760	562	811	1028	715	805	867	908	0	0	8084
TRAVEL	22	68	61	58	87	62	153	15	87	29	0	0	642
PMGE	135	234	227	-81	223	327	403	326	153	247	0	0	2194
OTHER	143	170	263	337	493	230	235	379	348	145	0	0	2743
CAPITAL	0	0	0	0	39	12	21	59	45	19	0	0	195
Total ACWP	1762	1993	2098	2273	2760	2938	2573	2972	2802	2544	0	0	24715

Resource Distributions

Fiscal Year 1995	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BCWS	2681	2710	2525	3162	3006	3035	2819	3098	2915	2818	3033	2827	34629
BCWP	2405	2559	2623	3399	2786	2642	2808	3228	2895	2652	0	0	27997
ACWP	1762	1993	2098	2273	2760	2938	2573	2972	2802	2544	0	0	24715
ETC	0	0	0	0	0	0	0	0	0	0	4679	4240	8919

Fiscal Year Distribution

	Prior	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	Future	At Complete
BCWS	0	34629	44570	473	0	0	0	0	0	0	0	0	79672
BCWP	0	27997	0	0	0	0	0	0	0	0	0	0	
ACWP	0	24715	0	0	0	0	0	0	0	0	0	0	
ETC	0	8919	44585	473	0	0	0	0	0	0	0	0	78692

YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant U.S. Geological Survey

Date Prepared [illegible] 14:54

MONTHLY COST/FTE REPORT

Fical Month/Year JULY 1995

Page 1 of 1

WBS ELEMENT	CURRENT MONTH END ACTUAL COSTS	PARTICIPANT HOURS	SUBCON HOURS	PURCHASE COMMITMENTS	SUBCON COMMITMENTS	ACCRUED COSTS	FISCAL YEAR APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1.2.1	2	16	0	0	0		134		30
1.2.3	2008	26537	15577	218	1215		25236		18801
1.2.5	95	815	1166	0	110		1388		770
1.2.9	60	848	388	0	79		991		756
1.2.11	134	1176	1488	0	241		1900		1473
1.2.12	39	128	881	0	131		530		368
1.2.13	87	799	168	0	14		914		532
1.2.15	92	1546	1008	0	78		2180		1707
TOTALS	2517	31865	20676	218	1868	0	33273	0	24437

