U.S. DEPARTMENT OF ENERGY

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Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT

MONTHLY REPORT

APRIL 1986

UNITED STATES DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE

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PDR WASTE
WM-11 PDR

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT

MONTHLY REPORT

APRIL 1986

Prepared by Nevada Nuclear Waste Storage Investigations (NNWSI) Project participants as part of the Civilian Radioactive Waste Management Program. The NNWSI Project is managed by the Waste Management Project Office of the U.S. Department of Energy (DOE), Nevada Operations Office. NNWSI Project work is sponsored by the Office of Geologic Repositories of the DOE Office of Civilian Radioactive Waste Management.

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE

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ABSTRACT

Key Activities

WBS 1.2.1 SYSTEMS

Decisions on pooling of saturation data from core samples concern the type of tests that can be used to pool samples on a drillhole-unit basis and on a unit basis. Two hydrologic analysis reports, "Hydrologic Calculations Concerning Activities in the Exploratory Shaft," and "One-Dimensional Hydrologic Calculations Concerning Groundwater Travel Time from the Repository as a Result of Water Redistriction Caused by Repository Heating," were completed. Two papers were published: "The Effects of Percolation Rate on Travel Time in Deep, Partially Saturated Zones" and "Fluid Flow in a Fractured Rock Mass."

WBS 1.2.2 WASTE PACKAGE

Designated criteria will guide development of a load limit envelope for loading conditions anticipated during normal handling and emplacement operations at the repository. Two contractor reports are ready for publication: "Reaction of Topopah Spring Tuff, J-13 Water, and Glass in a Gamma Radiation Field" and "Geochemical Gradients in the Topopah Spring Member of the Paintbrush Tuff: Evidence for Eruption Across a Magmatic Interface."

WBS 1.2.3 SITE INVESTIGATIONS

The stop-work order at USGS remained in effect and almost all site-characterization technical activities were suspended. The subcontractor completed the final version of the probable maximum flood study. The magnetotelluric field work network consists of 50 stations, 30 of which are in the southern Nevada region. An open-file report gives geophysical log data from 15 drill holes at Yucca Mountain. Sorption experiments on strontium, cessium, barium, and europium with spiked Well J-13 groundwater are complete.

WBS 1.2.4 REPOSITORY INVESTIGATIONS

Investigations will proceed to determine recommendations for remote systems for cask-receiving operations. A task definition memo initiates the development of interface control drawings to define physical repository interfaces between Project design organizations. Another problem definition memo describes the "Analysis of In Situ Stress at Yucca Mountain using a Compliant-Joint Model." The model for the horizontal emplacement system is complete. Contractor work will begin on five special studies: repository option, repository operations plan development, site-generated waste, design margins philosophy development, and a consolidation study case. Further definition of the requirements for the fuel consolidation study will consider four cases: Authorized System, Consolidated Fuel; Authorized System, Intact Fuel; Improved Performance System, Consolidated Fuel; and Improved Performance System, Intact Fuel. The paper "A Two-Dimensional Continuum Model for Jointed Media with Orthogonal Sets of Joints" was submitted to the 27th U.S. Rock Mechanics Symposium.

WBS 1.2.5 REGULATORY AND INSTITUTIONAL INVESTIGATIONS

Four performance allocation workshops were held in April. The environmental assessment reference "Technical Correspondence in Support of the Final Environmental Assessment" was published. The final camera-ready NNWSI Project Environmental Assessment was delivered to DOE/HQ on April 10.

WBS 1.2.6 EXPLORATORY SHAFT INVESTIGATIONS

The integrated data system was redefined to incorporate satellite system concepts. Subcontractor work in support of hydrologic testing will include writing prototype test activity plans and procedures, activity plans for the exploratory shaft, procedures specific to the exploratory shaft activity plan, and rewriting of the Calico Hills test plan. Prototype work to be performed in G-Tunnel in support of the exploratory shaft diffusion test will use holes drilled vertically in two tuffs.

WBS 1.2.7 TEST FACILITIES

A consolidated procedure includes directions for receiving, loading, and releasing a cask for shipment from E-MAD to Idaho Falls.

WBS 1.2.9 PROGRAM MANAGEMENT

The Revelation System now contains 1,930 Spent Fuel Test records. Project participants are revising program plans and QA procedures. Several agreements were reached at a meeting with representatives of the Office of Geologic Repositories. The approved Project Plan was published.

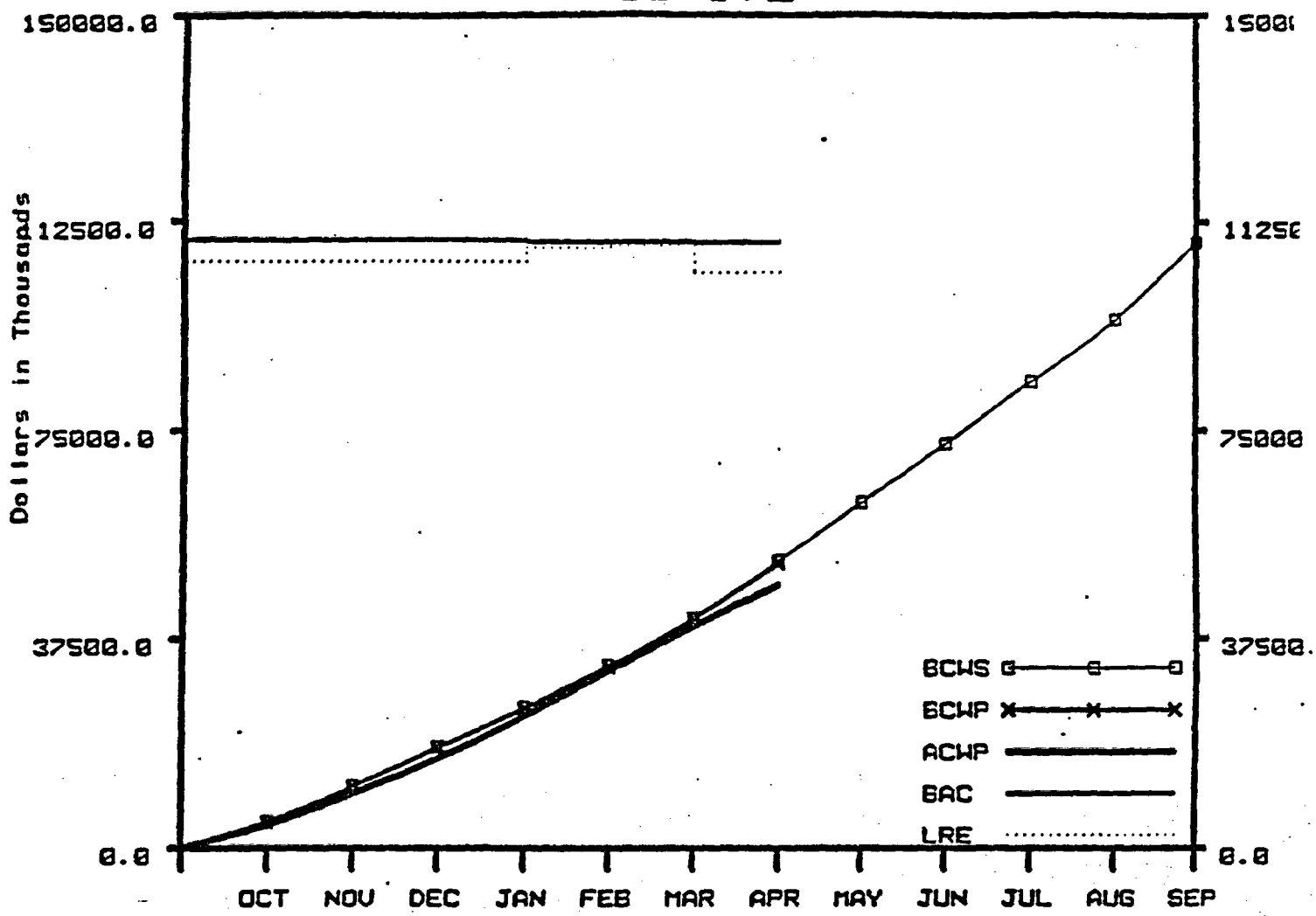
Funding Overview

The month-end estimated costs were $7,458,790 against a plan of $10,347,807 resulting in a cost underrun of $2,889,017.

The following are the year-to-date plans, costs, and variances:

		Plan	Cost ($000)	Variance	% Variance
1.2.1	Systems	$ 3,566	$ 3,256	$ 310	9
1.2.2	Waste Package	3,760	3,495	265	7
1.2.3	Site	15,677	14,456	1,221	8
1.2.4	Repository Investigations	6,341	5,815	526	8
1.2.5	Regulatory and Institutional Investigations	5,648	5,034	614	11
1.2.6	Exploratory Shaft Investigations	5,999	5,647	352	6
1.2.7	Test Facilities	617	617	0	0
1.2.9	Project Management	9,520	8,884	636	7
1.2	NNWSI Project	$ 51,128	$ 47,204	$ 3,924	8%

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2



NNWSI - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	10347.8	51488.5
B. BUDGETED COST OF WORK PERFORMED (BCWP)	10075.4	51127.8
C. ACTUAL COST OF WORK PERFORMED (ACWP)	7458.8	47204.4
D. BUDGET AT COMPLETION (BAC)		108745.0
E. LATEST REVISED ESTIMATE (LRE)		100382.5

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-360.7	-0.70
G. COST VARIANCE (B-C)	3923.4	7.67
H. AT COMPLETION VARIANCE (D-E)	8362.5	7.69

Remarks:

Cost and schedule variances within acceptable thresholds.

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NNWSI BUDGET BASELINE

APRIL 1986

CONTRACTORS	($000) FY 86 FUNDING	($000) REVISED ESTIMATE	($000) CHANGE
SNL	$25,309	$24,084	(1,225)
LLNL	12,620	12,480	(140)
Los Alamos	13,465	13,149	(316)
USGS	16,645	19,392	2,747
SAIC	14,891	17,524	2,633
REECo	17,476	10,113	(7,363)
H&N	1,153	2,298	1,145
F&S	3,014	2,860	(154)
WSI	221	208	(13)
PAN AM	52	49	(3)
State grant	2,600	4,650	2,050
DRI	160	160	--
EG&G	80	82	2
LBL	400	761	361
NTS allocation	1,314	935	(379)
SUBTOTAL	$109,400	$108,745*	(655)
CAPITAL EQUIPMENT	5,400	6,800**	1,400
TOTAL	114,800	115,545	745

* Revised estimate is the New Baseline Budget.
** $160 reduction not shown awaiting justification for alignment with April FIN Plan.

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PROJECT STATUS

1.2.1 SYSTEMS

OBJECTIVE

The objective of this task is to apply the concept of systems to the development and design of the repository, both the surface and subsurface facilities, and to the evaluation of the effectiveness of the geologic and hydrologic environment in isolating radionuclides.

ACTIVITIES

WBS 1.2.1.1 SYSTEMS MANAGEMENT AND INTEGRATION

NNWSI Project representatives participated in Site Characterization Plan workshops in Denver, Colorado; Los Alamos and Albuquerque, New Mexico; and Livermore, California. These workshops focused on performance allocation and its incorporation into the process for resolving issues.

WBS 1.2.1.2 SYSTEMS ENGINEERING

WBS 1.2.1.2.1 System Description

The systems requirements document remains in policy review at the Waste Management Project Office (WMPO). Sandia National Laboratories (SNL) staff members completed the matrix correlation of requirements in this document with issues in the NNWSI Project Issue Hierarchy. It is available for individuals responsible for resolving specific issues.

The system-component hierarchy, annotated outline, and an example section of the system description document (shafts and ramps) received management review at SNL. Several changes were made in the component hierarchy as a result of the review.

WBS 1.2.1.2.3 Cost Schedule

At SNL the absence of cost guidelines will probably delay completion of Milestone R058, the cost estimate for the Repository Conceptual Design in Support of Site Characterization (RCD/SC). The cost estimate for the surface facilities has been updated but will require additional updating when the final cost guidelines are issued. The extent of this effort could be significant. The cost estimate for the underground facilities will not be undertaken until the cost guidelines are finalized.

The second iteration of the cost guidelines for the fuel-rod-consolidation study was issued by the DOE and R. F. Weston, Inc. SNL personnel will participate in a meeting to resolve guideline issues and concerns about the need to include a procedures table that will result in about 900 pages of input.

The cost guideline schedule for the fuel-rod-consolidation study is divided into three 1-month segments with a deliverable due at the end of each segment. The schedule starts when the final cost guidelines are issued (probably at the end of May 1986). The first deliverable is the base case, which is the cost

estimate for the repository conceptual design. The second is the difference between the base case and the three consolidation alternatives. The third and final deliverable is the fuel-rod-consolidation report.

The two-stage repository report was revised at SNL to clarify some cost and staffing methodology.

WBS 1.2.1.2.4 Systems Engineering Integration

SNL personnel completed the first draft of the NNWSI Project Systems Engineering Management Plan (SEMP). The Plan was distributed to contributing authors for review and comment.

Staff members from the WMPO, Science Applications International Corporation (SAIC), and SNL met to discuss the relationship between the SEMP and the NNWSI Project Configuration Management Plan.

SAIC staff members issued the Interim Design Interface Control Procedure for the Exploratory Shaft Facility for comments on April 18, 1986. In addition to incorporating comments from many reviewers, the procedure was renumbered from NNWSI SOP-03-05 to Administrative Procedure AP-5.2.

At the request of the WMPO, SAIC staff members finalized the review and comments of the Draft Yucca Mountain Mined Geologic Disposal System (MGDS) requirements (SAND84-1882) and the Draft Subsystem Design Requirements for the Advanced Conceptual Design of the Yucca Mountain Mined Geologic Disposal System (SAND85-0260).

SAIC staff members reviewed the U.S. Nuclear Regulatory Commission Generic Technical Position, Borehole and Shaft Sealing of High-Level Nuclear Waste Repositories.

A Performance Allocation Workshop at Sandia Laboratories in Albuquerque focused on establishing parameters and ranges for site characterization activities and reviewed draft input for repository design requirements.

The Principal Investigators (PIs) are reviewing the draft of the Subsystem Design Requirements (SDR) for the ESF. In addition the PIs are submitting new criteria letters for the SDR.

WBS 1.2.1.2.5 Configuration Management and Change Control

A draft Configuration Management Plan was distributed for internal SAIC review during April. Comments should be received and incorporated in time to permit delivery to the WMPO during May.

A T&MSS procedure for the "Issuance and Maintenance of Controlled Documents" was approved by the T&MSS Project Manager and distributed during April. The procedure covers both T&MSS and WMPO controlled-document distributions.

A draft of a modification to the NNWSI Project Administrative Procedure AP-3.3, Change Control Process, is being prepared by Configuration Management Branch

(CMB) staff. This procedure will update the current AP-3.3 to implement aspects of change control as described in the Configuration Management Plan. A completed draft should be ready in early June 1986.

During April SAIC personnel distributed the T&MSS Administrative Procedure AP-1.22, Issuance and Maintenance of Controlled Documents, Revision 0, which covers both T&MSS and WMPO documents.

The Change Control Board (CCB) approved changes to the SCP baseline milestones so as to reflect a planned December 1986 release to the public. An updated listing of all baselined milestones will be distributed to NNWSI Project participants during May 1986.

The CCB approved the Project baseline for FY 86 at the April CCB meeting. Changes reflecting several minor modifications have been received and will be presented at the May CCB meeting.

A second draft of the proposed organization of the Baseline Policy, Program, and Project Guidance document will be forwarded to the WMPO for review during May 1986.

WBS 1.2.1.3 TECHNICAL DATA BASE MANAGEMENT

WBS 1.2.1.3.1 Tuff Data Base

At SNL staff members completed the first draft of a proposed standard operating procedure (SOP) for the authorization of release of test data for input into the technical data base. The procedure proposes that each principal participant institute a test-plan tracking system similiar to the SNL Data Records Management System (DRMS). The DRMS can then be used as the primary source of information for the technical data base. Advantages of this procedure include timely data acquisition, elimination of redundant data, and a built-in tracking system for correction of errors.

At SNL the staff members performing the systems analysis of the tuff data base have emphasized performance allocation in the requirements phase and have begun research into possible hardware and software for the design phase.

New and updated exploratory borehole information was received at SNL from Holmes & Narver and has been prepared for input into the tuff data base.

SNL staff members are working on a prototype for assigning QA levels to WBS tasks; the work plans will be used as a mechanism for doing this since QA should be an integral part of any given activity.

WBS 1.2.1.3.2 Computer Graphics

Personnel at SNL completed a detailed, isometric, cutaway view of Yucca Mountain, showing the physical position of the repository within the strata.

WBS 1.2.1.3.3 Reference Information Base

SNL data-base staff members completed the revision of the draft version of the NNWSI Project reference information base. This draft satisfies Milestone R081 and was sent to the WMPO.

WBS 1.2.1.4 TOTAL SYSTEMS PERFORMANCE ASSESSMENT

WBS 1.2.1.4.1 Flow and Radionuclide Transport

SNL personnel completed line reviews and revisions of the report entitled "Preliminary Estimates of Groundwater Travel Time and Radionuclide Transport at Yucca Mountain Repository Site" (SAND85-2701). This report, which supports the completion of Milestone R082, presents the assumptions, methods, and data used in a probabilistic approach to the calculation of ground-water travel times and total radionuclide release into the water table. The studies provide some of the information required in support of the NNWSI Project environmental assessment.

Incorporation of technical review comments by SNL was completed on a report from Lawrence Berkeley Laboratory entitled "Hydrologic Mechanisms Governing Partially Saturated Fluid Flow in Fractured Welded Units and Porous Nonwelded Units at Yucca Mountain" (SAND85-7114). This report, which will satisfy Milestone N117, uses a discrete-fracture porous-matrix model and composite-medium model to study the hydrological responses to cycles of pulse infiltration. This report will be ready for delivery to WMPO in May 1986.

At SNL a preliminary study investigated the effects of ventilation on saturation near a canister by using the finite-element program SAGUARO, which solves transient problems of single-phase water and energy transport through saturated and unsaturated porous media. The isothermal study of this ventilation process included one-dimensional comparison of the various cycling times and two-dimensional simulation of a prolonged ventilation and subsequent recovery period.

WBS 1.2.1.4.2 Radionuclide Source Term

RE/SPEC, Inc., staff members completed a draft letter report on the thermomechanical analyses that are determining the effects of heat and excavation on the fractures surrounding horizontal emplacement boreholes.

WBS 1.2.1.4.4 Radionuclide Releases from Total System

The SNL papers entitled "The Effects of Percolation Rate on Water Travel Time in Deep, Partially Saturated Zones" (SAND85-0854), and "Fluid Flow in a Fractured Rock Mass" (SAND85-0855), have been published.

The SNL document entitled "Estimation of Hydraulic Properties for an Unsaturated, Fractured Rock Mass" (SAND84-2642) has completed line review and is being prepared for printing.

SNL statisticians have nearly completed work that can be used to decide what saturation data from core samples can be pooled on a sample basis. It appears that most of the subsample data can be combined on a sample basis. Decisions have been made concerning the type of tests that can be used to pool samples on a drillhole-unit basis and on a unit basis.

SNL staff members presented another version of a performance allocation for system elements in the NNWSI Project Issues Hierarchy Performance Issue 1.16 (recently changed to Issues 1.1 through 1.3) on April 17, 1986. A final presentation on performance allocation for this issue will be made on May 6, 1986.

At SNL the first half of Volume 1 of the TOSPAC series (the hydrology module) has been reviewed by task participants and is being revised by the SNL authors. The second half of Volume 1 (the transport module) is in various stages of completion: the transport theoretical section has been reviewed by its authors and will go into final revision in May 1986; the transport example section is nearly ready for a first review; and the introductory section is still in draft stages.

The study of the coupling terms between the matrix- and fracture-transport equations continues at SNL. No definitive resolution of the ongoing problems has been achieved. The anticipated difficulties with solute transfer when the flow in fractures is large are now a confirmed reality; the TRANS module tracks the solute transport satisfactorily but with an annoyingly small time step.

The NNWSI Project Hydrologic Analysis No. 8, a letter report entitled "Hydrologic Calculations Concerning Activities in the Exploratory Shaft," is complete as reported in a memo dated April 14, 1986.

The NNWSI Project Hydrologic Analysis No. 9, "One-Dimensional Hydrologic Calculations Concerning Groundwater Travel Time from the Repository as a Result of Water Redistribution Caused by Repository Heating," was completed on schedule at SNL. This work was done in connection with the definition of the "disturbed zone" required in the resolution of NNWSI Project Performance Issue 1.12 (now called Issue 1.7); modifications to the DYNAMICS module of the TOSPAC added the capability of determining the travel time of one or more particles of water added at arbitrary points in the mesh at arbitrary times. Results of this work will be presented in a forthcoming letter report.

PLANNED WORK

SCP issue-resolution workshops will be completed in early May 1986. Performance assessment staff at SNL will participate in writing the parts of SCP Chapter 8 dealing with the resolution of the issues in the NNWSI Project Issues Hierarchy. The identification of system studies will be a result of the SCP issue-resolution process. Further system studies will be identified as the scope of activities associated with advanced conceptual design studies is defined.

At SNL work on the systems description document will continue with development of an example section to describe a natural system component and further development of descriptions for the engineered systems.

Work on the System Studies Register will begin at SNL as the NNWSI Project Systems Engineering Management Plan is completed and implemented.

Meetings will be held to define the relationships among the documents that make up the NNWSI Project technical and management baselines. The Project Management Plan, the SEMP, and the Configuration Management Plan must be consistent in their treatment of the content and control of documents in the NNWSI Project baseline. Following these discussions, the SEMP will be revised at SNL, based on author and WMPO comments, and submitted for Project-wide review and baselining.

In May 1986, SNL staff members plan to finish the graphics and written part of the TOSPAC Volume 1 transport section and submit it for review.

PROBLEM AREAS

Baselining the RCD/SC and hence the cost estimate report (SNL Milestone R058) is not possible without cost guidelines. The delayed cost guidelines may delay the completion of the RCD/SC Cost Estimate Report.

MILESTONE PROGRESS

CCB action is in progress to add the SNL Milestone P126, the System Studies Register.

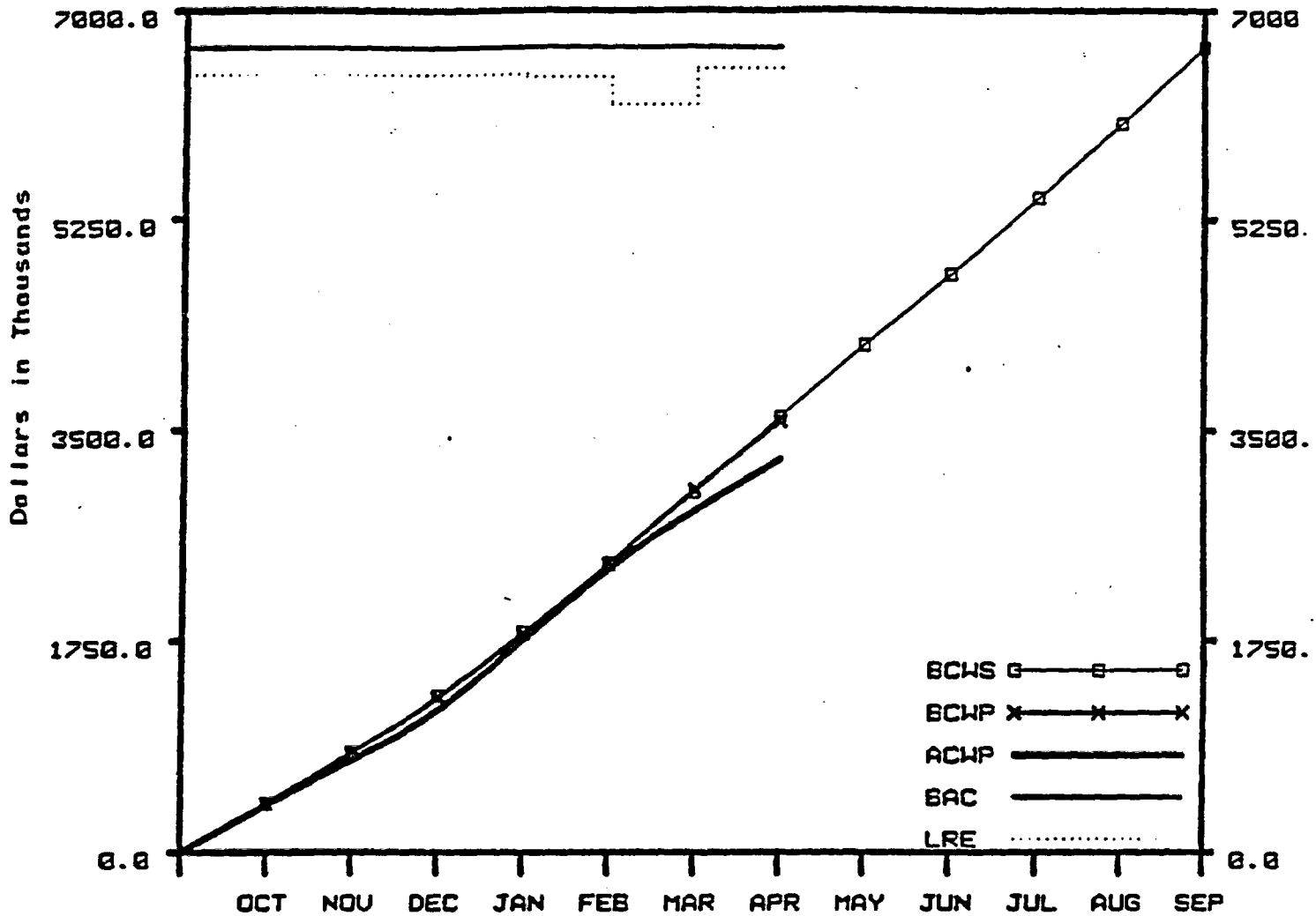
The SNL Milestones M108, the Systems Engineering Mangement Plan (SEMP), and R074, Systems Engineering Review of the NNWSI Project, are delayed. The estimated completion date for M108 is July 1986 and for R074, September 1986.

SNL Milestones N117, updated concepts of flow in fractured, unsaturated tuff, and R082, alternative approach in calculating ground-water travel times and radionuclide releases for the revised EA, are both delayed. Both milestones are in line review.

The NNWSI Project position paper describing the boundaries of the engineered barrier system and the disturbed-zone (SNL Milestone M107) is being revised; the new due date is June 30, 1986.

Change Control Board action will change the due date for SNL Milestone M128, documentation of the TOSPAC Volume 2: User's Manual and Sample, to July 31, 1987.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.1



SYSTEMS	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	619.7	3605.4
B. BUDGETED COST OF WORK PERFORMED (BCWP)	557.9	3566.1
C. ACTUAL COST OF WORK PERFORMED (ACWP)	420.4	3254.7
D. BUDGET AT COMPLETION (BAC)		6688.0
E. LATEST REVISED ESTIMATE (LRE)		6082.3

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-39.3	-1.09
G. COST VARIANCE (B-C)	311.3	8.73
H. AT COMPLETION VARIANCE (D-E)	605.7	9.06

Remarks:

Cost and schedule variances within acceptable thresholds.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986 Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE				
		BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST
1211	Systems Management and Integration	100.000	100.020	72.000	.020	28.020
1212	Systems Engineering	1,240.360	1,240.708	1,056.748	.348	183.960
1213	Technical Data Base Management	641.000	601.284	548.000	-39.716	53.284
1214	Total Systems Performance Assessment	1,624.000	1,624.081	1,578.000	.081	46.081
121	SYSTEMS	3,605.360	3,566.094	3,254.748	-39.266	311.346

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION		O	N	D	J	F	M	A	M	J	J	A	S
M277	SNL	1.2.1.1	Annual PASS Program Interaction - (Letter Report)	△ 9/85	◆											
M870	SNL	1.2.1.1	Annual PASS Program Interaction - (Letter Report)													△
M120	SNL	1.2.1.2	Yucca Mountain Mined Geologic Disposal System (MGSD) Requirements	△ 7/85								◇				
M108	SNL	1.2.1.2	Systems Engineering Management Plan (SEMP)	△ 8/85									◇			
M261	SNL	1.2.1.2	Draft Yucca Mountain Site - Specific Mined Geologic Disposal System (MGDS) Description											◇		△

△ PLANNED MILESTONE COMPLETION DATE ◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED ◆ COMPLETED AS REVISED

1.2.2 WASTE PACKAGE

OBJECTIVE

The primary objective of this task is to develop a technical basis and engineering capability to design, test, and fabricate a waste package that is compatible with the hydrological conditions and geochemical environment in the unsaturated zone beneath Yucca Mountain.

ACTIVITIES

WBS 1.2.2.2 PACKAGE ENVIRONMENT

At LLNL the rerun of the failed experiment with zeolitized tuff from UE25a#1 will not begin until May. The gold bag reaction cell for this experiment has been cleaned and the high pressure vessel is prepared for the run. The new furnace temperature controller (replacing the failed unit) was tested for two weeks and found to be stable. A through-system (thermocouple to datalogger) recalibration was made and the system is ready to be used.

The electron microprobe at LLNL is out of oepration due to a bad detector in one of the spectrometers. This is the only spectrometer with a flowing gas detector. The system is likely to be out of commission for a week or more. Coupled with the loss of technician support in this effort, the rate of progress in solid phase analyses has slowed somewhat.

LLNL personnel completed the jacketing of a fractured Topopah Spring tuff sample for the temperature gradient experiment. This sample will be ready for pressure testing (to check the seal) next month. The experiments on dehydration and rehydration will be started following successful pressure testing.

WBS 1.2.2.3 WASTE FORM AND MATERIALS TESTING

Staff members at LLNL wrote the instructions for the termination of Series 2, Cycle 3, bare fuel leaching and dissolution test; the instructions were approved. Cycle 3 was terminated and Cycle 4 started on April 7, 1986. Cycle 3 had run for 224 days when terminated.

The series 3, Cycle 1, spent fuel leaching and dissolution test is continuing at LLNL. This series is designed to evaluate the effect of elevated temperatures on the dissolution rate of spent fuel. Four solution samples covering the first 33 days of this test have been taken and analyzed for U concentration.

LLNL personnel are testing two additional specimens under dry conditions at 90 °C; the previous tests were carried out in J-13 water. This experiment will test if there is a change in the behavior of irradiated zircaloy cladding when it is stressed under dry conditions. If the mechanism of failure in the "wet" experiments was stress corrosion cracking, then the failure behavior of the "dry" specimens should be different from that observed in the previous run.

The water chemistry in future experiments will be controlled by periodic addition of fresh J-13 water and measures to reduce evaporative loss from the bath.

Four additional specimens of Turkey Point cladding were evaluated at LLNL for carbon-14; two were etched on the outer surface for 1 minute and two were etched for 10 minutes.

Staff members at LLNL have fabricated a prototype cladding pressurization jig. Testing of the jig will be carried out next month.

The thermogravimeteric analysis (TGA) test at 175 °C was terminated during the first week of April after 2,101 hours. As a check on that data, the next run will duplicate the 200 °C run.

The TGA procedures were revised to allow routine sampling of the cover gas for kryton-85 and xenon. These revisions have been reviewed and approved by LLNL. A trial sample of the cover gas was taken from the last run.

The sample preparation procedure for the dry-bath oxidation tests has been reviewed and approved by LLNL. The test plan for this work is being reviewed at NV.

LLNL personnel have completed collection of standard infrared spectra of synthetic phases in the system Ca-Si-H_2O. These phases are typically poorly crystalline when they precipitate on nuclear waste glass. Infrared spectroscopy will be used to identify and characterize them. The standard materials will also be used for Raman and Raman-microprobe analysis.

WBS 1.2.2.3.2 Metal Barrier Testing

Work has resumed at Pacific Northwest Laboratory (PNL) following cancellation of the stop-work order. The PNL QA Plan is being aligned with the LLNL plan, and no significant problems are expected in the alignment. PNL has already written detailed procedures for their stress corrosion testing activities, and these are being forwarded to LLNL for review and concurrence.

The two-month copper-Zircaloy interaction has been completed and examination and analysis are underway. The purpose of this experiment is to determine what interactions might occur between a breached copper container and spent fuel cladding if liquid water were present and considerable nitrate formation had occurred by radiolysis of air and water. Conditions are more severe than are expected in a tuff repository. Another exposure using J-13 water is still underway.

The draft report interpreting the radiation-chemical behavior observed in the Bates et al. (Argonne National Laboratory) experiments has been approved by the NNWSI Project. Final publication is awaiting the results of an irradiation of a vessel intentionally containing Trimsol, which is the chlorinated oil emulsion cutting fluid used in fabricating the vessels. Residual Trimsol is suspected of being the source of the chloride found in a small number of the vessels after the irradiation, since neither the bulk stainless steel, the silicone rubber O-rings, or the original water were found to contain significant amounts of chlorine.

The draft report on "Corrosion Testing of Type 304L Stainless Steel in Tuff Groundwater Environments," by PNL, has been reviewed by LLNL personnel.

Staff members at LLNL have started experiment 49 to measure stress intensity. Three samples each of type 304S (high sulfur) and 304 have been placed in a 90 °C bath. All specimens have been sensitized at 650 °C for 6 hours. These specimens will be removed after 500 hours for the next fatigue cycle and then returned to the bath.

During the last month, SRI International continued with a sensitivity study of the different constants where poor information is available in the literature. A meeting with LLNL staff to discuss the results of the various models to date has been set for May 2 at LLNL.

The vessels needed for doing long-term impressed potential tests on U-bend specimens have arrived at LLNL. Such tests will be used to simulate a radiation environment. The specimens to be examined include CDA 102, CDA 613, CDA 715, and Type 304 (sensitized), Type 304L, and Type 316L. The U-bends and temperature controllers are on order and testing will likely begin next month.

Work at HEDL on copper alloy corrosion under gamma irradiation is on schedule and some of the 6-month specimens have been pulled for examination to meet a June 1 reporting date. The electrochemical "pre-flawed" specimens of the copper materials that were sent to HEDL for radiation-corrosion testing will also be examined during May following a one-month exposure.

The Metal Barriers Strategy Document is expected to be available for final review at LLNL in May.

WBS 1.2.2.3.4 Integrated Testing

A rewrite at LLNL of the ion microscope data acquisition software for depth profiles allows for the simultaneous acquisition of 50 mass numbers in a single run. This will allow monitoring of all significant rock components and radionuclides in the tuff disc used in waste form tests. Real-time monitoring of up to ten mass numbers on the visual display can now be provided as well as disc-file storage for the remaining data and operating parameters. Automatic data reduction and plotting programs are in progress.

WBS 1.2.2.4 DESIGN, FABRICATE, AND PROTOTYPE TESTING

Representatives from SNL, Bechtel, WMPO, and SAIC were present at a Waste Package Design Interface meeting at LLNL on April 16. They discussed criteria for a container accept-reject envelope to be developed for loading conditions anticipated during normal handling and emplacement operations at the repository.

The following information was provided by LLNL as a basis for development of a load limit envelope:

> Integrity of the container for postclosure containment must not be compromised by repository preclosure operations. For load limits, all plastic flow in the container (i.e., scratches, dents, and digs), will be avoided. The load limit envelope will account for load magnitude as well

as the distribution of the load application; i.e., no point loads allowed. All handling fixture material that directly interfaces with the container wall must be "softer" than the container material. Consequently, work is being planned to define the size and geometry of objectionable surface flows and to define noncontact remote inspection techniques for certification of acceptable containers.

Three BWIP documents pertaining to the structural design of waste package containers and possible adoption of a national design code to all OCRWM projects were reviewed at LLNL and comments were prepared.

Final detailed revisions are underway on two Requests for Proposals involving container fabrication and closure development activities. These proposals will encompass the identification of a method for fabricating the cylindrical nuclear waste disposal containers and the identification of a joining method for their closure. These activities will be underway in parallel with results from other activities relating to container design, fabrication, and inspection.

The NDE development activity to determine the feasibility of ultrasonics as a final closure weld certification technique is underway using the Ultrasonic Test Bed. Convolution-deconvolution filtering of ultrasonic results from stainless steel welds has improved signal-to-noise ratio and resolution. Ultrasonic diffraction experiments on artificial cracks were also started to improved the detection of false signals from the weld metal.

WBS 1.2.2.5 PERFORMANCE ASSESSMENT

Staff members at LLNL began internal review of the revised draft of NNWSI Project Waste Package System Model (M276) report. The review should be complete in May.

Two UNIX-based workstations were ordered to provide the computing environment for controlled system and uncertainty model development. This system will allow the performance assessment staff to access other LLNL Earth Sciences resources already connected to an existing Ethernet network. These systems also allow implementation of software design and configuration management programs to be integrated into a software QA plan for performance assessment.

PLANNED WORK

The LLNL report on the functions of packing material in the unsaturated zone will be revised. It will include documentation of the recommendation to eliminate packing material from further consideration for the NNWSI Project design.

Tuff wafer samples from the gamma radiation tests of glass waste forms are being prepared at LLNL for a production run of depth profiling in May.

At LLNL plans have been completed for the synthesis of uranophane using a recently described technique. This work will begin in the near future.

PROBLEM AREAS

The test vessel used in the Series 3, Cycle 1, 85 °C bare fuel dissolution and leaching test was found to have a leak in the vessel cap. The cap assembly was replaced and no further evaporative loss has been noted. The leaky cap is being decontaminated so that the cause of the leak can be determined.

The ion microprobe at HEDL used for measurements on oxidized spent fuel was damaged in a flood and is under repair. Due to the age of the equipment, it will be several weeks before it is known if the instrument will be operable.

Testing of West Valley glass will be delayed at least until July because of delays in receipt of the glass from the Materials Characterization Center (MCC). LLNL received notification from the MCC that their projected completion of fabrication is the end of June; no schedule for the MCC's characterization of the glass has been established.

An internal QA audit in April indicated the need for detailed documentation of several activities in the metal barriers subtask. The possibility of having to retrofit much of the previously obtained experimental data may require additional personnel to carry out this work over the next three months or reassignment of duties of current personnel.

Input is needed from WBS 1.2.4.2.3.S on proposed grout and seal materials before this subtask can proceed.

New staff members will need to be identified in order to accomplish the planned activities.

MILESTONE PROGRESS

The LLNL report on the reaction of Topopah Spring tuff, J-13 water, and glass in a gamma radiation field (Milestone W210) was accepted for publication by the WMPO on April 7.

WMPO accepted LLNL Milestone W209, Geochemical Gradients in the Topopah Spring Member of the Paintbrush Tuff: Evidence for Eruption Across a Magmatic Interface, for publication on April 17.

The Reference Waste Package Environment Report (Milestone M254) was completed by LLNL personnel and sent to the WMPO on April 14.

A separate LLNL report (Milestone M255) on the release of radionuclides from glass is undergoing internal review. It is anticipated that the report will be submitted to the WMPO by May 30.

The LLNL preliminary report on testing of Actinide Doped PNL 76-68 Glass in J-13 Water using Tuff Reaction Vessels (Milestone W220) is undergoing minor revisions following internal review. Delivery to the WMPO is anticipated by May 30.

The final report on the PNL subcontract work, which will be part of the LLNL M-236 milestone, has been received. This milestone has been delayed due to higher priority efforts on the Site Characterization Plan, performance allocation work, and the Strategy Document for the Metal Barriers subtask. The milestone report is approximately 25 percent complete and will be submitted by July 31.

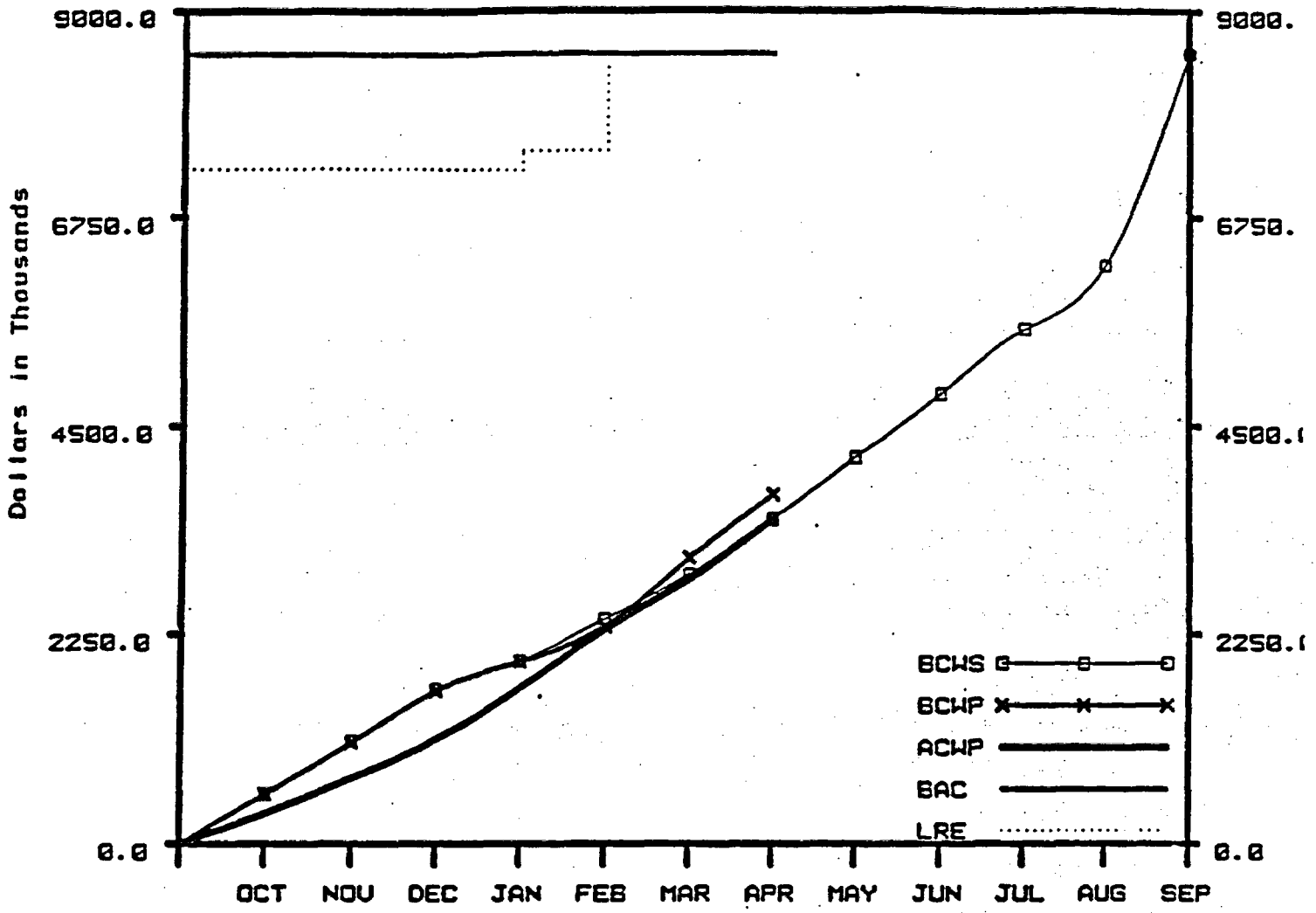
LLNL FY 86 milestones for the other materials subtask are complete.