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/94 - 07/31/95

		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
0G1695B	Project Change Control Board Suport	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	3.6	0.5	0.0	0.0	4.8
0G169561		0.0	0.0	1.3	2.9	4.6	2.1	13.4	-5.9	2.0	1.0	0.0	0.0	21.4
1.2.1.6		0.0	0.0	1.3	2.9	4.6	2.1	13.8	-5.6	5.6	1.5	0.0	0.0	26.2
*1.2.1.6		0.0	0.0	1.3	2.9	4.6	2.1	13.8	-5.6	5.6	1.5	0.0	0.0	26.2
0G1A95B	Q-List Development and Maintenance	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
1.2.1.10		0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
*1.2.1.1		0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
*1.2.1		0.0	3.7	1.3	2.9	4.6	2.1	13.8	-5.6	5.6	1.5	0.0	0.0	29.9
0G3129581	ESI Science Advisory Group	1.6	0.5	0.3	1.5	36.6	26.3	12.1	7.0	12.4	-0.6	0.0	0.0	97.7
0G3129582	Nevada Operations	19.6	19.9	18.5	17.7	17.5	28.2	23.5	77.1	31.5	-13.4	0.0	0.0	240.1
0G3129583	Tracer Gas Support	0.0	31.4	-3.5	19.5	5.6	-6.7	9.1	6.7	13.2	-10.1	0.0	0.0	65.2
0G3129585	YMPB Computer Operations	25.6	27.3	31.1	40.7	29.8	40.3	39.0	47.2	71.7	19.0	0.0	0.0	371.7
0G3129586	YMPB Scientific Rpts/Project Documents	14.8	7.0	19.5	17.4	17.6	15.9	25.5	22.2	12.5	20.9	0.0	0.0	173.3
0G3129587	Earth Science Investigations (ESI)	47.9	33.3	47.2	46.5	44.9	53.5	58.4	67.1	91.1	67.2	0.0	0.0	557.1
0G3129588	ESI QA Implementation	37.3	39.7	20.0	30.7	21.2	26.0	17.3	27.0	42.1	31.6	0.0	0.0	292.9
1.2.3.1.2		146.8	159.1	133.1	174.0	173.2	183.5	184.9	254.3	274.5	114.6	0.0	0.0	1798.0
*1.2.3.1		146.8	159.1	133.1	174.0	173.2	183.5	184.9	254.3	274.5	114.6	0.0	0.0	1798.0
0G32211B96	Update 3D models lithostrat/structural/r	26.1	23.7	31.4	65.2	26.1	24.8	25.9	29.1	26.0	23.9	0.0	0.0	302.2
0G32211C95	Results of Measured Sections in Site Are	18.6	21.5	22.2	-5.6	34.9	24.2	40.6	14.0	19.4	8.1	0.0	0.0	197.9
0G32211D95	Geophysics White Paper, Phase II	0.0	4.2	4.0	16.6	1.9	1.7	-3.1	5.6	1.7	1.7	0.0	0.0	34.3
0G32211E96	Regional Seismic Reflection Profiles	101.7	31.9	4.9	31.6	34.6	14.5	25.8	26.2	11.7	4.3	0.0	0.0	287.2
0G32211F96	Integration of Geology and Geophysics	1.1	-0.2	3.0	43.5	4.5	6.8	4.1	19.0	17.2	30.0	0.0	0.0	129.0
0G32211G96	Lithologic Logging of Core	20.9	12.3	13.1	25.7	30.5	10.8	41.6	19.9	3.0	25.7	0.0	0.0	203.5
0G32211H95	Magnetic Investigations - YM/Jet Ridge	0.0	0.0	0.0	0.0	0.0	14.5	10.7	1.2	16.0	-13.5	0.0	0.0	28.9
0G32211J95	Magnetic/Gravity Investigations, at YM	0.0	0.0	0.0	18.2	2.0	2.3	7.2	10.2	-11.6	10.3	0.0	0.0	38.6
0G32211K96	Mag Along Seismic Profile, Crater Flat,	0.0	0.6	0.0	20.2	6.2	2.4	-1.5	3.6	3.2	7.4	0.0	0.0	42.1
0G32211L96	Strat Desc of Bullfrog & Tram Tuffs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	6.4	0.0	0.0	11.5
0G32211M95	Lithology & Hydrologic Properties in the	1.7	7.7	11.7	10.3	-2.7	15.9	14.5	15.8	8.3	15.2	0.0	0.0	98.4
0G32211Q95	Mag/Grav Studies to Locate Volcanic Dril	0.0	1.4	0.0	11.3	10.6	13.0	4.5	6.1	-2.2	4.5	0.0	0.0	49.2
1.2.3.2.2.1.1		170.1	103.1	90.3	237.0	148.6	130.9	170.3	150.7	97.8	124.0	0.0	0.0	1422.8
0G32212A95	Enhance Surface Geologic Maps	48.8	63.7	60.2	7.1	-8.5	36.2	25.3	37.8	42.9	10.6	0.0	0.0	324.1
0G32212B95	Geometry & Continuity of the Sundance Fa	5.8	-0.2	1.4	67.5	28.6	75.8	41.7	28.2	10.4	36.4	0.0	0.0	296.0
0G32212C96	Expanded Surface Geology Mapping	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6	0.0	0.0	18.6
0G32212D96	Mapping in the ESF	55.8	95.6	70.2	20.2	277.7	237.5	238.9	167.8	180.1	194.6	0.0	0.0	1538.4
0G32212E95	Vert Continuity of Fracture/Char-Paintbr	8.3	2.8	9.1	-16.0	9.8	18.0	31.7	23.1	9.9	21.9	0.0	0.0	118.6
0G32212F95	Pavement Mapping At Fran Ridge	1.1	3.2	1.3	15.9	2.3	6.3	9.7	7.6	21.0	9.2	0.0	0.0	77.6
0G32212G96	Verif & Enhance Scott & Bonk-Jet Ridge/M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.2	0.0	0.0	38.2