LLNL milestones for the Design, Fabricate, and Prototype Testing subtask are not on schedule. The OGR schedule for development of programwide guidance on Advanced Conceptual Design (ACD) phase activities is not yet determined and will impact the formal initiation of the ACD. DOE/HQ has indicated that the Level I milestones are to be rescheduled following resolution of the guidance.

The second draft of the NNWSI Project Waste Package System Model description report (Milestone M276) is in internal review.

A new staff member has resumed work on the LLNL report on the development of the unsaturated flow/transport submodel for the performance assessment system model (LLNL Milestone W249).

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.2



WASTE PACKAGE	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	595.9	3502.3
B. BUDGETED COST OF WORK PERFORMED (BCWP)	678.9	3760.4
C. ACTUAL COST OF WORK PERFORMED (ACWP)	641.5	3495.7
D. BUDGET AT COMPLETION (BAC)		8529.8
E. LATEST REVISED ESTIMATE (LRE)		8202.2

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	258.1	7.37
G. COST VARIANCE (B-C)	264.7	7.04
H. AT COMPLETION VARIANCE (D-E)	327.6	3.84

Remarks:

Cost and schedule variances within acceptable thresholds.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986 Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE				
		BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST
1221	Management and Integration	186.300	186.275	190.800	-.025	-4.525
1222	Package Environment	424.000	514.170	561.900	90.170	-47.730
1223	Waste Form & Materials Testing	2,430.000	2,578.172	2,284.500	148.172	293.672
1224	Design, Fabricate, and Prototype Testing	198.000	217.829	232.200	19.829	-14.371
1225	Performance Assessment	264.000	264.000	226.300	.000	37.700
122	WASTE PACKAGE	3,502.300	3,760.447	3,495.700	258.147	264.747

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M222	LLNL	1.2.2.3	Input to DOE/HQ Report to Congress on Copper for Waste Packages △ 8/85	◆											
M233	LLNL	1.2.2.4	Initiate Waste Package Advanced Conceptual Design △ 4/85									◇			
M276	LLNL	1.2.2.5	Report on the System Model for Waste Package Performance Analysis △ 9/85									◇			
M236	LLNL	1.2.2.3	Progress Report on the Results of Testing Advanced Conceptual Design Metal Barrier Material under Relevant Environmental Conditions for a Tuff Repository							△			◇		
M247	LLNL	1.2.2.3	Final Report on Feasibility of using Copper as a Waste Package Material												△
M013	LLNL	1.2.2.4	Revised Draft Waste Package Subsystem Conceptual Design Requirements to DOE/HQ for Review						△		◇				

△ PLANNED MILESTONE COMPLETION DATE ◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED ◆ COMPLETED AS REVISED

1.2.3 SITE INVESTIGATIONS

OBJECTIVE

The objective of this task is to determine whether Yucca Mountain is a suitable location for a high-level waste repository. The effort is divided into two areas of study. The first is understanding the characteristics of the rock mass that lies below the surface of Yucca Mountain. This encompasses the geology (structure and stratigraphy), hydrology (both saturated and unsaturated zone), geochemistry (chemical reactions that can be expected when waste is emplaced), and mineralogy and petrology (the study of the materials that will control the isolation and engineering characteristics of the rock). The second is understanding the processes and events that could occur in the area surrounding Yucca Mountain that could serve as potential disruptive forces. These efforts include the study of tectonics, seismicity, and volcanism, and the regional hydrologic, paleohydrologic, and paleoclimatologic systems.

ACTIVITIES

WBS 1.2.3.1 MANAGEMENT AND INTEGRATION

The stop-work order (see March report) at USGS remained in effect through April, and almost all site-characterization technical activities were suspended during the entire month.

The WPAS was completed and shipped to HQ at the end of the month. Viewgraphs were prepared for the budget presentation and defense at DOE/HQ in Washington, scheduled for May 6-7.

At SAIC a draft standard operating procedure for core handling and storage and a draft criteria for establishing a Core and Sample Facility (CSF) were completed and presented to the WMPO for comments. A cost analysis for a new CSF will be completed in mid-May.

WBS 1.2.3.2 GEOLOGY

WBS 1.2.3.2.1 Geologic Investigations

The final version of the probable maximum flood study was completed by the United States Bureau of Reclamation (USBR) and forwarded to SNL on April 13, 1986. Clear water values for major channels were calculated and exceed earlier values determined by the United States Geological Survey (USGS). The calculated values do not include debris, which can contribute as much as 50 percent of the total. SNL staff has requested that the USBR make estimates for debris contribution by the time the flood inundation maps are completed. These products are needed for the advanced conceptual design and will become part of the data base for license application. The study is also being reviewed by WMPO staff.

SNL personnel evaluated proposals for trenching and mapping at the surface facility site. Contract award is expected in May, and planning work will commence in June 1986.

USGS personnel spent the entire month on preparation of Chapters 1 and 8 of the Site Characterization Plan, work on the Exploratory Shaft Test Plan, and preparation of quality assurance procedures.

WBS 1.2.3.2.2 Geophysical Investigations

USGS and Los Alamos National Laboratory personnel sited two drill sites on magnetic anomalies--one near Lathrop Wells and the other in Crater Flat.

USGS personnel reduced and made computer plots of the new gravity and ground magnetic data obtained in Crater Flat in March.

Magnetotelluric field work was undertaken by USGS staff members in southern Nevada and adjacent states in March. Geophysicists obtained 50 magnetotelluric stations of which 35 are in the region of southern Nevada, including a 3- to 6-kilometer spacing traverse across Death Valley, and a similarly spaced east-to-west traverse partially crossing the Nevada Test Site from the area of Beatty, Nevada, to the east side of Jackass Flats. The weather was reasonable and the signals were moderate to strong. On the test site itself less data were obtained than expected because of a series of nuclear tests during the period.

A new technique has been applied by the USGS Menlo Park office to a statewide compilation of aeromagnetic data from Nevada in order to locate boundaries between magnetic and less magnetic rock types. The results indicate edges of major magnetic sources and show geologic and structural boundaries throughout Nevada insofar as magnetization reflects rock type.

An open-file report (USGS-OFR-86-46) by USGS on geophysical log data from 15 drill holes at Yucca Mountain has been completed and published.

A USGS memo reports on the preliminary results of the borehole geophysics in three holes on the Moapa Indian Reservation in Nevada.

WBS 1.2.3.2.3 Site Stability

At Los Alamos incorrect data for the heavy rare earth elements, included in the geochemistry data base, were removed and the multiple discriminant analyses were repeated on the edited data base.

The seismic network for recording natural seismic events in southern Nevada continued in operation during April.

WBS 1.2.3.3 HYDROLOGY

WBS 1.2.3.3.1 Streamflow

USGS activities during April included setting up a filing system for records on runoff at the various streamflow measurement sites on and near the Nevada Test Site. Files include original data collected by personnel in the USGS Las Vegas office that have been processed to assess rainfall and runoff and to duplicate field notes for data that have not yet been processed and for which the original data are temporarily stored in the Las Vegas office. Many of the drainage areas above NTS measurement sites were planimetered from appropriate maps.

H&N personnel completed specific gravity and helium porosity tests on core samples from neutron holes. They also began to determine bulk specific gravities, rock grain densities, bulk densities, and permeability on about 140 core samples from UZ-4.

A Quality Assurance Level Assignment Sheet for the Inundation Map has been prepared and is in review at the Bureau of Reclamation prior to transmittal to USGS.

WBS 1.2.3.3.3 Unsaturated-Zone Hydrology

USGS received the final copy of the vertical seismic profiling paper from the Colorado School of Mines. Elements of this investigation will be incorporated in the Scientific Investigation Plan for the deep unsaturated zone project.

WBS 1.2.3.3.4 Unsaturated-Zone Hydrochemistry

Dr. Donald Langmier, professor for the Department of Chemistry and Geochemistry, Colorado School of Mines, will contract with the USGS for 3 months during the summer of 1986 to write activity plans for water-tracer studies, exploratory shaft tests, for the unsaturated-zone hydrochemistry project.

The USGS is in the process of contracting with the University of Miami tritium lab for future tritium analysis on unsaturated zone water samples.

At the USGS, hydrochemistry test plans for cores and holes in the shallow and deep unsaturated zone, planned for the next 5 years (including sampling locations, number of samples, and analysis, etc.) are being reviewed.

Personnel at USGS have drafted plans for extracting pore-fluid from neutron-hole cores for isotopic and chemical analysis (including location of samples, numbers of samples, etc.). The cores will be scheduled for squeezing along with all other unsaturated zone cores.

At USGS staff members have successfully tested the transport mode of the completely revamped version of computer code SEGOL-2D, now known as VSFAST (Variably Saturated Flow and Solute Transport), using a triangular element.

WBS 1.2.3.4 GEOCHEMISTRY

WBS 1.2.3.4.1.1 Groundwater Chemistry

At meetings in Albuquerque, Los Alamos, and Denver, Project personnel were involved in the work evaluation performance allocation Issue 1.15, ground-water travel time, and Issue 1.16, radionuclide releases to the accessible environment.

WBS 1.2.3.4.1.3 Hydrothermal Geochemistry

The effort appears to have been accomplished at Los Alamos to find the best set of nonlinear equations to make weighting of the least squares problem practical and a valid solution possible.

WBS 1.2.3.4.1.4 Solubility Determination

The computer-controlled pH monitoring system and the CO_2 pressure control unit required for the solubility measurement task at Lawrence Berkeley Laboratory are being installed in an inert atmosphere glove box.

WBS 1.2.3.4.1.5 Sorption and Precipitation

Los Alamos completed collating information for the Dynamic Transport subtask for the NNWSI Project data catalog. This catalog is a result of an NRC/DOE agreement.

Sorption experiments were completed on strontium, cesium, barium, and eruopium with spiked Well J-13 ground water. These experiments are part of the effort to characterize the effects of groundwater composition on sorption. Desorption experiments are also continuing on tin by using spiked Well J-13 ground water.

An inventory of approximately 1,500 sorption data sets indicates that the large majority of data sets do not have the minimum number of data points required for either equilibrium (isotherm) or nonequilibrium (kinetics) modeling. In most cases one or two additional experimental points would be required for either analysis.

At Los Alamos preliminary trials for isotherm analysis for which sufficient data exist indicate that the Freundlich and modified Freundlich isotherms may well model the data. However, cation exchange capacity information for the application of the modified Freundlich isothermal does not seem reliable and needs to be checked.

At Los Alamos work began on column sorption studies. Thin sections (3 millimeters) of the the 50.8-millimeters-diameter core taken from a depth of 1,501 feet (Calico Hills) at Yucca Mountain were placed in a Nucleopore membrane filter unit. The filter unit was machined to accommodate the rock wafer. In this experiment, plutonium-239 feed solution will be passed through five such filter apparatuses. A chelating agent will be added to an additional five replications and passed through the rock wafers.

Short-time sorption measurements were made at Los Alamos with a specially prepared Np(V) stock solution. The feed solution was made by dilution of an aliquot of the stock with rock-equilibrated ground water rather than the usual preparation method of drying the aliquot before beginning the activity in ground water. The series of measurements are continuing.

WBS 1.2.3.4.1.6 Dynamic Transport Process

Diffusion cell experiments with tritiated water (HTO) and technetium-95m spiked solutions are in progress at Los Alamos. Results to date show consistent variations with wafer thickness and are being analyzed.

Crushed rock column experiments to investigate anion exclusion and nonactinide tracer transport are largely completed for HTO, techneticum-95m, and solutions spiked with F^-, Cl^-, SO^-_4, and NO^-_3. Columns are being prepared for two final runs with the latter four anions and for runs with a variety of tracers and more clay-rich rock samples. Examination of trace quantities of iodine-131 in

Well J-13 water has revealed that approximately half of the iodine forms a volatile compound that can be lost within hours if the solution is stored in open containers. Los Alamos personnel continue to investigate and interpret iodine behavior during the crushed rock column flow tests.

Staff members at Los Alamos have established steady state flow in the syringe pumps for solid tuff core flow experiments. Tritium tracer tests are in progress.

WBS 1.2.3.4.1.7 Retardation Sensitivity Analysis

Improvements that involved modifying the numerical scheme in TRACR3D resulted in reducing run times for transport problems by approximately a factor of 3.5.

Los Alamos staff members began discussions on modeling the effects of microbiological interactions on radionuclide transport.

The Los Alamos milestone report on petrographic variation in the Tonopah Spring tuff matrix is nearing completion. The proposed transformation was found to have limited variance-stabilizing effect; if this type of analysis is pursued, other transformations should be considered.

WBS 1.2.3.4.2 Mineralogy & Petrology

At Los Alamos, x-ray diffraction studies concentrated on (1) samples from Yellowstone National Park as part of a natural analog study of zeolite-silica assemblages, and (2) samples from springs, soils, and faults around Yucca Mountain. The data from Yellowstone are still being compiled for analysis.

Work continued at Los Alamos on fracture-related mineralogy of deeper samples in drill core USW G-4. Experiments on clay-mineral stability yielded the first indication of a significant mineral transformation in dry heating at 200 °C after three years; a magnesium-smectite held at this temperature has begun to collapse. Irreversible collapse of smectites in the Topopah vitrophyre would affect their sorptive capacity. Experiments with smectite will continue to investigate whether such collapse is possible at the temperatures anticipated below the repository.

WBS 1.2.3.5 DRILLING

Test hole USW UZ-8 remained at a temporary depth of 58 feet as drilling is still suspended due to the stop-work order.

H&N personnel staked out three locations for percolation tests to be conducted for initial work on the ESF site sewer system. They also completed a topographic base map as requested by WMPO.

WBS 1.2.3.6.1 Environmental Surveys

The meteorological monitoring stations are operating and there are no significant problems to report. A Readiness Review will be held on May 16, 1986. The draft Procedures Manual was finalized.

USGS, SAIC, and DOE/HQ representatives attended an SCP Chapter 5 review on April 30 and May 1, 1986.

SAIC staff members discussed radiological monitoring rquirements with the WMPO and the EPA in April.

WBS 1.2.3.6.2 Transportation

Personnel at SAIC are evaluating two proposals for a subcontract to complete a plan for the designation and construction of a rail access route to Yucca Mountain.

The planned completion date for a draft report based on U.S. Air Force overflight data has been changed to July 1986 because of the quantity and form of data supplied by the Air Force.

SAIC personnel completed a review of the siting guidelines and current version of the EA to identify analysis requirements for the EIS and to support the selection of Yucca Mountain Access routes. A list of data needs will be used as a starting point for discussions with the State of Nevada and development of route-specific analysis techniques.

SAIC staff members participated in a meeting on April 28 and 29 in Washington, DC, to discuss the scope of the national program to conduct route-specific transportation analyses. Topics included the identification of routes, factors for analysis, methodology, state participation, and data collection. Identified issues that could impact the process include interpretation of responses to the EA comments and desires of states to have their routes considered in a detailed way. Results of the national analyses, along with additional work for the Yucca Mountain region, will be used to meet the needs of the EIS and to support access route decisions.

Draft radiation safety training and radiation dosimetry procedures were completed at SAIC. These procedures would apply to all staff members who have access to the NTS.

A SAIC letter report was sent to the WMPO that makes a risk comparison of radiological limits for the repository to sources of natural background radiation.

WBS 1.2.3.7 SOCIOECONOMICS

Efforts to revise the Tourism Report continued during April. Completion of the report is scheduled for May 15, 1986.

SAIC staff members attended a planning session for the Socioeconomics Monitoring and Mitigation Plan in Washington with DOE/HQ on April 4, 1986. SAIC personnel presented the draft Social Impact Assessment: Scope and Methods report to the WMPO on April 21, 1986.

WBS 1.2.3.8 PERFORMANCE ASSESSMENT

The LLNL paper "Some forms of transition state theory, including nonequilibrium steady state forms, and their application in geochemistry" was submitted to the American Journal of Science.

The current version of SUPCRT, obtained from G. Flowers of Tulane University, is now running on the LLNL computer system.

The Geochemical Modeling Task Plan was expanded at LLNL to contain descriptions of the thermodynamic data base milestones. The first draft of this report will be ready for review next month.

PLANNED WORK

Los Alamos staff members will begin to use the cluster code with real data to discriminate lines in magnetic fields. Probabilities of a disruptive event will be developed based on the results of these cluster analyses.

The literature search concerning the levels of uranium, thorium, and radium at Yucca Mountain will be finished next month and work will begin on the Los Alamos milestone report due in June.

Once the stability calculations have been completed at Los Alamos for the Yellowstone mineral assemblages, the results will be combined with data on geology and observed water chemistry to derive a model for the origin of the alteration assemblages in Yellowstone.

At Los Alamos water composition data will be added to the sorption data base. An analysis will investigate the effect of water composition on the sorption ratios.

Los Alamos personnel will complete the equilibrium analysis, and make a selection of mathematical expressions for analysis of kinetic behavior because the kinetic data base is much larger than the isotherm data base.

Neptunium isotherms will be started in the laboratory at Los Alamos and in the CO_2 controlled atmosphere box by using the newly prepared Np(V) stock solution.

Studies of the effect of ground-water composition on sorption at Los Alamos will be expanded to include uranium, neptunium, and americium.

Los Alamos personnel will use modal counting data to characterize zones within the Topopah Spring Member of the Paintbrush Tuff (Milestone R320).

At Los Alamos staff members will quantify x-ray diffraction measurement errors.

Additional wafer diffusion experiments are being prepared at Los Alamos, both for single tracers and for long-term experiments with multi-tracer cocktails.

At Los Alamos the x-ray diffraction studies will focus on samples of cuttings from drill hole UE-25p#1. Complete drafts of the Exploratory Shaft Test plans in mineralogy-petrology will be prepared.

AT SNL field studies for the trenching and mapping effort at the repository surface facility site will begin in July 1986. Test plans are being prepared and will be peer-reviewed in May 1986.

The draft Community Profiles Report will be revised in May 1986.

LLNL personnel will start the expanded effort to obtain additional thermochemical data for the EQ3/6 codes by identifying the laboratories and scientists that may be able to assist in this work.

PROBLEM AREAS

A limiting factor for the modeling of the Yellowstone system at Los Alamos is the lack of adequate solid solution models for zeolites and clays.

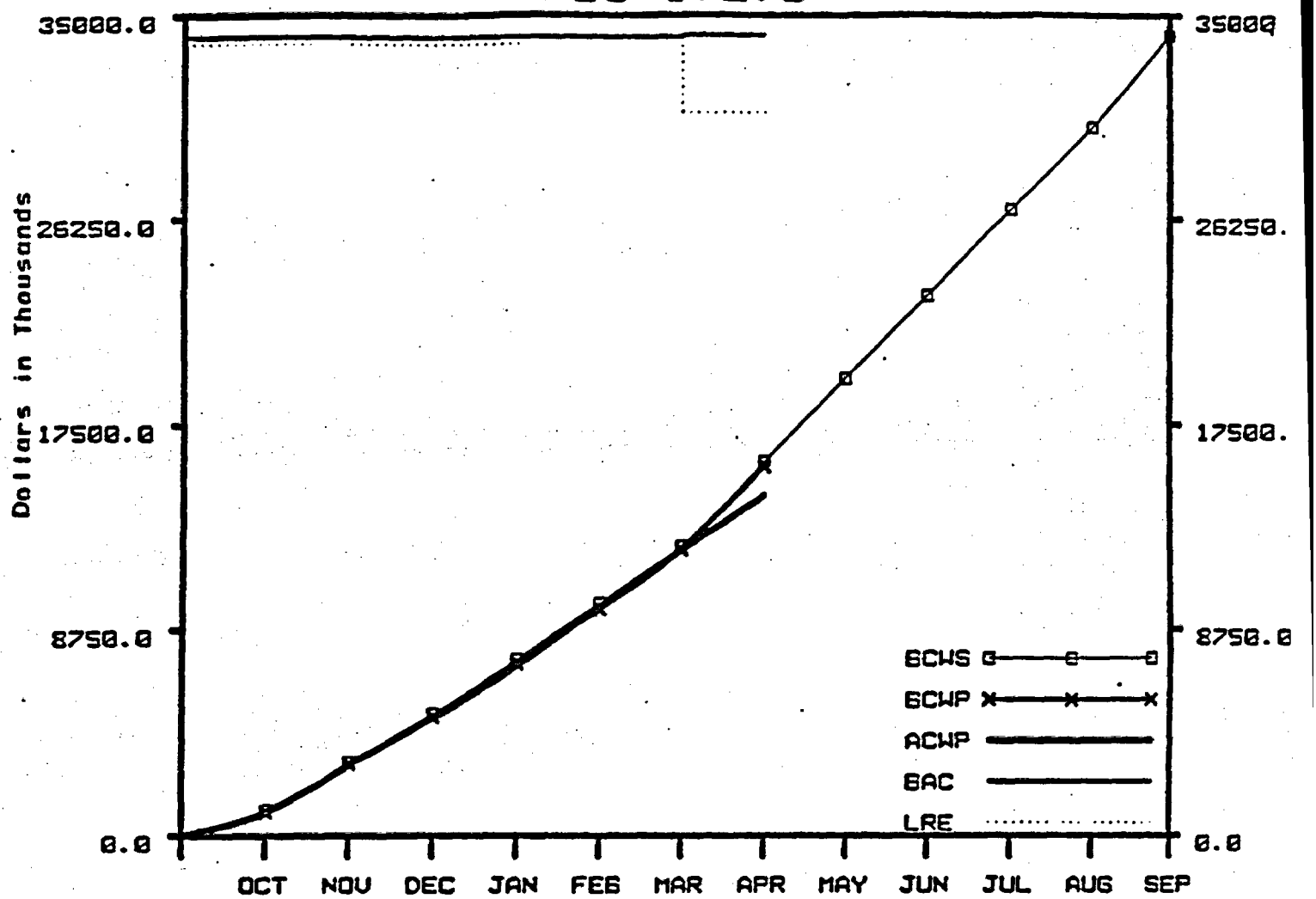
A variety of bugs in the EQ3NR codes prevent the release of the new version; they should be located and repaired soon.

MILESTONE PROGRESS

Los Alamos Milestone M303 will be delayed because of the work load required for the performance allocation tasks.

The draft milestone, Implications of National Routing on Nevada (E419), is undergoing internal review and revision. This milestone is delayed due to other unscheduled demands. The report should be transmitted to the WMPO in early May.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.3



SITE INVESTIGATIONS	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	3569.4	15885.3
B. BUDGETED COST OF WORK PERFORMED (BCWP)	3492.7	15676.7
C. ACTUAL COST OF WORK PERFORMED (ACWP)	2294.2	14456.3
D. BUDGET AT COMPLETION (BAC)		34124.8
E. LATEST REVISED ESTIMATE (LRE)		30647.8

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-208.6	-1.31
G. COST VARIANCE (B-C)	1220.4	7.78
H. AT COMPLETION VARIANCE (D-E)	3477.0	10.19

Remarks:

Cost and schedule variances within acceptable thresholds.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986 Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST
1241	Management and Integration	2,392.205	2,392.095	2,437.091	-.110	-44.996
1242	Development and Testing	2,214.400	2,200.264	2,023.000	-14.136	177.264
1243	Facilities	959.000	958.334	841.000	-.666	117.334
1244	Operations and Maintenance	190.000	190.014	165.000	.014	25.014
1245	Decommissioning	15.000	15.000	.000	.000	15.000
1246	Repository Performance Assessment	585.000	584.913	349.000	-.087	235.913
124	REPOSITORY INVESTIGATIONS	6,355.605	6,340.620	5,815.091	-14.985	525.529

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
N457	SNL	1.2.4.6	Preliminary Study of the Effects of Uncertain Geologic Data on Design of the Underground Facility											△	
P404	SNL	1.2.4.2	Prepare Design Requirements & Materials Recommendation Report										△		
M802	SNL	1.2.4.1	Review of Concepts Developed by HEDL for Remote/ Automated Waste Handling Systems										△		
M806	SNL	1.2.4.1	Assistance to HEDL in Defining Remote/Automated Waste Handling Systems	◆											
N430	SNL	1.2.4.1	Start Repository Advanced Conceptual Design △ 9/85									◇			
N432	SNL	1.2.4.1	Repository Conceptual Design in Support of Site Characterization △ 9/85										◇		
N433	SNL	1.2.4.1	Initial Subsystem Design Requirement (SDR)	△							◇				
M295	SNL	1.2.4.2	Feasibility Analysis o Horizontal Emplacement & Retrieval - Letter Report	△									◇		
N406	SNL	1.2.4.2	Horizontal Waste Emplacement Equipment Development Plan △ 8/85										◇		
M455	SNL	1.2.4.2	Report on G-Tunnel Underground Facility (G-TUFF) Summary												△

△ PLANNED MILESTONE COMPLETION DATE ◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED ◆ COMPLETED AS REVISED

1.2.4 REPOSITORY INVESTIGATIONS

OBJECTIVE

The objective of this task is to develop the engineering capability to design, construct, operate, and decommission a repository in tuff. Four specific technical areas are involved that include (1) determination of the physical and mechanical properties of the rock matrix and rock mass that are important to the design and construction of an underground structure; (2) engineering analysis and evaluation of technical details that are important to the design and operation of a repository; (3) development of the techniques of sealing a repository as part of decommissioning; and (4) preparation of a site-specific design that will be accommodated within the development of the equipment to construct the repository, handle the waste and waste package, and transfer the waste package within the repository system.

ACTIVITIES

WBS 1.2.4.1 MANAGEMENT AND INTEGRATION

WBS 1.2.4.1.1 Management

Work began in mid-April for SNL Milestone M802, Review of the Concepts Developed by Hanford Engineering Development Laboratory (HEDL) for Remote/Automated Waste-Handling Systems. At a meeting with SNL and Hanford representatives, Bechtel National, Inc. (BNI), personnel described the NNWSI Project surface facility conceptual design. The BNI presentation placed particular emphasis on the waste-handling facilities. HEDL personnel discussed their previous experience with emphasis on the work they had recently completed for SNL. These studies were funded as part of the defense program for the disposal of high-level defense waste. HEDL developed remote systems for cask receiving and unloading as part of this work. It was mutually agreed that HEDL would investigate and recommend the application of remote systems for cask-receiving operations as their initial activity for the NNWSI Project.

SNL staff members have prepared a schedule of design activities for the Advanced Conceptual Design Studies (Milestone N430) and the Advanced Conceptual Design (ACD). This schedule has been reviewed by the major design contractors, BNI and Parsons Brinckerhoff Quade & Douglas (PBQD), and is acceptable. The schedule of activities has been submitted to WMPO for inclusion in the NNWSI Project schedule.

WBS 1.2.4.1.2 Basis for Design

A task-definition memo was prepared by SNL personnel to initiate the development of interface control drawings (ICDs) by BNI and PBQD. The ICDs will provide the definition of physical repository interfaces between NNWSI Project design organizations and will be baselined as part of the SDR document.

The matrix correlating system requirements to repository facilities was revised at SNL based on the comments of DOE-HQ staff. The matrix shows the allocation of requirements to physical systems.

The proposed methodology for predicting seismic hazards for ground motion and surface rupture and the associated parametric studies at the proposed NNWSI repository facilities, which are currently being performed by URS, will be discussed during the forthcoming seismic and tectonic working group meeting on April 29 and 30 in Las Vegas, Nevada. An SNL draft report on the methodology and the parametric studies will be reviewed during this meeting. The objective of this meeting is to evaluate the proposed methodology and the parametric studies by USGS and others for concurrence before they are presented to the NRC for review.

WBS 1.2.4.1.3 Major Design Deliverables

An annotated outline (AO) for the advanced conceptual design report was submitted to the repository coordination group (RCG). The content of the outline is under discussion by the coordination group. Submission of the AO to the WMPO will satisfy SNL Milestone N426.

Work on the Repository Conceptual Design in Support of Site Characterization (RCD/SC) Chapters 1-5 and 9 is about 85 percent complete (SNL Milestone N432). Text for Sections 2.7 and 4.6 is expected to be available about June 1, 1986. Network analysis is being redone to incorporate the impact of the SCP completion on the RCD/SC schedule.

WBS 1.2.4.1.4 Engineering Design Support: Special Studies

The report by BNI entitled "An Engineering Study of the Impact on Costs and Schedules of Using a Monitored Retrievable Storage Facility in Conjunction with a Repository in Tuff at Yucca Mountain" (SAND85-7112) has been edited and made available for technical peer review. The peer review should be completed by mid-May 1986. The report, after editing to include peer-review comments, should be ready for management and policy review by the end of May 1986.

WBS 1.2.4.2.1.1 Rock Mass Analysis

Revision of the draft of "Analyses for G-Tunnel Field Experiment Small Diameter Heater" (SAND85-7115) received at SNL from RE/SPEC, Inc., has been delayed due to other commitments.

A problem-definition memo, "Analysis of In Situ Stress at Yucca Mountain Using a Compliant-Joint Model" (Thermomechanics Analysis #14), has been submitted to the SNL Applied Mechanics Division. As defined, the problem will use the JAC code compliant-joint model to determine the gravitationally induced component of in situ stress within Yucca Mountain using intact rock properties and fracture characteristics for individual thermomechanical units as summarized in "Preliminary Report on Yucca Mountain Fracture Characteristics." This work will support Milestone M444.

Final revisions on the SNL report entitled "Preliminary Report on Yucca Mountain Fracture Characteristics," which summarizes mechanical and geometric

data on fractures from Yucca Mountain, are complete. The report has been submitted as a letter report pending its incorporation into Milestone M444, Update on Rockmass Properties for Conceptual Design.

WBS 1.2.4.2.1.2 Field Testing

The final six multipoint borehole extensometers were installed by SNL personnel in the demonstration drift of the G-Tunnel underground facility. Installation of rock-bolt load cells was initiated.

The SNL area for the pressurized slot-cutting work was rearranged to make room for heater testing by personnel from LLNL.

WBS 1.2.4.2.1.3 Laboratory Properties

An SNL draft report on the mechanical properties of samples of the Topopah Spring Member from drillhole USW G-2 is in line review. A draft report on the effect of variation in sample size on the mechanical properties of the welded, devitrified Topopah Spring Member is being revised at SNL following peer review.

Placement of contracts for heat capacity measurements and for high-temperature, low-strain-rate compressive tests has been delayed by contractual discussions between SNL purchasing personnel and potential contractors. It is anticipated that both contracts will be awarded by May 15, 1986. However, initiation of work on the contracts will be subject to approval of relevant QA level assignments.

WBS 1.2.4.2.1.4 Water-Migration Analysis

SNL personnel have completed the drying phase of the gamma-beam experimental series. Modeling of the first phase, the imbibition experiment, is ongoing. Estimates of the hydrologic properties of higher-porosity zones are being determined to be used in computer-code modeling of the experiment. The decision to perform the third phase of the experimental series, the "heat-pipe" experiment, with the current sample is being evaluated.

At SNL fracture permeability as a function of effective confining stress was measured on a core sample from drillhole USW G-4 at 1,467 feet. The sample contains a discrete fracture running along the core axis approximately perpendicular to flow.

Peer review is complete for the SNL report entitled "Calculation of Hydrologic Properties for Tuffs from Yucca Mountain, Nevada, using Mercury Porosimetry Results" (SAND86-0286). Comments are being incorporated.

WBS 1.2.4.2.2 Equipment and Instrumentation Development

At SNL the model of the horizontal emplacement system is complete. This model duplicates the mechanism that is planned for emplacing waste into a horizontal borehole.

Staff members at SNL are initiating work to evaluate the loads that may be imposed on the horizontal emplacement hole liner by failure of the borehole. Borehole failures being considered are large-block fall and fragmented-rock fall. These loads will be used to determine the thickness required for the liner.

WBS 1.2.4.2.3 Sealing

WBS 1.2.4.2.3.2 Seal Material Evaluation

At Los Alamos, as starting materials for tobermorite preparation, a second lime-alumina-silica gel was prepared from silicon tetraethoxide and aluminum tri-secondary butoxide. Calcium oxide was introduced before enough water was added to cause the mix to gel. This method is the same as that used for the first gel reported in March that apparently had too low a ratio for synthesis of tobermorite. As the presence of sodium or hydroxide may aid crystallization, three compositions were made for hydrothermal treatment: one with gel alone, one with gel plus NaCl, and one with gel plus NaOH. X-ray diffraction data on these gels after hydrothermal treatment were collected with a SCINTAG PAD-V diffractometer.

Researchers at Pennsylvania State University have completed internal review of their current revision of the report entitled "Reactivity of a Tuff-Bearing Concrete: CL-40, CON-14."

A response to the QA audit performed by SNL staff member on the laboratory testing at Waterways Experiment Station (WES) was prepared for submission to SNL. A follow-up audit was held by SNL representatives to verify compliance with the QA audit findings.

WBS 1.2.4.2.3.3 Seal Concept Development

Environmental conditions deleterious to a concrete surface cover were investigated at SNL. Conditions that may deteriorate a surface cover constructed of portland-cement-based concrete include moisture, dissolved sulfates, acidity, dissolved alkalis, and dissolved chloride. The chemical factors can usually be overcome by good concrete design, particularly if the concrete does not need to withstand excessively high concentrations of sulfates or sulfuric acid.

WBS 1.2.4.3.2 FACILITIES

WBS 1.2.4.3.2 Surface Facilities

A revised scope of works to be performed by BNI under the existing contract with SNL for conceptual design of surface facilities has been finalized and is being sent to BNI to obtain a cost quotation. This revised workscope has a heavy emphasis on special studies needed to finalize the basic design options to be used in the advanced conceptual design phase. In addition, it has tasks to develop a design based on the results of the special studies and the RCD/SC design. BNI has been instructed to start work on five of the special studies: repository options, repository operations plan development, site-generated waste study, design margins philosophy development for the NNWSI Project, and a consolidation study case. Engineering study memos, which describe the tasks to be performed, outputs, and schedules for these tasks, have been issued to BNI.

Engineering study memos for the other tasks in the workscope will be issued to BNI as soon as the response to the request for quotation is received from BNI.

BNI has issued a set of checked drawings for use in the RCD/SC report. These are to be reviewed by SNL before they are included in the RCD/SC report.

WBS 1.2.4.3.4 Underground Excavations

Drawings and text revisions of the RCD/SC to incorporate the relocation of the exploratory shaft facility and the commingling of defense high-level waste and spent fuel are complete at SNL. Ventilation and thermal calculations to support these revisions are being completed.

WBS 1.2.4.4 OPERATIONS AND MAINTENANCE

Further definition (by DOE) of the requirements for the Office of Geologic Repositories fuel-consolidation study increases the scope of the work to be done by SNL. Four cases are to be considered as follows:

Case 1 - Authorized System, Consolidated Fuel. This case incorporates no Monitored Retrievable Storage (MRS); at-repository consolidation; two-stage Waste Handling Building (WHB); intact fuel assemblies shipped (without canisters) directly from the utilities to the repository; 90 percent of the fuel is consolidated and 10 percent is emplaced as intact assemblies; and NNWSI Project "reference" disposal containers, with higher loading for consolidated boiling-water-reactor (BWR) fuel.

Case 2 - Authorized System, Intact Fuel. This case incorporates no MRS; no consolidation; one-stage WHB (this is optional, but the NNWSI Project consolidation study has already shown that the NWPA 1998 startup schedule can be met at a repository designed around a one-stage WHB); and a NNWSI Project "hybrid" disposal container.

Case 3 - Improved Performance System, Consolidated Fuel. This case incorporates MRS; at-MRS consolidation (90 percent), no consolidation at the repository or at the Western utilities; one-stage WHB: new NNWSI Project MRS disposal container and new canisters for both consolidated fuel rods and intact fuel assemblies; generic hardware waste canister and new NNWSI Project hardware waste disposal container; and all-rail shipment from the MRS.

Case 4 - Improved Performance System, Intact Fuel. This case incorporates no consolidation; one-stage WHB; new enlarged NNWSI Project "hybrid" disposal container to accomodate fuel assemblies shipped from the MRS in canister; and all-rail shipment from MRS.

Only vertical disposal container emplacement will be considered, since the NNWSI Project consolidation study showed that the cost saving resulting from "intact" disposal is about the same for either vertical or horizontal emplacement. Underground disposal panels will be designed on the assumption that spent fuel, hardware waste, and defense and West Valley high-level waste (WVHLW) will be commingled.

Seven tasks have been defined for SNL, Los Alamos Technical Associates (LATA), BNI, and PBQD. A tentative schedule indicates that a draft report will be completed by July 31, 1986, and the final report will be completed by September 15, 1986.

A March 27, 1986, draft of Section B.1 of a revised Generic Requirements document was reviewed at SNL, and comments were prepared for transmittal to DOE-HQ. The document still requires at-repository consolidation in a two-stage WHB and it now divides an 8,640-metric-ton uranium inventory of DHLW and WVHLW between the first two repositories.

WBS 1.2.4.6 REPOSITORY PERFORMANCE ASSESSMENT

WBS 1.2.4.6.1 Repository Performance Code Development and Certification

Work continued at SNL on verification and validation plans for thermal and mechanical codes to meet criteria in NNWSI SOP-03-02. A draft of this plan should be available by the end of May 1986.

The SNL conference paper "A Two-Dimensional Continuum Model for Jointed Media with Orthogonal Sets of Joints" has been approved and submitted to the 27th U.S. Rock Mechanics Symposium to be held at the University of Alabama in June 1986. The paper provides documentation for the new version of the JAC compliant-joint material model with its new capabilities of an orthogonal joint set and hardening behavior in the joint shear portion of the model.

WBS 1.2.4.6.2 Design Analysis

Initial performance allocation is about 95 percent complete for the NNWSI Project Issues Hierarchy Issue 1.12 (old Issue 1.10, postclosure underground facility design issue). The relationship of this issue to other issues was reviewed to establish interfaces. In particular, the borehole stability, borehole temperature, allowable materials, and moisture control goals were rewritten to make them more consistent with the goals in the waste package design issue.

SNL personnel reviewed work on the definition of the engineered barrier system boundary and made a recommendation on how to address the inclusion of thermal stresses in this work.

At SNL the effects of jointly varying geologic parameters on model response were studied over several emplacement times. The model compared both the presence and absence of a horizontal emplacement drift. The geostatistical study is one of several being incorporated into a document to meet Milestone N457.

The first draft of a report entitled "Investigation of Excavation Stability in a Finite Repository" was received by SNL from Agapito and Associates. Following review and modifications, the draft document will be ready for peer review.

WBS 1.2.4.6.3 Preclosure Safety Analysis

Staff members at SNL have developed event trees for seismic events and external floods. Preliminary calculations and engineering judgements indicate that the three other preliminary screened external events (sandstorm, extreme wind, and loss of off-site power) will not lead to any significant off-site radiological release.

Initial analyses of source term release fractions and transport mechanisms were completed at SNL. This task included gap radioactivity release fractions, spent-fuel pellet and waste-glass pulverization fractions due to severe impacts, retention factors, and deposition factors of airborne particulates.

SNL personnel completed quantifications of the event trees for frequencies and consequences for several accident scenarios. A personal computer software program was obtained to draw event-tree and fault-tree diagrams.

PLANNED WORK

SNL personnel will conduct a preliminary review of the HEDL work for Milestone M802 on May 15, 1986, at the HEDL offices.

An SNL problem-definition memo will define an analysis of the G-Tunnel Mining Evaluation Experiment. This experiment was analyzed previously, but upon developing the drift, the stratigraphy was found to be different from what had been envisioned. Also, the room shape that was actually developed was dimensioned in accord with the current reference shape for the repository horizontal emplacement scheme. These specifics will be included in the memo.

The report entitled "Analysis for G-Tunnel Field Experiment Small Diameter Heater" will be amended. This report is SNL Milestone R083, due August 31, 1986 and must be completed shortly.

SNL staff members will initiate work on the Thermomechanics Analysis #14, "Analysis of In Situ Stress at Yucca Mountain using a Compliant Joint Model."

Mining of the last 12 meters of the demonstration drift in G-Tunnel will be completed.

The first draft of the report entitled "Summary of Geomechanical Measurements Taken in and around the G-Tunnel Underground Facility, NTS" will be completed (Milestone M455).

Two SNL draft reports on properties of the Topopah Spring Member will be completed. The report subjects include thermal properties of lithophysae-rich material and a summary of bulk, thermal, and mechanical properties of matrix material.

Mechanical testing will be initiated (assuming approval of QA level assignments) at SNL to determine matrix tensile strength and potential anisotropy of compressive strength and elastic properties of the welded, devitrified Topopah Spring Member.

SNL personnel are planning to acquire water-retention data using a thermocouple psychrometer. The work will take place under QA Level I. Appropriate procedures will be written to satisfy QA Level I requirements.

SNL personnel are working on a detailed design of the emplacement envelope. This design includes the borehole liner and the shield plug. This design will also establish the orientation of the borehole in the case of horizontal emplacement. Provisions for handling condensate will be included.

Laboratory testing on crushed tuff will resume at the Waterways Experiment Station once the letter of criteria is modified and the QA audit findings are addressed.

Additional design calculations will be performed to support Milestone P404. These calculations will also support the future design calculations associated with the Advanced Conceptual Design.

SNL personnel will prepare an underground construction contingency plan. This plan will address the methods that will be used in the construction of the underground facility in the event that bad ground or faults are encountered.

Staff members at SNL will undertake development of a document addressing seismic considerations for underground design. This document will summarize literature findings and experience to evaluate the potential effects of seismic events on the underground facilities of the repository.

PROBLEM AREAS

Work on SNL Milestone N426 has been suspended pending resolution of the content requirements for the advanced conceptual design report by the repository coordination group. The SCP efforts at SNL have adversely impacted preparation of Chapters 6, 7, and 8 of the RCD/SC. This adverse impact is being considered in current RCD/SC planning efforts.