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/94 - 07/31/95

		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
1.2.3.2.2.1.2		119.8	165.5	142.2	94.7	309.9	373.8	347.3	264.5	264.3	329.5	0.0	0.0	2411.5
OG3252A95	Structural Controls on Basaltic Volcanis	3.6	-0.4	6.0	13.6	-2.2	7.8	6.3	5.4	8.7	13.4	0.0	0.0	62.2
OG3252C95	Tectonic Effects on YM Hydrologic System	0.0	0.0	0.0	0.0	18.0	21.3	5.2	23.1	5.3	18.8	0.0	0.0	91.7
1.2.3.2.5.2		3.6	-0.4	6.0	13.6	15.8	29.1	11.5	28.5	14.0	32.2	0.0	0.0	153.9
OG32623A95	Technical Support for Soil and Rock	0.0	0.1	0.7	1.9	3.5	-0.5	0.1	1.8	-0.3	0.7	0.0	0.0	8.0
1.2.3.2.6.2.3		0.0	0.1	0.7	1.9	3.5	-0.5	0.1	1.8	-0.3	0.7	0.0	0.0	8.0
OG32722A96	Collect/Interpret Heat Flow Data	0.0	0.1	0.8	0.0	27.7	40.5	4.1	1.2	20.2	35.8	0.0	0.0	130.4
1.2.3.2.7.2.2		0.0	0.1	0.8	0.0	27.7	40.5	4.1	1.2	20.2	35.8	0.0	0.0	130.4
OG32831A95	Synthesis of Geol/Geophys/Seismic Data	5.7	11.4	-1.1	10.2	20.3	30.8	13.8	13.7	12.1	24.8	0.0	0.0	141.7
1.2.3.2.8.3.1		5.7	11.4	-1.1	10.2	20.3	30.8	13.8	13.7	12.1	24.8	0.0	0.0	141.7
OG32833A95	Ground Motion Attenuation	0.0	0.0	0.0	52.6	10.8	28.8	17.8	16.9	57.2	0.0	0.0	0.0	184.1
OG32833B96	Ground Motion Modeling	0.0	0.0	0.0	8.2	33.1	134.6	2.8	13.9	16.3	3.4	0.0	0.0	212.3
1.2.3.2.8.3.3		0.0	0.0	0.0	60.8	43.9	163.4	20.6	30.8	73.5	3.4	0.0	0.0	396.4
OG32836A95	GM Char in Prob. Seismic Hazard Analysis	2.0	-0.3	0.0	-1.7	6.1	1.2	3.5	12.0	6.5	5.4	0.0	0.0	34.7
OG32836B95	Probalistic Seismic Hazard Analysis	6.9	4.4	23.6	20.4	-20.5	6.8	0.7	12.6	6.6	-0.5	0.0	0.0	61.0
1.2.3.2.8.3.6		8.9	4.1	23.6	18.7	-14.4	8.0	4.2	24.6	13.1	4.9	0.0	0.0	95.7
OG32841A95	Catalog of Seismic Activity	116.0	10.9	22.4	63.9	61.1	51.7	49.4	47.9	49.7	34.5	0.0	0.0	507.5
OG32841B95	Excavation Induced Seismic Activity	0.0	9.1	20.5	2.7	2.4	1.5	1.5	2.2	1.4	1.0	0.0	0.0	42.3
OG32841C96	Digital Upgrade SGB Seismic Network	0.0	68.0	20.5	36.6	35.8	38.4	68.2	58.1	57.4	38.5	0.0	0.0	421.5
OG32841D95	Precarious Rock Methodology	0.0	0.0	20.5	4.6	4.3	7.1	8.9	7.7	7.0	8.0	0.0	0.0	68.1
OG32841E95	Strong Motion Array	0.0	22.7	20.5	6.2	5.1	9.2	4.9	7.2	7.5	21.8	0.0	0.0	105.1
1.2.3.2.8.4.1		116.0	110.7	104.4	114.0	108.7	107.9	132.9	123.1	123.0	103.8	0.0	0.0	1144.5
OG32843A95	Quaternary Faulting - Amargosa Desert	0.0	0.0	0.0	24.2	24.2	-0.2	1.0	18.0	21.0	44.8	0.0	0.0	133.0
OG32843B95	Quaternary Faulting - Regional Faults	0.0	0.0	0.0	42.0	12.5	26.8	11.6	47.1	37.7	81.1	0.0	0.0	258.8
OG32843C95	Quaternary Fltng - Bare Mtn Fault Zone	8.6	8.0	3.3	7.6	3.0	28.0	30.4	46.5	34.2	26.6	0.0	0.0	196.2
OG32843D95	Char Death Valley-Furnace Creek Flt. Zon	0.0	42.9	7.9	29.2	15.5	23.9	22.5	5.1	0.0	0.0	0.0	0.0	147.0
1.2.3.2.8.4.3		8.6	50.9	11.2	103.0	55.2	78.5	65.5	116.7	92.9	152.5	0.0	0.0	735.0
OG32844A95	Quaternary Fltng Rock Valley Flt Sys	0.0	0.6	10.1	13.2	17.0	29.1	18.0	9.7	23.9	9.0	0.0	0.0	130.6
OG32844B95	Quaternary Fltng - Mine Mtn Flt System	0.0	0.0	0.0	0.0	4.9	-0.1	10.0	3.4	2.4	0.2	0.0	0.0	20.8
OG32844C95	Quaternary Fltng - Cane Springs Flt Sys	3.3	2.7	-6.0	0.0	9.5	1.1	4.0	4.1	5.1	11.0	0.0	0.0	34.8
1.2.3.2.8.4.4		3.3	3.3	4.1	13.2	31.4	30.1	32.0	17.2	31.4	20.2	0.0	0.0	186.2
OG32845A95	Detachment Faults	5.8	14.5	46.3	-21.8	19.3	23.0	29.3	15.0	29.3	44.7	0.0	0.0	205.4
1.2.3.2.8.4.5		5.8	14.5	46.3	-21.8	19.3	23.0	29.3	15.0	29.3	44.7	0.0	0.0	205.4
OG32846A95	Quat Fltng-Solitario Cyn/Crater Flt/Win	11.0	7.0	18.4	-3.7	25.8	14.5	15.0	7.8	15.6	27.9	0.0	0.0	139.3
OG32846B95	Quaternary Fltng - Ghost Dance Flt	2.4	6.9	9.9	2.4	8.2	21.5	17.6	20.5	18.9	21.4	0.0	0.0	129.7
OG32846C95	Quaternary Fltng - Post Fortymile Wash	0.0	0.5	0.0	0.0	3.1	1.2	10.3	9.6	14.3	5.0	0.0	0.0	44.0
OG32846D95	Quat Fltng-Bow Ridge/Paintbrush Cyn/Sta	8.9	10.8	14.0	13.6	19.8	20.1	4.8	9.7	5.9	2.2	0.0	0.0	109.8

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/94 - 07/31/95

	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
1.2.3.2.8.4.6	22.3	25.2	42.3	12.3	56.9	57.3	47.7	47.6	54.7	56.5	0.0	0.0	422.8
OG3284BA95 In-situ Stress Measurements	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.8	0.0	4.6	0.0	0.0	8.5
1.2.3.2.8.4.8	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.8	0.0	4.6	0.0	0.0	8.5
OG3284AA95 Geodetic Leveling	0.0	0.0	0.0	17.0	-6.4	22.0	0.0	14.5	39.6	0.0	0.0	0.0	86.7
OG3284AB95 Death Valley/Furnace Creek Leveling	0.0	0.0	0.0	5.4	9.4	6.8	0.0	17.9	0.5	12.9	0.0	0.0	52.9
1.2.3.2.8.4.10	0.0	0.0	0.0	22.4	3.0	28.8	0.0	32.4	40.1	12.9	0.0	0.0	139.6
OG3284CA96 Tectonic Models and Synthesis	4.4	40.0	7.8	-12.5	27.8	21.0	3.1	33.5	27.7	35.9	0.0	0.0	188.7
1.2.3.2.8.4.12	4.4	40.0	7.8	-12.5	27.8	21.0	3.1	33.5	27.7	35.9	0.0	0.0	188.7
*1.2.3.2	468.5	528.5	478.6	667.5	860.7	1122.6	882.4	902.1	893.8	986.4	0.0	0.0	7791.1
OG33111A96 Char of the Meteorology for Regional Hyd	11.3	8.5	11.9	8.4	6.3	11.8	6.9	12.0	26.9	25.6	0.0	0.0	129.6
1.2.3.3.1.1.1	11.3	8.5	11.9	8.4	6.3	11.8	6.9	12.0	26.9	25.6	0.0	0.0	129.6
OG33112A95 Streamflow Data, FY94	5.5	5.5	8.1	13.5	4.8	10.6	16.7	24.2	0.0	0.0	0.0	0.0	88.9
OG33112B96 Streamflow Data, FY95	21.7	23.5	26.2	25.2	28.6	21.3	19.9	32.2	19.3	29.7	0.0	0.0	247.6
1.2.3.3.1.1.2	27.2	29.0	34.3	38.7	33.4	31.9	36.6	56.4	19.3	29.7	0.0	0.0	336.5
OG33113A95 Assessment of Key Data/Modeling Problems	4.3	4.6	2.4	5.9	15.0	5.9	4.8	11.2	36.3	14.6	0.0	0.0	105.0
OG33113C95 Fortymile Wash Recharge	5.5	5.4	6.0	7.2	5.5	5.8	7.2	21.2	7.2	6.9	0.0	0.0	77.9
1.2.3.3.1.1.3	9.8	10.0	8.4	13.1	20.5	11.7	12.0	32.4	43.5	21.5	0.0	0.0	182.9
OG33114A96 Regional SZ Numerical Flow Model	7.0	17.8	5.3	-6.5	15.6	2.3	3.9	41.5	8.2	9.8	0.0	0.0	104.9
OG33114B96 SZ Flow Model Boundary Conditions Evalua	0.0	0.2	0.6	0.8	3.6	3.8	3.0	3.6	-1.3	0.7	0.0	0.0	15.0
OG33114C96 Regional SZ Hydrogeologic Framework Mode	0.0	0.0	0.0	0.0	1.5	7.0	10.7	13.8	59.2	2.5	0.0	0.0	94.7
1.2.3.3.1.1.4	7.0	18.0	5.9	-5.7	20.7	13.1	17.6	58.9	66.1	13.0	0.0	0.0	214.6
OG33121A96 Infiltration Properties	35.0	50.0	58.8	33.6	49.4	49.0	52.8	48.1	61.3	44.5	0.0	0.0	482.5
OG33121B96 Infiltration Processes	26.3	30.5	40.3	28.8	49.6	29.0	36.1	39.2	15.5	27.3	0.0	0.0	322.6
OG33121C95 Infiltration Distribution	22.5	15.2	19.7	31.2	19.8	24.1	20.3	23.2	23.7	17.0	0.0	0.0	216.7
1.2.3.3.1.2.1	83.8	95.7	118.8	93.6	118.8	102.1	109.2	110.5	100.5	88.8	0.0	0.0	1021.8
OG33123A96 Matrix Properties of Hydrogeologic Units	29.7	26.2	30.5	37.3	33.2	39.8	29.0	35.0	35.6	37.2	0.0	0.0	333.5
OG33123B95 Surface-Based Air-Permeability Testing	23.5	20.4	27.9	22.5	168.1	24.7	38.2	34.0	18.7	21.8	0.0	0.0	399.8
OG33123C95 Vertical Seismic Profiling Test	14.3	9.8	2.6	9.4	73.0	18.3	46.4	-10.8	13.9	20.1	0.0	0.0	197.0
OG33123D95 Drilling & Drillhole Instrumentation	102.1	76.5	40.4	46.4	30.6	66.4	23.7	130.3	38.0	47.3	0.0	0.0	601.7
OG33123E95 Sensor Calibration & In-Situ Testing	33.6	41.7	38.6	42.7	42.3	36.8	32.2	29.6	63.9	49.6	0.0	0.0	411.0
OG33123F95 UZ Monit, DataBase Mgnt, QA Support, & C	24.4	25.1	23.9	30.4	23.3	36.4	23.8	23.4	21.7	25.3	0.0	0.0	257.7
OG33123G95 Integrated Data Analysis and Interpretat	0.0	1.0	7.5	-2.6	5.5	3.8	17.2	20.3	14.7	21.7	0.0	0.0	89.1
1.2.3.3.1.2.3	227.6	200.7	171.4	186.1	376.0	226.2	210.5	261.8	206.5	223.0	0.0	0.0	2289.8
OG33124A96 North Ramp Perched Water Testing	6.0	6.5	6.6	6.9	6.0	10.8	6.7	10.2	10.2	20.2	0.0	0.0	90.1
OG33124B95 Percolation Test in the ESF	6.0	11.2	10.6	7.3	7.4	7.2	6.1	4.5	6.9	10.6	0.0	0.0	77.8
OG33124C95 Excavation Effects Test in the ESF	6.3	2.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
OG33124D96 Intact Fractures Test, ESF	22.1	50.7	29.0	32.2	22.9	35.6	29.3	34.2	30.4	32.3	0.0	0.0	318.7