The completion of Milestone R060 will be delayed about eight weeks, in part because of the effort diverted to the two-stage report revision (a reference for the Environmental Assessment) and the effort devoted to the issue resolution strategy for the SCP and RCD/SC.

All schedules for SNL Rock Mass Analysis work are expected to be delayed due to commitments to the SCP.

The work on Milestones R266 and R267, the draft and final reports on spent fuel rod consolidation has been expanded by the DOE, and the milestones are not expected to be completed on schedule. Completion of Milestone R266 is currently forecast for July 31, 1986, and completion of Milestone R267 for September 15, 1986.

Commitments to the SCP will supersede all work planned for the repository performance assessment task. All schedules for work are expected to be delayed accordingly.

At SNL impact of the Issues Resolution Strategy (IRS) on the RCD/SC has not been defined at this time. This impact may delay additional work as current guidance and structure is likely to change when the IRS is incorporated into the RCD/SC.

Design analysis milestones are being delayed because of commitments to other Project work such as the SCP and RCD/SC.

The relationship between retrievability and waste isolation and the Q-list needs to be identified and clarified. The DOE-HQ guidance paper on the RCD/SC and SCP Q-list methodology should perform this function, but the final paper is not out yet.

MILESTONE PROGRESS

The due date for SNL Milestone N432, the Repository Conceptual Design in Support of Site Characterization (RCD/SC), has been revised to November 3, 1986.

The revised due date for SNL Milestone N434, the Repository Design Plan, is November 30, 1986.

The new completion date for SNL Milestone N444, G-tunnel small-diameter heater experiments, is May 31, 1986.

SNL milestones M295, (feasibility analysis of horizontal emplacement and retrieval), N406, (horizontal waste emplacement equipment development plan), N440 (vertical waste emplacement system conceptual design), N450 (horizontal waste emplacement system conceptual design), and continue to be delayed in management review.

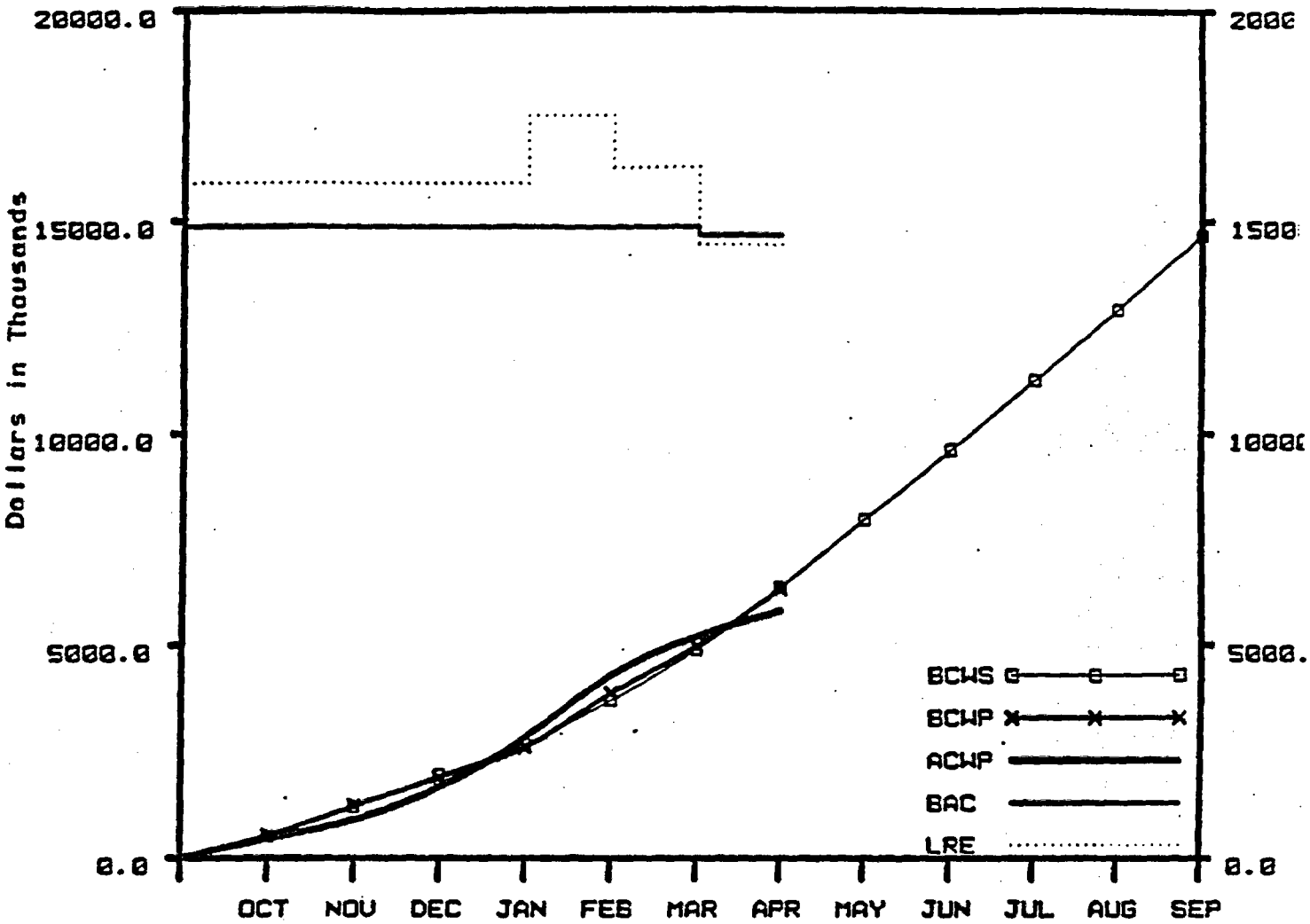
SNL milestone P404, the design requirements and materials recommendation report, will be delayed due to SCP activities. Draft reports for SNL milestones R062, "Mechanical Compatibility Between Select Cementitous Material and Topopah Spring Member Tuff, and R063, "Development and Application of a Computer Program for Prediction of Thermal Loading Due to the Hydration of Cement (SAND84-7117), are prepared; delays are expected due to SCP involvement.

Additional SNL milestones that will be delayed due to SCP preparation include M462 and R037.

SNL milestones M413, N414, and N452 are in line review.

The parameter-effects testing at RE/SPEC, Inc., has been delayed because of additional equipment problems. As a result, SNL Milestone N429 either will be delayed or will be met by omitting the results of the RE/SPEC tests.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.4



REPOSITORY INVESTIGATIONS	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1456.1	6355.6
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1362.7	6340.6
C. ACTUAL COST OF WORK PERFORMED (ACWP)	620.0	5815.1
D. BUDGET AT COMPLETION (BAC)		14664.6
E. LATEST REVISED ESTIMATE (LRE)		13628.2

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-15.0	-0.24
G. COST VARIANCE (B-C)	525.5	8.29
H. AT COMPLETION VARIANCE (D-E)	1036.4	7.07

Remarks:

Cost and schedule variances within acceptable thresholds.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986

Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE				
		BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST
1251	Management and Integration	432.529	432.410	492.223	-.119	-59.813
1252	Licensing	3,166.441	2,843.278	2,707.897	-323.163	135.381
1253	Environmental Compliance	1,017.043	984.327	906.253	-32.716	78.074
1254	Communication and Liaison	165.473	165.473	133.373	.000	32.101
1255	Technology and Financial Assistance	1,222.153	1,222.146	794.693	-.007	427.453
125	REGULATORY AND INSTITUTIONAL INVESTIGATIONS	6,003.639	5,647.633	5,034.438	-356.006	613.196

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M521	SAIC	1.2.5.2	Draft Site Characterization Plan △ 10/84											◇	
M522	SAIC	1.2.5.2	Site Characterization Plan △ 5/85												◇ 12/86
M504	SAIC	1.2.5.3	Final Environmental Assessment				▲								

△ PLANNED MILESTONE COMPLETION DATE

◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED

◆ COMPLETED AS REVISED

1.2.5 REGULATORY AND INSTITUTIONAL INVESTIGATIONS

OBJECTIVE

The objective of the Regulatory and Institutional Investigations task is to provide the capability for interfacing with all the institutions and to meet the requirements identified in various laws and regulations pertaining to the siting, design, and construction of a nuclear waste repository and a test and evaluation facility. The principal laws and regulations which govern the licensing of these include the Atomic Energy Act of 1954, the National Environmental Policy Act (NEPA) of 1969, and the Nuclear Waste Policy Act (NWPA) of 1982, 10 CFR Part 60, and 40 CFR part 191.

ACTIVITIES

WBS 1.2.5.2 LICENSING

WBS 1.2.5.2.1 Regulatory Interactions

Milestone R194, the quarterly update of the SNL data catalog, was completed and transmitted to the WMPO on April 7, 1986. A new feature of the data catalog is the documentation of QA levels for each data-set entry.

The NNWSI Project SAIC Licensing Branch staff met on April 24, 1986, with DOE/HQ representatives, and the licensing representatives of the other three projects to discuss requirements for coordination of interactions with the Nuclear Regulatory Commission (NRC). The NNWSI Project had transmitted draft NRC interaction procedures to HQ for review and comments prior to this meeting.

SAIC personnel prepared for the WMPO a report on the NRC workshop on validation of mathematical models.

At a meeting in Las Vegas on April 29 and 30, NRC representatives discussed simplification of the licensing process and current licensing support system concepts.

Work continued at SAIC on the NNWSI Project Seismic/Tectonic Position Paper. Drafts of the regulatory portions of the paper were completed and sent to the Seismic/Tectonic Working Group. The group met on April 29 and 30 and commented on proposed probability ranges that have been developed to define the anticipated and unanticipated processes and event concepts found in 10 CFR 60. All comments were resolved during the meeting.

SAIC Licensing Branch members completed a draft "Explication of the EPA Standard (40 CFR 191)" which incorporates comments from the WMPO and various reviewers within SAIC. The draft was provided to the Seismic/Tectonic Working Group and, after incorporating their comments, will become an appendix to the Seismic/Tectonic position paper.

Staff members at SAIC prepared a draft annotated outline for the Radiological Compliance Plan and transmitted it to the WMPO for review and comment. The

purpose of this Plan is to define the radiological health and safety requirements that must be met by the NNWSI Project during the preclosure period.

The Information Management System (IMS) Concepts Evaluation Report is in internal review at SAIC. The report will be finalized and issued for WMPO review by May 23, 1986.

NNWSI Project representatives attended the DOE/NRC Licensing Support System (LSS) Interagency Coordinating Committee (ICC) meeting in Washington on April 22, 1986. Major topics of discussion included a status report on DOE development activities for the LSS, a presentation on the NRC pilot project and efforts to cause a negotiated rule making relative to the LSS, and a discussion of the scope of the LSS.

SAIC personnel reviewed information management systems of NNWSI Project participants, relative to preparation of the Information Management System Plan. The purpose of this plan is to define, in a consistent and integrated fashion, the purpose, policy, scope, requirements, authority, responsibilities, and methods through which all NNWSI Project information will be managed.

WBS 1.2.5.2.2 Site Characterization Plan

The process of holding performance allocation workshops is essentially complete. Four workshops were held during the month of April as follows:

1. Waste package engineered barrier systems at LLNL, April 15.

2. Releases to the accessible environment at Los Alamos, April 17 and 18.

3. Higher level findings at USGS, April 22 and 23.

4. Repository and waste package design at SNL, April 24 and 25.

One additional performance-allocation workshop for Issues 1.1, 1.2, and 1.3 has been scheduled for May 6, 1986, in Denver, Colorado. At SNL attention is now directed toward writing up the issue-resolution strategy for inclusion in SCP Section 8.3, along with the information need descriptions. SNL, SAIC, DOE-HQ, and R. F. Weston, Inc., personnel are appropriately adjusting the SCP annotated outline to accomodate the reworked Issues Hierarchy developed at DOE-HQ meetings during April 1986.

The performance allocation workshops should be completed in mid-May. The results of these workshops, the issue resolution strategies, are being written for incorporation into Section 8.3 of the SCP.

Work continued at USGS through April on revisions to Chapters 1 (Geology), 3 (Hydrology), and Section 5.2 (Paleoclimatology) and on preparation of Section 8.3 (Planned Activities) of the SCP.

Preparation of the individual chapters and sections of the SCP continue to fall behind schedule. Reasons for the slippages can be divided into two categories: (1) inability of Project participants to deliver completed chapter inputs on

schedule and (2) changes in chapter content requested by DOE/HQ and lack of clear guidance on these changes. The most serious problems with chapter preparation are summarized below:

1. Chapter 3 (Hydrology) is delayed at least 1 month due to problems with the sections on the unsaturated zone and hydrochemistry.

2. Chapter 4 (Geochemistry) was rejected at the HQ review and is now undergoing changes at Los Alamos in preparation for the second HQ review.

3. Chapters 6 (Repository) and 7 (Waste Package) and Section 8.6 (Quality Assurance) are on hold, pending guidance from HQ.

4. Sections 8.1 (Rationale), 8.2 (Issues), and 8.3 (Plans) are awaiting the completion of performance allocation.

There is a meeting scheduled for May 5 and 6 with DOE/HQ and the NRC to discuss the level of detail expected in the SCP. Agreements may be made between DOE/HQ and the NRC that could seriously impact the Project's ability to issue the SCP by the December 22 deadline.

WBS 1.2.5.3 ENVIRONMENTAL COMPLIANCE

WBS 1.2.5.3.1 Environmental Assessment

SNL EA references include the document entitled "Technical Correspondence in Support of the Final Environmental Assessment" (SAND85-2509), which has completed final review and is in the print shop for publication; the report entitled "Two-Stage Repository Development at Yucca Mountain: An Engineering Feasibility Study" (SAND84-1351/Rev. 1), which has completed peer review and has been sent to the WMPO for a preliminary review prior to policy review; and the document entitled "Preliminary Estimate of Groundwater Travel Time and Radionuclide Transport at the Yucca Mountain Repository Site" (SAND85-2701), which has completed peer and initial management review, and management comments are being incorporated.

Another camera-ready copy of the EA was completed and delivered to DOE/HQ on April 10, 1986. The final EA is still scheduled to be released to the public in mid-May along with the Candidate Site Recommendation Report.

WBS 1.2.5.3.2 Environmental Impact Statement

Initial planning for EIS-scoping documents is underway. The new Environmental Coordinating Group (ECG) meeting to being planning EIS efforts is scheduled for May in Washington, DC.

WBS 1.2.5.3.3 Environmental Regulatory Interaction

At SAIC the draft Environmental Permit Plan was revised again in April. The revised plan will be ready for review in May.

Two Environmental Monitoring and Mitigation Plan planning sessions were held with DOE/HQ, one from April 1 to 4, and a second on April 22, 1986.

A revised draft of the Issues Hierarchy Key Issue 3 was prepared at SAIC and sent to the WMPO and the NNWSI Project Issues Hierarchy Working Group for review.

WBS 1.2.5.4.1 INSTITUTIONAL STUDIES

Members of SAIC Institutional staff prepared Nevada-specific material for inclusion in an EA-release briefing book for use by DOE/HQ.

Staff members responded to a DOE/HQ request for a summary of WMPO and State and local interactions thus far in 1986.

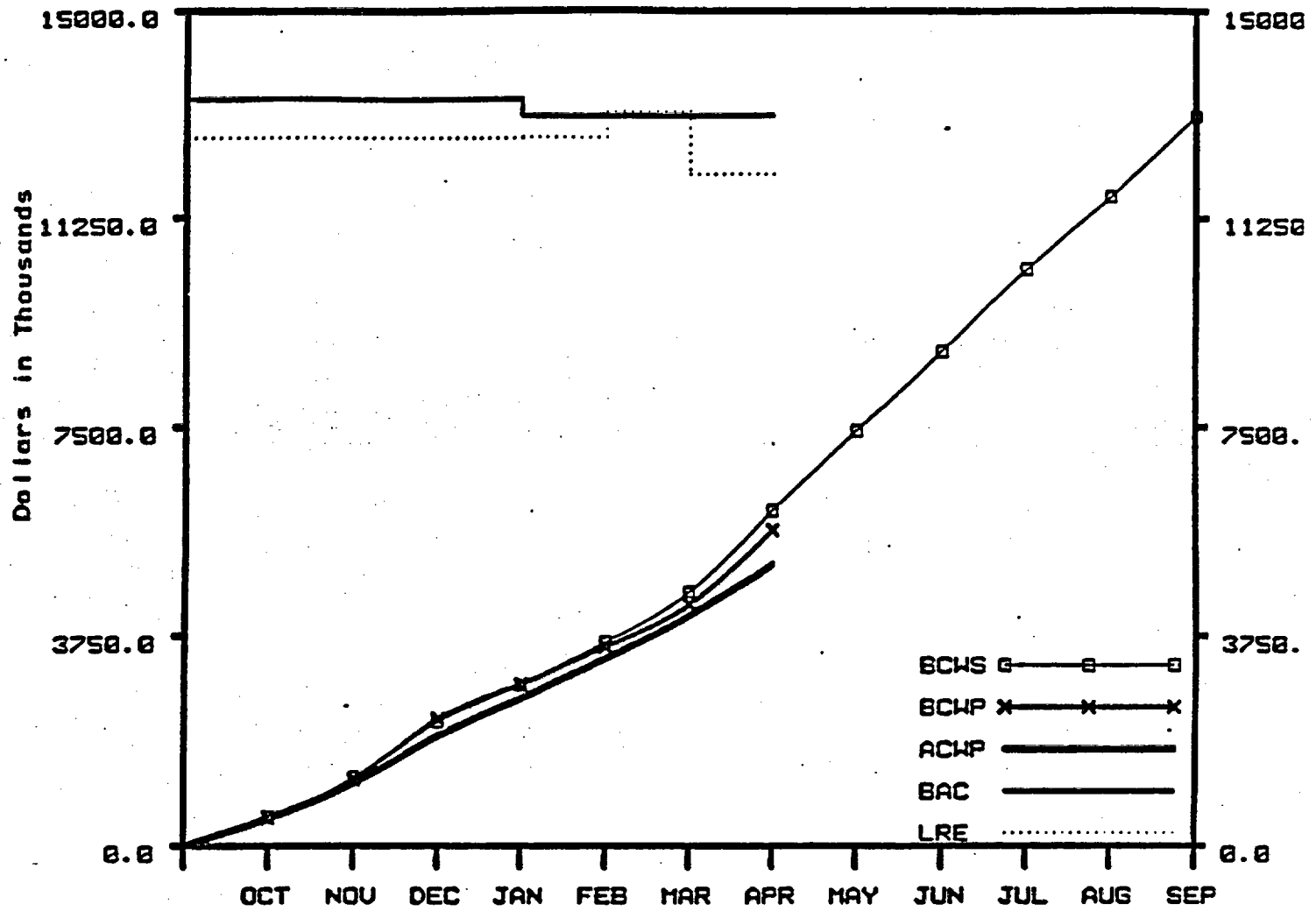
PLANNED WORK

Appropriate SNL staff will be available on May 19 to 20, 1986, to provide a review of existing Project information management systems to the WMPO and SAIC personnel in support of the requirement to issue a draft NNWSI Project Information Plan by September 30, 1986, by SAIC.

PROBLEM AREAS

Preparation of SCP Chapter 6 and RCD/SC text has been impacted by guidance from DOE/HQ on March 24, 1986. This clarification of scope, content, and format for these two documents, as well as the requirement that all text be written before any is reviewed by DOE-HQ, dictates that DOE-HQ review of Chapter 6 cannot occur before mid-July 1986.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.5



REGULATORY AND INSTITUTIONAL INVESTIGATIONS	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1465.1	6003.6
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1334.0	5647.6
C. ACTUAL COST OF WORK PERFORMED (ACWP)	917.3	5034.4
D. BUDGET AT COMPLETION (BAC)		13088.0
E. LATEST REVISED ESTIMATE (LRE)		11875.0

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-356.0	-5.93
G. COST VARIANCE (B-C)	613.2	10.86
H. AT COMPLETION VARIANCE (D-E)	1213.0	9.27

Remarks:

Cost variance due to delay in State billing and late start of licensing activities.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986

Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE				
		BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST
1231	Management & Integration	1,279.305	1,278.933	1,243.506	-.372	35.426
1232	Geology	3,760.488	3,723.806	3,585.288	-36.682	138.518
1233	Hydrology	2,867.512	2,838.566	2,809.476	-28.946	29.090
1234	Geochemistry	3,376.600	3,440.987	3,225.300	64.387	215.687
1235	Drilling	3,450.851	3,441.748	2,526.990	-9.103	914.758
1236	Environment	459.444	399.930	435.707	-59.514	-35.776
1237	Socioeconomic	293.090	140.198	237.426	-152.892	-97.228
1238	Geochemical Modeling Code EQ3/6	398.000	412.516	392.600	14.516	19.916
1239	Deferred Site Close Out	.000	.000	.000	.000	.000
123	SITE INVESTIGATIONS	15,885.290	15,676.683	14,456.294	-208.607	1,220.390

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M364	WMPO	1.2.3.6	Implementation of Meteorological Monitoring Plan △ 6/85							◇					
M325	LANL	1.2.3.4	Report on Geochemistry Simulation of Yucca Mountain Using Best Available Data on Mineralogy, Water Chemistry, Flow Rates & Crack Statistics										△		

△ PLANNED MILESTONE COMPLETION DATE

◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED

◆ COMPLETED AS REVISED

1.2.6 EXPLORATORY SHAFT INVESTIGATIONS

OBJECTIVE

The objective of this task is to identify and plan the tests that need to be conducted at the repository horizon as a part of detailed site characterization and to design and construct the Exploratory Shaft (ES) and the underground test area in Yucca Mountain. The primary focus of this effort will be to establish the basis for evaluating the unsaturated zone in a welded tuff formation. In addition, an effort will be made to define the nature of the unsaturated zone with regard to water content and water movement, and the nature of the natural barriers between the repository horizon and the static water level.

ACTIVITIES

WBS 1.2.6.1 MANAGEMENT AND INTEGRATION

WBS 1.2.6.1.1 Exploratory Shaft Management, Planning, and Design Review

The Los Alamos FY 88 WPAS submittal covers the "Base Case," which includes a 12-foot-diameter shaft, a 6-foot-diameter shaft for emergency egress, a main test level at the 1,020-foot depth, and long exploratory core holes. Advance copies of the FY 88 WPAS and Weston format that were forwarded by WMPO to DOE/OGR resulted in questions and additional guidance from DOE/OGR.

REECo staff members completed construction check estimates for the exploratory shaft facility on April 10 and submitted them to ~~LLNL~~ LANL and the WMPO for the WPAS.

REECo personnel completed revision and update of the ESF Safety Plan, which was sent to the WMPO and the TPOs for comment.

A list of all NNWSI Project drawings that have been generated by H&N will be used to develop a milestone schedule for use in setting up earned value performance measurement.

REECo contract administration personnel requested that, for any new budgets prepared for the Project, the estimate for preparation of the subcontract solicitation package be increased from $50,000 to $70,000 to cover possible in-plant inspection for prequalification of bidders and possible use of Source Evaluation Board procedures for procurement.

WBS 1.2.6.9 TESTING

WBS 1.2.6.9.1 Exploratory Shaft Test Plan

At Los Alamos action items for the Exploratory Shaft Test Plan (ESTP) Committee meetings going back to January 1985 were compiled; items still relevant were identified and listed for committee action.

Prototype drift wall mapping continued in G-Tunnel at NTS by USGS and Bureau of Reclamation personnel. Work included both photographic activities and fracture mapping. Similar work was also underway with the prototype shaft wall mapping in the test pits at Fran Ridge.

All nine criteria letters for the hydrologic tests were transmitted to USGS on April 9 by the Bureau of Reclamation.

A draft of the scope of work for continuing support to the USGS effort in hydrologic testing was completed by the Bureau of Reclamation. Priorities are to be (1) writing the prototype activity plans; (2) writing the prototype procedures; (3) rewriting the Calico Hills test plan; (4) writing activity plans for the exploratory shaft; and (5) writing procedures specific to the exploratory shaft activity plan.

Criteria for use in designing the Exploratory Shaft test facilities were prepared and documented in draft form at LLNL this month for the waste package environment tests. These criteria will be improved as the conceptual Exploratory Shaft Test Plan (ESTP) is revised and preparation of detailed engineering test plans is started. Also, functional performance criteria (separate from the facility design criteria) were prepared for the exploratory shaft (ES) integrated data system (IDS). The ES Principal Investigators met in Las Vegas twice this month: once to reach a consensus on the proper scope and functions of the IDS, and a second time to discuss the results of the first meeting with WMPO management.

At LLNL initial reviews were completed for the report on thermal calculations that describes the temperature profiles expected around the tests and revision of the report is now in progress. The draft report on thermomechanical scoping calculations was revised and forwarded to the WMPO for policy review this month. Both of these reports play an important role in waste package environment test planning.

LLNL personnel prepared technical review comments on NRC generic technical position papers entitled "Generic Technical Position on In Situ Testing During Site Characterization for High-Level Nuclear Waste Repositories" and "Draft Generic Technical Position: Interpretation and Identification of the Disturbed Zone in the High-Level Waste Rule (10 CFR 60)."

Contingency planning for ES radionuclide migration or tracer tests was initiated at LLNL in view of the recent NRC position paper on sorption. The need for such tests has not yet been either established or ruled out, but is being evaluated in the context of defining the near-field environment expected for the waste package.

WBS 1.2.6.9.2 Exploratory Shaft Testing

Using the Odex 115 System, REECo personnel drilled four 6-inch by 5-foot test cell infiltration holes and two 6-inch by 45-foot holes (UE25 TC3 and 4) with 100 percent recovery of core samples. The drilling crew also tested 135 drill rods, each 3-1/2-inches by 20-feet, for 4,000 pounds per second inch. Sixty-eight passed the test.

Due to the stop-work order to USGS, the drill crew demobilized the Hycalog and Ideco 525 rigs and relocated the rigs to the Area 6 equipment yard. The five-person drill crew will be separated from employment by May 2, 1986.

The SNL report "Analyses of a Proposed Slot Test for the Exploratory Shaft" (SAND86-0977) has been submitted for peer review. The work includes two sets of two-dimensional analyses of the slot test; one for each plan and elevation view using elastic and compliant-joint material models. A three-dimensional elastic analysis allowed for an evaluation of each of the two-dimensional analyses.

SNL personnel continued work on Analysis #6, which is being run in support of the Sequential Drift Mining experiment proposed for the exploratory shaft. The calculations for the two-dimensional "elevation-view" analysis are complete. The hourglassing problem in now understood. The problem resulted from arching of the floor upon excavation and was solved by using a four-point integration scheme as opposed to a one-point integration scheme.

Staff members of RE/SPEC, Inc., completed analysis of the demonstration break-out rooms (DBRs) off of the exploratory shaft (Thermomechanics Analysis #15). After an oral presentation to SNL personnel, an addition to the problem-definition memo was made that considered elastic deformations of the upper DBR with no damage zone.

Los Alamos and F&S personnel discussed details of the prototype tests to be performed in G-Tunnel in support of the exploratory shaft diffusion test with John Newsom (drilling consultant). The goals of the prototype work should be accomplished with holes drilled vertically in each of the two tuffs of interest. Both the emplacement holes and the overcoring will be performed with air as the drilling fluid. The tracer delivery system design will be simplified by the decision to consider only vertical emplacement holes.

At Los Alamos the Fran Ridge drilling report was revised extensively to incorporate suggestions from peer reviewers. The revised version will be submitted for NNWSI Project technical review.

WBS 1.2.6.9.2.5 Exploratory Shaft Testing

Geotomography evaluations in the sand pit test bed at LLNL were suspended this month so that experimental work could proceed in the G-Tunnel test facility.

A major G-Tunnel activity during April was the deployment and testing of equipment to be used in the heater experiment.

Baseline measurements of medium properties, including relative permittivity, RF attenuation factor, thermalized neutron transmissivity, and temperature, were performed before the heater was energized on April 29 with a power input of 1 kilowatt. Measurements of the parameters previously listed continued at regular intervals.

The draft American Society for Testing and Materials (ASTM) paper on a proposed screening method for NX borehole jack data was completed at LLNL and sent to the WMPO for review. This report examines certain aspects of a proposed ASTM procedure for NX jack usage. Two-dimensional and three-dimensional finite

element calculations were begun to examine the load-deformation curves produced by NX jack tests in an undersized or oversized borehole. An NX borehole jack may be used in the waste package environment tests to measure elastic moduli in the test settings.

WBS 1.2.6.9.3 Integrated Data System

At Los Alamos work on development of a complete and current Integrated Data System Requirements Document is proceeding as planned. The document will be submitted in May to the principal investigators, Technical Project Officers, and the WMPO for review. The document will be baselined after revision and approval. The document will be the basis for a procurement solicitation to determine alternatives and potentially more cost-effective equipment for the complete integrated data system.

The implementation committee for the integrated data system held its first meeting on April 16 to address both technical and operational requirements for the system. Consensus was reached on most major requirements for the system. The most significant change of concept is the capability for transmission of all data, as acquired, to a separate data system for each organization. The principal investigators presented the conclusions of the implementation committee meeting to the WMPO on April 21.

Proposed changes to the integrated data system concept will be incorporated into the Requirements Document. Los Alamos personnel do not expect that these changes will significantly affect the schedule or budget for the system.

PLANNED WORK

Los Alamos personnel hope to send the ESTP Revision 1 document out for technical peer reviews.

At Los Alamos, staff members will complete the work plans and procedures and QA procedures for prototype air coring.

Los Alamos plans to make measurements of tuff properties that are necessary to prepare the Engineering Plan for the exploratory shaft chlorine-36 test.

SNL staff members will initiate peer review of the slot-strength-test analysis report.

Work will proceed at LLNL with instrument evaluations as resources permit. The conceptual test plan for Waste Package Environment Tests will also be revised as soon as possible.

PROBLEM AREAS

Development of the ESTP at Los Alamos is presently very slow because there is no approval to obtain informal NRC and technical peer reviews.

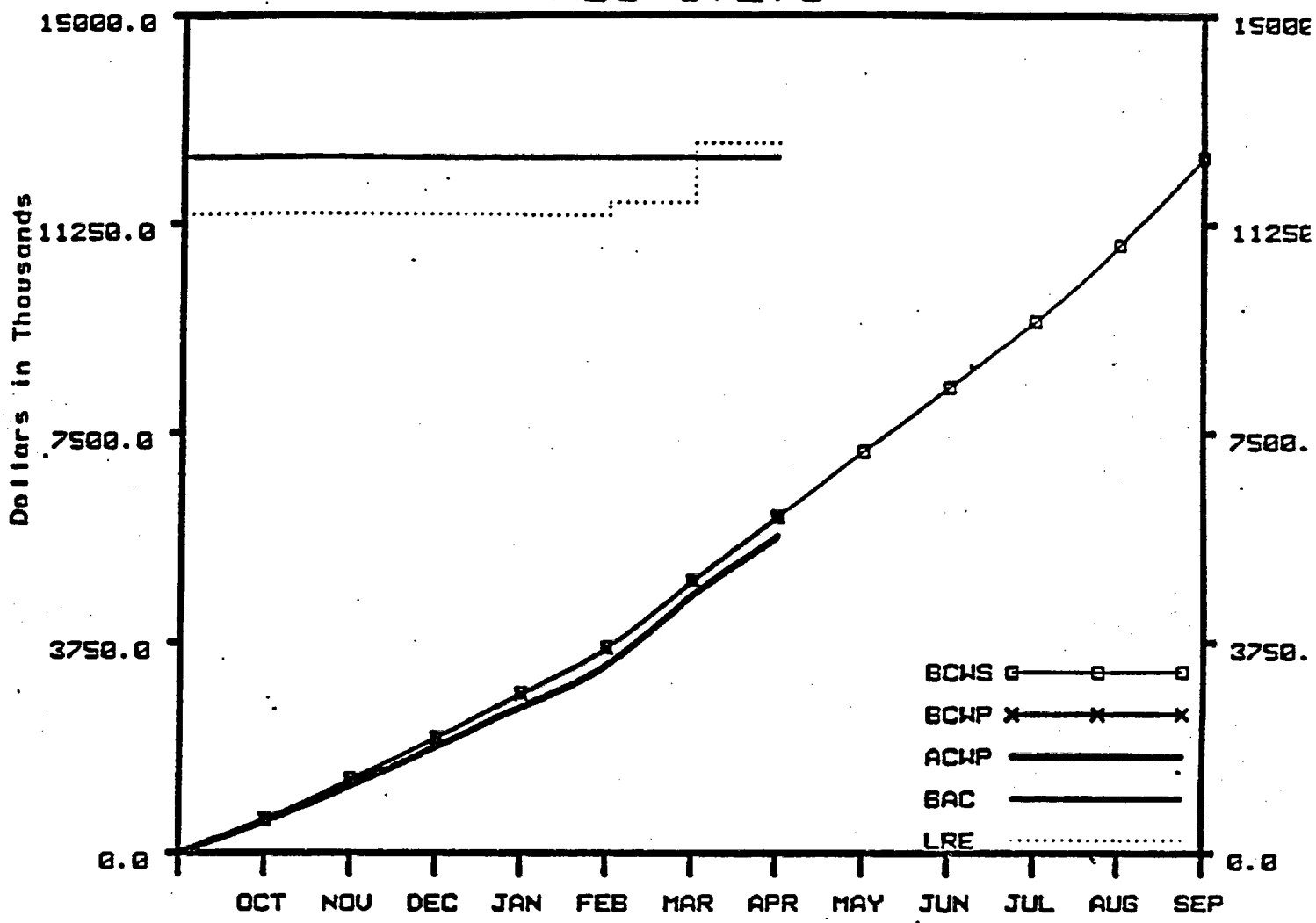
At LLNL a certain amount of effort continues to be diverted from exploratory shaft work to performance allocation and other issues. Revision of the conceptual test plan has now been delayed for over three months because of WPAS and performance allocation priorities. In addition, a very significant increase in effort looms ahead in the areas of test planning and quality assurance.

MILESTONE PROGRESS

The recently baselined dates for Los Alamos Milestones M641, M649, M085, and M666 are all unrealistic, given the present schedules.

LLNL submitted two deliverables to the WMPO this month: "Thermomechanical Scoping Calculations for the Waste Package Environment Tests" (2.6.9.2-86-IV-1) and "A Monte Carlo Investigation of a Proposed Screen for NX Borehole Jack Data" (LLNL identified 2.6.9.2-III-3).

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.6



EXPLORATORY SHAFT INVESTIGATIONS	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1134.2	6000.5
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1141.9	5999.0
C. ACTUAL COST OF WORK PERFORMED (ACWP)	1042.6	5646.5
D. BUDGET AT COMPLETION (BAC)		12441.7
E. LATEST REVISED ESTIMATE (LRE)		11941.5

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-1.5	-0.02
G. COST VARIANCE (B-C)	352.5	5.88
H. AT COMPLETION VARIANCE (D-E)	500.2	4.02

Remarks:

Cost and schedule variances within acceptable thresholds.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986 Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST
1261	Management and Integration	1,539.169	1,539.339	1,302.804	.170	236.535
1262	Site Preparation	102.255	102.255	116.775	-.000	-14.520
1263	Surface Facilities	11.360	11.360	10.900	.000	.460
1264	First Shaft	63.298	63.298	232.294	.000	-168.996
1265	Second Shaft	16.854	16.854	106.980	.000	-90.126
1266	Subsurface Excavations	143.296	143.296	156.273	.000	-12.977
1267	Underground Service Systems	158.650	158.650	288.653	-.000	-130.003
1268	Operations	.000	.000	.000	.000	.000
1269	Testing	3,965.600	3,963.953	3,431.780	-1.647	532.173
126	EXPLORATORY SHAFT INVESTIGATIONS	6,000.482	5,999.005	5,646.459	-1.477	352.546

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S	
M022	LANL	1.2.6.1	ESF Shaft and Mining Subcontract Awarded						△							◇ 3/87
M243	LANL	1.2.6.1	Complete Exploratory Shaft Readiness Review					△								◇ 11/86
M652	LANL	1.2.6.1	Start First Shaft (ES-1) Construction							△						◇ 5/87
M645	LANL	1.2.6.2	Start ESF Site Preparation						△							◇ 12/86

△ PLANNED MILESTONE COMPLETION DATE ◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED ◆ COMPLETED AS REVISED

1.2.7 TEST FACILITIES

OBJECTIVE

The major objective of this task is the design, construction, and operation of the test facilities that support technology development for other waste management programs and other geologic repository projects. The two major facilities operated under this WBS element are the Climax Spent Fuel Test Facility and the E-MAD Facility.

ACTIVITIES

WBS 1.2.7.2 TESTING

WBS 1.2.7.2.1 Climax

The report "Spent Fuel Test--Climax: Technical Measurements Data Management System Description and Data Presentation" is still at the WMPO for policy review.

Formal peer review for the LLNL report entitled "Post-Test Thermal Calculations and Data Analyses for the Spent Fuel Test--Climax" was completed; the report is now being revised.

WBS 1.2.7.2.2 E-MAD

Westinghouse personnel completed preparations for summer operation of the E-MAD facility.

All of the 17 fuel assemblies at E-MAD are now being stored in the Hot Bay Lag Storage Pit. With exhaust fans off, the highest Lag Storage Pit exhaust temperature was 31.5 °C. All canisterized fuel assemblies located in the Lag Storage Pit are in a safe configuration. The maximum recorded canister temperatures are well below the canister design limits.

Comments from Transnuclear have been received at Westinghouse and incorporated with DOE approval into a consolidated procedure for receiving, loading, and releasing a cask for shipment.

The DOE has approved the transfer of 2 BWR canisters, 2 BWR mockup fuel assemblies, and a BWR fuel handling tool from E-MAD to INEL/EG&G. Westinghouse personnel placed a mockup fuel assembly in each of the canisters and REECo will locate this equipment for shipment.

Westinghouse personnel also completed a number of other procedures. The operating consoles for the surface transport vehicle and calorimeter have been covered with vinyl for deactivation. The canister evacuation system including the evacuation console and two varian leak detectors have been deactivated. NOWO 1041 was completed to inspect the spent fuel dry storage locations. Deactivation of post mortem cell shield doors was completed.

The revised Quality Assurance Plan for Westinghouse was completed and submitted to WMPO for review and approval.

LLNL staff members began field testing for the exploratory shaft geomechanical tests in the G-tunnel underground facility.

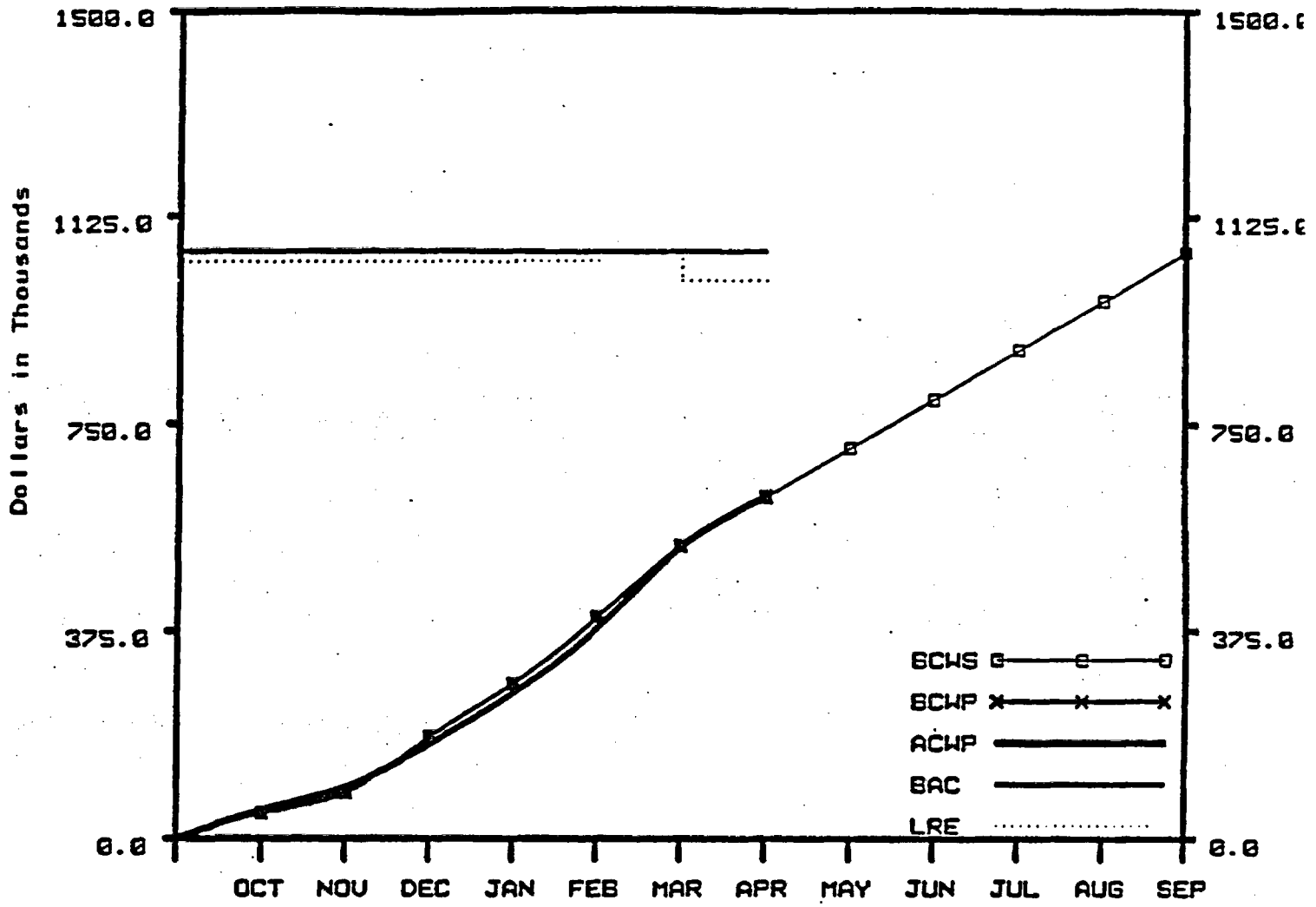
PROBLEM AREAS

General understaffing of the NNWSI Project at LLNL continues to cause conflicts between this work and other work of higher priority within the program.