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/94 - 07/31/95

	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
OG33124E97 Air-K & Hydrochemistry Testing-North Ram	16.4	20.8	23.6	24.4	36.0	64.2	15.3	66.1	43.3	27.9	0.0	0.0	338.0
1.2.3.3.1.2.4	56.8	91.2	70.5	70.8	72.3	117.8	57.4	115.0	90.8	91.0	0.0	0.0	833.6
OG33126A96 North Ramp, SSP Gas Phase Circulation	20.2	17.5	24.3	50.1	43.1	24.1	20.5	8.5	16.2	11.3	0.0	0.0	235.8
1.2.3.3.1.2.6	20.2	17.5	24.3	50.1	43.1	24.1	20.5	8.5	16.2	11.3	0.0	0.0	235.8
OG33127A96 UZ Hydrochemistry	71.7	69.8	71.6	-24.6	43.9	59.1	78.1	39.4	66.7	95.9	0.0	0.0	571.6
1.2.3.3.1.2.7	71.7	69.8	71.6	-24.6	43.9	59.1	78.1	39.4	66.7	95.9	0.0	0.0	571.6
OG33128A95 Fluid Flow in UZ Fractured Rock	6.5	3.5	11.7	8.8	10.5	11.2	39.5	-5.8	18.4	12.7	0.0	0.0	117.0
1.2.3.3.1.2.8	6.5	3.5	11.7	8.8	10.5	11.2	39.5	-5.8	18.4	12.7	0.0	0.0	117.0
OG33129A96 Intermediate Site UZ Flow Model	15.2	16.8	21.2	20.3	14.2	22.2	25.1	21.6	15.9	19.5	0.0	0.0	192.0
1.2.3.3.1.2.9	15.2	16.8	21.2	20.3	14.2	22.2	25.1	21.6	15.9	19.5	0.0	0.0	192.0
OG33131A97 Conduct Hydraulic/Tracer Test C-Holes	23.2	47.4	47.5	35.2	29.3	45.2	61.6	57.0	60.6	-43.6	0.0	0.0	363.4
OG33131B95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	0.0	0.0	9.6
OG33131C97 Site Potentiometric Levels Monitoring	28.6	42.6	84.4	44.3	25.1	41.9	32.1	18.8	44.6	46.1	0.0	0.0	408.5
OG33131E96 Pumping and Testing Existing Monitoring	0.0	1.3	-0.7	0.6	13.0	15.6	5.7	10.5	7.9	8.9	0.0	0.0	62.8
1.2.3.3.1.3.1	51.8	91.3	131.2	80.1	67.4	102.7	99.4	86.3	113.1	21.0	0.0	0.0	844.3
OG33132A96 SZ Hydrochemistry Data Summary	2.3	2.8	6.5	2.7	1.5	5.0	30.6	-12.0	27.5	5.1	0.0	0.0	72.0
OG33132B96 Death Valley SZ Hydrochemistry	3.8	1.2	3.9	1.0	4.0	5.0	8.5	6.8	1.6	3.9	0.0	0.0	39.7
OG33132C96 SZ Hydrochemistry Equipment Procurement	0.0	29.2	34.0	0.9	0.8	1.2	16.2	33.6	23.6	82.5	0.0	0.0	222.0
1.2.3.3.1.3.2	6.1	33.2	44.4	4.6	6.3	11.2	55.3	28.4	52.7	91.5	0.0	0.0	333.7
OG33133A96 Site SZ Flow Model Framework	16.7	32.0	43.8	4.5	51.9	33.4	10.0	9.0	18.4	15.8	0.0	0.0	235.5
OG33133B96 Site 3-D SZ Model	5.7	13.1	11.9	7.8	14.4	18.7	19.0	41.4	14.4	41.4	0.0	0.0	187.8
OG33133C95 Site SZ Conceptual Model Report	0.4	1.9	3.5	5.6	4.2	0.0	-2.3	2.2	1.8	0.4	0.0	0.0	17.7
1.2.3.3.1.3.3	22.8	47.0	59.2	17.9	70.5	52.1	26.7	52.6	34.6	57.6	0.0	0.0	441.0
*1.2.3.3	617.8	732.2	784.8	562.2	903.9	797.2	794.8	878.0	871.2	802.1	0.0	0.0	7744.2
OG36211B96 Isotopic Analysis of Modern Precipitatio	0.6	1.4	0.1	1.8	-0.4	9.6	9.7	15.0	9.4	2.7	0.0	0.0	49.9
1.2.3.6.2.1.1	0.6	1.4	0.1	1.8	-0.4	9.6	9.7	15.0	9.4	2.7	0.0	0.0	49.9
OG36212A96 Ostracodes, C-14, & Stable Isotopic Data	9.3	6.9	27.1	15.3	13.4	30.4	36.3	99.1	53.5	50.1	0.0	0.0	341.4
1.2.3.6.2.1.2	9.3	6.9	27.1	15.3	13.4	30.4	36.3	99.1	53.5	50.1	0.0	0.0	341.4
OG36213A96 Packrat Middens & Pollen Studies	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	35.9	0.0	0.0	36.4
1.2.3.6.2.1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	35.9	0.0	0.0	36.4
OG36214A95 Document Erosion at Jake Ridge	0.0	0.0	0.0	3.7	0.8	1.0	0.5	0.0	0.5	0.3	0.0	0.0	6.8
OG36214B95 Geochronological Studies of Surface Depo	9.5	7.4	12.2	85.1	90.8	57.5	41.1	13.5	9.4	29.9	0.0	0.0	356.4
OG36214C96 Surficial Deposits Mapping	5.4	4.8	10.8	7.4	5.5	4.8	5.9	6.2	8.0	7.4	0.0	0.0	66.2
1.2.3.6.2.1.4	14.9	12.2	23.0	96.2	97.1	63.3	47.5	19.7	17.9	37.6	0.0	0.0	429.4
OG36215A95 Paleoclimate/Environmental Synthesis Stu	3.9	6.6	3.1	3.5	2.9	1.2	-4.1	7.2	-0.6	0.0	0.0	0.0	23.7
OG36215C95 Paleoclimate Synthesis	0.0	0.1	0.0	6.6	5.8	6.2	0.0	0.0	0.1	5.4	0.0	0.0	24.2
1.2.3.6.2.1.5	3.9	6.7	3.1	10.1	8.7	7.4	-4.1	7.2	-0.5	5.4	0.0	0.0	47.9