MILESTONE PROGRESS

The LLNL final report entitled "Spent Fuel Test--Climax: An Evaluation of the Technical Feasibility of Geologic Storage of Spent Nuclear Fuel in Granite" (LLNL Milestone M708) was completed in draft form and submitted to the WMPO for review. Technical reviews are in progress simultaneously at LLNL.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.7



TEST FACILITIES	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	88.5	617.3
B. BUDGETED COST OF WORK PERFORMED (BCWP)	88.5	617.3
C. ACTUAL COST OF WORK PERFORMED (ACWP)	90.7	617.5
D. BUDGET AT COMPLETION (BAC)		1060.8
E. LATEST REVISED ESTIMATE (LRE)		1043.5

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	-0.2	-0.03
H. AT COMPLETION VARIANCE (D-E)	17.3	1.63

Remarks:

Cost and schedule variances within acceptable thresholds.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986

Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE				
		BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST
1271	Management and Integration	.000	.000	.000	.000	.000
1272	Testing	617.345	617.345	617.530	-.000	-.185
1273	New Facility Acquisitions	.000	.000	.000	.000	.000
127	TEST FACILITIES	617:345	617.345	617.530	-.000	-.185

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M708	LLNL	1.2.7.2	Final Report on the SFT-C			△						◇			
M279	SNL	1.2.7.2	Completion of Mining for G-Tunnel Welded Tuff Mining Evaluations								△				

△ PLANNED MILESTONE COMPLETION DATE

◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED

◆ COMPLETED AS REVISED

1.2.8 LAND ACQUISITION

OBJECTIVE

The objective of this task is to maintain access to land adjacent to the Nevada Test Site that is controlled by the U.S. Air Force and the Bureau of Land Management and to protect land that could be used for a high-level waste repository and the surrounding buffer zones.

ACTIVITIES

None.

PLANNED WORK

To be included in future NNWSI Project Monthly Reports.

PROBLEM AREAS

None.

1.2.9 PROGRAM MANAGEMENT

OBJECTIVE

The objective of this task is to manage all activities of the NNWSI Project by all participants. The five major areas identified are Project Management, Project Control, Interface Activities, Quality Assurance, and Generic Requirements Document (GRD) Support.

ACTIVITIES

WBS 1.2.9.1 MANAGEMENT AND INTEGRATION

Input for the revision of the Exploratory Shaft Project Management Plan is being prepared by the WMPO, SAIC, and Los Alamos. Because of the WPAS and Work Plan preparation, the March 31 date for a compiled draft was not met. The projected draft date to the WMPO is June 15.

The draft Systems Engineering Plan (SEMP) and Configuration Management Plan (CMP) have been issued for review. That review will be used to evaluate input on the Project Management Plan (PMP) before the latter is drafted. According to DOE Order 4700, the CMP and SEMP are part of the PMP and discussions are underway to determine how they will be included (either as separate, referenced documents, or as annexes). In addition, a consistency check is being made with the approved Project Plan. The expected date of late April for completion of the draft PMP was delayed because of eforts required for the Task Plans, Work Plans, and WPAS preparation. An optimistic projected draft delivery date to the WMPO is May 15.

The majority of the management effort went into revising and modifying WPAS input. LLNL and SNL developed a surrogate WPAS for the Performance Assessment activities within the NNWSI Project.

The approved NNWSI Project Plan was published at WMPO on April 9.

Two meetings, one on April 2 and the other on April 9 in Las Vegas, concerned the development and implementation of a procedure for Scientific Investigation Plans and their integration with the assignment of Quality Assurance levels.

The conversion of Inmagic records to the Revelation system was made on April 17. The system now contains 1,930 Spent Fuel Test records. This effort is part of the overall implementation of the NWMP Quality Assurance Records System.

H&N staff members reviewed report input with SAIC to ensure that H&N is meeting all reporting requirements and met with WMPO to review the status of budget, capital equipment, and the Area 25 Project Records Center.

An article to be published in "The Centerline," a Bureau of Reclamation Engineering & Research Center Information Publication, briefly describes the NNWSI Project and the Bureau's involvement.

WBS 1.2.9.1.4 Records Management

REECo submitted a report of records volume estimates to the WMPO on April 18, 1986.

A review team of WMPO, SAIC, and REECo personnel met on April 30 to discuss the overall flow of incoming and outgoing information.

The processing of drawings into the NNWSI Project quality records management system will be enchanced by the provision of aperture cards by contractors. The procedures for the development and transmittal of aperture cards (in addition to blue-line drawings) by contractors were initiated in 1984 and are now being revised and finalized by SNL staff members.

SNL record volume estimates were submitted to the WMPO on April 21, 1986.

The records management section of the USGS QA Manual is being revised by SAIC/Golden to meet current DOE regulations under NNWSI-SOP-01-01, Rev. 1. The draft of NNWSI-SOP-17-01 has not yet been approved.

The USGS QA files have been organized into a new filing system based on the current QA Manual organization. The original documents are stored at SAIC/Golden, with a duplicate file housed in the USGS QA Manager's office. Original documents are copied and transported to SAIC/Golden twice a week.

Initial training of the Records Administrator was conducted by Effective Solutions, Inc., during the week of April 7.

WBS 1.2.9.2 PROJECT CONTROL

Several USGS hydrology schedules were modified by SAIC/Golden on the basis of input from SCP planning sessions and FY 88 budget submission exercises. A summary schedule of exploratory shaft hydrologic testing was developed. A summary schedule was prepared at DOE's request for Site Investigations to be included in the budget submission. Detailed schedules were prepared for streamflow, saturated zone hydrology, unsaturated zone hydrology, and paleohydrology. As these schedules were developed, a notebook was established to track changes of status for USGS milestones.

A task plan was developed by SAIC/Golden to update the USGS work plans. A decision was made to update several sections in greater detail for the FY 86 submission. These plans should aid the preparation of the scientific investigation plans.

Members of the SAIC planning and scheduling staff began incorporating input for the WPAS from all NNWSI Project participants. Summary milestone networks were created for each WBS element as well as three different overview networks.

Members of SAIC Cost and Schedule Control Branch developed a new level 4 cost performance report, to be used in the NNWSI Project report monthly. Branch personnel completed a draft network of PMDS development activities and began a validation network.

A checkout of the Budget Data Entry System (BDES) software using IBM PC/XT was reinitiated and is now waiting for new BDES software from DOE/RMBD.

SAIC personnel completed the budget, cost analysis, and estimating sections for the Project Management Plan guideline and reviewed the NNWSI Project CMP for consistency with the NNWSI Project SEMP.

WBS 1.2.9.3 QUALITY ASSURANCE

On April 30, 1986, staff members finalized REECo's Quality Assurance Program Plan (QAPP) for the NNWSI Project and nineteen procedures in draft form for transmittal to the WMPO for review and approval.

Surveillances by REECo personnel of neutron hole drilling activity were ongoing until the receipt of the USGS stop-work order by the WMPO.

A WMPO surveillance visit was conducted at Los Alamos as part of WMPO's audit response and corrective action verification.

The WMPO hosted two quality assurance (QA) committee meetings to review and draft new guidelines for quality level assignments. Interim guidance will be sent to NNWSI Project participants to give them the basis for resubmitting the quality level assignments for WMPO approval. These resubmittals will include more information to facilitate WMPO review and approval.

Los Alamos personnel participated in the WMPO Sample Overview Committee (SOC) meeting at the USGS in Las Vegas. The major topic of discussion was the proposed expanded role of the SOC. A sample control Standard Operating Procedure was presented and discussed.

A review of QA procedures at Los Alamos was completed during a two-day "write-in" attended by a QA procedure reviewer from SAIC. This was the first attempt to conduct a write-in for procedure preparation, and it was successful. Four more QA procedures are to be submitted in early May for this review process.

Los Alamos personnel reviewed and commented on eight supplements to the QA plan for DOE's Office of Geological Repositories (OGR). The comments were provided to the WMPO for forwarding to OGR.

On April 9 to 11, 1986, staff members from SNL and PBQD met with WMPO personnel to discuss design interfaces for the exploratory shaft facility. On April 16, 1986, SNL and LLNL personnel met to discuss interface loads on the waste package being used for design consideration.

A follow-up QA audit visit was made by SNL to WES on April 21, 1986. Although it was found that appropriate actions in response to specific audit findings either had been taken or were planned, it also became clear that an understanding of the totality of QA requirements for this work does not exist at WES.

F. E. Rush a USGS staff member visited the Carson City office for several days during the latter part of the month to instruct flow management personnel in quality assurance procedures required as part of that investigation.

Numerous details concerning implementing the QA Program were attended to by SAIC/Golden, including preparation or revision of several technical procedures for the USGS Geologic Division and resolving operating procedures for the filing and document tracking requirements. The revision of the USGS QA manual is near completion. It should be available for USGS management review by mid-May.

Two meetings, one on April 2 and the other on April 9, in Las Vegas concerned the development and implementation of a procedure for Scientific Investigation plans and their integration with the assignment of Quality Assurance levels.

Three revised LLNL procedures were submitted for WMPO review and approval on April 11. These procedures constitute the system for the generation of technical procedures, document control, and quality assurance records. Eleven other procedures were sent out for internal review.

H&N submitted Amendments to the Quality Assurance Manual, to conform to NVO-196-17, Rev. 4, to WMPO on April 25, 1986.

Representatives from the USGS, SAIC, and SAIC, Golden, attended a meeting to finalize modifications to the USGS QA Manual. Many of the changes made will be germane to the USBR Manual.

SAIC QA personnel performed a surveillance of the meteorological monitoring equipment inspection and calibration activities on April 23. There was one nonconformance reported and assigned for disposition.

SAIC QA staff members reviewed and provided comments on the proposed Office of Geologic Repositories (OGR) QA Supplements in preparation for the OGR QACG meeting held April 22 to 24, 1986. Workshops to resolve the issues were conducted during the meeting. Since not all issues were resolved, further workshops will be scheduled.

SAIC and NRC representatives met on April 25 to discuss the NNWSI Project QA program and to receive feedback from the NRC on the NNWSI Project approach. There was a good interchange of information and a commitment to hold more frequent informal discussion.

Three audits have been conducted to date as scheduled in FY 86. Of the 15 audits conducted in FY 85, 9 remain open.

A total of three surveillances were conducted during the month of April. The surveillances were concentrated in three locations at the Nevada Test Site: USGS, Area 25; F&S; and REECo, Mercury. A total of 11 items and activities were monitored and no nonconformances were reported.

A QA audit team assigned to audit REECo reported 22 findings, 3 major findings, and numerous observations.

At SAIC changes to the final draft of NNWSI-SOP-17-01 have been incorporated. The draft NNWSI-SOP-17-01 is being reviewed by the WMPO Records Administrator.

Presently the QA Records Management System (QARMS) is installed at USGS/Denver, SAIC/Las Vegas (including QASC and T&MSS QA records), LLNL/Livermore, SNL/Albuquerque, and Los Alamos/Los Alamos. The data base has been updated at SNL and update for the USGS data base is scheduled for late May. The next installation of the QARMS will be the Project Record Center, with installation of H&N, F&S, and REECo to follow. The computers for these installations have been received; however, the printer order has not been placed. The installation is now dependent on receipt of the remaining equipment.

Interim changes to the NNWSI Project QAP NVO-196-17, Rev. 4; NNWSI-SOP-02-01, Rev. 1; and NNWSI-SOP-02-02, Rev. 1, have been prepared. These changes are necessary to provide additional programmatic guidance relative to scientific investigations, design control activities, and the assignment of Quality Assurance Levels to NNWSI Project items and activities. The specific changes were reviewed with the appropriate Project participants during QA Level Assignment workshops held in Las Vegas on April 2, 9, and 10, 1986. The interim changes are currently being reviewed by WMPO staff and should be issued for implementation in early May 1986.

SAIC staff members met with NRC representatives in Las Vegas on April 30 to provide the NRC with an informal briefing concerning the proposed interim changes to NVO-196-17, its supplemental SOPs, and their relationship to assignment of QA levels to NNWSI Project items and activities. The NRC is contemplating a revision of their Standard Review Plan for High-level Waste Repositories. Some of the concepts and terminology given in the NNWSI Project approach may be helpful on the revision of the NRC Standard Review Plan.

A review of the NNWSI Project QA Plan NVO-196-17 and the various Standard Operating Procedures (SOPs), to determine if changes to these documents are required, is complete. A letter containing the recommendations for revisions will be submitted to the WMPO for concurrence.

All comments on several Los Alamos QA procedures were satisfactorily resolved at a comment resolution meeting that took place in Los Alamos on April 21 and 22. A letter is currently being prepared for the DOE that will approve these procedures for implementation, and baseline the approval status of the Los Alamos QA Program. Several additional Los Alamos procedures have been received for review. Comments are expected to be resolved in a comment resolution meeting scheduled for May 21 and 22, 1986.

Revisions have been received for the F&S, REECo, and WEC QA Program Plans and QA Procedures. These revisions are intended to comply with the latest revisions to NVO-196-17 and SOPs. Review of these documents should be complete by May 26, 1986.

Several LLNL QA procedures are currently being reviewed. Review of these documents should be complete by May 23, 1986.

The Holmes & Narver Energy Support Division QA Manual, as amended for the NNWSI Project QAP and SOPs (latest revision), was approved. A letter approving this manual was prepared and issued.

The WMPO granted a delay in submitting the revised SAIC QAPP until May 30, 1986.

SAIC staff members continue to be assigned to USGS/Denver to provide assistance to USGS QA as a result of the WMPO 86-2 audit conducted in March.

Comments from the Office of Geologic Repositories (OGR) review of Section 8.6 of the SCP are being incorporated with the exception of those that require clarification or changes to the Office of Civilian Radioactive Waste Management annotated outline.

SAIC staff members attended the OGR QA coordinating group meeting on April 22 and 23, at which the affected Indian tribes and States were invited to participate. Each project presented the status of their QA Program implementation and problem areas that were identified as a result of audits and surveillances. The projects also presented comments to the proposed OGR QA Plan and the nine supplements. The meeting resulted in the following agreements: 1) closure was reached on the supplement dealing with QA overview, records, R&D, peer review, graded QA, and validity of data (with many modifications); and 2) supplements on M&TE and QA software were deleted and the supplement on qualification of personnel was deferred to a working group.

PROBLEM AREAS

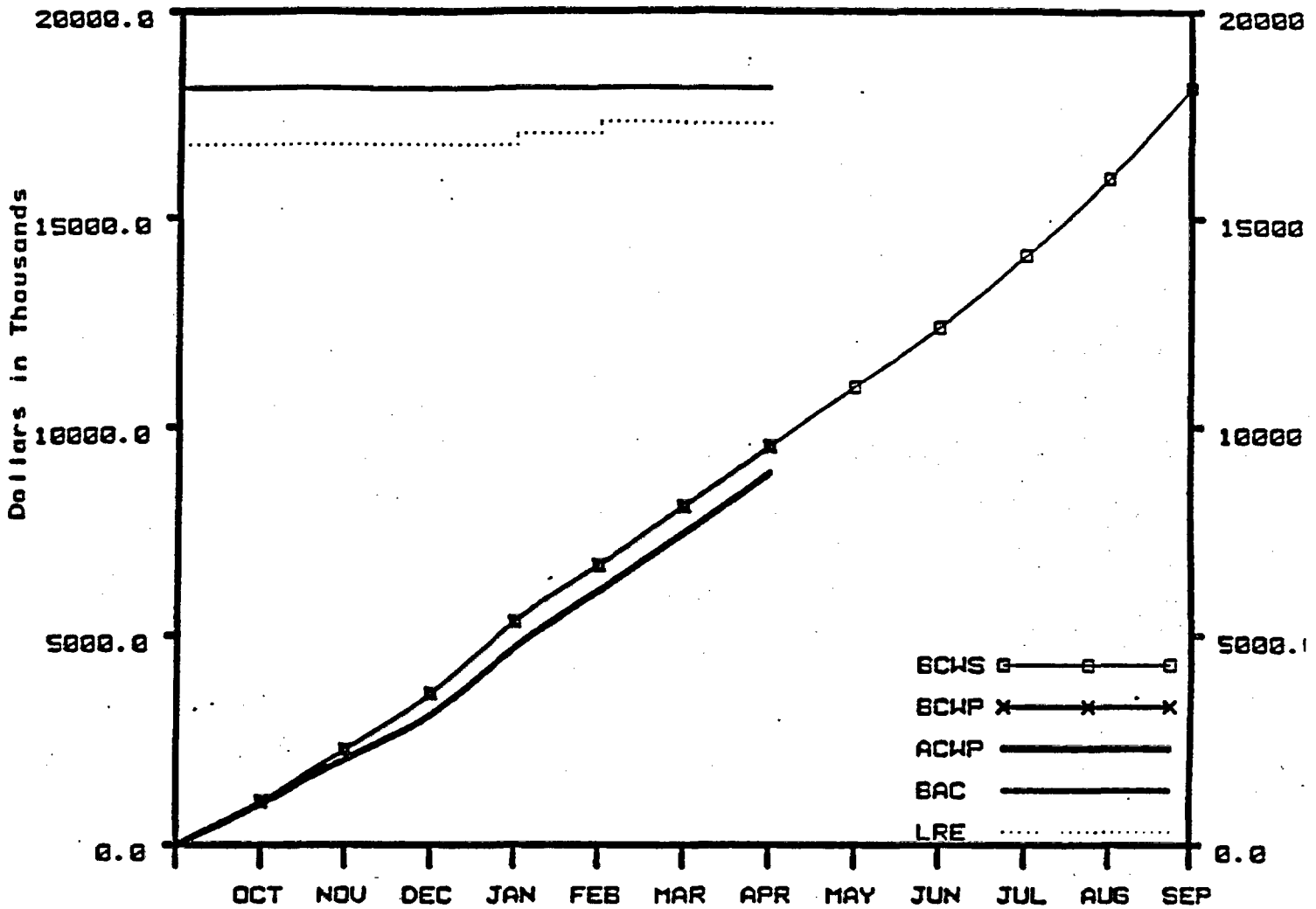
Closing the NNWSI Project core library has cast a shadow on all previously collected data based on samples from the library. Solution of this dilemma must be achieved or a large number of measurements and analysis will have to be repeated. The measurements and resultant data are the foundations of a number of important licensing considerations for the repository.

LLNL continues to search for additional support for this subtask.

MILESTONE PROGRESS

Completion of the SNL Milestone R088, a quality assurance program plan, is expected by May 1, 1986.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.9



PROJECT MANAGEMENT	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1418.8	9518.5
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1418.8	9520.0
C. ACTUAL COST OF WORK PERFORMED (ACWP)	1432.1	8884.1
D. BUDGET AT COMPLETION (BAC)		18147.3
E. LATEST REVISED ESTIMATE (LRE)		16962.0

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	1.5	0.02
G. COST VARIANCE (B-C)	635.8	6.68
H. AT COMPLETION VARIANCE (D-E)	1185.3	6.53

Remarks:

Cost and schedule variances within acceptable thresholds.

COST PERFORMANCE REPORT
WBS LEVEL 4
U.S. DEPARTMENT OF ENERGY
NNWSI PROJECT

For: APR 1986

Date: May 16, 1986

WBS NUMBER AND DESCRIPTION		YEAR TO DATE				
		BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES	
					SCHEDULE	COST
1291	Management and Integration	4,949.101	4,949.251	4,763.258	.150	185.993
1292	Project Control	2,010.042	2,010.465	1,908.054	.423	102.410
1293	Quality Assurance	2,559.332	2,560.261	2,212.833	.929	347.428
129	PROJECT MANAGEMENT	9,518.475	9,519.976	8,884.145	1.501	635.831

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION		O	N	D	J	F	M	A	M	J	J	A	S
M907	SAIC	1.2.9.1	Draft Project Management Plan	△ 3/85								◇				
M901	SAIC	1.2.9.1	Submit FY 85 NNWSI Project Plan to DOE/HQ for Approval	△ 2/85	◆											
M719	WMPO	1.2.9.1	Submit FY 88 Budget to DOE/HQ								◆					

△ PLANNED MILESTONE COMPLETION DATE

◇ REVISED MILESTONE COMPLETION DATE

▲ COMPLETED AS SCHEDULED

◆ COMPLETED AS REVISED

U.S. DEPARTMENT OF ENERGY

OCRWM

OGR

Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

PARTICIPANT

BUDGET vs COST

COST PERFORMANCE REPORT - LEVEL 3
WORK BREAKDOWN STRUCTURE (FORMAT 1)
U.S. DEPARTMENT OF ENERGY

CONTRACTOR: NNSI Project

LOCATION: P.O. Box 14100, Las Vegas, NV 89114

CONTRACT TYPE NO.:

PROJECT NAME/NUMBER: NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS

REPORT YEAR AND MONTH: APR 1986

SIGNATURE:

TITLE: PROJECT MANAGER

DATE: May 16, 1986

WBS NUMBER AND DESCRIPTION	CURRENT PERIOD					YEAR TO DATE					FISCAL YEAR COMPLETION		
	BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST	BUD. COST OF WORK SCHEDULED	BUD. COST OF WORK PERFORMED	ACTUAL COST OF WORK PERFORMED	VARIANCES SCHEDULE	VARIANCES COST	BASELINED BUDGET	LATEST REVISED ESTIMATE	VARIANCE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
121 SYSTEMS	619.700	557.857	420.382	-61.843	137.476	3.605.360	3.566.094	3.254.748	-39.266	311.346	6.680.000	6.002.329	685.671
122 WASTE PACKAGE	595.500	678.899	641.500	82.999	37.399	3.502.300	3.760.447	3.495.700	258.147	264.747	8.529.000	8.202.177	327.623
123 SITE INVESTIGATIONS	3.569.440	3.492.722	2.294.228	-76.718	1.198.494	15.885.290	15.676.603	14.456.294	-208.687	1.220.398	34.124.000	30.647.009	3.476.991
124 REPOSITORY INVESTIGATIONS	1.458.105	1.352.720	619.968	-93.385	742.752	6.355.685	6.340.620	5.815.091	-14.985	525.529	14.664.600	13.628.153	1.036.447
125 REGULATORY AND INSTITUTIONAL INVESTIGATIONS	1.465.123	1.333.973	917.323	-131.150	416.650	6.003.639	5.647.633	5.034.438	-356.006	613.195	13.000.000	11.875.004	1.212.996
126 EXPLORATORY SHAFT INVESTIGATIONS	1.134.242	1.141.942	1.042.630	7.700	99.312	6.000.482	5.999.005	5.646.459	-1.477	352.546	12.441.700	11.941.522	500.178
127 TEST FACILITIES	89.491	89.491	90.676	-.000	-2.185	617.345	617.345	617.530	-.000	-.185	1.060.000	1.043.499	17.302
128 LAND ACQUISITION	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
129 PROJECT MANAGEMENT	1.419.005	1.418.006	1.432.003	.001	-13.277	9.510.475	9.519.976	8.884.145	1.501	635.831	18.147.300	16.962.025	1.185.275
12 NNSI - TOTAL	10.347.007	10.075.411	7.458.750	-272.356	2.616.621	51.488.496	51.127.003	47.204.404	-360.693	3.923.399	108.745.000	100.302.519	8.362.481

COST PERFORMANCE REPORT - LEVEL 4
WORK BREAKDOWN STRUCTURE (FORMAT 1)
U.S. DEPARTMENT OF ENERGY

CONTRACTOR: WASSI Project

LOCATION: P.O. Box 14188, Las Vegas, NV 89114

CONTRACT TYPE NO.:

PROJECT NAME/NUMBER: NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS

REPORT YEAR AND MONTH: APR 1986

SIGNATURE:

TITLE:

Date:

WBS NUMBER AND DESCRIPTION	CURRENT PERIOD: BUD. COST OF WORK SCHEDULED	CURRENT PERIOD: BUD. COST OF WORK PERFORMED	CURRENT PERIOD: ACTUAL COST OF WORK PERFORMED	CURRENT PERIOD: VARIANCES SCHEDULE	CURRENT PERIOD: VARIANCES COST	YEAR TO DATE: BUD. COST OF WORK SCHEDULED	YEAR TO DATE: BUD. COST OF WORK PERFORMED	YEAR TO DATE: ACTUAL COST OF WORK PERFORMED	YEAR TO DATE: VARIANCES SCHEDULE	YEAR TO DATE: VARIANCES COST
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1211 Systems Management and Integration	16.000	16.000	2.000	.000	9.000	100.000	100.070	72.000	.070	28.070
1212 System Engineering	214.700	214.699	126.382	-.001	88.318	1.240.360	1.240.708	1.056.748	.348	183.960
1213 Technical Data Base Management	99.000	37.158	94.000	-61.842	-56.842	641.000	601.284	548.000	-39.716	53.284
1214 Total Systems Performance Assessment	290.000	290.000	191.000	.000	97.000	1.624.000	1.624.081	1.578.000	.081	46.081
121 SYSTEMS	619.700	557.857	420.382	-61.843	137.476	3.605.360	3.566.094	3.254.748	-39.266	311.346
1221 Management and Integration	37.900	37.900	34.700	.000	3.200	186.300	186.275	150.800	-.025	-4.525
1222 Package Environment	52.000	72.000	76.100	20.000	-4.100	424.000	514.170	561.900	90.170	-47.730
1223 Waste Form & Materials Testing	430.000	482.979	439.100	52.979	43.879	2.430.000	2.578.177	2.284.500	148.177	293.677
1224 Design, Fabricate, and Prototype Testing	28.000	38.000	47.200	10.000	-9.200	198.000	217.829	232.200	19.829	-14.371
1225 Performance Assessment	48.000	48.000	44.900	.000	3.100	264.000	264.000	226.300	.000	37.700
122 WASTE PACKAGE	595.900	678.899	641.500	82.999	37.399	3.502.300	3.760.447	3.495.700	258.147	264.747
1231 Management & Integration	290.874	290.874	235.714	.000	53.310	1.279.305	1.278.903	1.243.505	-.372	35.476
1232 Geology	659.510	659.510	591.710	-.000	67.800	3.760.488	3.723.806	3.585.288	-36.682	138.518
1233 Hydrology	506.600	506.600	473.564	-.000	33.036	2.867.512	2.838.566	2.809.476	-28.946	29.090
1234 Geochemistry	553.900	514.000	396.500	-39.500	117.500	3.376.600	3.440.987	3.225.300	64.387	215.687
1235 Drilling	1.309.900	1.309.901	384.539	.001	925.362	3.450.851	3.441.248	2.526.970	-9.103	914.278
1236 Environment	117.628	111.766	82.891	-5.862	28.875	459.444	399.930	435.707	-59.514	-35.776
1237 Socioeconomic	41.870	10.913	58.513	-30.957	-47.600	293.090	140.198	237.476	-152.892	-97.278
1238 Geochemical Modeling Code EQ3/6	90.000	90.000	69.000	.000	20.200	399.000	412.516	392.600	14.516	19.916
1239 Deferred Site Close Out	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
123 SITE INVESTIGATIONS	3.569.440	3.492.722	2.294.228	-76.718	1.198.494	15.885.290	15.676.683	14.456.294	-208.607	1.220.390
1241 Management and Integration	499.286	499.286	278.768	-.000	220.437	2.392.205	2.392.095	2.437.091	-.110	-44.996
1242 Development and Testing	455.900	362.514	162.200	-93.386	200.314	2.214.400	2.200.264	2.023.088	-14.136	177.264
1243 Facilities	330.000	330.001	128.000	.001	202.001	959.000	958.334	841.000	-.666	117.334
1244 Operations and Maintenance	43.000	43.000	38.000	.000	5.000	190.000	190.014	165.000	.014	25.014
1245 Decommissioning	4.000	4.000	.000	-.000	4.000	15.000	15.000	.000	.000	15.000
1246 Repository Performance Assessment	124.000	124.000	21.000	-.000	103.000	585.000	584.913	349.000	-.087	235.913
124 REPOSITORY INVESTIGATIONS	1.456.186	1.362.720	619.968	-93.386	742.752	6.355.605	6.340.620	5.815.091	-14.985	525.529
1251 Management and Integration	62.051	62.051	105.254	-.000	-43.203	432.529	432.410	492.223	-.119	-59.813
1252 Licensing	457.382	451.364	477.942	-105.018	-26.578	3.166.441	2.843.278	2.707.897	-323.163	135.381
1253 Environmental Compliance	134.897	109.767	58.343	-25.130	51.424	1.017.043	984.327	906.253	-32.716	78.074
1254 Communication and Liaison	25.293	25.293	17.745	.000	7.548	165.473	165.473	133.373	.000	32.101
1255 Technology and Financial Assistance	685.500	685.498	258.040	-.002	427.458	1.227.153	1.222.146	794.693	-.007	427.453
125 REGULATORY AND INSTITUTIONAL INVESTIGATIONS	1.465.123	1.333.973	917.323	-131.150	416.650	6.008.639	5.647.633	5.034.438	-356.006	613.195
1261 Management and Integration	305.237	305.237	193.372	-.000	111.865	1.539.169	1.539.339	1.382.884	.170	236.535
1262 Site Preparation	1.805	1.805	16.225	.000	-14.420	102.255	102.255	116.775	-.000	-14.520
1263 Surface Facilities	1.960	1.960	1.500	.000	.460	11.360	11.360	10.900	.000	.460
1264 First Shaft	10.790	10.790	135.413	.000	-124.623	63.298	63.298	232.294	.000	-168.996
1265 Second Shaft	2.210	2.210	33.074	.000	-30.864	16.854	16.854	106.980	.000	-90.126
1266 Subsurface Excavations	36.200	36.200	49.177	.000	-12.977	143.296	143.296	156.273	.000	-12.977
1267 Underground Service Systems	19.550	19.550	75.199	.000	-55.649	158.650	158.650	288.653	-.000	-130.003
1268 Operations	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
1269 Testing	756.500	764.200	538.600	7.700	225.520	3.989.600	3.983.953	3.431.780	-1.647	552.173
126 EXPLORATORY SHAFT INVESTIGATIONS	1.134.242	1.141.942	1.042.630	7.700	99.312	6.008.482	5.999.805	5.646.459	-1.677	352.546
1271 Management and Integration	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
1272 Testing	88.491	88.491	90.676	-.000	-2.185	617.345	617.345	617.530	-.000	-.185
1273 New Facility Acquisitions	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

COST PERFORMANCE REPORT - LEVEL 4
WORK BREAKDOWN STRUCTURE (FORMAT 1)
U.S. DEPARTMENT OF ENERGY

CONTRACTOR: NNMSI Project

LOCATION: P.O. Box 14100, Las Vegas, NV 89114

CONTRACT TYPE.NO.:

PROJECT NAME/NUMBER: NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS

REPORT YEAR AND MONTH: APR 1986

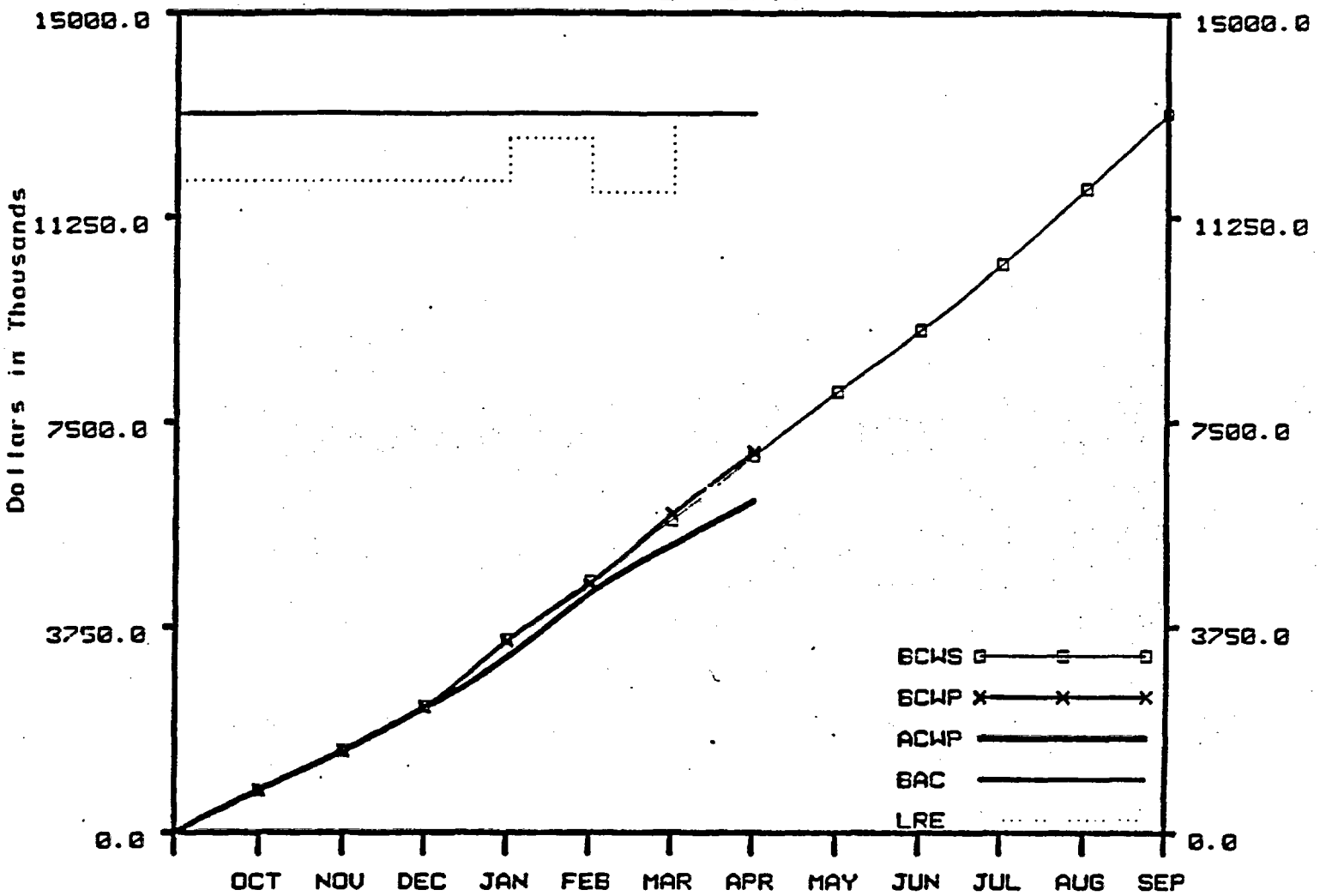
SIGNATURE:

TITLE: PROJECT MANAGER

Date: May 16, 1986

WBS NUMBER AND DESCRIPTION	CURRENT PERIOD BCWS	CURRENT PERIOD BCWP	CURRENT PERIOD ACWP	CURRENT PERIOD VARIANCES SCHEDULE	CURRENT PERIOD VARIANCES COST	YEAR TO DATE BCWS	YEAR TO DATE BCWP	YEAR TO DATE ACWP	YEAR TO DATE VARIANCES SCHEDULE	YEAR TO DATE VARIANCES COST	FISCAL YEAR COMPLETION BASELINED BUDGET	FISCAL YEAR COMPLETION LATEST REVISED ESTIMATE	FISCAL YEAR COMPLETION VARIANCE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
127 TEST FACILITIES	88.491	88.491	90.676	-.000	-2.185	617.345	617.345	617.530	-.000	-.185	1.060.000	1.043.498	17.302
128 LAND ACQUISITION	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
1291 Management and Integration	844.551	844.551	817.467	-.000	-172.986	4.949.101	4.949.251	4.763.258	.150	185.993	9.161.400	9.121.328	40.072
1292 Project Control	317.303	317.304	285.740	.001	31.564	2.010.042	2.010.465	1.980.054	.423	102.410	3.927.700	3.497.598	430.102
1293 Quality Assurance	456.941	456.942	328.876	.001	128.066	2.559.332	2.560.261	2.212.833	.929	347.428	5.050.200	4.343.099	715.101
129 PROJECT MANAGEMENT	1.418.805	1.418.806	1.432.083	.001	-13.277	9.518.475	9.519.976	8.894.145	1.501	635.831	18.147.300	16.962.025	1.185.275
12 NNMSI - TOTAL	10.347.807	10.075.411	7.458.798	-272.395	2.616.621	51.488.496	51.127.803	47.204.404	-360.693	3.923.399	108.745.800	100.392.519	8.352.481

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.A



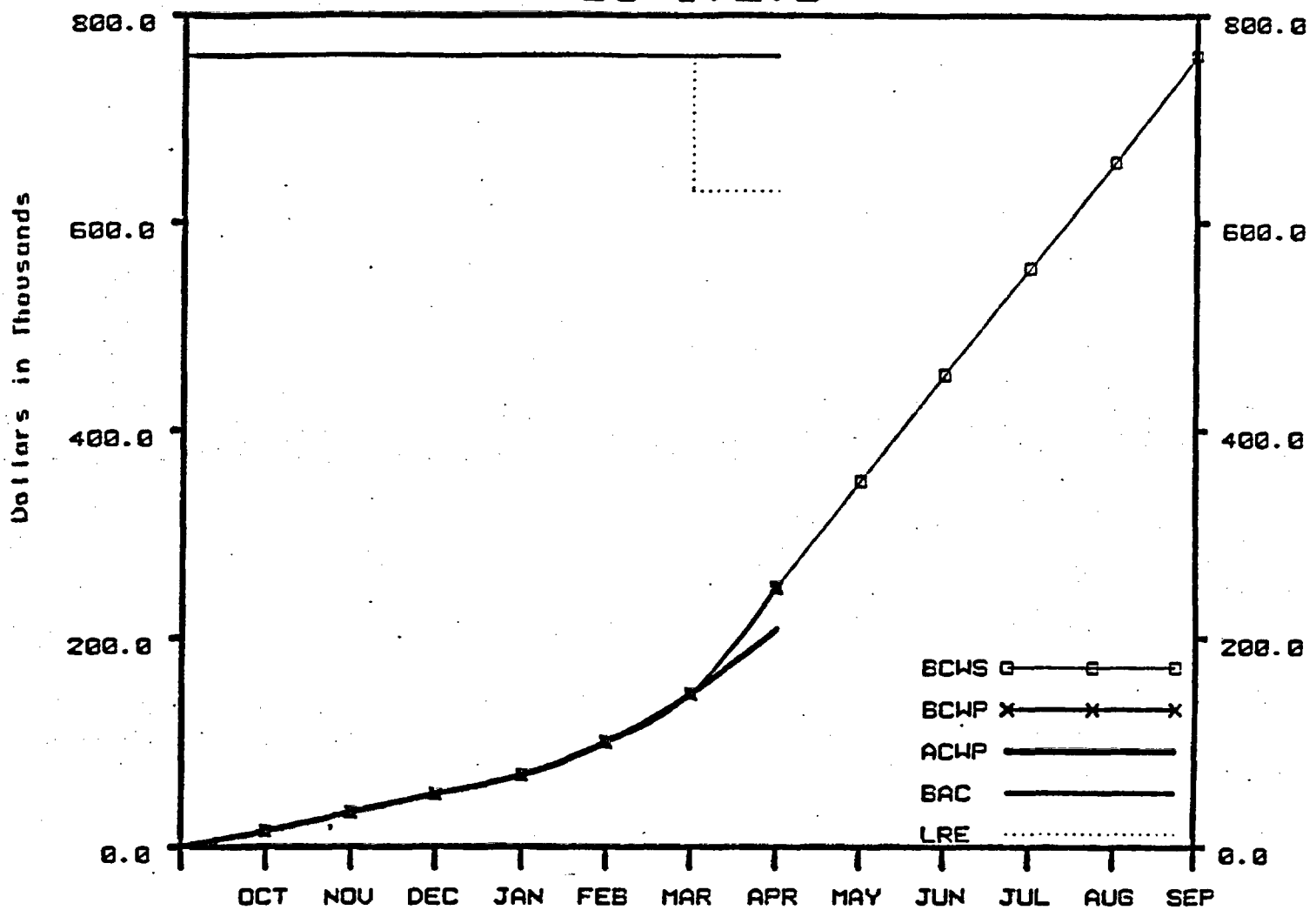
LOS ALAMOS - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1172.9	6876.9
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1137.7	6946.9
C. ACTUAL COST OF WORK PERFORMED (ACWP)	811.4	6055.1
D. BUDGET AT COMPLETION (BAC)		13149.0
E. LATEST REVISED ESTIMATE (LRE)		12988.4

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	70.0	1.02
G. COST VARIANCE (B-C)	891.8	12.84
H. AT COMPLETION VARIANCE (D-E)	160.6	1.22

Remarks:

Cost variance due to the need to redefine some work, billing lag with a subcontractor, various subcontracts pending and reallocation of effort to later part of fiscal year.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.B



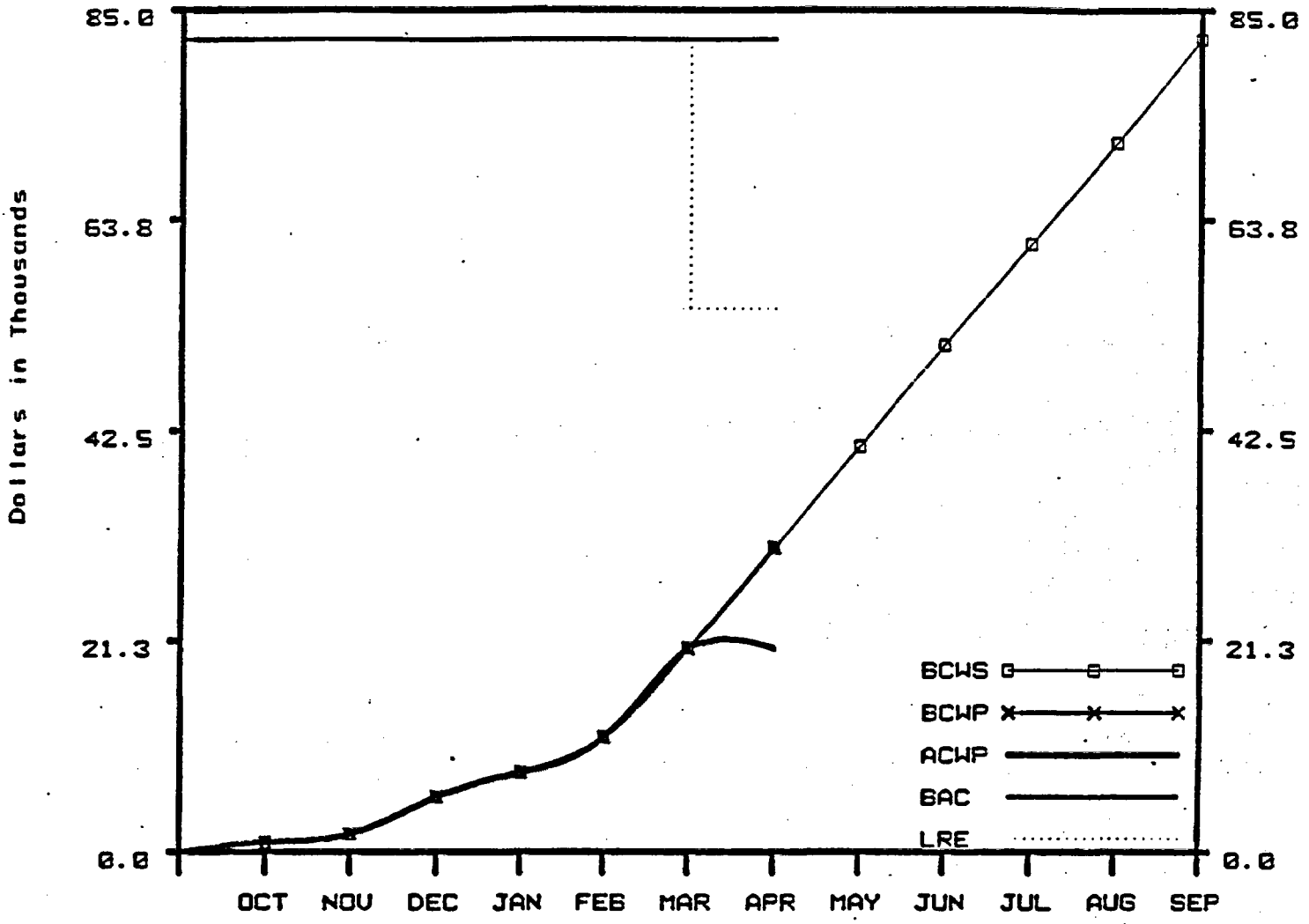
LBL - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	102.3	248.8
B. BUDGETED COST OF WORK PERFORMED (BCWP)	102.3	248.8
C. ACTUAL COST OF WORK PERFORMED (ACWP)	61.7	208.2
D. BUDGET AT COMPLETION (BAC)		761.0
E. LATEST REVISED ESTIMATE (LRE)		630.2