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/94 - 07/31/95

		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
0G36221A96	Formation of Silica Within Yucca Mountai	2.4	3.6	8.5	0.1	5.2	-15.9	26.0	0.9	1.9	-1.8	0.0	0.0	30.9
0G36221B96	Dating Calcite Vein Deposits	0.3	8.8	14.3	8.9	25.9	9.4	2.0	7.8	14.7	5.1	0.0	0.0	97.2
0G36221C95	Evaluation of Past Discharge Areas	1.9	3.1	10.9	5.7	26.7	14.4	12.2	7.9	6.7	-0.6	0.0	0.0	88.9
0G36221D96	Soil Fluid/Gas Isotopic Chemistry	5.9	4.0	13.6	8.3	11.3	-2.6	11.0	6.2	10.7	8.1	0.0	0.0	76.5
0G36221E95	Vein Filling Calcite & Opaline Silica De	12.6	7.8	7.9	7.3	24.2	5.8	40.7	7.1	5.5	-40.8	0.0	0.0	78.1
1.2.3.6.2.2.1		23.1	27.3	55.2	30.3	93.3	11.1	91.9	29.9	39.5	-30.0	0.0	0.0	371.6
*1.2.3.6		51.8	54.5	108.5	153.7	212.1	121.8	181.8	170.9	119.8	101.7	0.0	0.0	1276.6
0G3721A95	Geochem Assessment of YM/Pot for Mineral	12.6	20.6	21.4	11.1	27.1	21.5	2.2	2.8	1.5	3.5	0.0	0.0	124.3
0G3721B95	Assess Geothermal Energy Potential at YM	0.0	0.6	0.0	7.7	18.2	0.7	0.4	2.1	0.0	0.0	0.0	0.0	29.7
1.2.3.7.2.1		12.6	21.2	21.4	18.8	45.3	22.2	2.6	4.9	1.5	3.5	0.0	0.0	154.0
*1.2.3.7		12.6	21.2	21.4	18.8	45.3	22.2	2.6	4.9	1.5	3.5	0.0	0.0	154.0
0G3999584	Study Plan Comment Resolution	0.0	7.0	2.4	7.9	5.2	0.0	5.1	4.3	4.1	-1.0	0.0	0.0	35.0
1.2.3.9.9		0.0	7.0	2.4	7.9	5.2	0.0	5.1	4.3	4.1	-1.0	0.0	0.0	35.0
*1.2.3.9		0.0	7.0	2.4	7.9	5.2	0.0	5.1	4.3	4.1	-1.0	0.0	0.0	35.0
**1.2.3		1297.5	1502.5	1528.8	1584.1	2200.4	2247.3	2051.6	2214.5	2164.9	2007.3	0.0	0.0	18798.9
0G511958	Regulatory Coordination and Planning	0.8	0.0	0.0	0.0	0.0	8.7	-9.3	15.0	-1.4	2.3	0.0	0.0	16.1
1.2.5.1.1		0.8	0.0	0.0	0.0	0.0	8.7	-9.3	15.0	-1.4	2.3	0.0	0.0	16.1
*1.2.5.1		0.8	0.0	0.0	0.0	0.0	8.7	-9.3	15.0	-1.4	2.3	0.0	0.0	16.1
0G535958	Technical Data Coordination	31.9	28.5	28.2	33.9	32.0	79.8	35.2	71.2	50.0	66.0	0.0	0.0	456.7
1.2.5.3.5		31.9	28.5	28.2	33.9	32.0	79.8	35.2	71.2	50.0	66.0	0.0	0.0	456.7
*1.2.5.3		31.9	28.5	28.2	33.9	32.0	79.8	35.2	71.2	50.0	66.0	0.0	0.0	456.7
0G56958	Site Suitability Evaluation	2.9	0.8	0.3	0.0	0.4	0.0	0.0	0.0	1.1	-5.5	0.0	0.0	0.0
0G569581		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0	5.5
1.2.5.6		2.9	0.8	0.3	0.0	0.4	0.0	0.0	0.0	1.1	0.0	0.0	0.0	5.5
*1.2.5.6		2.9	0.8	0.3	0.0	0.4	0.0	0.0	0.0	1.1	0.0	0.0	0.0	5.5
0G579561	NRC/CNWRA/ACNW Interactions	4.5	20.0	-6.8	8.4	13.5	6.9	2.7	24.5	25.6	1.1	0.0	0.0	100.4
0G579562	Site Characterization Program	22.5	22.4	29.3	34.2	-26.7	7.3	13.1	5.8	9.0	9.1	0.0	0.0	126.0
0G579584	Semi-Annual Progress Report	0.0	1.4	-1.4	0.3	0.0	8.5	-5.0	11.0	7.4	11.1	0.0	0.0	33.3
0G579585	Issue Resolution	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
0G579586	Volcanic Hazards	0.0	0.0	0.0	0.0	0.0	6.9	4.8	7.7	5.9	5.9	0.0	0.0	31.2
1.2.5.7		27.0	43.8	21.4	42.9	-13.2	29.6	15.6	49.0	47.9	27.2	0.0	0.0	291.2
*1.2.5.7		27.0	43.8	21.4	42.9	-13.2	29.6	15.6	49.0	47.9	27.2	0.0	0.0	291.2
**1.2.5		62.6	73.1	49.9	76.8	19.2	118.1	41.5	135.2	97.6	95.5	0.0	0.0	769.5
0G912195B	Technical Project Office Management	38.4	42.7	54.3	50.6	28.8	79.3	32.1	19.3	26.2	24.2	0.0	0.0	395.9
1.2.9.1.2.1		38.4	42.7	54.3	50.6	28.8	79.3	32.1	19.3	26.2	24.2	0.0	0.0	395.9
*1.2.9.1		38.4	42.7	54.3	50.6	28.8	79.3	32.1	19.3	26.2	24.2	0.0	0.0	395.9
0G922958	Participant Project Control	29.2	30.6	28.6	31.4	42.0	38.7	41.8	37.8	44.0	35.6	0.0	0.0	359.7

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/94 - 07/31/95

		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
1.2.9.2.2		29.2	30.6	28.6	31.4	42.0	38.7	41.8	37.8	44.0	35.6	0.0	0.0	359.7
*1.2.9.2		29.2	30.6	28.6	31.4	42.0	38.7	41.8	37.8	44.0	35.6	0.0	0.0	359.7
**1.2.9		67.6	73.3	82.9	82.0	70.8	118.0	73.9	57.1	70.2	59.8	0.0	0.0	755.6
0G31950	Quality Assurance Coordination and Plann	20.9	16.7	20.2	20.8	22.2	27.7	22.6	25.9	39.4	17.8	0.0	0.0	234.2
1.2.11.1		20.9	16.7	20.2	20.8	22.2	27.7	22.6	25.9	39.4	17.8	0.0	0.0	234.2
*1.2.11.1		20.9	16.7	20.2	20.8	22.2	27.7	22.6	25.9	39.4	17.8	0.0	0.0	234.2
0G32950	Quality Assurance Program Development	49.6	46.9	48.5	52.7	35.7	33.6	30.0	41.2	37.2	40.3	0.0	0.0	415.7
1.2.11.2		49.6	46.9	48.5	52.7	35.7	33.6	30.0	41.2	37.2	40.3	0.0	0.0	415.7
*1.2.11.2		49.6	46.9	48.5	52.7	35.7	33.6	30.0	41.2	37.2	40.3	0.0	0.0	415.7
0G331950	Quality Assurance Verification - Audits	33.6	17.1	38.2	16.7	12.8	37.8	59.3	42.1	39.9	32.9	0.0	0.0	330.4
1.2.11.3.1		33.6	17.1	38.2	16.7	12.8	37.8	59.3	42.1	39.9	32.9	0.0	0.0	330.4
0G332950	Quality Assurance Verification - Surveil	8.8	30.1	26.5	16.7	23.2	20.3	11.0	26.4	12.2	19.4	0.0	0.0	194.6
1.2.11.3.2		8.8	30.1	26.5	16.7	23.2	20.3	11.0	26.4	12.2	19.4	0.0	0.0	194.6
*1.2.11.3		42.4	47.2	64.7	33.4	36.0	58.1	70.3	68.5	52.1	52.3	0.0	0.0	525.0
0G35950	Quality Assurance - Quality Engineering	2.2	8.7	21.0	23.1	31.2	63.7	26.1	59.2	39.3	24.1	0.0	0.0	298.6
1.2.11.5		2.2	8.7	21.0	23.1	31.2	63.7	26.1	59.2	39.3	24.1	0.0	0.0	298.6
*1.2.11.5		2.2	8.7	21.0	23.1	31.2	63.7	26.1	59.2	39.3	24.1	0.0	0.0	298.6
**1.2.11		115.1	119.5	154.4	130.0	125.1	183.1	149.0	194.8	168.0	134.5	0.0	0.0	1473.5
0GC2295B	Local Records Center Operation	24.5	24.5	21.2	26.3	20.0	22.7	20.2	54.9	24.2	19.2	0.0	0.0	257.7
1.2.12.2.2		24.5	24.5	21.2	26.3	20.0	22.7	20.2	54.9	24.2	19.2	0.0	0.0	257.7
0GC2395B	Participant Records Management	6.8	9.5	10.5	9.9	8.9	6.0	9.5	16.5	12.6	19.7	0.0	0.0	109.9
1.2.12.2.3		6.8	9.5	10.5	9.9	8.9	6.0	9.5	16.5	12.6	19.7	0.0	0.0	109.9
*1.2.12.2		31.3	34.0	31.7	36.2	28.9	28.7	29.7	71.4	36.8	38.9	0.0	0.0	367.6