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-0.1	-0.03
G. COST VARIANCE (B-C)	40.6	16.30
H. AT COMPLETION VARIANCE (D-E)	130.8	17.19

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS:1.2.E



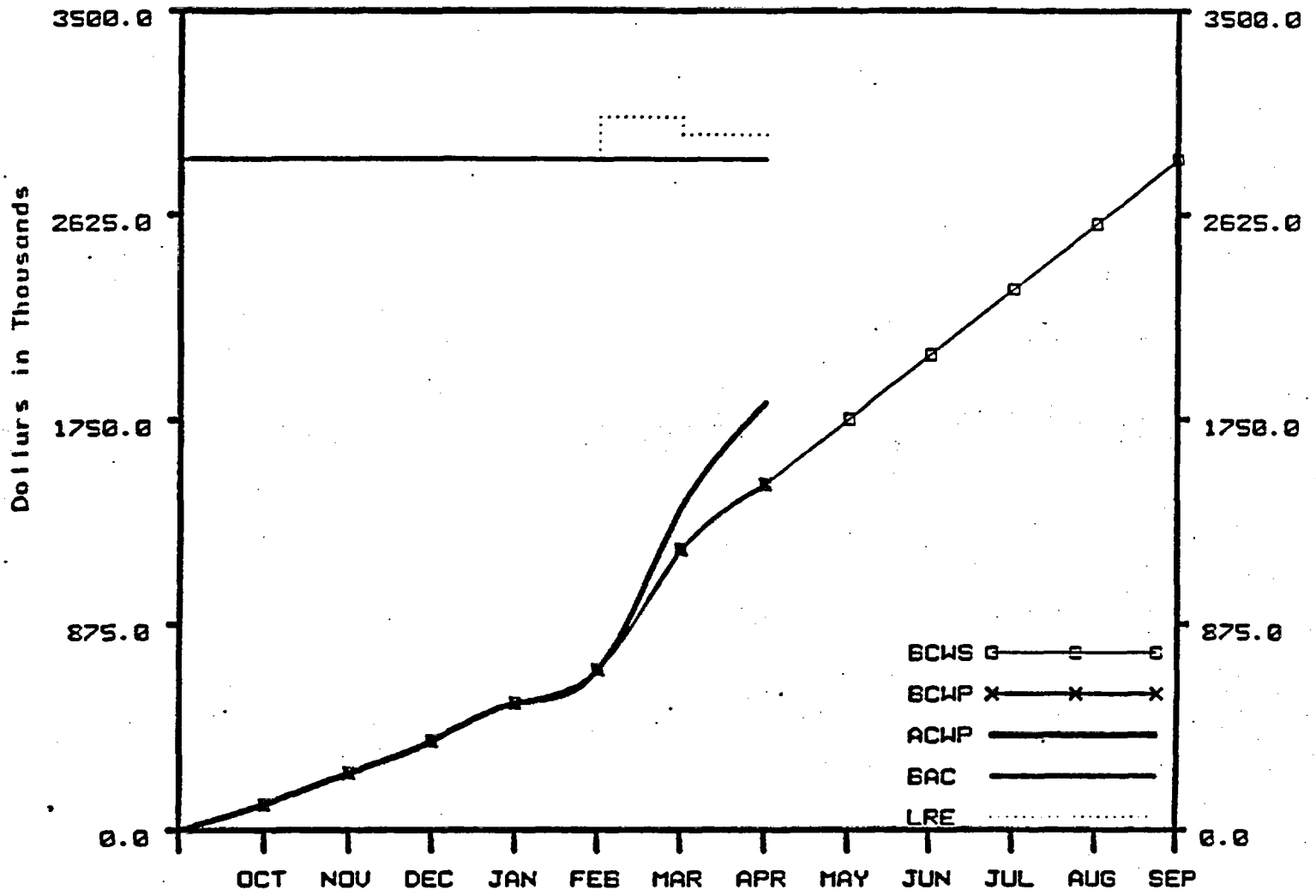
EG&G - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	10.2	30.7
B. BUDGETED COST OF WORK PERFORMED (BCWP)	10.2	30.7
C. ACTUAL COST OF WORK PERFORMED (ACWP)	0.0	20.5
D. BUDGET AT COMPLETION (BAC)		82.0
E. LATEST REVISED ESTIMATE (LRE)		54.7

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	10.2	33.26
H. AT COMPLETION VARIANCE (D-E)	27.3	33.26

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.F



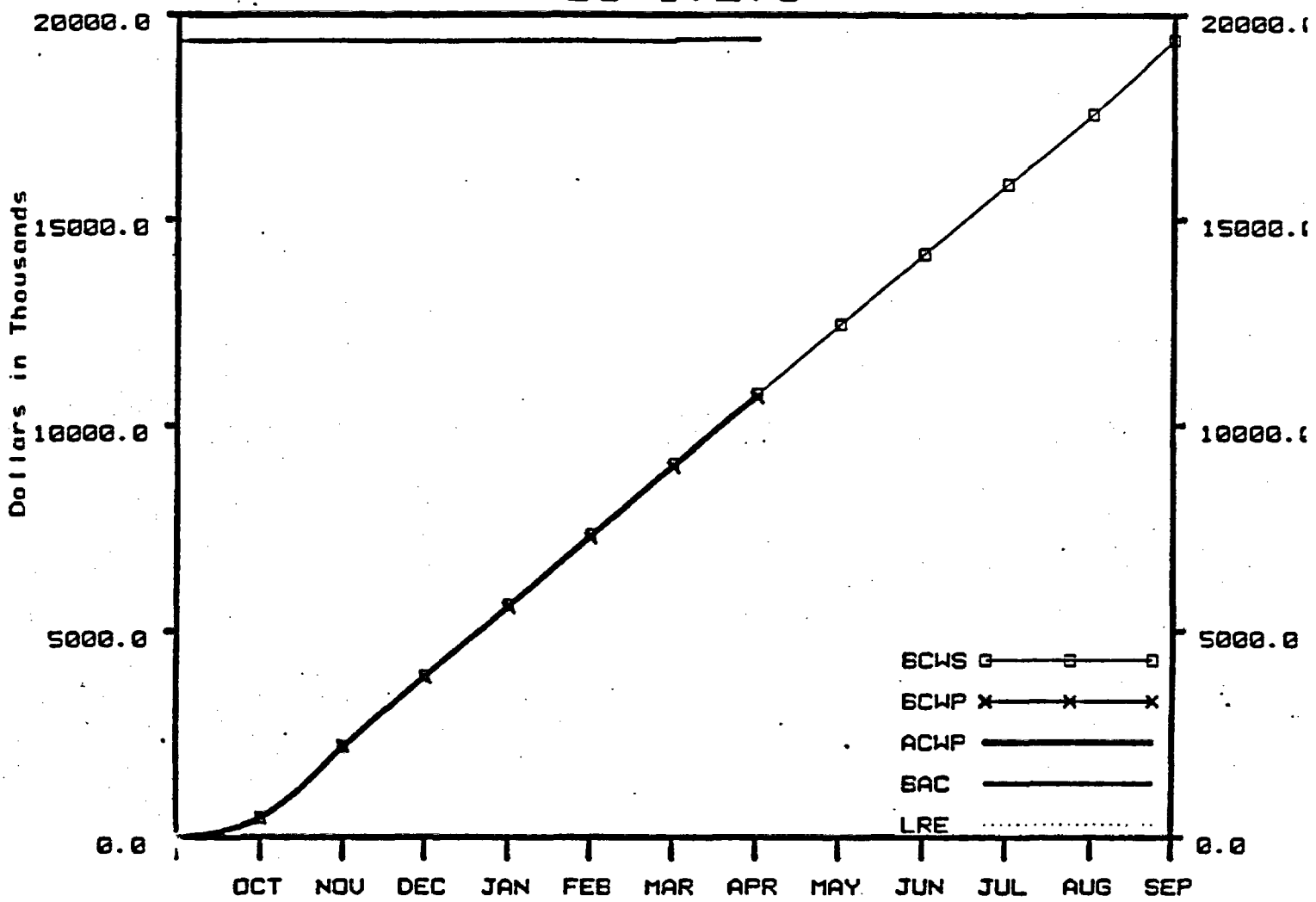
F&S - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	277.4	1472.1
B. BUDGETED COST OF WORK PERFORMED (BCWP)	277.4	1472.1
C. ACTUAL COST OF WORK PERFORMED (ACWP)	444.5	1817.2
D. BUDGET AT COMPLETION (BAC)		2860.2
E. LATEST REVISED ESTIMATE (LRE)		3118.4

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	-345.1	-23.44
H. AT COMPLETION VARIANCE (D-E)	-258.2	-9.03

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.6



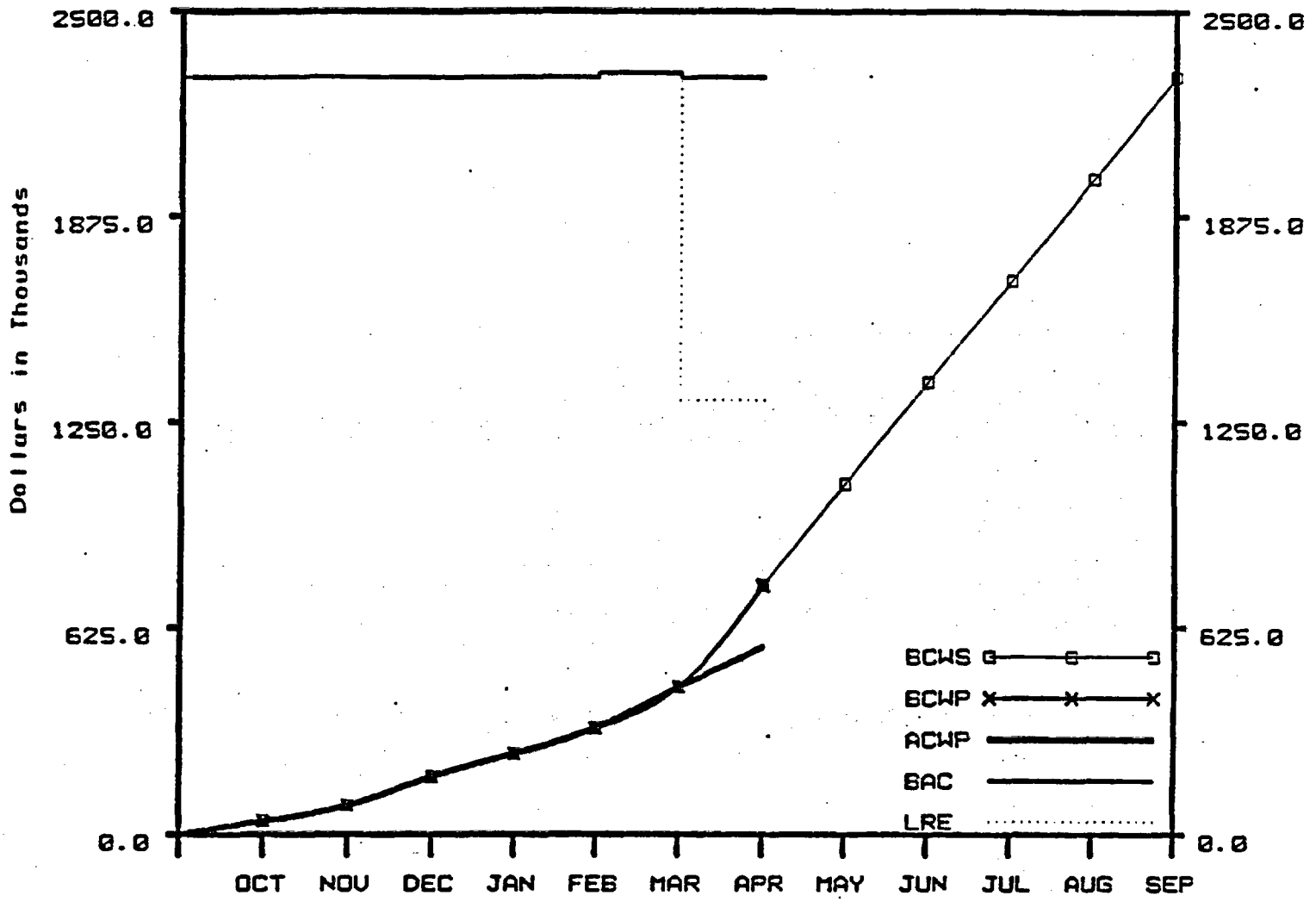
USGS - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1705.3	10745.7
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1705.3	10671.1
C. ACTUAL COST OF WORK PERFORMED (ACWP)	1705.3	10719.2
D. BUDGET AT COMPLETION (BAC)		19391.9
E. LATEST REVISED ESTIMATE (LRE)		19532.8

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-74.5	-0.69
G. COST VARIANCE (B-C)	-48.0	-0.45
H. AT COMPLETION VARIANCE (D-E)	-140.9	-0.73

Remarks:

Variance below analysis threshold. No detailed explanation required.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.H



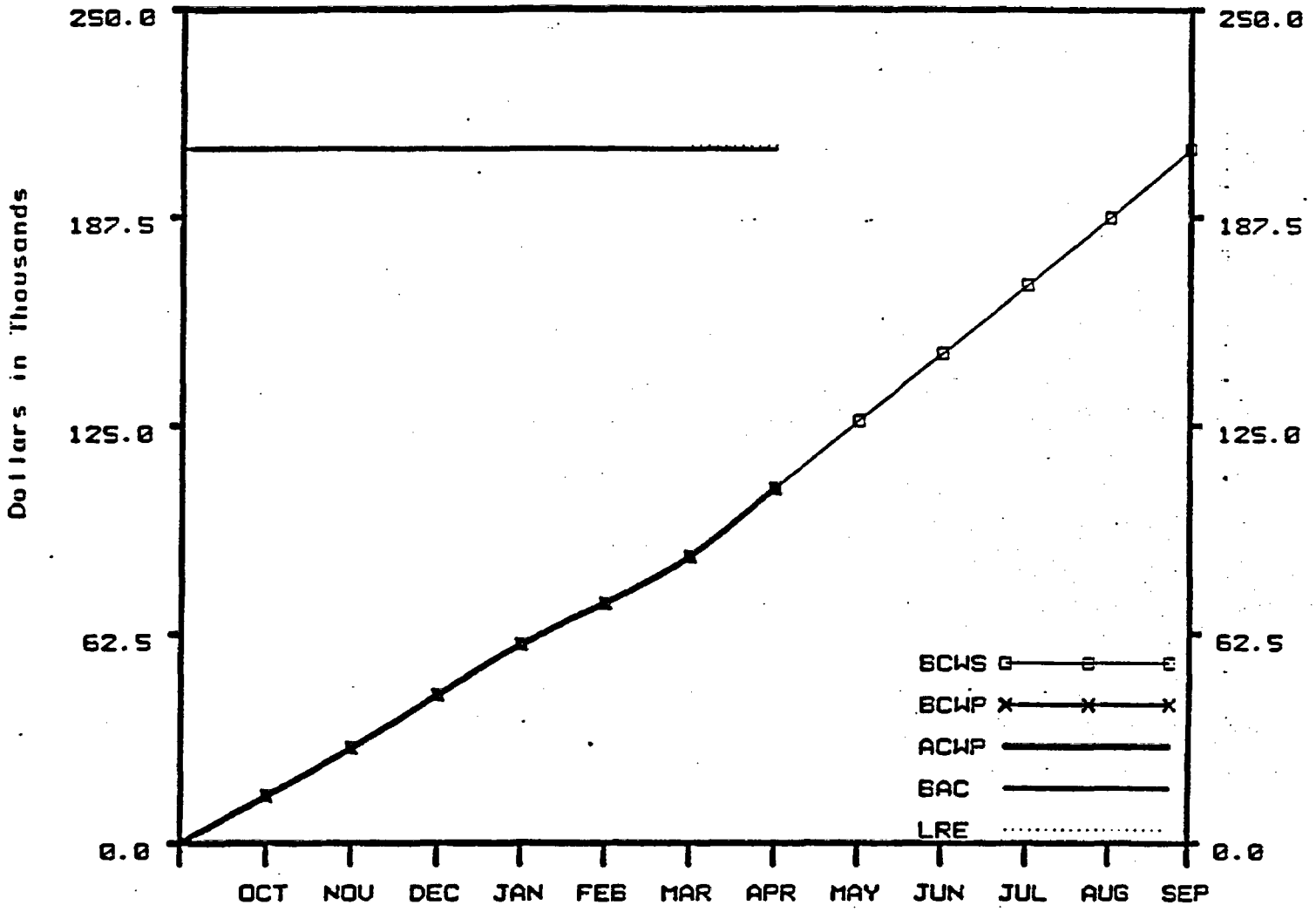
H&N - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	308.4	753.6
B. BUDGETED COST OF WORK PERFORMED (BCWP)	308.4	753.6
C. ACTUAL COST OF WORK PERFORMED (ACWP)	121.0	566.3
D. BUDGET AT COMPLETION (BAC)		2298.4
E. LATEST REVISED ESTIMATE (LRE)		1315.8

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	187.3	24.86
H. AT COMPLETION VARIANCE (D-E)	982.6	42.75

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.I



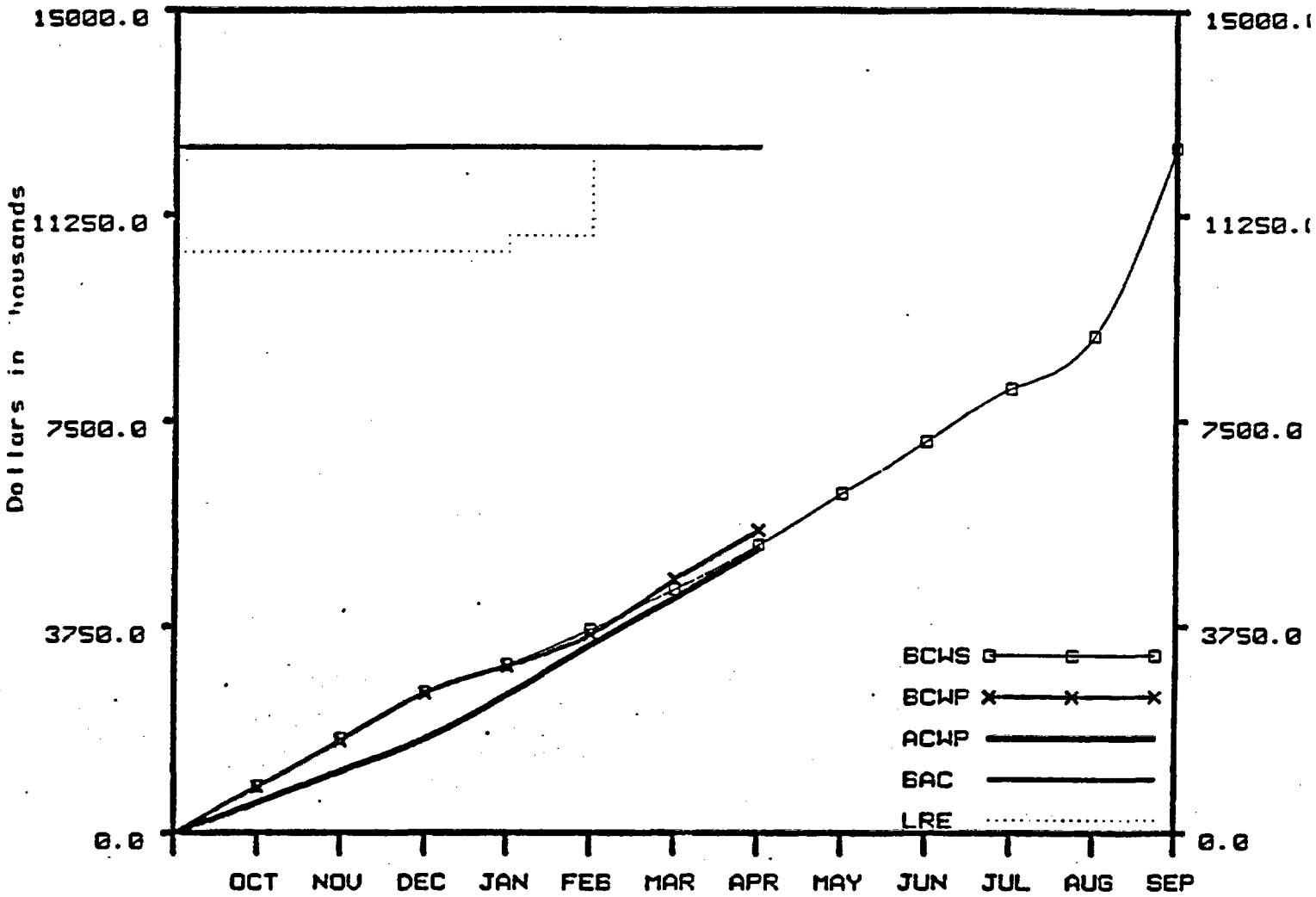
WSI - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	20.3	106.1
B. BUDGETED COST OF WORK PERFORMED (BCWP)	20.3	106.1
C. ACTUAL COST OF WORK PERFORMED (ACWP)	20.6	106.4
D. BUDGET AT COMPLETION (BAC)		208.0
E. LATEST REVISED ESTIMATE (LRE)		208.6

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	-0.3	-0.27
H. AT COMPLETION VARIANCE (D-E)	-0.6	-0.27

Remarks:

Variance analysis below threshold. No detailed explanation required.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.L



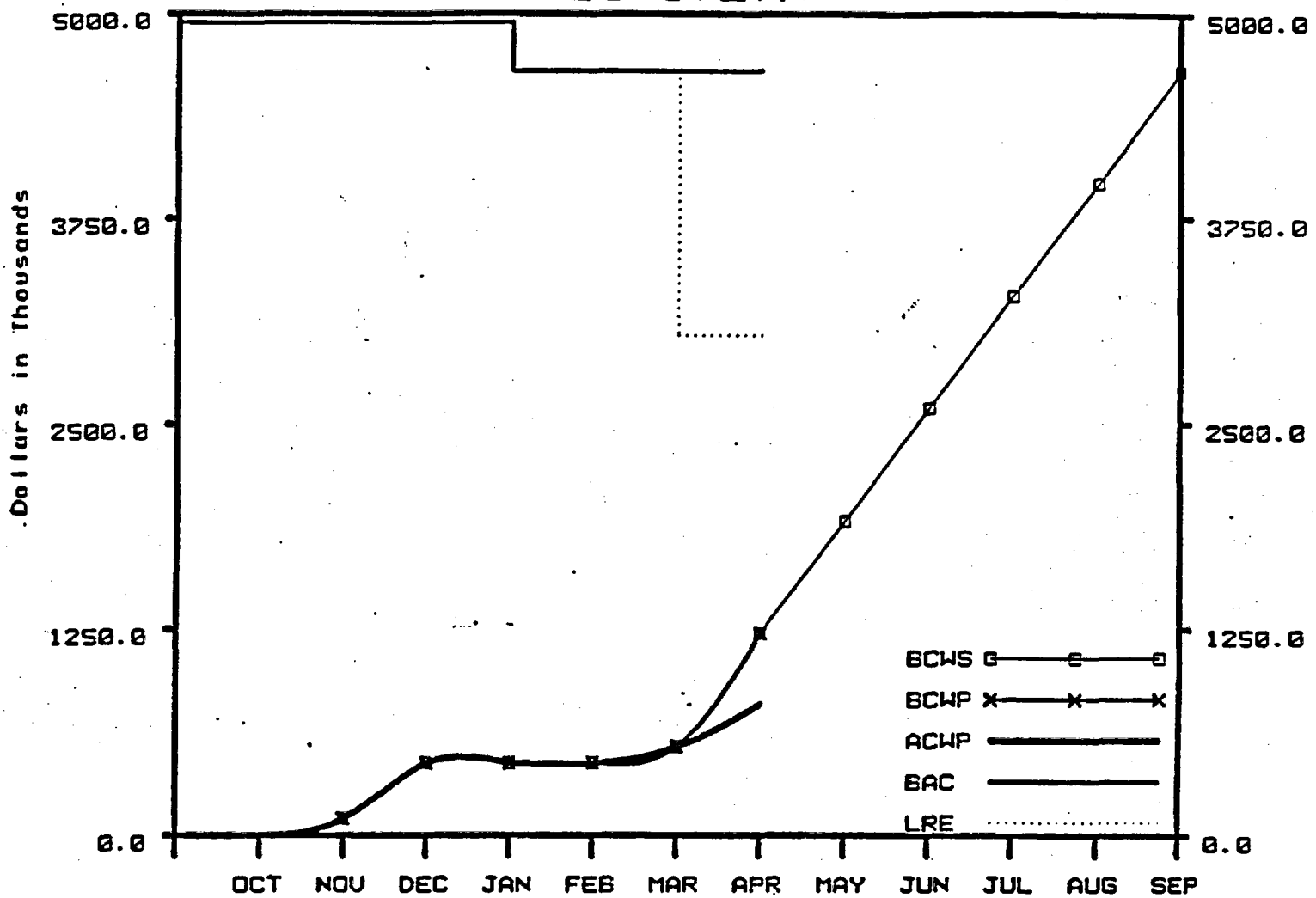
LLNL - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	817.0	5238.0
B. BUDGETED COST OF WORK PERFORMED (BCWP)	903.0	5503.8
C. ACTUAL COST OF WORK PERFORMED (ACWP)	898.8	5160.1
D. BUDGET AT COMPLETION (BAC)		12480.0
E. LATEST REVISED ESTIMATE (LRE)		11756.6

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	265.8	5.07
G. COST VARIANCE (B-C)	343.7	6.24
H. AT COMPLETION VARIANCE (D-E)	723.4	5.80

Remarks:

Variance analysis below threshold. No detailed explanation required.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.N



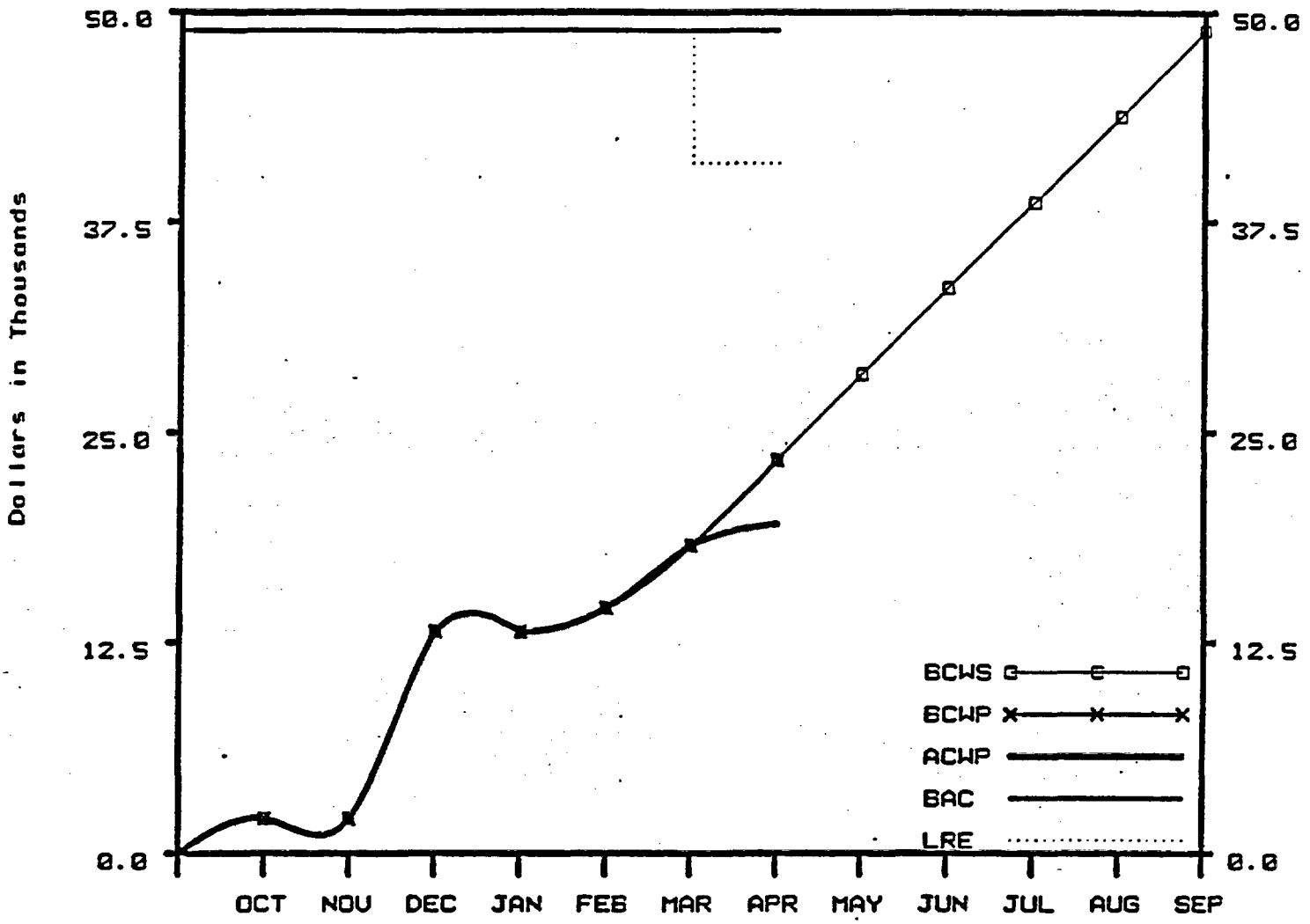
STATE - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	685.5	1222.2
B. BUDGETED COST OF WORK PERFORMED (BCWP)	685.5	1222.1
C. ACTUAL COST OF WORK PERFORMED (ACWP)	258.0	794.7
D. BUDGET AT COMPLETION (BAC)		4650.0
E. LATEST REVISED ESTIMATE (LRE)		3023.7

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	427.5	34.98
H. AT COMPLETION VARIANCE (D-E)	1626.3	34.98

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.P



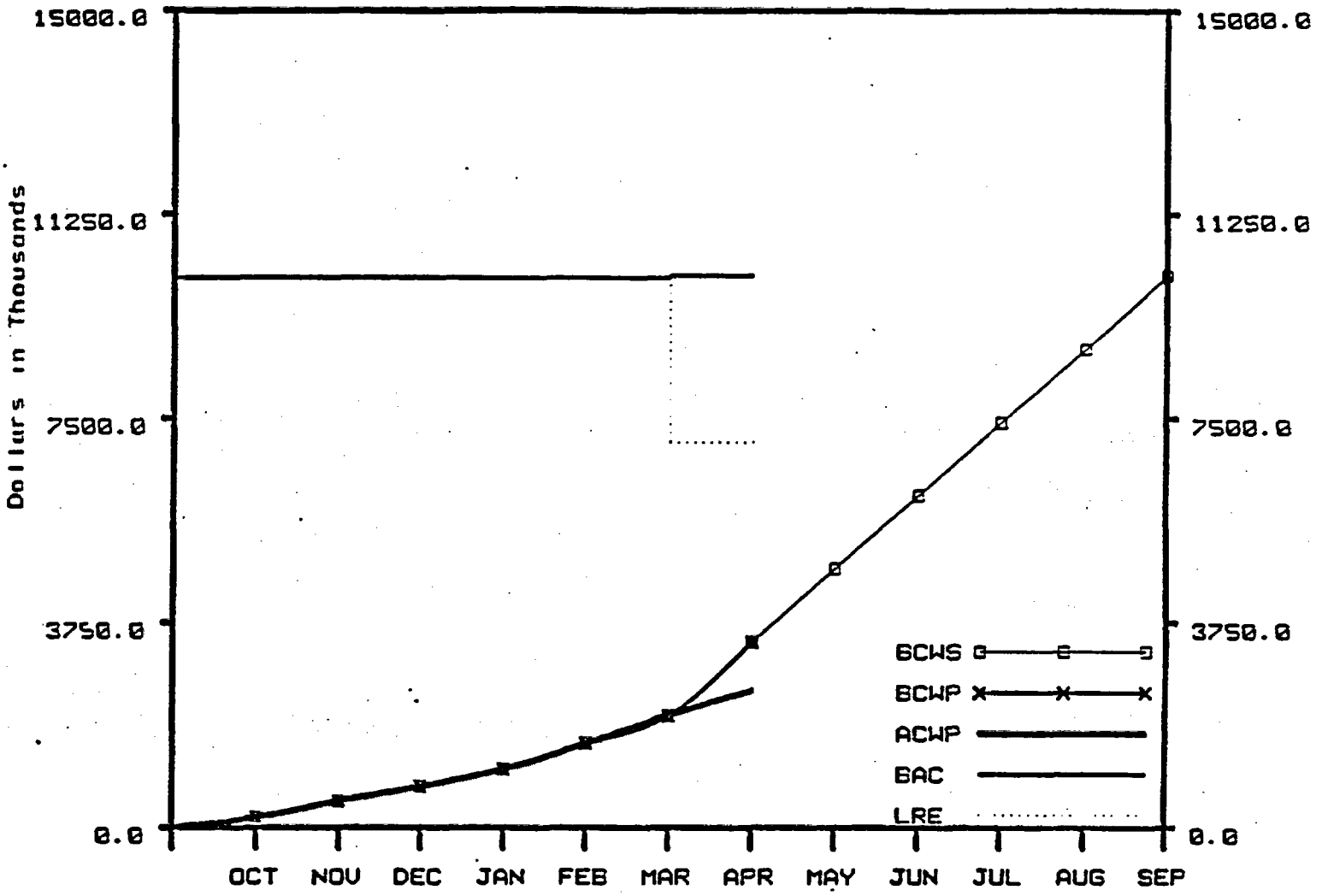
PAN AM - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	5.1	23.4
B. BUDGETED COST OF WORK PERFORMED (BCWP)	5.1	23.4
C. ACTUAL COST OF WORK PERFORMED (ACWP)	1.3	19.5
D. BUDGET AT COMPLETION (BAC)		48.9
E. LATEST REVISED ESTIMATE (LRE)		48.9

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	3.8	16.33
H. AT COMPLETION VARIANCE (D-E)	8.0	16.33

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.R



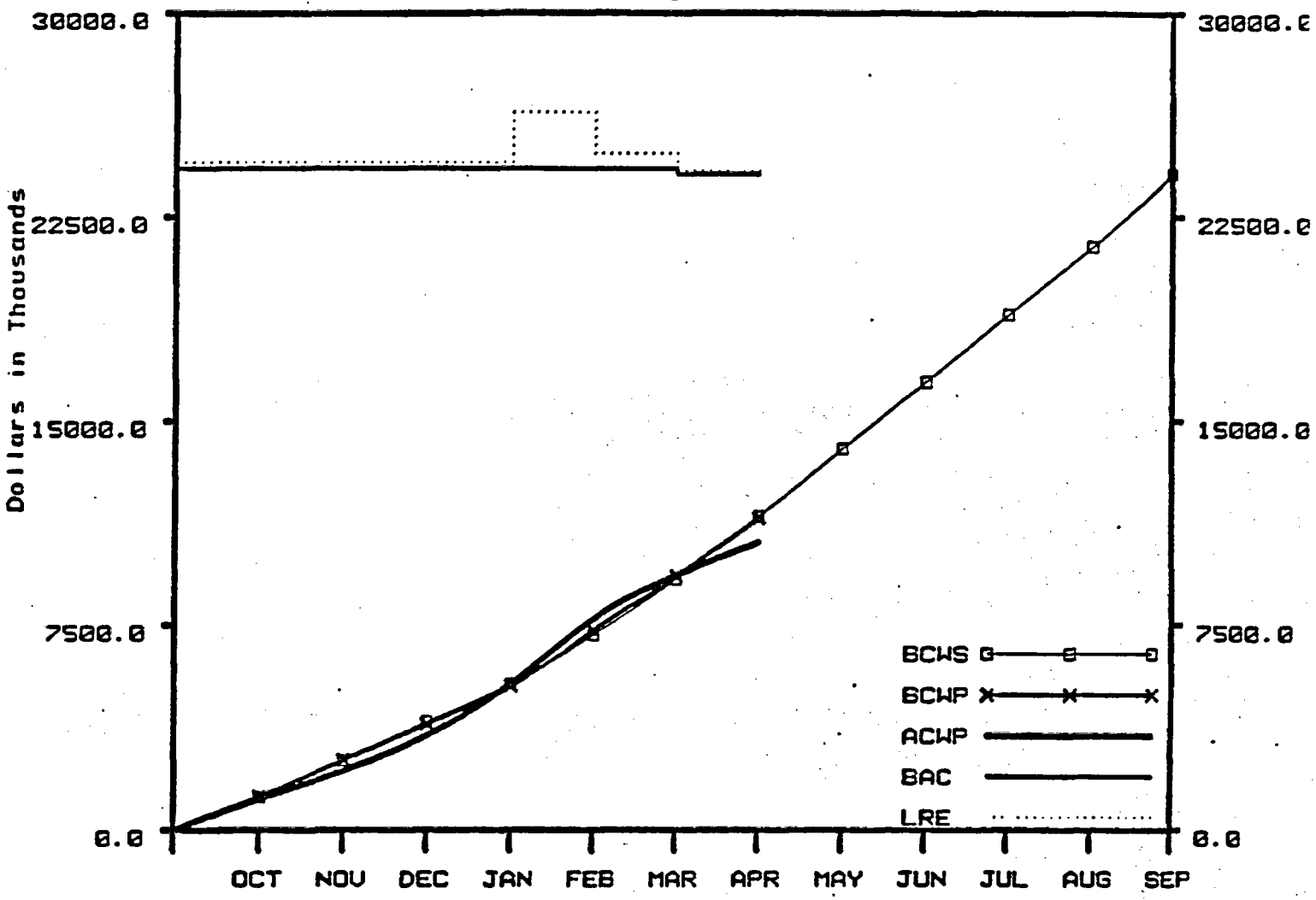
REECO - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1342.7	3398.4
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1342.7	3398.4
C. ACTUAL COST OF WORK PERFORMED (ACWP)	452.7	2515.0
D. BUDGET AT COMPLETION (BAC)		10113.4
E. LATEST REVISED ESTIMATE (LRE)		7052.8

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	883.4	26.00
H. AT COMPLETION VARIANCE (D-E)	3060.6	30.26

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.S



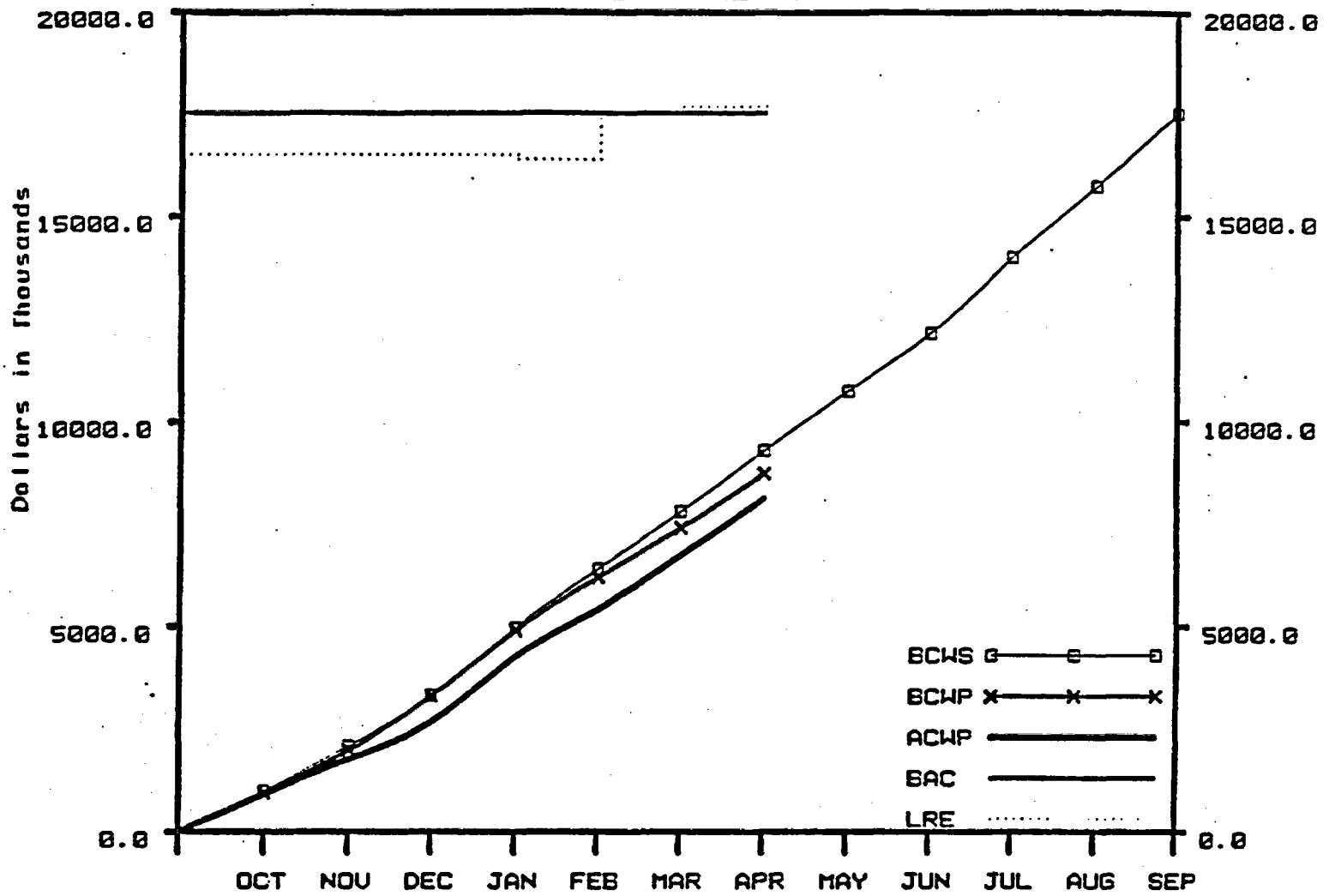
SNL - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	2307.0	11491.0
B. BUDGETED COST OF WORK PERFORMED (BCWP)	2151.8	11436.2
C. ACTUAL COST OF WORK PERFORMED (ACWP)	1218.0	10534.0
D. BUDGET AT COMPLETION (BAC)		24084.0
E. LATEST REVISED ESTIMATE (LRE)		21962.3