**1.2.12		31.3	34.0	31.7	36.2	28.9	28.7	29.7	71.4	36.8	38.9	0.0	0.0	367.6
0GD2595B	Occupational Safety and Health	6.7	8.2	5.1	13.1	8.7	8.5	6.5	8.7	6.7	13.2	0.0	0.0	85.4
1.2.13.2.5		6.7	8.2	5.1	13.1	8.7	8.5	6.5	8.7	6.7	13.2	0.0	0.0	85.4
*1.2.13.2		6.7	8.2	5.1	13.1	8.7	8.5	6.5	8.7	6.7	13.2	0.0	0.0	85.4
0GD4795B	Regional Groundwater Quality Network	0.0	3.1	2.7	4.4	3.9	6.1	7.5	13.2	10.0	37.6	0.0	0.0	88.5
0GD4795H	Water Resources Monitoring	35.2	31.8	49.1	34.3	35.0	29.5	-7.0	80.1	34.0	35.8	0.0	0.0	357.8
1.2.13.4.7		35.2	34.9	51.8	38.7	38.9	35.6	0.5	93.3	44.0	73.4	0.0	0.0	446.3
*1.2.13.4		35.2	34.9	51.8	38.7	38.9	35.6	0.5	93.3	44.0	73.4	0.0	0.0	446.3
**1.2.13		41.9	43.1	56.9	51.8	47.6	44.1	7.0	102.0	50.7	86.6	0.0	0.0	531.7
0GF2395B1	Administrative Support	27.1	36.2	45.2	42.2	36.2	56.5	42.8	44.4	45.0	39.6	0.0	0.0	415.2
0GF2395B2	Space and Facilities	100.6	84.0	117.2	230.8	153.5	95.4	118.5	45.1	68.1	24.9	0.0	0.0	1038.1
0GF2395B3		0.0	9.9	5.9	9.5	6.4	7.5	5.8	12.3	7.6	6.2	0.0	0.0	71.1
1.2.15.2.3		127.7	130.1	168.3	282.5	196.1	159.4	167.1	101.8	120.7	70.7	0.0	0.0	1524.4
*1.2.15.2		127.7	130.1	168.3	282.5	196.1	159.4	167.1	101.8	120.7	70.7	0.0	0.0	1524.4

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/94 - 07/31/95

	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
CGF395B YMP Support of the Training Mission	10.2	17.7	16.3	16.9	16.8	18.9	19.1	20.0	25.1	21.6	0.0	0.0	182.6
1.2.15.3	10.2	17.7	16.3	16.9	16.8	18.9	19.1	20.0	25.1	21.6	0.0	0.0	182.6
*1.2.15.3	10.2	17.7	16.3	16.9	16.8	18.9	19.1	20.0	25.1	21.6	0.0	0.0	182.6
**1.2.15	137.9	147.8	184.6	299.4	212.9	178.3	186.2	121.8	145.8	92.3	0.0	0.0	1707.0
1.2 OPERATING	1753.9	1997.0	2090.5	2263.2	2709.5	2919.7	2552.7	2891.2	2739.6	2516.4	0.0	0.0	24433.7
CAPITAL EQUIPMENT	0.0	0.0	0.0	0.0	39.2	11.9	20.8	59.9	44.8	18.7	0.0	0.0	195.3
GRAND TOTAL	1753.9	1997.0	2090.5	2263.2	2748.7	2931.6	2573.5	2951.1	2784.4	2535.1	0.0	0.0	24629.0
FTEs													
FEDERAL	104.9	112.4	103.7	161.4	143.4	169.8	159.0	171.2	183.9	184.1	0.0	0.0	
CONTRACT	80.4	83.7	86.8	97.2	117.6	135.4	128.2	127.0	131.0	127.9	0.0	0.0	
TOTAL	185.3	196.1	190.5	258.6	261.0	305.2	287.2	298.2	314.9	312.0	0.0	0.0	

* Fourth level WBS roll-up
** Third level WBS roll-up