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-54.8	-0.48
G. COST VARIANCE (B-C)	902.2	7.89
H. AT COMPLETION VARIANCE (D-E)	2121.7	8.81

Remarks:

Variance below analysis threshold. No detailed explanation required.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.T



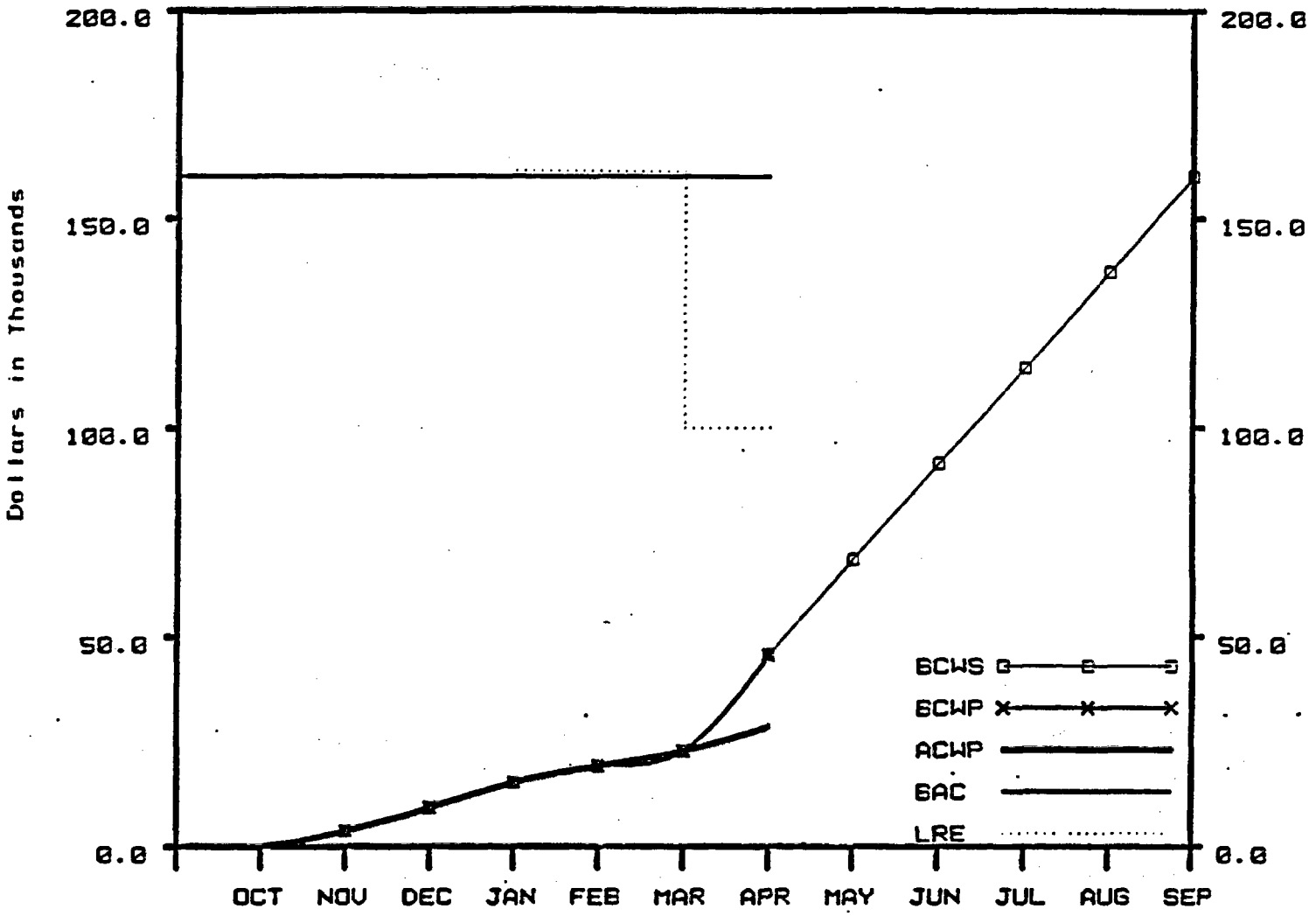
SAIC - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	1493.3	9293.5
B. BUDGETED COST OF WORK PERFORMED (BCWP)	1325.3	8726.5
C. ACTUAL COST OF WORK PERFORMED (ACWP)	1382.3	8117.3
D. BUDGET AT COMPLETION (BAC)		17523.9
E. LATEST REVISED ESTIMATE (LRE)		17663.4

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	-567.0	-6.10
G. COST VARIANCE (B-C)	609.1	6.98
H. AT COMPLETION VARIANCE (D-E)	-139.5	-0.80

Remarks:

Variance below analysis threshold. No detailed explanation required.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.U



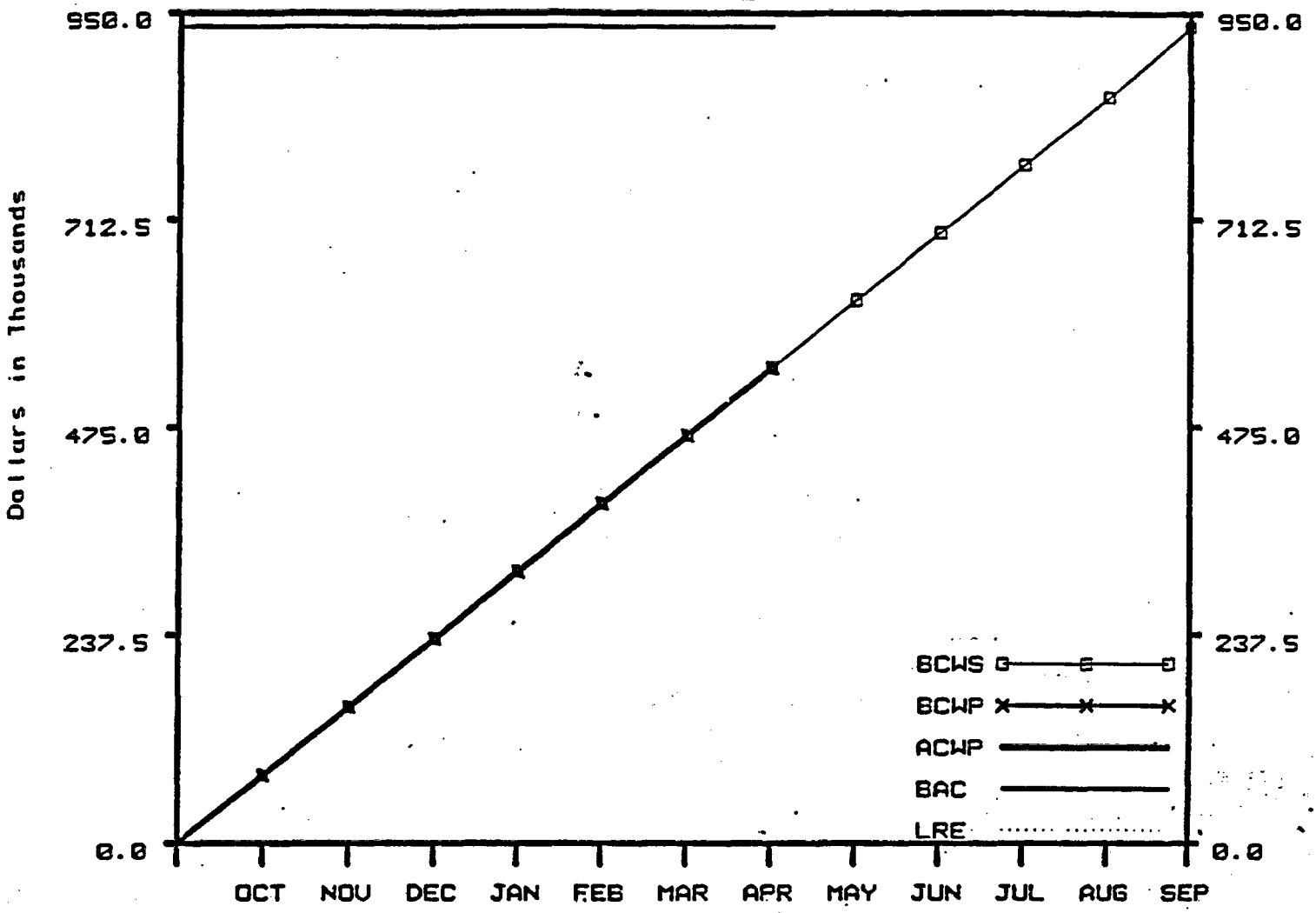
DRI - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	22.9	45.6
B. BUDGETED COST OF WORK PERFORMED (BCWP)	22.9	45.6
C. ACTUAL COST OF WORK PERFORMED (ACWP)	5.7	28.4
D. BUDGET AT COMPLETION (BAC)		160.0
E. LATEST REVISED ESTIMATE (LRE)		99.7

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	17.2	37.66
H. AT COMPLETION VARIANCE (D-E)	60.3	37.66

Remarks:

Per instruction from DOE/HQ, BCWS is no longer set equal to ACWP where the participant has not provided a detailed cost plan, resulting in a cost variance to a straight-line plan.

NNWSI PROJECT
COST PERFORMANCE GRAPH FOR APR 1986
WBS: 1.2.X



NTS - TOTAL	Current Period	Year To Date
A. BUDGETED COST OF WORK SCHEDULED (BCWS)	77.5	542.5
B. BUDGETED COST OF WORK PERFORMED (BCWP)	77.5	542.5
C. ACTUAL COST OF WORK PERFORMED (ACWP)	77.5	542.5
D. BUDGET AT COMPLETION (BAC)		934.3
E. LATEST REVISED ESTIMATE (LRE)		934.3

VARIANCES (Year To Date)	Dollars	Percent
F. SCHEDULE VARIANCE (B-A)	0.0	0.00
G. COST VARIANCE (B-C)	0.0	0.00
H. AT COMPLETION VARIANCE (D-E)	0.0	0.00

Remarks:

Variance below analysis threshold. No detailed explanation required.

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
LEVEL 1 MILESTONES IN A TIME WINDOW OF 1 Oct 1985 TO 30 Sep 1986
Run Date: 2 May 1986

MILESTONE DESCRIPTION	WBS NO.	WMPO RESP	LEVEL	RESP ORG	MILESTONE	BASELINED	HQ PLANNED HQ ACTUAL/ EXPECTED	
Annual PASS Program Interaction - (Letter Report)	1.2.1.1.S	Blanchard	1	SNL	M870	B	30 Sep 86	E
Yucca Mountain Mined Geologic Disposal System (MGDS) Requirements	1.2.1.2.1.S	Skousen	1	SNL	M120	B	30 Nov 85	E
Draft Yucca Mountain Site-Specific Mined Geologic Disposal System (MGDS) Description	1.2.1.2.1.S	Skousen	1	SNL	M261	B	30 Sep 86	E
System Engineering Management Plan (SEMP)	1.2.1.2.4.S	Skousen	1	SNL	M108	B	2 May 86 2 May 86	E
Input to DOE/HQ Report to Congress on Copper for Waste Packages	1.2.2.3.2.L	Valentine	1	LLNL	M222	B	1 Aug 85 24 Oct 85	A
Progress Report on the Results of Testing Advanced Conceptual Design Metal Barrier Materials Under Relevant Environmental Conditions for a Tuff Repository	1.2.2.3.2.L	Valentine	1	LLNL	M236	B	30 Apr 86 30 Jun 86	E
Final Report on Feasibility of Using Copper as a Waste Package Material	1.2.2.3.2.L	Valentine	1	LLNL	M247	B	30 Sep 86	E
Revised Draft Waste Package Subsystem Conceptual Design Requirements to DOE/HQ for Review	1.2.2.4.L	Valentine	1	LLNL	M013	B	30 May 86	E
Initiate Waste Package Advanced Conceptual Design	1.2.2.4.L	Valentine	1	LLNL	M233	B	31 Jan 86 30 Jun 86	E
Report on the System Model for Waste Package Performance Analysis	1.2.2.5.L	Valentine	1	LLNL	M276	B	30 Jun 86	E

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
LEVEL 1 MILESTONES IN A TIME WINDOW OF 1 Oct 1985 TO 30 Sep 1986
Run Date: 2 May 1986

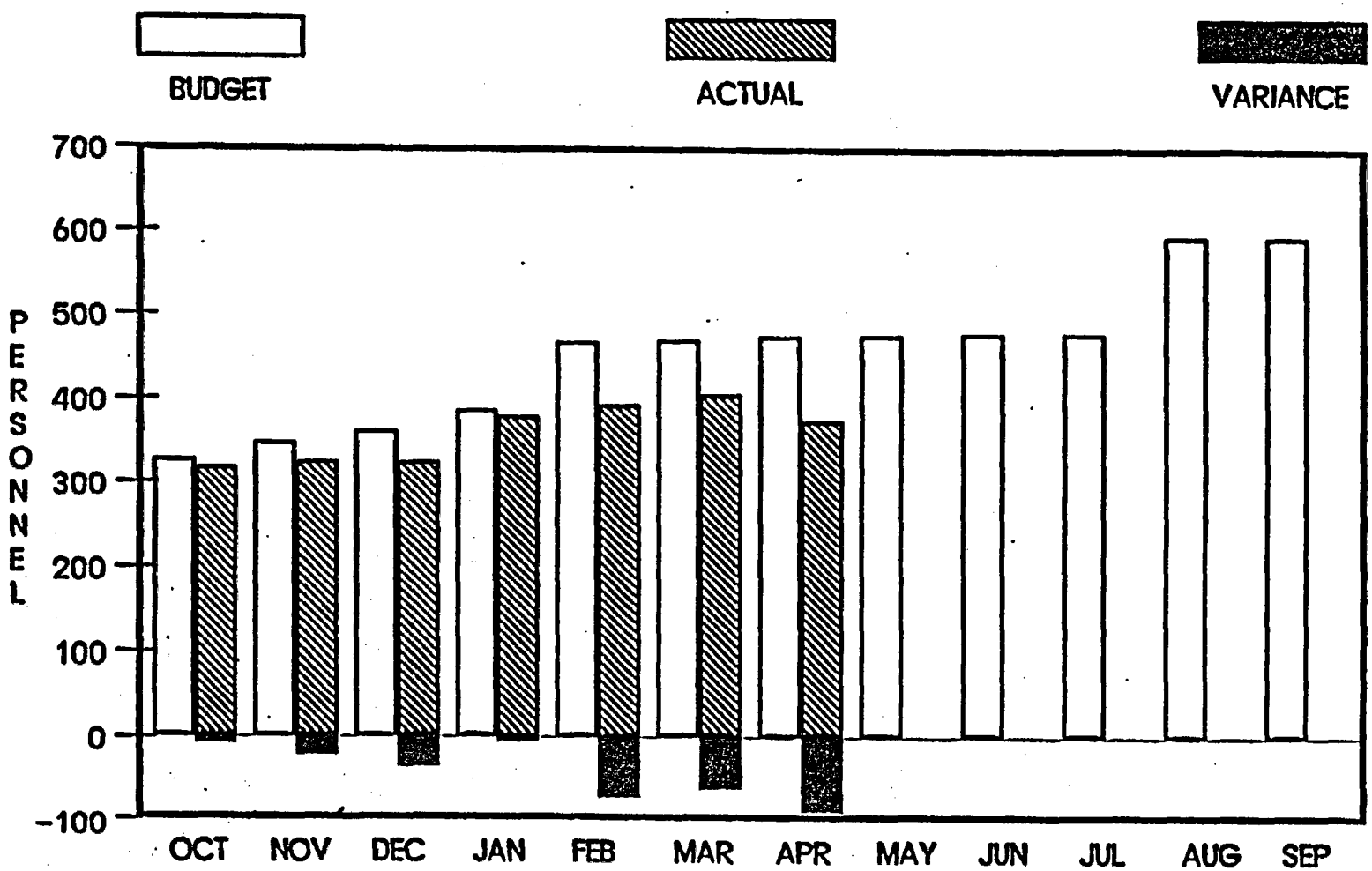
MILESTONE DESCRIPTION	WBS NO.	WMPO RESP	LEVEL	RESP ORG	MILESTONE	BASELINED	HQ PLANNED HQ ACTUAL/ EXPECTED	
Report on Geochemistry Simulation of Yucca Mountain Using Best Available Data on Mineralogy, Water Chemistry, Flow Rates and Crack Statistics	1.2.3.4.1.7.A	Livingston	1	LANL	M325	B	27 Jul 86	E
Review of the Concepts Developed by HEDL for Remote/Automated Waste Handling Systems Initiated	1.2.4.1.1.S	Skousen	1	SNL	M802	B	30 Jul 86	E
Assistance to HEDL in Defining Remote/Automated Waste Handling Systems	1.2.4.1.1.S	Skousen	1	SNL	M806	B	31 Oct 85	E
Start Repository Advanced Conceptual Design	1.2.4.1.1.S	Skousen	1	SNL	N430	B	30 Jan 86 2 Jun 86	E
Initial Subsystem Design Requirement (SDR)	1.2.4.1.2.S	Skousen	1	SNL	N433	B	31 Jan 86	E
Repository Conceptual Design in Support of Site Characterization	1.2.4.1.3.S	Skousen	1	SNL	N432	B	31 Mar 86 3 Nov 86	E
Report on G-Tunnel Underground Facility (GTUF) Summary	1.2.4.2.1.2.S	Skousen	1	SNL	M455	B	30 Sep 86	E
Feasibility Analysis of Horizontal Emplacement and Retrieval - Letter Report	1.2.4.2.2.1.S	Skousen	1	SNL	M295	B	31 Oct 85 31 May 86	E
Horizontal Waste Emplacement Equipment Development Plan	1.2.4.2.2.1.S	Skousen	1	SNL	N406	B	30 Apr 86 31 Jul 86	E
Prepare Design Requirements and Materials Recommendation Report	1.2.4.2.3.1.S	Skousen	1	SNL	P404	B	30 Jul 86	E

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
LEVEL 1 MILESTONES IN A TIME WINDOW OF 1 Oct 1985 TO 30 Sep 1986
Run Date: 2 May 1986

MILESTONE DESCRIPTION	WBS NO.	WMPO RESP	LEVEL	RESP ORG	MILESTONE	BASELINED	HQ PLANNED HQ ACTUAL/ EXPECTED
Preliminary Study of the Effects of Uncertain Geologic Data on Design of the Underground Facility	1.2.4.6.2.S	Skousen	1	SNL	N457	B	30 Aug 86 E
Draft Site Characterization Plan (SCP)	1.2.5.2.2.T	Clanton	1	SAIC	M521	B	15 Aug 86 E
Camera Ready Environmental Assessment/Comment Response Appendix (EA/CRA) to DOE/HQ	1.2.5.3.1.T	Blanchard	1	SAIC	M504	B	6 Dec 85 24 Jan 86 A
ESF Shaft and Mining Subcontract Awarded	1.2.6.1.1.A	Irby	1	LANL	M022	B	21 Mar 86 E
Complete Exploratory Shaft Readiness Review	1.2.6.1.1.A	Irby	1	LANL	M243	B	24 Feb 86 E
Start First Shaft (ES-1) Construction	1.2.6.1.1.A	Irby	1	LANL	M652	B	28 Aug 86 E
Start ESF Site Preparation	1.2.6.2.A	Irby	1	LANL	M645	B	20 Mar 86 1 Dec 86 E
Final Report on the SFT-C	1.2.7.2.1.L	Zavada	1	LLNL	M708	B	28 Feb 86 30 Jun 86 E
Completion of Mining for G-Tunnel Welded Tuff Mining Evaluations	1.2.7.2.3.S	Skousen	1	SNL	M279	B	30 May 86 E
Submit FY 1988 Budget to DOE/HQ	1.2.9.1.2.X	Dixon	1	WMPO	M719	B	21 Apr 86 24 Apr 86 E

NO. MILESTONES IN THIS REPORT: 30

NNWSI PROJECT STAFFING*
FISCAL YEAR 1986



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
B	327	347	361	386	466	468	473	474	476	476	593	593
A	317	324	324	379	393	405	374					
V	-10	-23	-37	-7	-73	-63	-99					

*These budgeted and actual amounts reflect input from six project participants: F&S, Los Alamos, LLNL, REECo, SAIC, and SNL.

PLANNED NNWSI PROJECT FIELD ACTIVITIES
For JUNE

Participant	Activity	Location	Planned Day	Planned Time
LLNL	Geotomography testing	G-Tunnel	Days to be determined (contact J. Yow or A. Ramirez for definite days and time).	
SAIC	Meteorological Monitoring	Yucca Mountain	Field site technician will maintain stations weekly, 3 days per week.	
USGS	Hydrologic and seismic monitoring	NTS	Continues throughout month	
	Drift wall mapping	G-tunnel	Continues throughout month	
	Shaft wall mapping	Test pits at Fran Ridge	Continuous throughout month	
	All other field activities suspended under USGS stop-work order.			

U.S. DEPARTMENT OF ENERGY

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Nevada Nuclear Waste Storage Investigations PROJECT

OGR

GEOCHEMICAL MODELING CODE EQ3/6
1.2.3.8.L

PRESENTATION TO THE MAY PM-TPO MEETING OF THE NNWSI

DON EMERSON & TOM WOLERY
PRINCIPAL INVESTIGATORS

84-782

MAY 21, 1986
LAS VEGAS

EQ3/6: HISTORY OF SUPPORT

1975-77 T. J. WOLERY PH.D. DISSERTATION, NORTHWESTERN UNIVERSITY (INTERACTIONS OF SEA WATER WITH BASALT IN MID-OCEAN RIDGE HYDROTHERMAL SYSTEMS)

1978-80 WOLERY AT LLNL, DEVELOPMENT SPONSORED BY

DOE: OFFICE OF BASIC ENERGY SCIENCES
GEOTHERMAL ENERGY PROGRAM

NRC: WASTE MANAGEMENT PROGRAM

1980-82 DOE THROUGH PNL'S WISAP PROGRAM

1983-85 DOE THROUGH ONWI (SRPO) AND NNWSI

1986 NNWSI, SRPO, BWIP

EQ3/6: CURRENT FUNDING ARRANGEMENTS FOR DEVELOPMENT AND MAINTENANCE

FY 1986	NNWSI	695K	(Code and Data Base Development and Maintenance)
		318K	(Data Base Expansion)
	SRPO	350K	(Code and Data Base Development and Maintenance)
	BWIP	70K	(Code and Data Base Development and Maintenance)
FY1987	NNWSI	790K	(Code and Data Base Development and Maintenance)
		210K	(Data Base Expansion)
	SRPO	370K	(Code and Data Base Development and Maintenance)
	BWIP	75K	(Code and Data Base Development and Maintenance)

EQ3/6 IS A COMPUTER CODE THAT CARRIES OUT GEOCHEMICAL MODELING CALCULATIONS

EQ3

- CALCULATES EQUILIBRIUM SPECIATION IN SOLUTION FROM WATER ANALYSIS
- DETERMINES MINERAL SATURATION STATES

EQ6

- CALCULATES REACTION PATHS
- APPROACH TO EQUILIBRIUM IS TRACKED BY NOTING CHANGES IN SOLID AND AQUEOUS COMPOSITIONS.

DATA BASE REQUIREMENTS

- THERMODYNAMIC DATA FOR BOTH SOLIDS AND AQUEOUS SPECIES TO MODEL GEOCHEMICAL PROCESSES THAT ATTAIN EQUILIBRIUM.
- KINETIC DATA ARE NECESSARY TO MODEL GEOCHEMICAL PROCESSES THAT ARE SLUGGISH.

NNWSI PROJECT WORK BREAKDOWN STRUCTURE DICTIONARY

WBS: 1.2.3.8.L

TITLE: Geochemical Modeling Code EQ3/6

PARTICIPANT: Lawrence Livermore National Laboratory

OBJECTIVE: To further develop the geochemical modeling code EQ3/6 for use in long-term predictions for site suitability and radionuclide release from a nuclear waste repository.

DESCRIPTION OF WORK: All efforts required to:

- upgrade the EQ3/6 code package and supporting data base, thereby allowing the NNWSI Project to model chemical processes to determine the relative contribution of these processes to the potential transport of radionuclides in groundwater from a nuclear waste repository in tuff
- document codes (EQ6 and MCRT) such that user manuals satisfying NRC's requirements for computer codes (NUREG-0856) are made available to the NNWSI Project
- perform code and data base maintenance tasks to insure that the code package meets user requirements and QA specifications.

10 CFR 60 (POST-CLOSURE) PERFORMANCE OBJECTIVES ADDRESSED BY EQ3/6

OBJECTIVE	W.B.S. RESPONSIBLE
• RELEASE TO ENVIRONMENT	SYSTEMS P.A.
• 300 TO 1000 YEAR CONTAINMENT (40 CFR 191)	WASTE PACKAGE P.A.
• 1 PART IN 100,000 RELEASE FROM ENGINEERED BARRIER SYSTEM	WASTE PACKAGE P.A.

ISSUES ADDRESSED

EQ3/6 does not directly address any issue or information need. Rather it provides techniques and thermochemical data needed to resolve post-closure issues and information needs. These are:

PERFORMANCE ISSUES

1.1 Radionuclide releases to the accessable environment. (10 CFR 60.112 and 40 CFR 191.137)

1.4 Waste package performance objective. (10 CFR 60.113)

1.5 Waste package and engineered barriers performance objective for radionuclide release. (10 CFR 60.113)

DESIGN ISSUES

1.11 Characteristics of the waste package to establish compliance with postclosure design criteria of 10 CFR 60.135.

CHARACTERIZATION ISSUES

1.15 Does data collected describe the present and future geochemical characteristics required by design and performance issues?

1.19 Does data collected to describe rock dissolution provide information required by design and performance issues?

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NNWSI SITE INVESTIGATION FUNDS FOR EQ3/6 ACTIVITIES (K$)

ACTIVITY	FY86	FY87	FY88	FY89	FY90	FY91	FY92
EQ3/6	1013	1000	1652	2032	1509	990	590
Model Development	180	376	190	195	130	-	-
Data Base Development	318*	210*	962	1377	919	400	-
Thermochemical Data	235	210	400	750	400	200	-
Generic Validation	83	-	562	627	519	200	-
Documentation and Release	175	-	180	40	120	-	-
Maintenance	200	250	200	300	200	470	470
Management and QA	140	164*	120	120	120	120	120

* Funds reprogrammed from Waste Package

QUALITY LEVEL ASSIGNMENTS FOR THE EQ3/6 SUBTASK

ACTIVITY	QA LEVEL
Model Development	II
Data Base Development	III
Documentation and Code Release	II
Maintenance	II
(Applications (not part of this sub-task) probably	I)

Following Appendix A of SOP-02-01, a draft Scientific Investigation Plan (SIP) has been prepared. It will be submitted to WMPO along with the Quality Assurance Level Assignment Sheets for these major activities.

U.S. DEPARTMENT OF ENERGY

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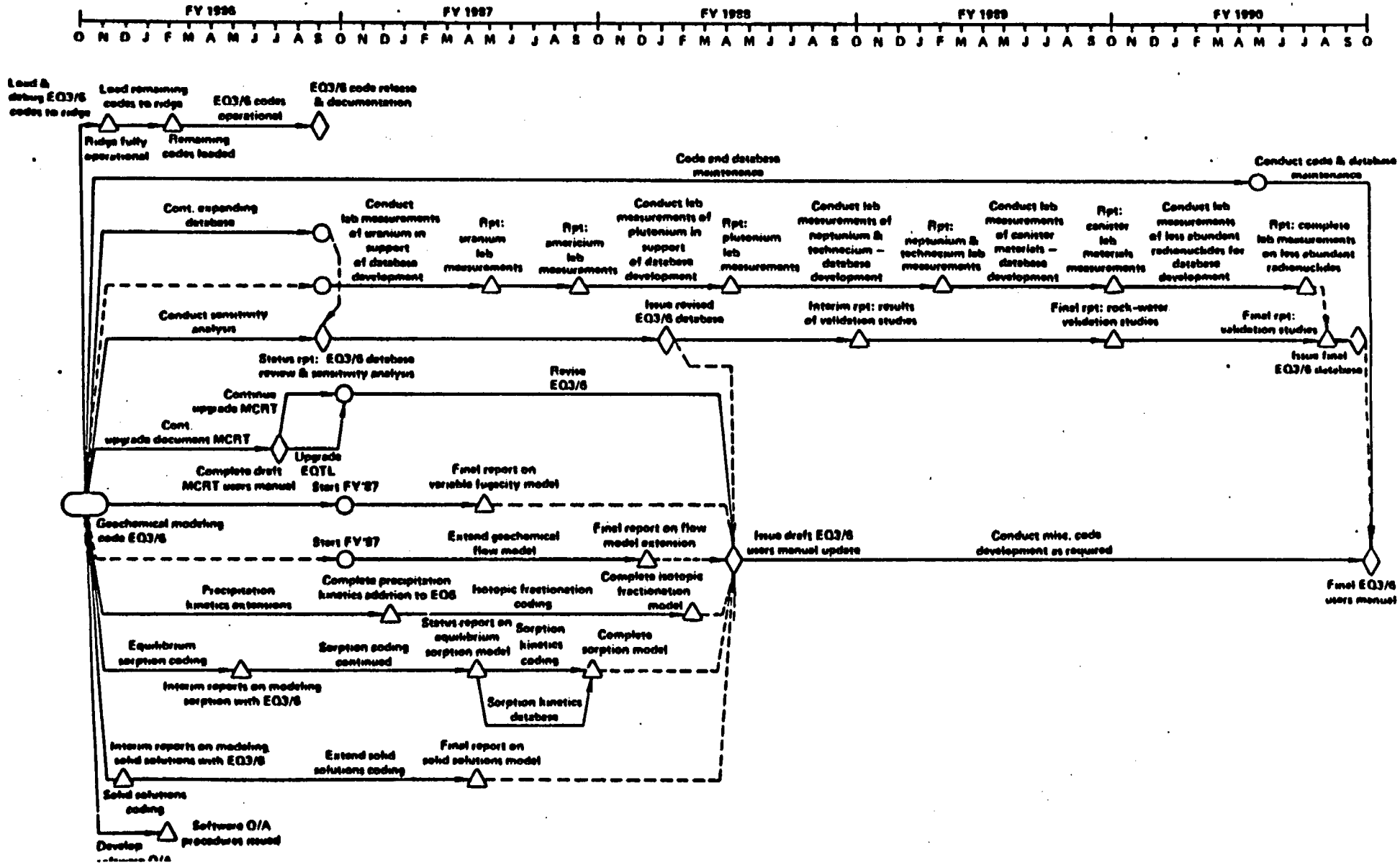
Nevada Nuclear Waste Storage Investigations PROJECT

EQ3/6 NNWSI NETWORK

(prepared by SAIC)



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Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

OGR

THE EQ3/6 GROUP

Management

Program Leader Don Emerson
Lead Code Developer Tom Wolery
ONWI Liason Ken Jackson
BWIP Liason Don Emerson
Data Base Supervision Joan Delany (Contract)
Data Base Experiments Bob Silva
Geochemistry Group Leader Kevin Knauss

Geochemists

Carol Bruton
Bill Bourcier
Joe Rard (Data Base Chemist)
New Hires (2)

Quality Assurance

John Dronkers and staff

Programmers

Manny Clinnick
Suzanne Lundeen
Miki Moore

Secretary

Deborah Kiraly

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EQ3/6 DATA BASE FY85 PROGRESS

	March, 1985	October, 1985
MCRT Data File:	MDARS38	MDARS69
Total Species:	705	1234
Basis	66	87
Non-basis	377	543
Solids	260	601
Gases	2	3
References:	21	182

APPLICATION OF GEOCHEMICAL MODELING RESULTS

CALCULATE RADIONUCLIDE RELEASE

- Glass Waste Form (2.2.3.1) R. Aines LLNL
- Spent Fuel Waste Form (2.2.3.1) R. Aines LLNL
- Waste Package Performance Assessment (2.2.5) K. Eggert LLNL
- Site Geochemistry (2.3.4.1) J. Kerrisk LANL

EVALUATE ANALYTICAL ACCURACY AND ADEQUACY

- Site Geochemistry (2.3.4.1) J. Kerrisk LLNL
- Integrated Testing (2.2.3.4) J. Delany LLNL

SIMULATE LABORATORY EXPERIMENTS

- Waste Package Environment (2.2.2) R. Glassley LLNL
- Integrated Testing (2.2.3.4) J. Delany LLNL
- Waste Package R. Smith BWIP

DESIGN EXPERIMENTS

- Waste Package Environment (2.2.2) R. Glassley LLNL
- Synthetic Brine Equilibrium P. Cloke ONWI

SIMULATE NATURAL SITUATIONS

- Salton Sea Geothermal Field P. Cloke ONWI
- Model Groundwater Compositions C. Solomon BWIP
- Model Yellowstone Hot Springs LANL

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YUCCA MOUNTAIN

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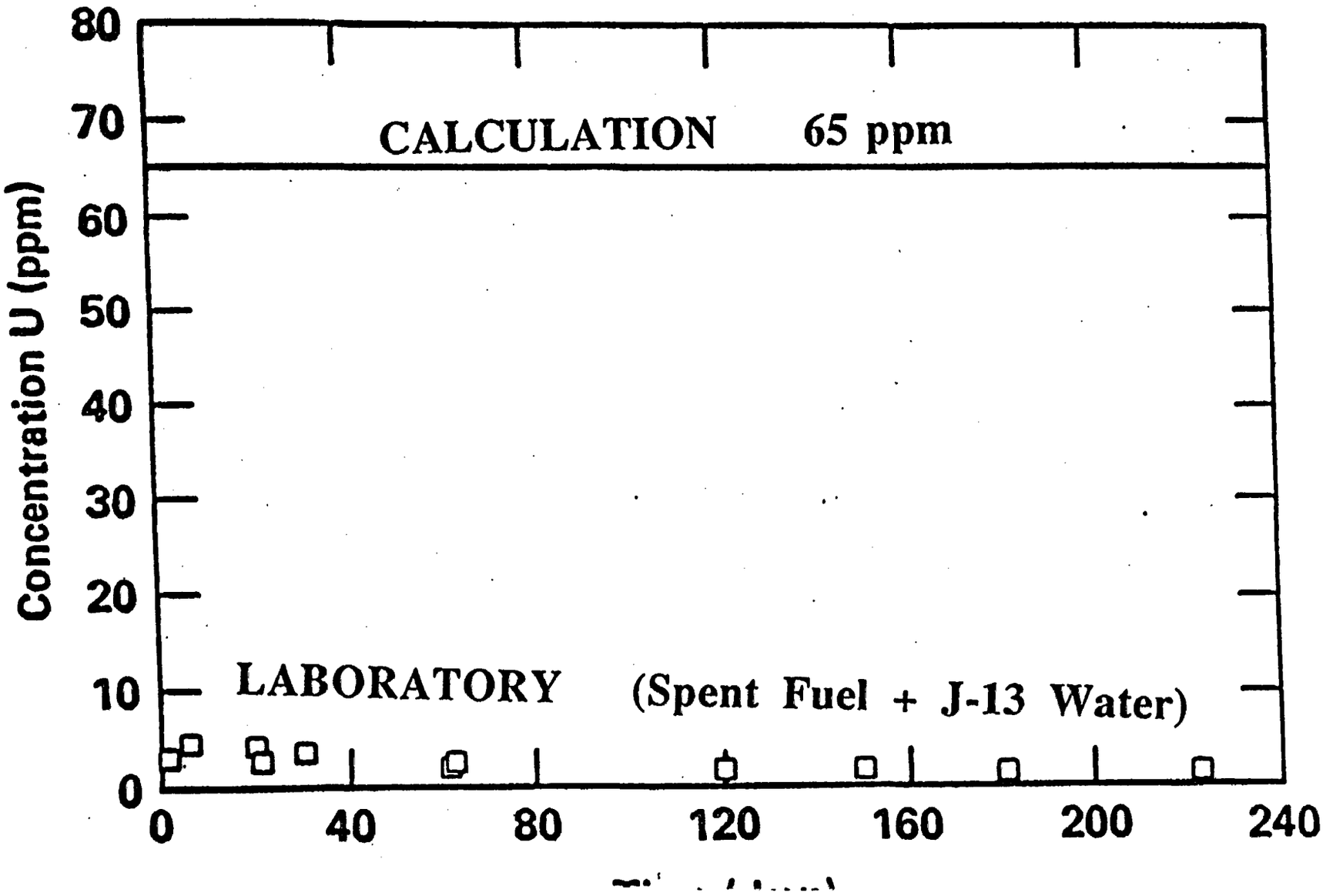
EQ3NR solubility constrant = shoepite
J-13 + uranium (25°C, pH 8.1)



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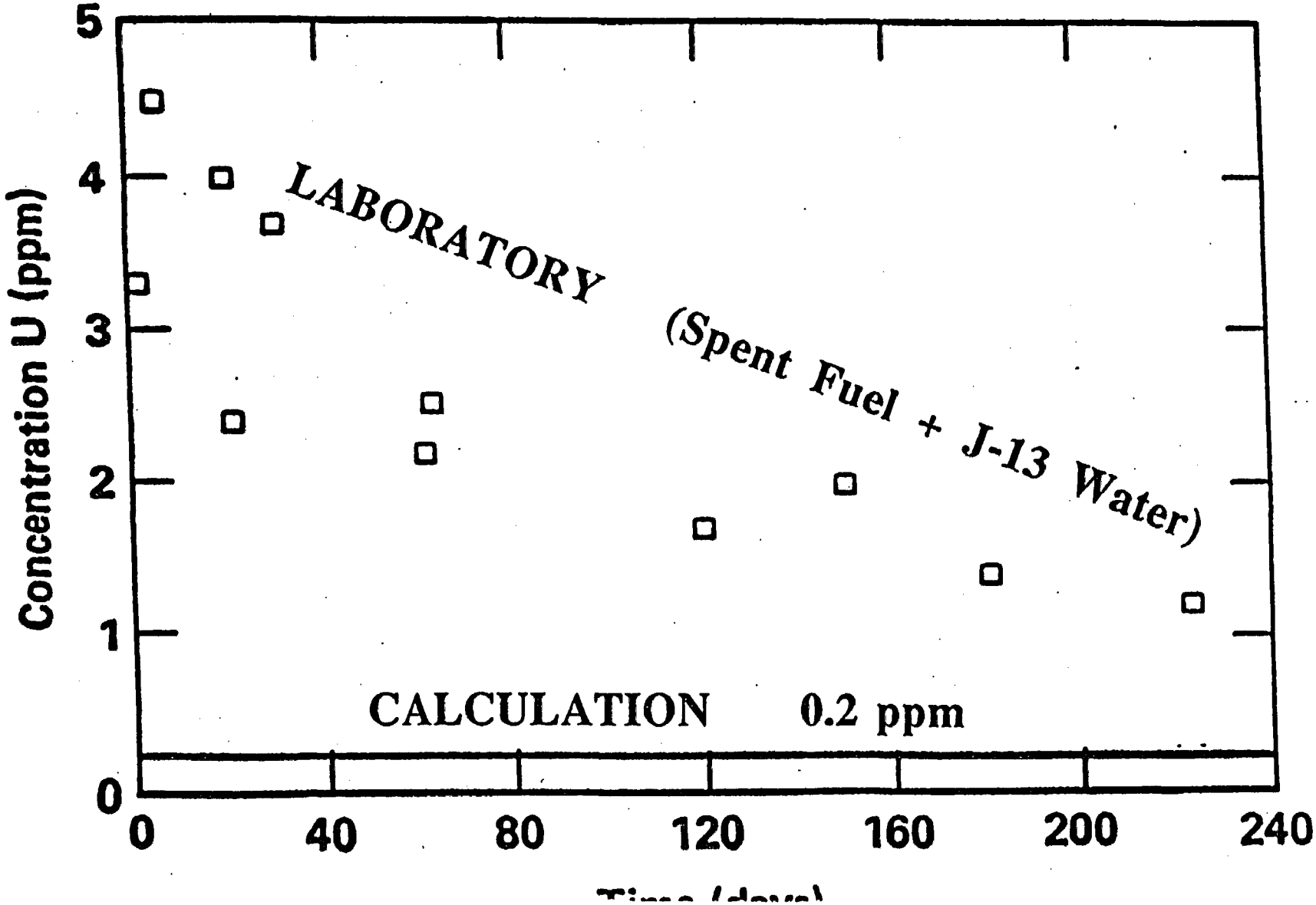
Yucca Mountain

OGR

EQ3NR solubility constrant = soddyite J-13 + uranium (25°C, pH 8.1)



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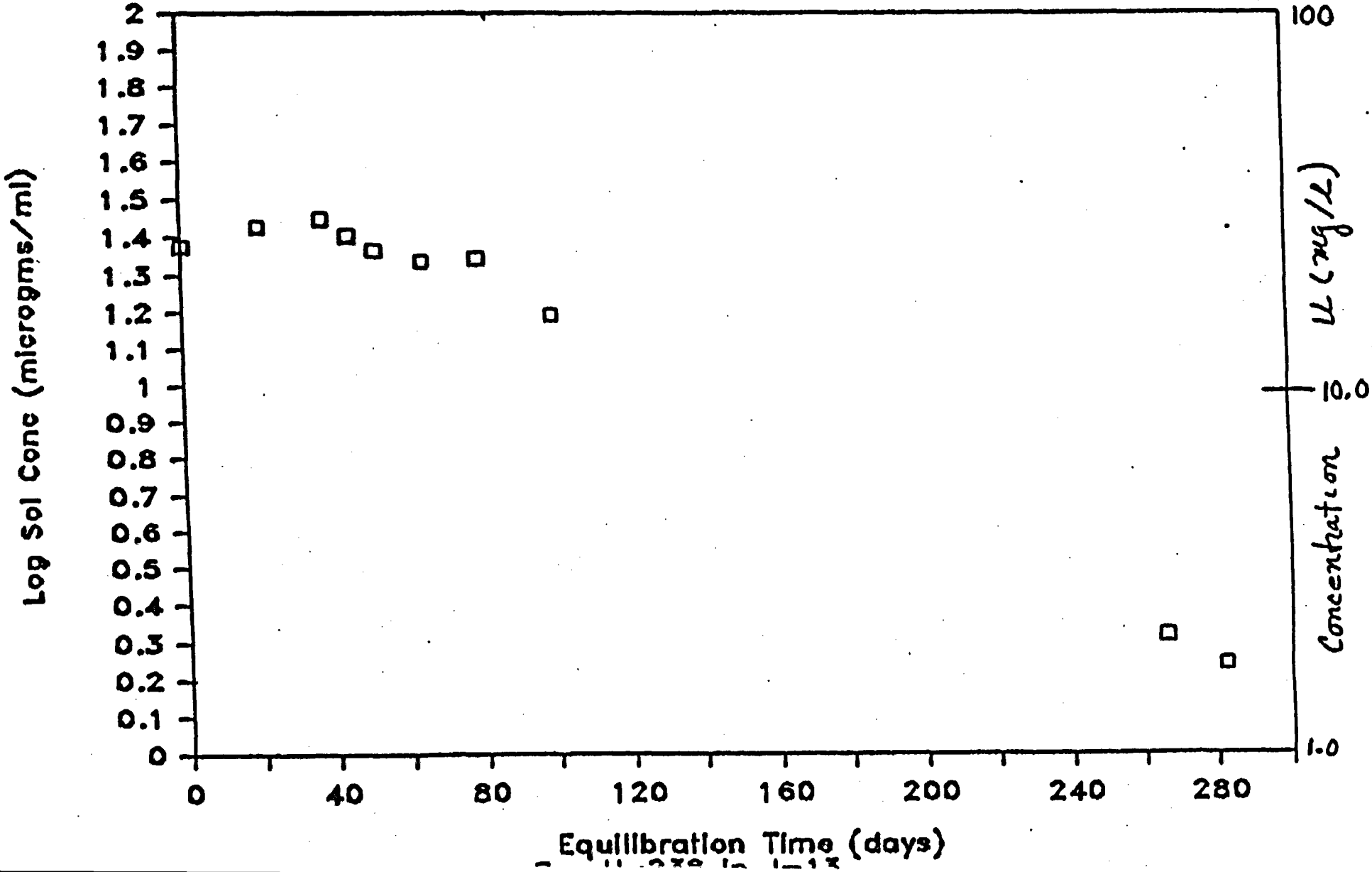
EQ3NR solubility constrant = soddyite J-13 + uranium (25°C, pH 8.1)



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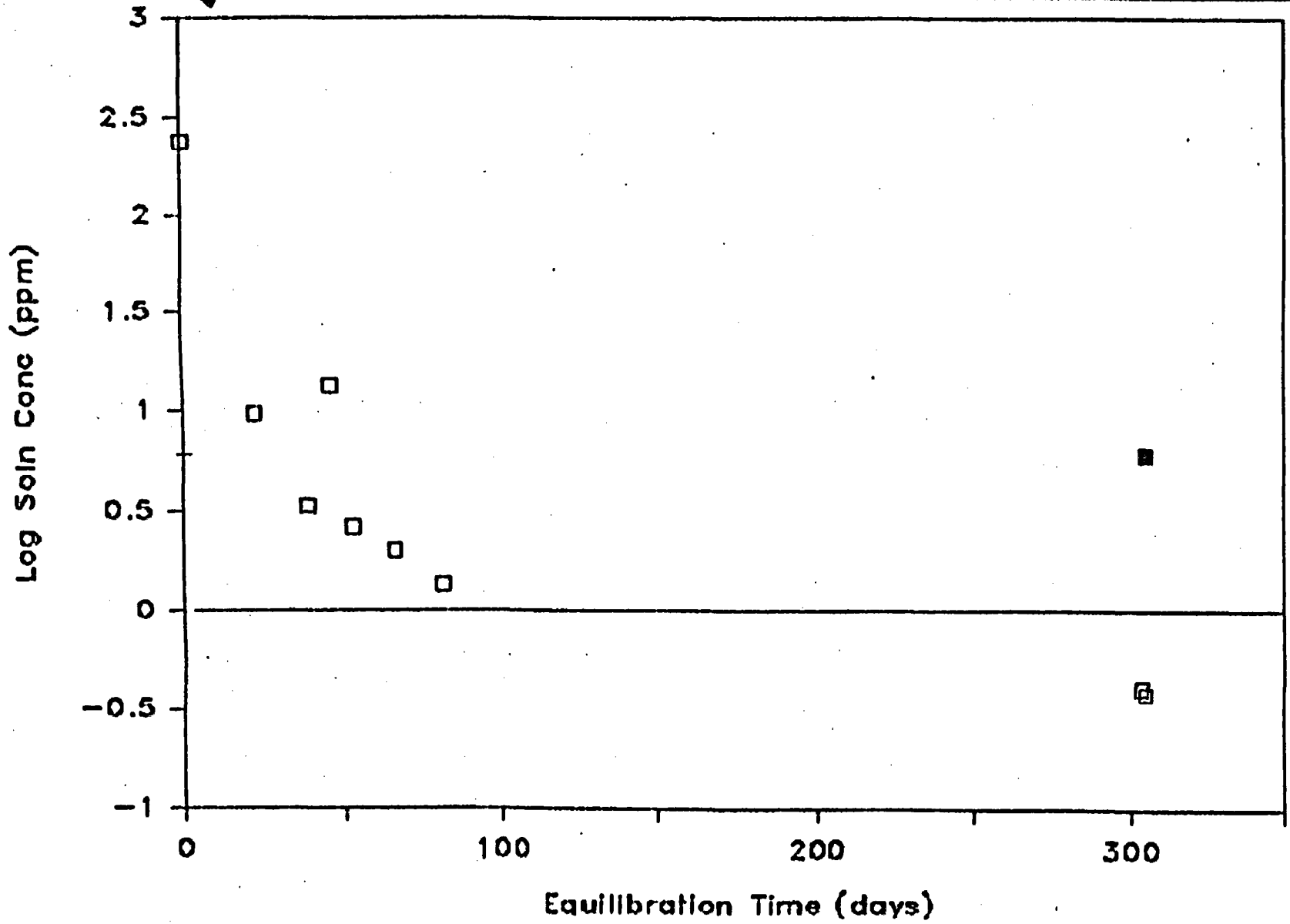
Np-237 in J-13 Water



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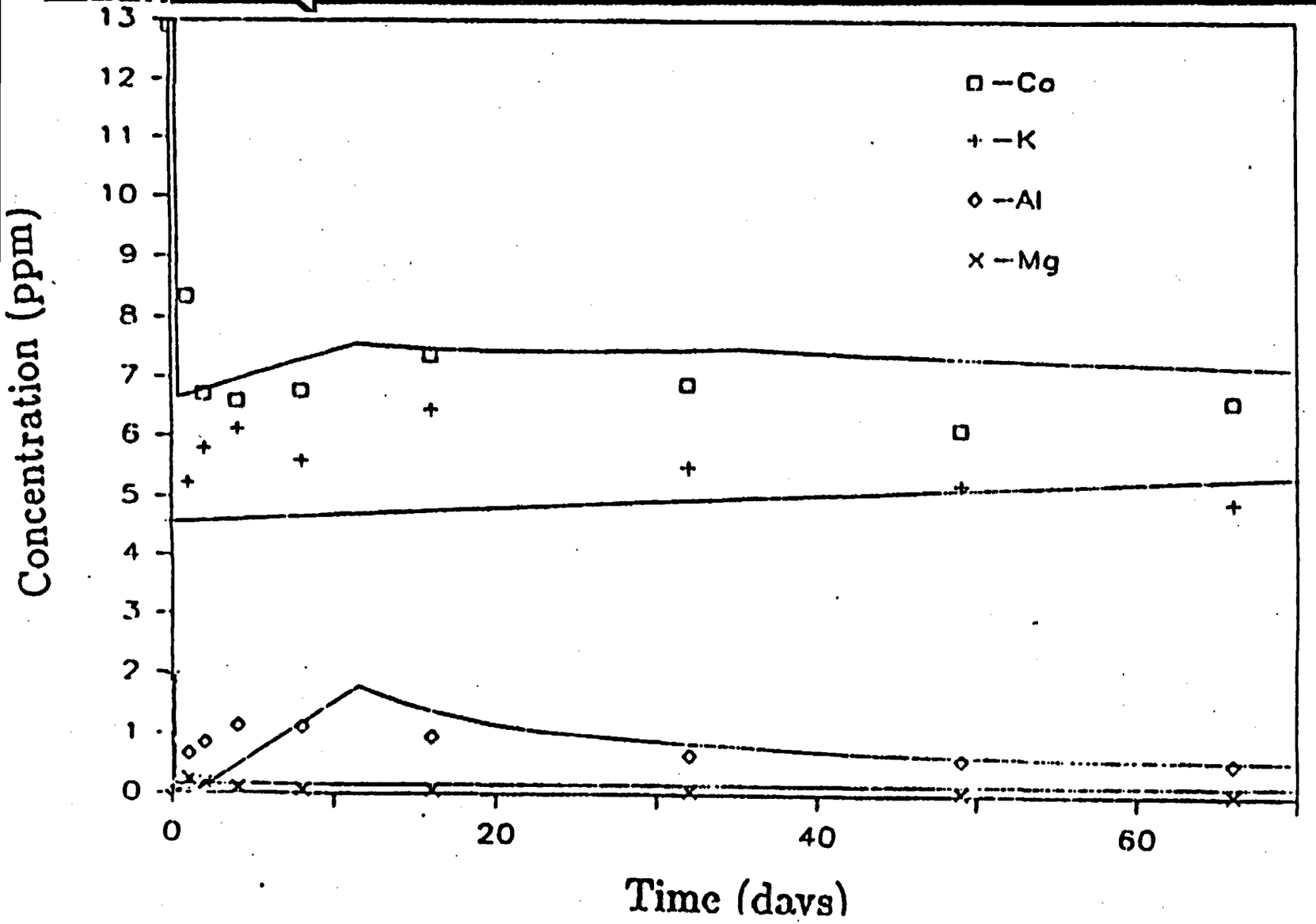
Nevada Nuclear Waste Storage Investigations PROJECT

150°C Solution Compositions

EQ6 Simulation



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YUCCA MOUNTAIN

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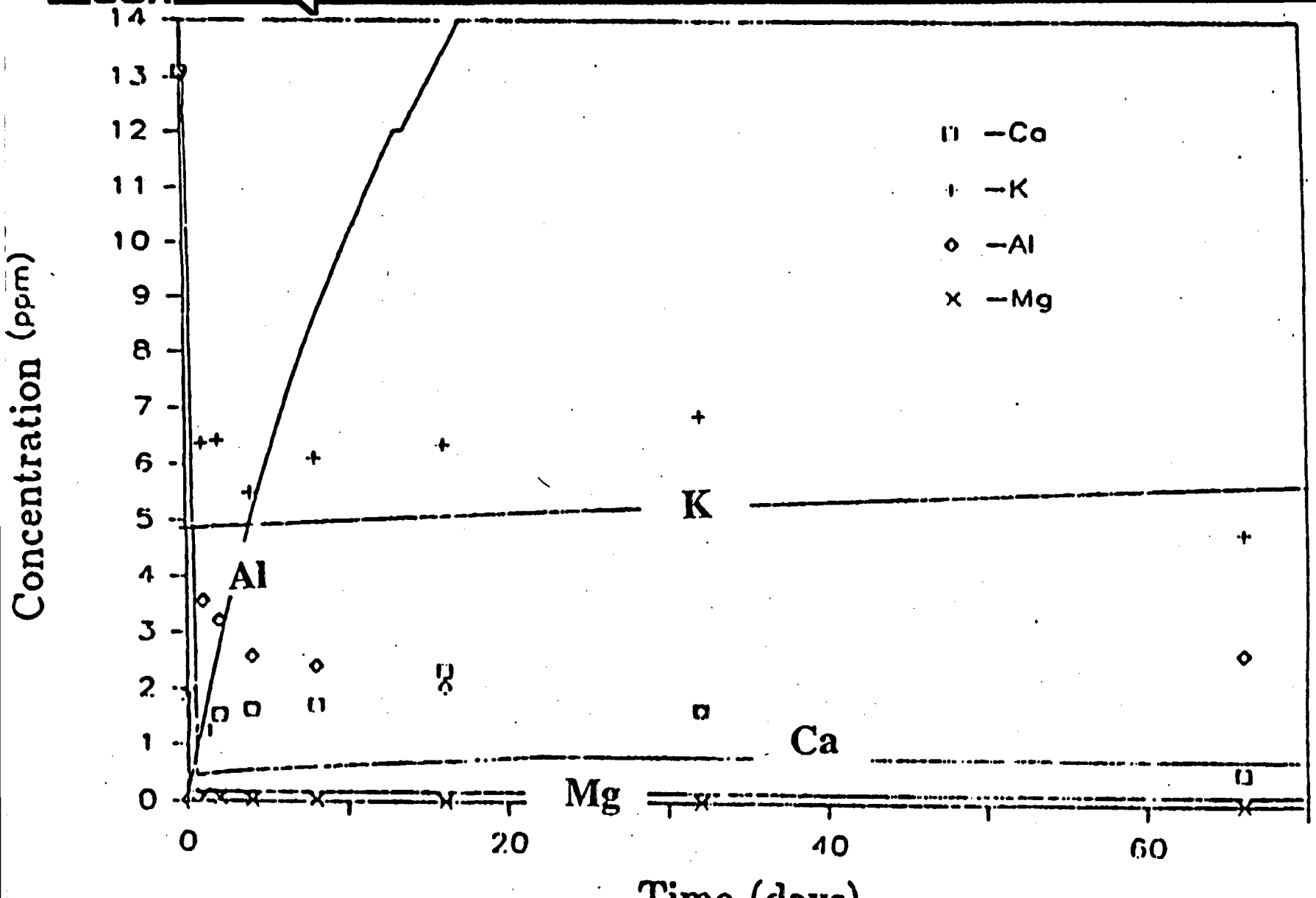
250°C Solution Compositions

EQ6 Simulation



Summary of EQ6 Tpt Tuff + J-13 Simulations

- Solution trends suggest that EQ6 can nearly match experimental data for short simulations at 150°C.
- Data base limitations severely handicap successful simulations for long term 150°C and 250°C experiments.
- Additional thermodynamic data is needed for zeolite compositions.

THE NUCLEAR REGULATORY COMMISSION

LICENSING HEARING PROCESS*

The Atomic Energy Act of 1954 granted a right to a hearing to any person whose interest may be affected by a nuclear license. In practice, anyone who resides or carries on substantial activities near a nuclear facility has the requisite legal "interest" or "standing" to contest or intervene in a license application proceeding. NRC public hearings are governed by formal rules required by the Federal Administrative Procedure Act. These rules are found in Part 2 of Title 10 of the Code of Federal Regulations. (10CFR2). The rules authorize an interested person (called an intervenor) to present any argument that the license, as applied for, would pose a danger to the public health or safety. Such arguments are known as contentions, and the bases for the contention must be stated with reasonable specificity. An Atomic Safety and Licensing Board (normally composed of a lawyer, a physicist or engineer, and an environmental scientist) decides at the outset whether the contention is reasonably specific and thus whether a hearing is required. Initially, the board must defer its judgment as to whether the contention or its basis has legal or technical merit.

The NRC has stressed that an intervenor must come forward with evidence "sufficient to require reasonable minds to inquire further" before a contention may be admitted and a hearing ordered. If no adequate contention is presented, no hearing is held, and the proceeding is dismissed. In the last five years the majority of cases have been resolved in this manner. If a

hearing is found to be necesssary, the Administrative Procedure Act requires that the applicant for a license prove, with respect to admitted contentions, that the public health and safety are adequately protected.

While a licensing board is free to draw conclusions by applying known engineering principles to, and making mathematical calculation from, facts in the record, the findings of the board must be supported by reliable, probative, and substantial evidence in the record. The applicant or licensee is not presumed guilty until proven innocent, but it does have the burden of supplying for the record the technical or other basis in support of the licensing action requested. This is not the burden of either the NRC staff or the intervenor. Once contentions have been admitted, the case proceeds just like any other civil litigation in court.

After the issues in the contentions have been identified, the parties to the proceeding may conduct discovery (e.g., interrogatories, requests for documents or depositions). Discovery is the method whereby each party learns of all views on the issues in the case. Discovery focuses the issues, prevents surprises during the hearing, and speeds the actual hearing. Failure to conduct meaningful discovery can lead to inadequate preparation of a party's case for hearing.

The size of cases and the number of issues in them can be pared down by a motion by any party for summary disposition. Such a motion requests a licensing board to decide in favor of one party on all or any part of an issue or issues based on discovery and usually without any trial. Such motions may be

filed at any time, except that the board may summarily dismiss motions filed close to or during the hearing, if it would require a substantial diversion of resources from the hearing itself. The board will render the decision sought if the record shows that there is no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law. If the record shows that there is a material fact in issue, the issue must be litigated. For complex technical issues, summary disposition is almost never appropriate, because there are very likely to be genuine issues of fact. By way of comparison, in the federal courts, summary disposition motions are rarely successful.

At a hearing, each party may present direct and rebuttal evidence and conduct cross-examination. The license applicant normally presents its evidence first because it has the burden of proving its application adequately protects the public health and safety. The applicant may then present evidence to answer points made by its opponent. All witnesses are subject to cross-examination under oath.

The applicant must meet all allegations leveled against it by introducing into the formal record a preponderance of reliable, probative, and substantial evidence in its direct case. Failure by the applicant to include such evidence in its direct case is a dangerous course of action, which could lead to a denial of the application.

The licensing board may not look beyond the formal record made by the parties in reaching its decision. If it believes that

the record is inadequate to support a rational decision, it has discretion to permit or call for additional evidence. Obviously, such an action can delay resolution of the issues.

Some recent proceedings have been graphic examples of the potential consequences of a license applicant's failure to understand the procedures described above and to utilize these procedures to achieve its goal. Technically trained individuals, as well as others involved in NRC licensing proceedings, need to understand thoroughly the legal concepts involved, i.e., the "rules of the game"- and how these impinge on their positions. Further, they also need to appreciate the procedural devices that are available to them (and to their opponents) to present their case adequatedly and effectively. Failure to do so may result in loss of a license.

*Based on a Letter to the Editor of the ANS News, March, 1986 from B. Paul Cotter Jr., Chief Administrative Judge, Atomic Safety and Licensing Board Panel. This letter has been edited to remove references to a specific licensing hearing proceeding.

THE NUCLEAR REGULATORY COMMISSION LICENSING PROCESS

ERNEST E. HILL
HILL ASSOCIATES

ADMINISTRATIVE JUDGE
ATOMIC SAFETY LICENSING BOARD PANEL

NRC LICENSING PROCESS

- NUCLEAR POWER PLANT LICENSING
- ATOMIC SAFETY LICENSING BOARD PANEL
- CONSTRUCTION PERMIT HEARINGS
  - PRE HEARING
  - HEARING
  - POST HEARING
- ADJUDICATION OF TECHNICAL SAFETY ISSUES

Years ↓

NUCLEAR POWER PLANT LICENSING

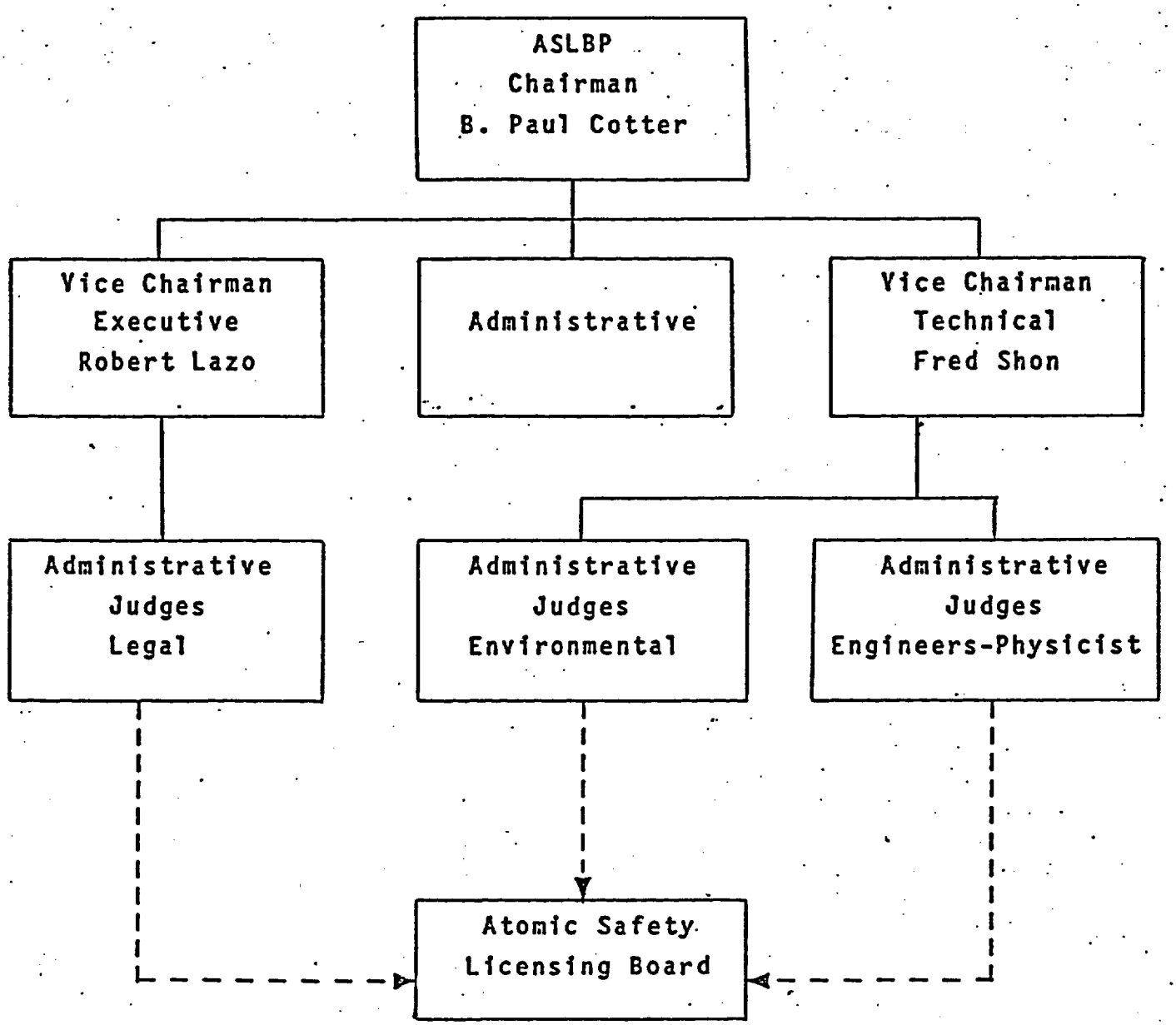
	AEA		NEPA	
	Licensee	NRC	Licensee	NRC
	Selection of NSSS		Site Selection	
2	Application for CP	Docket CP	Prelim. Ecol. Studies	
	Prepare PSAR		Prepare ER	
	Submit PSAR	Prelim. Review PSAR	Submit ER	Review ER
		Q1 on PSAR		Prepare EIS
3	Q1 Responses	Prepare SER		Agency Review EIS
		Prepare SSER		Prepare final EIS
		ACRS Review		
	ASLB CP Hearing	ASLB CP Hearing	ASLB CP Hearing	ASLB CP Hearing
1	ASLB Decision	ASLB Decision	ASLB Decision	ASLB Decision
	Start Construction	Grant CP	Site Preparation	Grant LWA
			Start Environmental Monitoring	
5 to 10	Construction	QA during Constr.		
	Prepare FSAR			
	Submit FSAR	Review FSAR		
		Prepare Final SER		
		Final ACRS Letter		
		Prepare SSERs		
	ASLB OL Hearing	ASLB OL Hearing		
1	ASLB Decision	ASLB Decision		
		Grant OL		
1	Fuel Loading			
	Startup			
	Full Comm Operation			
		QA during operation		

NRC Licensing Acronyms

ACRS	Advisory Committee on Reactor Safeguards
AEA	Atomic Energy Act
AEC	Atomic Energy Commission
ASLAB	Atomic Safety Licensing Appeal Board
ASLB	Atomic Safety Licensing Board
ASLBP	Atomic Safety Licensing Board Panel
CP	Construction Permit
EIS	Environmental Impact Statement
ER	Environmental Report
FAA	Federal Aviation Administration
FSAR	Final Safety Analysis Report
LWA	Limited Work Authorization
NEPA	National Environmental Policy Act
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
OL	Operation License
PSAR	Preliminary Safety Analysis Report
Q1	First round of questions
QA	Quality Assurance
QC	Quality Control
SER	Safety Evaluation Report
SSER	Supplemental Safety Evaluation Report

ASLBP

ORGANIZATION



ASLB

FUNCTIONS

- CONDUCT HEARINGS ON:

  Construction Permits
  Operating Licenses
  Special Proceedings as directed by NRC

- ISSUE DECISIONS TO:

  Grant Permits or Licenses
  Suspend Permits or Licenses
  Revoke Permits or Licenses
  Amend Permits or Licenses

- CONDUCT PROCEEDINGS IN ACCORDANCE WITH FEDERAL ADMINISTRATIVE LAW

  Rules of Evidence
  Cross Examination
  Intervenors - Parties

CP PRE HEARING

- NOTICE OF HEARING FEDERAL REGISTER
- PETITION TO INTERVENE
- PRE HEARING CONFERENCE
- ADMISSION OF INTERVENORS AS PARTIES
- ADMISSION OF STATE AS PARTY
- FILING OF CONTENTIONS
- PRE HEARING CONFERENCE ON CONTENTIONS

CP PRE HEARING (Cont.)

- DISCOVERY
  - ADMINISTRATIVE LAW
  - INTERROGATORIES
  - DEPOSITIONS
- PRE HEARING CONFERENCES
- PRE FILED TESTIMONY
- MOTION FOR SUMMARY DISPOSITION

CP HEARING

- TRANSCRIPT
  - RECORDS
  - EXHIBITS
- LIMITED APPEARANCES
- OPENING STATEMENTS
- TESTIMONY
  - WITNESSES and PANELS
  - RULES OF EVIDENCE

CP HEARING (Cont.)

- EXAMINATION
  - DIRECT
  - CROSS
  - RE-DIRECT
  - RE-CROSS
- BOARD QUESTIONS
- MOTION FOR SUMMARY DISPOSITION
- CLOSING STATEMENTS

CP POST HEARING

- PROPOSED FINDINGS and CONCLUSIONS
- INITIAL DECISION (PARTIAL)
- FINAL DECISION
- APPEAL TO ASLAB
- APPEAL TO NRC
- APPEAL TO FEDERAL COURTS
  - DISTRICT COURT
  - APPEAL COURT
  - SUPREME COURT
- GRANT CONSTRUCTION PERMIT

ADJUDICATION OF TECHNICAL SAFETY ISSUES

- RULES OF EVIDENCE
- EXPERT WITNESSES
- TECHNICAL EXPERTISE-OBJECTIVITY
- PEER REVIEW
- BURDEN OF PROOF ON APPLICANT
- QUALITY ASSURANCE (10CFR50 APPENDIX B)

Paul

U.S. DEPARTMENT OF ENERGY

OCRWM

Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

OGR

NATURAL ISOTOPE CHEMISTRY

Los Alamos

WBS 1.2.3.4.1.2.A
TPO PRESENTATION

MAY 21, 1986

A. E. NORRIS
PRINCIPAL INVESTIGATOR

U.S. DEPARTMENT OF ENERGY

OCRWM

Nevada Nuclear Waste Storage Investigations PROJECT YUCCA MOUNTAIN

OGR

NATURAL ISOTOPE CHEMISTRY

OBJECTIVES

Los Alamos

DETERMINE DISTRIBUTIONS OF NATURALLY OCCURRING RADIONUCLIDES AT YUCCA MOUNTAIN TO CHARACTERIZE

1) INFILTRATION OF PRECIPITATION

2) VELOCITY OF WATER MOVEMENT IN VADOSE ZONE

3) RETARDATION OF RADIONUCLIDES RELATIVE TO WATER VELOCITY

U.S. DEPARTMENT OF ENERGY

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Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

OGR

NATURAL ISOTOPE CHEMISTRY

PERFORMANCE ISSUES ADDRESSED

Los Alamos

1.1.1 SITE INFORMATION TO CALCULATE RADIONUCLIDE RELEASES (10 CFR 60.112 AND 40 CFR 191.13)

1.6.1 SITE INFORMATION TO IDENTIFY FASTEST PATH OF RADIONUCLIDE TRAVEL (10 CFR 60.113)

1.9.1 SITE INFORMATION TO IDENTIFY FAVORABLE AND POTENTIALLY ADVERSE CONDITIONS (10 CFR 60.122)

1.10.1 DETERMINATION THAT SITE IS NOT DISQUALIFIED (10 CFR 960.4-2-1)

1.10.2 DETERMINATION THAT SITE MEETS QUALIFYING CONDITIONS OF TECHNICAL GUIDELINES (10 CFR 960.4-2)

1.10.3 DETERMINATION THAT SITE MEETS QUALIFYING CONDITION OF SYSTEM GUIDELINE (10 CFR 960.4-1)

U.S. DEPARTMENT OF ENERGY

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Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

OGR

NATURAL ISOTOPE CHEMISTRY

CHARACTERIZATION ISSUES ADDRESSED

Los Alamos

1.14.2 DESCRIPTION OF THE UNSATURATED ZONE HYDROLOGY SYSTEM AT THE SITE

1.14.4 INFORMATION ABOUT PRESENT GEOHYDROLOGIC SETTING

1.15.4 RADIONUCLIDE RETARDATION BY SORPTION PROCESSES

1.15.5 RADIONUCLIDE RETARDATION BY PRECIPITATION PROCESSES

1.15.6 RADIONUCLIDE RETARDATION BY DISPERSIVE/DIFFUSIVE/ADVECTIVE TRANSPORT

1.15.7 RADIONUCLIDE RETARDATION BY ALL PROCESSES

U.S. DEPARTMENT OF ENERGY

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Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

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NATURAL ISOTOPE CHEMISTRY

NRC GENERIC TECHNICAL POSITIONS

Los Alamos

GROUNDWATER TRAVEL TIME

- CALCULATION OF TRAVEL TIME SHALL BE BASED ON ACTUAL DATA TO EXTENT POSSIBLE

IN SITU TESTING

- INTEGRATE LAB TESTING WITH IN SITU TEST RESULTS
- IN SITU TESTING OF RETARDATION AND MIGRATION

SORPTION

- SORPTION PARAMETERS USED SHALL BE BASED ON EXP. DATA
- DETERMINE APPLICABILITY IN FIELD TESTS

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Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

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NATURAL ISOTOPE CHEMISTRY

QUALITY ASSURANCE

Los Alamos

QUALITY ASSURANCE LEVEL ASSIGNMENT 1

APPROVED APPLICABLE PROCEDURES

TWS-MSTQA-QP-06 NNWSI PROCUREMENT PROCEDURE

TWS-MSTQA-QP-14 ONE TIME RESEARCH AND DEVELOPMENT

U.S. DEPARTMENT OF ENERGY

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Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

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NATURAL ISOTOPE CHEMISTRY

SUBTASKS

Los Alamos

1. ^{36}Cl INFILTRATION
2. ^{99}Tc RETARDATION RELATIVE TO ^{36}Cl
3. ^{36}Cl MASS SPECTROMETRY DEVELOPMENT
4. URANIUM DISEQUILIBRIUM IN GROUNDWATER

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Nevada Nuclear Waste Storage Investigations PROJECT

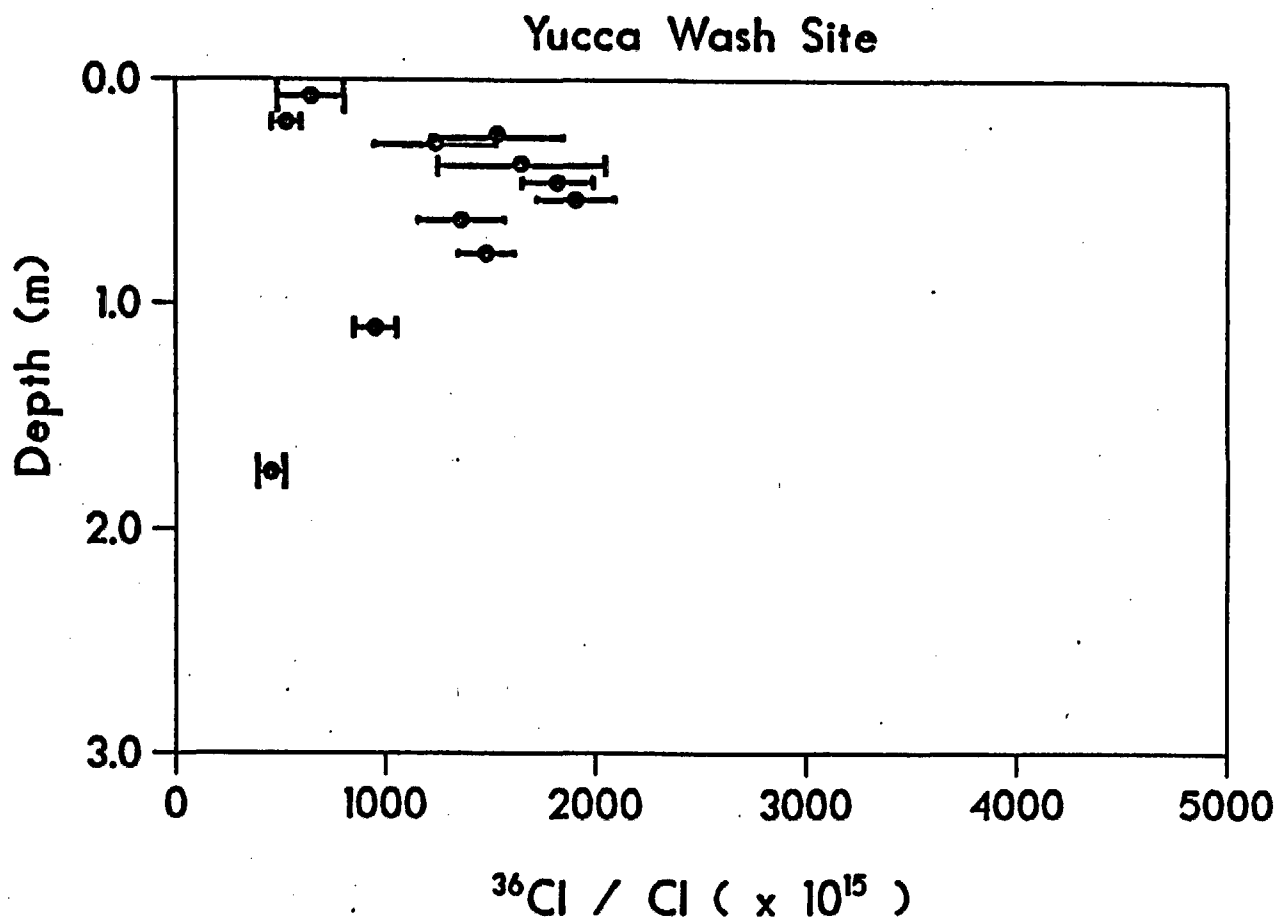
YUCCA MOUNTAIN

OGR

NATURAL ISOTOPE CHEMISTRY

^{36}Cl INFILTRATION

Los Alamos



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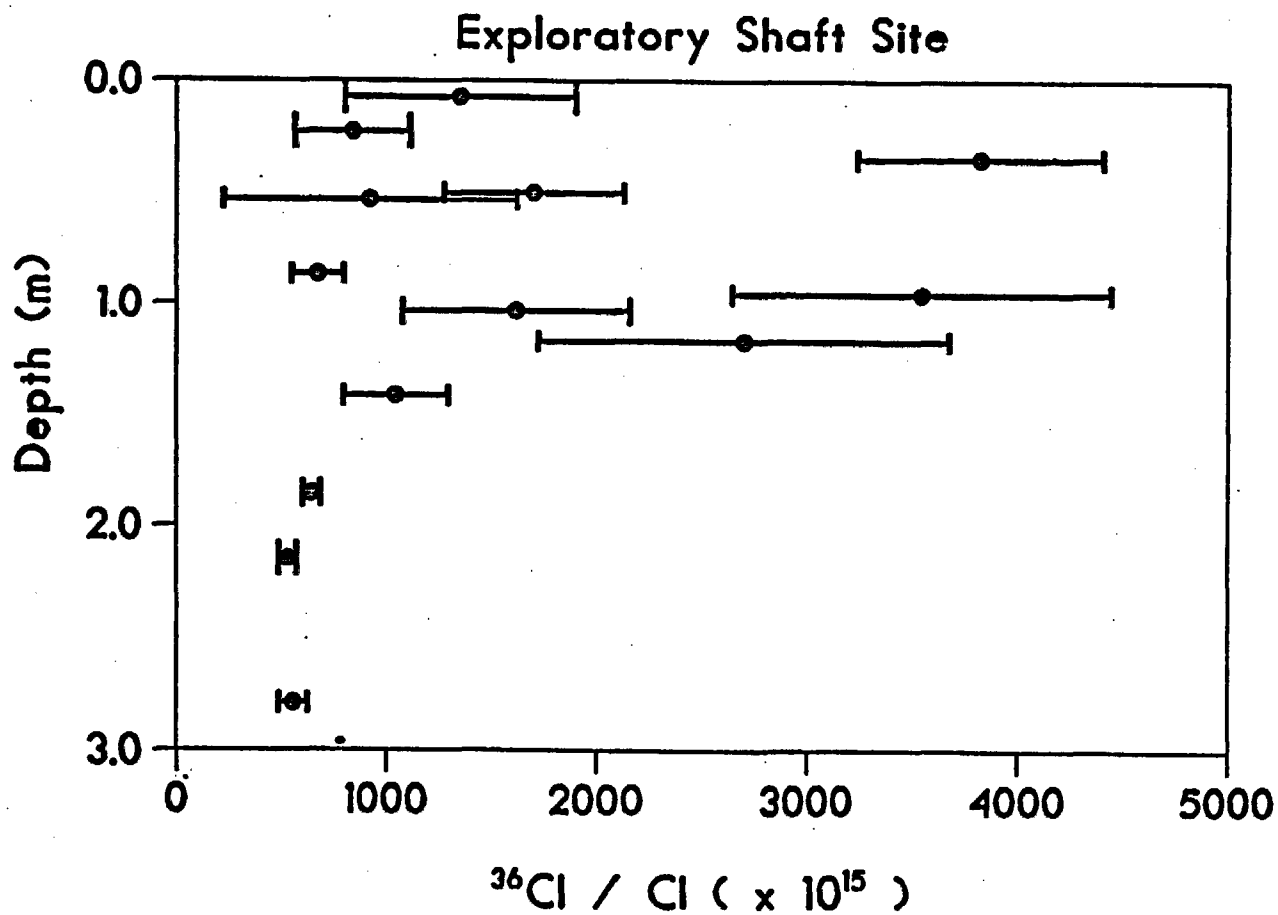
YUCCA MOUNTAIN

OGR

NATURAL ISOTOPE CHEMISTRY

^{36}Cl INFILTRATION

Los Alamos



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NATURAL ISOTOPE CHEMISTRY

^{36}CI INFILTRATION RESULTS

Los Alamos

^{36}CI BOMB PULSE 1952 - 1963

YUCCA WASH 6 TRENCH
- SINGLE PEAK
- 6.0×10^{12} ATOMS/M^2
- INFILTRATION 1.8 MM/YR

EXPLORATORY SHAFT SITE
- STRUCTURED PEAK
- 4.5×10^{10} ATOMS/M^2

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NATURAL ISOTOPE CHEMISTRY

^{99}Tc RETARDATION

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NON-NNWSI MASS SPECTROMETRY DEVELOPMENT IN PROGRESS

CHEMICAL DEVELOPMENT WILL BE NECESSARY

THEN MEASURE ^{99}Tc DISTRIBUTION RELATIVE TO ^{36}Cl

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NATURAL ISOTOPE CHEMISTRY

^{36}Cl MASS SPECTROMETRY

Los Alamos

TAMS AVAILABILITY PROBLEM

CONVENTIONAL MASS SPECTROMETRY SENSITIVITY 1 IN 10^9 ATOMS CHLORINE

DEVELOP TO USEFUL SENSITIVITY

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URANIUM DISEQUILIBRIUM

Los Alamos

LITERATURE REVIEW IN PROGRESS

70 REFERENCES IN DATABASE

FEASIBILITY STUDY DUE 9/86

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NATURAL ISOTOPE CHEMISTRY

PERSONNEL

Los Alamos

KAY COEN	SECRETARIAL SUPPORT
BRUCE CROWE	MANAGEMENT
SUZIE DYE	QUALITY ASSURANCE
DAVID FINNEGAN	URANIUM DISEQUILIBRIUM
LIA MITCHELL	SECRETARIAL SUPPORT
TED NORRIS	^{36}CI INFILTRATION
HYDRO GEO CHEM	^{36}CI MEASUREMENTS

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NATURAL ISOTOPE CHEMISTRY

PROJECT PARTICIPANTS

Los Alamos

LOS ALAMOS NATIONAL LABORATORY	GEOCHEMISTRY SITE INVESTIGATION
NEVADA TEST SITE OFFICE - REECo	FIELD SAMPLING SUPPORT
U. S. GEOLOGICAL SURVEY	FIELD SAMPLES
SANDIA NATIONAL LABORATORIES	DATA BASE AND PERFORMANCE ASSESSMENT

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NATURAL ISOTOPE CHEMISTRY

BUDGET

Los Alamos

	FY 86	FY87	FY 88	FY 89
^{36}Cl INFILTRATION	58	217	116	73
^{99}Tc RETARDATION		77	58	
^{36}Cl MASS SPECTROMETRY		129		
^{238}U DISEQUILIBRIUM	64			
TOTALS	122	423	174	73

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NATURAL ISOTOPE CHEMISTRY

MILESTONES

Los Alamos

R494	9/30/87	COMPLETE ^{36}Cl ANALYSES OF Y. M. SAMPLES
R495	1/31/88	REPORT ON ^{36}Cl IN Y. M. SAMPLES
R496	9/30/89	REPORT ON INFILTRATION RATES
R703	3/31/87	INTERIM REPORT ON ^{99}Tc ANALYSES
R337	3/31/88	FINAL REPORT ON ^{99}Tc RETARDATION
R305	9/26/86	U DISEQUILIBRIUM FEASIBILITY REPORT

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Nevada Nuclear Waste Storage Investigations PROJECT

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Paul

U.S. DEPARTMENT OF THE INTERIOR · GEOLOGICAL SURVEY

ISOTOPE PERSONNEL

John N. Rosholt -- Branch Chief

Zell E. Peterman -- Asst. Branch Chief
John S. Stuckless -- Asst. Branch Chief

Barney J. Szabo -- U-series dating
Daniel R. Muhs -- U-series dating

Robert J. Fleck -- K-Ar dating
Brent D. Turrin -- K-Ar dating

ISOTOPE PERSONNEL

Steven W. Robinson -- ^{14}C dating

Micheal G. Reimer -- Fission-track dating

James R. O'Neil -- Stable isotopes
Kurtis T. Kyser -- Stable isotopes

Zell E. Peterman -- Sr-tracer isotopes
John S. Stacey -- Pb-tracer isotopes

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ISOTOPE BUDGET

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	1986	1987
K-Ar dating	310k	290k
U-series dating	240k	260k
Fission-track	60k	55k
^{14}C-dating	25k	20k
Stable isotopes	15k	25k
Tracer isotopes	0	50k
Total	650k	700k

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ISOTOPIC DATING
U-series

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^{238}U ---> ^{234}U half-life = 4.5×10^9 yrs.

^{234}U ---> ^{230}Th half-life = 2.4×10^5 yrs.

^{230}Th ---> ^{226}Ra half-life = 4.0×10^4 yrs.

Dating assumes:

1. Known $^{234}U/^{238}U$ when system formed
2. No ^{230}Th when system formed
3. Closed system for entire history

Most useful for 5,000 to 400,000 yr. ages

ISOTOPIC DATING
K-Ar

$^{40}K \longrightarrow {}^{40}Ar + {}^{40}Ca$ half-life = 1.25×10^{9} yrs.

Dating assumes:

1a. No ^{40}Ar in sample when system formed

OR

1b. All ^{40}Ar is atmospheric and can be subtracted based on measured ^{36}Ar

2. Closed system for entire history

Most useful for ages >500,000 yrs. but special techniques and circumstances permit use down to 10,000 yrs.

ISOTOPIC DATING
^{14}C

^{14}C ---> ^{14}N half-life + 5.73×10^3 yrs.

Dating assumes:

1. Known $^{14}C/^{12}C$ when system formed
2. closed system for entire history

Most useful for ages <35,000 yrs.

ISOTOPIC DATING
Fission-track

^{235}U ---> Fission prod. half-life 9.86×10^{15} yrs

Used on apatite crystals to determine uplift ages

Fission particles cause damage paths (fission tracks) that can be etched out and counted

The number of tracks is proportional to uranium content and time

Damage in apatite anneals at low temp. (~50° C)

Thus, tracks are not preserved until rocks are exposed in the near-surface environment

Most useful for ages >2 m.y., but under favorable circumstances can be used down to 200,000 yrs.

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U-SERIES DATING

Results

U.S. DEPARTMENT OF THE INTERIOR · GEOLOGICAL SURVEY

1. Ages for 31 units cluster around 40, 170, 270, and 440 kyrs.

2. Ages for 18 fracture fillings cluster around 28, 170, 280, and >400 kyrs.

3. Ages for 8 travertine & caliche deposits are around 190, 245, 435, and 570 kyrs.

4. Remaining work will be defined as needs are identified by various projects.

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K-Ar DATING

Results

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1. 53 ages for Cima Volcanic Field cluster at <1, 3.8 to 5.5, and 6.5 to 7.5 myrs.

2. 20 ages for Lunar Crater Field cluster at 0.8 to 1 and 3.8 to 5.7 myrs.

3. 12 ages for Big Pine Volcanic Field cluster near 1 myrs. and about 24 kyrs.

4. About 75 more ages to be determined at these sites plus Death Valley, Clayton Valley, and the Nevada Test Site.

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ISOTOPIC DATING
Objectives

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1. Determine timing of past tectonic events
   - Recurrence interval needed to assess unanticipated events
   - Time of last movement needed to assess active faulting
2. Determine ages of volcanic rocks
   - Input for volcanic risk assessment
3. Determine ages of spring and lake deposits
   - Input for paleohydrology
   - Input for paleoclimatology

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STABLE ISOTOPES

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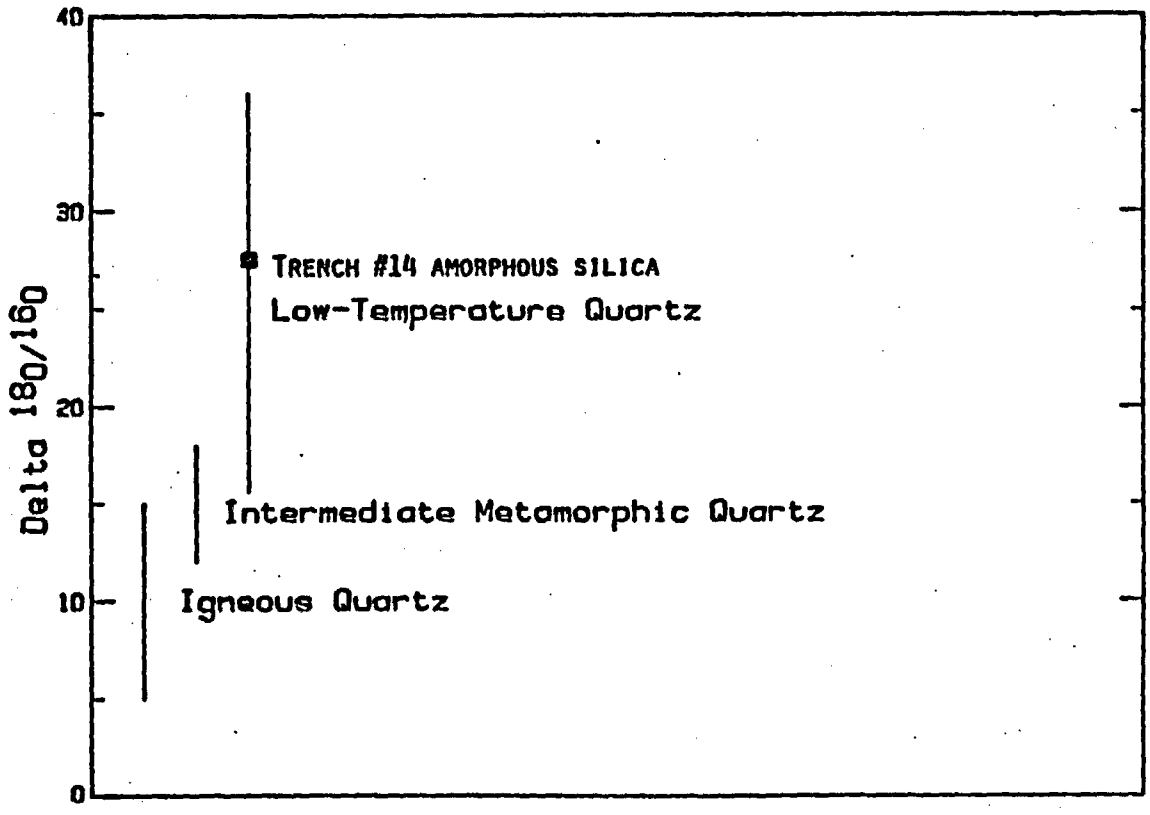

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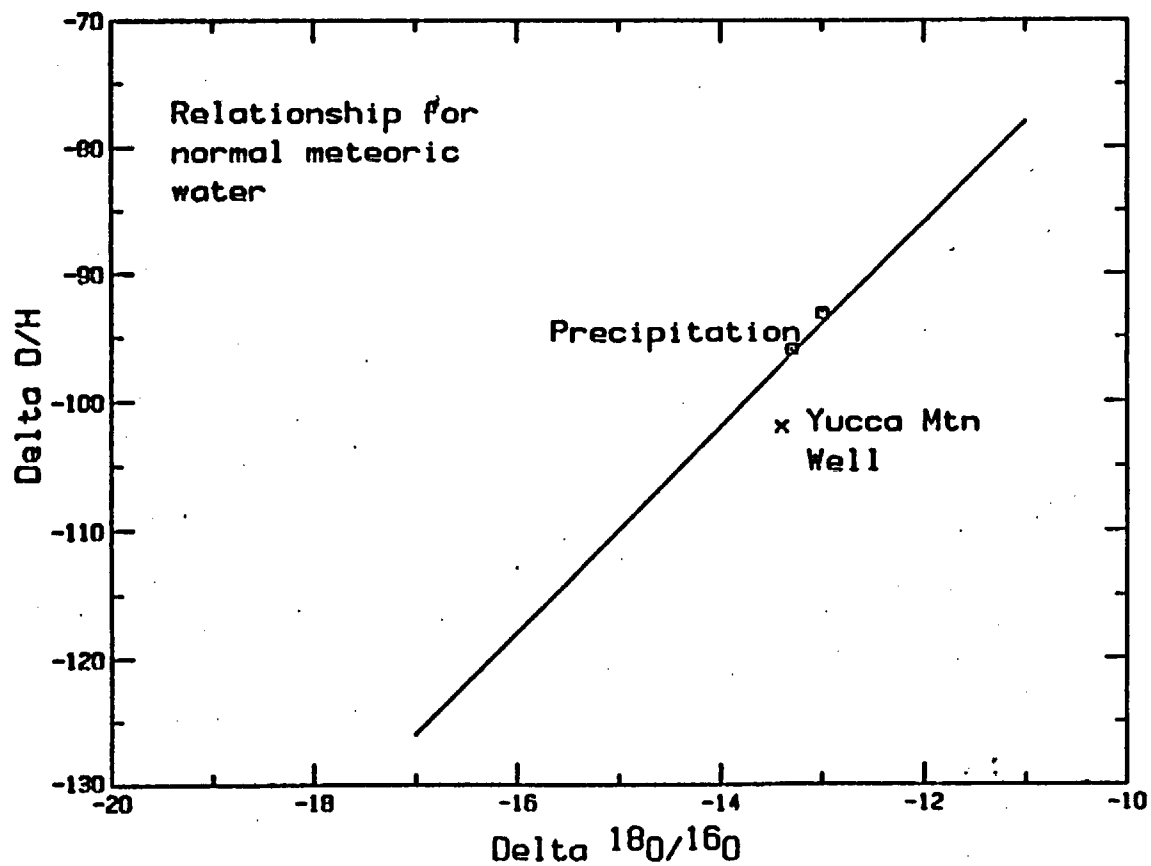
STABLE ISOTOPES

U.S. DEPARTMENT OF THE INTERIOR · GEOLOGICAL SURVEY



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TRACER ISOTOPES

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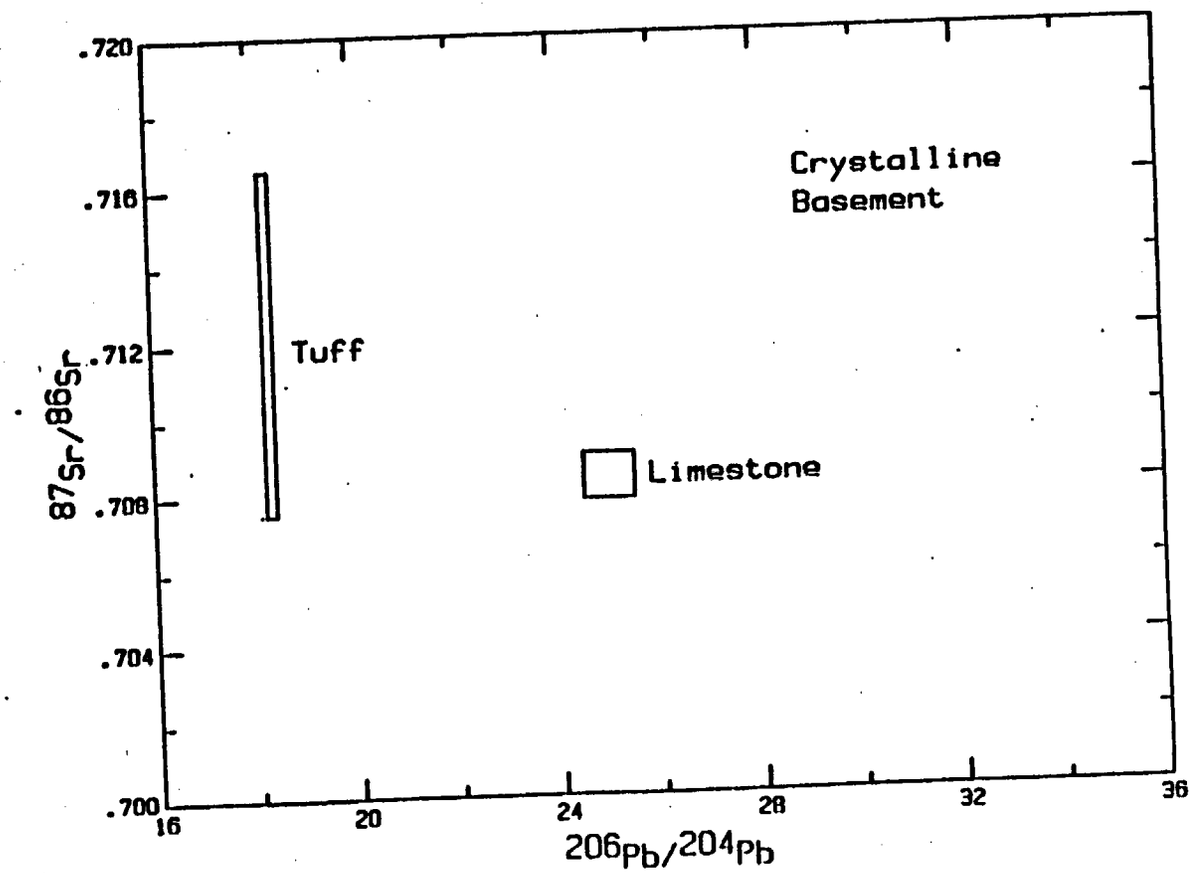

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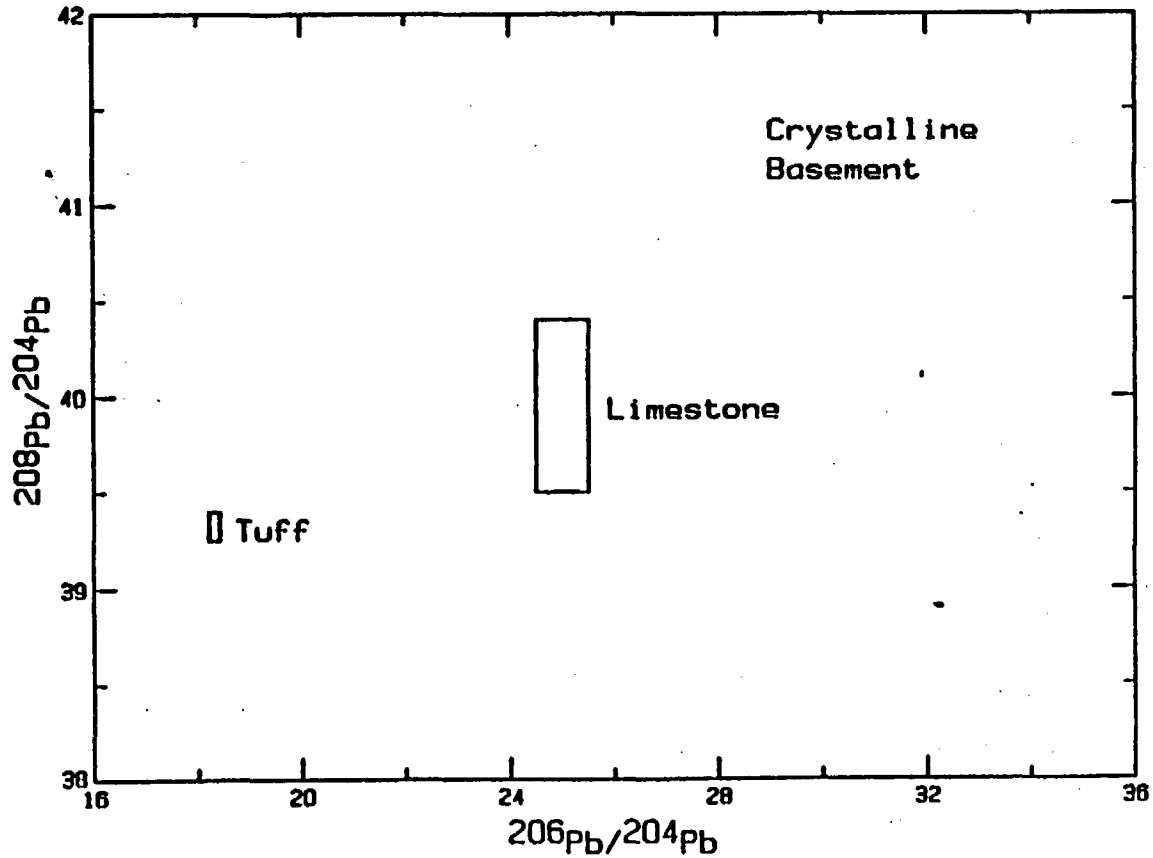
TRACER ISOTOPES

U.S. DEPARTMENT OF THE INTERIOR · GEOLOGICAL SURVEY



STABLE ISOTOPES
Objectives

1. To determine temperature of deposition for spring deposits.
2. To determine paleo isotopic composition of ground water.

TRACER ISOTOPES
Objectives

To determine sources of water-precipitated deposits and hence, paleo ground water paths

TRACER ISOTOPES

The isotopic compositions of Pb and Sr vary widely in different geologic material as a function of time and differing U/Pb or Rb/Sr.

Waters in contact with various geologic materials acquire the isotopic composition of those materials.

These compositions are then passed to chemical precipitates from those waters.

Department of Energy
Nevada Operations Office
P. O. Box 14100
Las Vegas, NV 89114-4100

MAY 28 1986

P. T. Prestholt
NRC Site Representative
1050 East Flamingo Road, Suite 319
Las Vegas, NV 89109

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS (NNWSI) PROJECT INFORMATION - DATA CATALOG, APRIL 9, 1986

The NNWSI Project, in accordance with the Site Specific Agreement between the Department of Energy (DOE), and the Nuclear Regulatory Commission (NRC) is transmitting to you the quarterly update (April 9, 1986) of the Data Catalog from Sandia National Laboratories (SNL).

The Catalog describes all data currently available from both laboratory and field tests and specifies a quality assurance level for each Data Set Entry.

Please contact J. S. Szymanski if you have questions on this Catalog.

Donald L. Vieth, Director
Waste Management Project Office

WMPO:JSS-1252

Enclosure:
As stated

cc w/encl:
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M. D. Voegele, SAIC, Las Vegas, NV
J. S. Szymanski, WMPO, DOE/NV

cc w/o encl:
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Tom Blejwas, SNL, 6313, Albuquerque, NM
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WMPO
LtR 1253

Sandia National Laboratories

Albuquerque, New Mexico 87185

APR 7 1986

THIS IS AN NNWSI
MILESTONE
No. R 194
Date Completed 4/7/86

D. L. Vieth, Director
Waste Management Project Office
U. S. Department of Energy
Nevada Operations Office
P. O. Box 14100
Las Vegas, Nevada 89114

Dear Don:

Subject: Transmittal of Data Catalog per Milestone R194

On January 10, 1986, we provided to your office the fourth update of the SNL Department 6310 NNWSI Data Catalog. The Data Catalog is used by the NRC in accordance with the site-specific agreement.

Attached is the quarterly update to the SNL Data Catalog, due April 14, 1986.

A new feature of the Data Catalog is the documentation of QA Levels for each Data Set entry.

If you have questions regarding the Data Catalog, please contact me (844-9160), Tom Blejwas (846-0541) or Barry Schwartz (846-8268).

Sincerely,

Thomas O. Hunter

Thomas O. Hunter, Manager
NNWSI Projects Department 6313

BMSchwartz:6313:1477k:mb

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6311 L. W. Scully
6312 F. W. Bingham
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6314 J. R. Tillerson
6315 S. Sinnock
6310 10/1292-2/COR/NQ
6310 10/12911-2/COR/NQ

Copy to: (w/attach.)
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6310 E. W. Shepherd
6313 B. M. Schwartz (2)
(For Transmittal to 6310 Record Center 50/S01)
6310 NNWSI CF

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Francis B. Nimick, Div. 6313

Thermal Conductivity Tests

DATA SET ID: L01A.A-06/24/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of thermal conductivity behavior in tuffs from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	5	SNL
2	Yucca Mtn	USW G-1	Tct	4	SNL
3	Yucca Mtn	USW G-1	Tcp	4	SNL
4	Yucca Mtn	USW G-1	Tht	3	SNL
5	Yucca Mtn	USW G-1	Tpt	3	SNL

* *

DATA SET ID: L01A.A-01/13/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Bullfrog Member in USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	4	SNL

* *

DATA SET ID: L01A.A-01/15/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Comparison of testing techniques, (USGS).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tct	2	SNL

* *

DATA SET ID: L01A.A-04/21/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of G-Tunnel in situ tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-RM-P-1	Tig	6	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Thermal Conductivity Tests (Con't)

DATA SET ID: L01A.A-07/16/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Pah Canyon and Topopah Spring member of USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tpp	2	SNL
2	Yucca Mtn	USW G-2	Tpt	4	SNL

* *

DATA SET ID: L01A.A-10/07/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the tuffaceous beds of Calico Hills and of the Topopah Spring Member in USW G-1 and USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	5	SNL
2	Yucca Mtn	USW G-1	Tpt	10	SNL
3	Yucca Mtn	USW G-2	Tht	4	SNL
4	Yucca Mtn	USW G-2	Tpt	2	SNL

* *

DATA SET ID: L01A.A-02/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Tests run at SNL to determine the effect of composition, porosity, bedding plane orientation, water content, and a joint on thermal conductivity of tuff using a thermal compactor.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-HEH-1B	Tig	4	SNL
2	Yucca Mtn	USW G-1	Tcb	3	SNL
3	Yucca Mtn	USW G-1	Tct	2	SNL

* *

DATA SET ID: L01A.A-03/29/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the tuffaceous beds of Calico Hills in USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tht	11	SNL

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Francis B. Nimick, Div. 6313

Thermal Conductivity Tests (Con't)

DATA SET ID: L01A.A-05/07/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization/support for G-Tunnel heater tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-SDH#1	Tig	3	SNL
2	G-Tunnel	U12g-SDH#3	Tilt5	3	SNL

* *

DATA SET ID: L01A.A-05/17/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Comparative testing techniques examination.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	1	SNL

* *

DATA SET ID: L01A.A-07/02/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of pure zeolites.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Zeolites	N/A	N/A	4	SNL

* *

DATA SET ID: L01A.A-09/07/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in UE-25b#1H, USW G-2, USW GU-3, and drill holes in G-Tunnel.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25b#1H	Tcb	3	SNL
2	Yucca Mtn	UE-25b#1H	Tct	3	SNL
3	Yucca Mtn	USW G-2	Tpt	2	SNL
4	Yucca Mtn	USW G-2	Tcb	3	SNL
5	Yucca Mtn	USW G-2	Tct	3	SNL
6	Yucca Mtn	USW GU-3	Tpt	4	SNL
7	Yucca Mtn	USW GU-3	Tht	2	SNL
8	Yucca Mtn	USW GU-3	Tcp	1	SNL
9	Yucca Mtn	USW GU-3	Tcb	2	SNL
10	G-Tunnel	U12g-HB-MPBX	Tig	4	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Thermal Conductivity Tests (Con't)

DATA SET ID: L01A.A-12/02/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Topopah Spring Member in USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	4	SNL

* *

DATA SET ID: L01A.A-02/21/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the tuffaceous beds of Calico Hills in USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tht	3	SNL

* *

DATA SET ID: L01A.A-03/05/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory quality and accuracy determination.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Standard	N/A	N/A	2	SNL

* *

DATA SET ID: L01A.A-08/31/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Effects of Lithophysae on the thermal conductivity of the Topopah Spring Member at Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	4	SNL

* *

DATA SET ID: L01A.A-01/23/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Topopah Spring Member in UE-25a#1, USW GU-3 and USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tpt	1	SNL
2	Yucca Mtn	USW GU-3	Tpt	1	SNL
3	Yucca Mtn	USW G-4	Tpt	2	SNL

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Francis B. Nimick, Div. 6313

Confined Thermal Expansion Tests

DATA SET ID: L01B1.A-06/24/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of confined thermal expansion behavior in tuffs from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	5	SNL
2	Yucca Mtn	USW G-1	Tct	4	SNL
3	Yucca Mtn	USW G-1	Tcp	4	SNL
4	Yucca Mtn	USW G-1	Tht	3	SNL
5	Yucca Mtn	USW G-1	Tpt	3	SNL

* *

DATA SET ID: L01B1.A-04/21/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of G-tunnel in situ tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-RM-P-1	Tig	3	SNL

* *

DATA SET ID: L01B1.A-08/11/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Bullfrog Member in USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	4	SNL

* *

DATA SET ID: L01B1.A-10/07/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the tuffaceous beds of Calico Hills in USW G-1 and USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	5	SNL
2	Yucca Mtn	USW G-2	Tht	4	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Confined Thermal Expansion Tests (Con't)

DATA SET ID: L01B1.A-03/29/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the tuffaceous beds of Calico Hills in USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tht	13	SNL

* *

DATA SET ID: L01B1.A-07/02/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Tunnel Bed 5 and of the thermal expansion behavior of zeolite tuff.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-SDH #3	Tilt5	4	SNL

* *

DATA SET ID: L01B1.A-09/07/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in UE-25b#1H, USW G-2, USW G-1, USW GU-3 and G-Tunnel.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25b#1H	Tcb	3	SNL
2	Yucca Mtn	UE-25b#1H	Tct	3	SNL
3	Yucca Mtn	USW G-2	Tpt	2	SNL
4	Yucca Mtn	USW G-2	Tcb	3	SNL
5	Yucca Mtn	USW G-2	Tct	3	SNL
6	Yucca Mtn	USW G-1	Tcb	5	SNL
7	Yucca Mtn	USW G-1	Tct	2	SNL
8	Yucca Mtn	USW GU-3	Tpt	3	SNL
9	Yucca Mtn	USW GU-3	Tht	2	SNL
10	Yucca Mtn	USW GU-3	Tcb	1	SNL
11	G-Tunnel	U12g-HB-MPBX	Tig	4	SNL

* *

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SNL CONTACT: Francis B. Nimick, Div. 6313

Confined Thermal Expansion Tests (Con't)

DATA SET ID: L01B1.A-12/02/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Topopah Spring Member in USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	4	SNL

* *

DATA SET ID: L01B1.A-02/21/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the tuffaceous beds of Calico Hills in USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tht	3	SNL

* *

DATA SET ID: L01B1.A-03/05/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Evaluation of errors in thermal expansion testing/bondline compaction.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	2	SNL
2	Busted Butte	Outcrop	Tpt	2	SNL

* *

DATA SET ID: L01B1.A-08/31/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Lithophysal effects on thermal expansion of the Topopah Spring Member.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	3	SNL

* *

DATA SET ID: L01B1.A-01/23/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Topopah Spring Member in UE-25a#1, USW GU-3 and USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tpt	1	SNL
2	Yucca Mtn	USW GU-3	Tpt	1	SNL
3	Yucca Mtn	USW G-4	Tpt	2	SNL

* *

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SNL CONTACT: Francis B. Nimick, Div. 6313

Unconfined Thermal Expansion Tests

DATA SET ID: L01B2.A-05/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of unconfined thermal expansion in drill holes USW G-1, USW G-2, UE-25a#1, and G-Tunnel, to gain knowledge of the expansion behavior of different tuff lithologies.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	46	SNL
2	Yucca Mtn	USW G-1	Tht	26	SNL
3	Yucca Mtn	USW G-1	Tcp	18	SNL
4	Yucca Mtn	USW G-1	Tcb	58	SNL
5	Yucca Mtn	USW G-1	Tct	66	SNL
6	Yucca Mtn	USW G-1	Tfb	1	SNL
7	Yucca Mtn	USW G-2	Tht	5	SNL
8	Yucca Mtn	UE-25a#1	Tpt	21	SNL
9	Yucca Mtn	UE-25a#1	Tht	33	SNL
10	G-Tunnel	U12g-RMP-1	Tig	6	SNL
11	G-Tunnel	U12g-SDH #3	Tilt5	2	SNL
12	N/A-Zeolites	N/A	N/A	2	SNL
13	N/A-Silica	N/A	N/A	1	SNL

* *

Heat Capacity Tests

DATA SET ID: L01C.A-07/23/85 QA LEVEL II STATUS: PLANNED
DESCRIPTION: Heat capacity measurements of selected Tuff units from Yucca Mountain to be used to verify the accuracy of calculated heat capacities and to quantify the heat absorbed or released in reactions involving zeolites and clay rich tuffs

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tht	0	SNL
2	Yucca Mtn	USW G-1	Tpt	0	SNL
3	Yucca Mtn	USW G-1	Tht	0	SNL
4	Yucca Mtn	USW G-2	Tpt	0	SNL
5	Yucca Mtn	USW GU-3	Tpt	0	SNL
6	Yucca Mtn	USW G-4	Tpt	0	SNL
7	Yucca Mtn	USW G-4	Tht	0	SNL

* *

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SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Compression Tests (Matrix)

DATA SET ID: L02A1.A-03/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuffs from the Nevada Test Site.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tpc	5	SNL
2	Yucca Mtn	UE-25a#1	Tpt	5	SNL
3	Yucca Mtn	UE-25a#1	Tht	5	SNL
4	Yucca Mtn	UE-25a#1	Tcp	5	SNL
5	Yucca Mtn	UE-25a#1	Tcb	4	SNL
6	G-Tunnel	Laser Drift	Tig	20	SNL

* *

DATA SET ID: L02A1.A-06/24/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of mechanical behavior of tuffs from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	30	SNL
2	Yucca Mtn	USW G-1	Tct	14	SNL
3	Yucca Mtn	USW G-1	Tcp	14	SNL
4	Yucca Mtn	USW G-1	Tht	7	SNL
5	Yucca Mtn	USW G-1	Tpt	7	SNL

* *

DATA SET ID: L02A1.A-04/14/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory comparison using the Bullfrog Member in USW G-1, (Terra Tek data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	11	SNL

* *

DATA SET ID: L02A1.B-04/14/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Lab comparison using the Bullfrog Member in USW G-1, (SNL Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	11	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Compression Tests (Matrix) (Con't)

DATA SET ID: L02A1.A-04/21/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of G-tunnel in situ tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-RM-P-1	Tig	3	SNL

* *

DATA SET ID: L02A1.A-06/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Mechanical testing of the Bullfrog Member in USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	7	SNL

* *

DATA SET ID: L02A1.A-07/30/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Lab comparison using the Prow Pass, Bullfrog, and Tram Members in USW G-1, (Terra Tek Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	2	SNL
2	Yucca Mtn	USW G-1	Tcb	20	SNL
3	Yucca Mtn	USW G-1	Tct	2	SNL

* *

DATA SET ID: L02A1.A-08/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Lab comparison using the Prow Pass, Bullfrog, and Tram Members in USW G-1, (SNL Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	2	SNL
2	Yucca Mtn	USW G-1	Tcb	16	SNL
3	Yucca Mtn	USW G-1	Tct	1	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Compression Tests (Matrix) (Con't)

DATA SET ID: L02A1.A-09/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Bullfrog Member in USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	19	SNL

* *

DATA SET ID: L02A1.A-10/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Lab comparison using the Calico Hills Member in USW G-1, (SNL Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	44	SNL

* *

DATA SET ID: L02A1.A-10/07/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory comparison using the tuffaceous beds of Calico Hills in USW G-1, (Terra Tek data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	20	SNL

* *

DATA SET ID: L02A1.A-12/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory comparison of the Prow Pass and Tram Members in USW G-1, (SNL data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tct	25	SNL
2	Yucca Mtn	USW G-1	Tcp	2	SNL

* *

DATA SET ID: L02A1.A-12/16/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory comparison using the Prow Pass and Tram Members in USW G-1, (Terra Tek Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	2	SNL
2	Yucca Mtn	USW G-1	Tct	20	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Compression Tests (Matrix) (Con't)

DATA SET ID: L02A1.A-03/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Topopah Spring Member in USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	15	SNL

* *

DATA SET ID: L02A1.A-09/07/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW GU-3.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	21	SNL
2	Yucca Mtn	USW GU-3	Tpt	19	SNL
3	Yucca Mtn	USW GU-3	Tht	6	SNL
4	Yucca Mtn	USW GU-3	Tcb	20	SNL

* *

DATA SET ID: L02A1.A-02/11/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Mechanical testing of the Topopah Spring Member in USW GU-3.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpt	35	SNL

* *

DATA SET ID: L02A1.A-06/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Topopah Spring Member in USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	5	SNL

* *

DATA SET ID: L02A1.A-07/29/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory comparison of Busted Butte outcrop, (Terra Tek data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	9	SNL
2	N/A-Standard	N/A	N/A	1	SNL
3	N/A-Standard	N/A	N/A	1	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Compression Tests (Matrix) (Con't)

DATA SET ID: L02A1.A-08/04/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory comparison of Busted Butte outcrop, (SNL Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	9	SNL
2	N/A-Standard	N/A	N/A	1	SNL
3	N/A-Standard	N/A	N/A	1	SNL
4	N/A-Standard	N/A	N/A	2	SNL
5	N/A-Standard	N/A	N/A	1	SNL
6	N/A-Standard	N/A	N/A	1	SNL
7	N/A-Standard	N/A	N/A	1	SNL

* *

DATA SET ID: L02A1.B-08/04/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Laboratory comparison of Busted Butte outcrop, (RE/SPEC Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	8	SNL &/or RE
2	N/A-Standard	N/A	N/A	1	SNL &/or RE
3	N/A-Standard	N/A	N/A	1	SNL &/or RE

* *

DATA SET ID: L02A1.A-10/12/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Topopah Spring Member in USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	52	SNL

* *

DATA SET ID: L02A1.A-12/07/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of G-tunnel in situ tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-FH#2A	Tig	6	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Compression Tests (Matrix) (Con't)

DATA SET ID: L02A1.A-02/24/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determination of the effect of sample size on mechanical properties of the Topopah Spring Member.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	16	SNL

* *

DATA SET ID: L02A1.A-03/30/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Topopah Spring Member in USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tpt	36	SNL

* *

DATA SET ID: L02A1.B-03/30/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Parameter effects (temperature, pressure, strain rate, and saturation) on mechanical properties of the Topopah Spring Member.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	10	RE/SPEC

* *

DATA SET ID: L02A1.A-04/01/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Effects of lithophysae on the mechanical properties of large diameter samples of the Topopah Spring Member at Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	10	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Compression Tests (Matrix) (Con't)

DATA SET ID: L02A1.A-12/05/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Testing to determine parameter effects (temperature, pressure, strain rate, and saturation) on mechanical properties of the Topopah Spring Member.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	32	SNL

* *

DATA SET ID: L02A1.A-05/01/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Complete characterization of mechanical properties of welded Topopah Spring Member in UE-25a#1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tpt	2	SNL

* *

DATA SET ID: L02A1.A-06/26/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determinations of the effect of sample size on the mechanical properties of the welded Topopah Spring Member, Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	16	SNL

* *

Mechanical Tensile Tests (Matrix)

DATA SET ID: L02A2.A-12/07/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of G-tunnel in situ tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-FH#2A	Tig	6	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mechanical Creep Tests (Matrix)

DATA SET ID: L02A3.A-06/04/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Mechanical creep testing of the Topopah Spring Member.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	0	SNL

* *

Mechanical Tests (Fractured Samples)

DATA SET ID: L02B.A-06/06/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Fracture normal and shear behavior experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	9	SNL

* *

Miscellaneous Mechanical Tests

DATA SET ID: L02C.A-01/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Examination of acoustic emissions during compression of welded tuff.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	RMD	Tig	9	SNL

* *

DATA SET ID: L02C.A-06/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Cutting force determination for evaluation of mining machine requirements.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	3	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information)

DATA SET ID: L03.A-06/24/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization/support of mechanical and thermal property testing on tuff samples from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	38	SNL
2	Yucca Mtn	USW G-1	Tct	22	SNL
3	Yucca Mtn	USW G-1	Tcp	22	SNL
4	Yucca Mtn	USW G-1	Tht	13	SNL
5	Yucca Mtn	USW G-1	Tpt	13	SNL

* *

DATA SET ID: L03.A-08/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Grouse Canyon Member of the Belted Range Tuff to determine where to site rock mechanics field experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	RMD	Tig	5	SNL

* *

DATA SET ID: L03.A-01/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Grouse Canyon Member of the Belted Range Tuff to determine where to site rock mechanics field experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	RMD	Tig	14	SNL

* *

DATA SET ID: L03.A-01/13/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units from USW G-1 and UE-25a#1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	14	SNL
2	Yucca Mtn	USW G-1	Tcb	25	SNL
3	Yucca Mtn	USW G-1	Tct	32	SNL
4	Yucca Mtn	USW G-1	Tfb	4	SNL
5	Yucca Mtn	USW G-1	Trt	7	SNL
6	Yucca Mtn	USW G-1	TtA	4	SNL
7	Yucca Mtn	USW G-1	TtB	2	SNL

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SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information)

DATA SET ID: L03.A-06/24/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization/support of mechanical and thermal property testing on tuff samples from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	38	SNL
2	Yucca Mtn	USW G-1	Tct	22	SNL
3	Yucca Mtn	USW G-1	Tcp	22	SNL
4	Yucca Mtn	USW G-1	Tht	13	SNL
5	Yucca Mtn	USW G-1	Tpt	13	SNL

* *

DATA SET ID: L03.A-08/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Grouse Canyon Member of the Belted Range Tuff to determine where to site rock mechanics field experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	RMD	Tig	5	SNL

* *

DATA SET ID: L03.A-01/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of Grouse Canyon Member of the Belted Range Tuff to determine where to site rock mechanics field experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	RMD	Tig	14	SNL

* *

DATA SET ID: L03.A-01/13/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units from USW G-1 and UE-25a#1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	14	SNL
2	Yucca Mtn	USW G-1	Tcb	25	SNL
3	Yucca Mtn	USW G-1	Tct	32	SNL
4	Yucca Mtn	USW G-1	Tfb	4	SNL
5	Yucca Mtn	USW G-1	Trt	7	SNL
6	Yucca Mtn	USW G-1	TtA	4	SNL
7	Yucca Mtn	USW G-1	TtB	2	SNL

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-01/13/81 STATUS: COMPLETED

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
8	Yucca Mtn	USW G-1	TtC	8	SNL
9	Yucca Mtn	USW G-1	Tpt	13	SNL
10	Yucca Mtn	USW G-1	Tht	7	SNL
11	Yucca Mtn	UE-25a#1	Tht	3	SNL
12	Yucca Mtn	UE-25a#1	Tcp	9	SNL

* *

DATA SET ID: L03.A-04/21/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of G-Tunnel in situ tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-RM-P-1	Tig	9	SNL

* *

DATA SET ID: L03.A-05/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Prow Pass and Topopah Spring Members from USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tpp	2	SNL
2	Yucca Mtn	USW G-2	Tpt	4	SNL

* *

DATA SET ID: L03.A-05/21/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units from USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tpy	8	SNL
2	Yucca Mtn	USW G-2	Tpp	13	SNL
3	Yucca Mtn	USW G-2	Tpt	38	SNL
4	Yucca Mtn	USW G-2	Tht	42	SNL
5	Yucca Mtn	USW G-2	Tcp	18	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-06/11/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units from UE-25b#1H.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25b#1H	Tcp	23	SNL
2	Yucca Mtn	UE-25b#1H	Tcb	34	SNL

* *

DATA SET ID: L03.A-07/29/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Bullfrog and Tram Members in UE-25b#1H.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25b#1H	Tcb	2	SNL
2	Yucca Mtn	UE-25b#1H	Tct	68	SNL

* *

DATA SET ID: L03.A-07/31/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tcp	7	SNL
2	Yucca Mtn	USW G-2	Tcb	14	SNL
3	Yucca Mtn	USW G-2	Tct	18	SNL

* *

DATA SET ID: L03.A-08/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW G-1 in support of mechanical testing.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	1	SNL
2	Yucca Mtn	USW G-1	Tcb	11	SNL
3	Yucca Mtn	USW G-1	Tct	1	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-09/15/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tct	5	SNL
2	Yucca Mtn	USW G-2	Tfb	5	SNL
3	Yucca Mtn	USW G-2	Trt	26	SNL

* *

DATA SET ID: L03.A-10/05/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of mechanical testing on the Calico Hills Member.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	11	SNL

* *

DATA SET ID: L03.A-10/07/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of thermal and mechanical property testing on tuff samples from USW G-1 and USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	9	SNL
2	Yucca Mtn	USW G-1	Tpt	12	SNL

* *

DATA SET ID: L03.A-10/23/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	2	SNL
2	Yucca Mtn	USW G-1	Tcb	2	SNL
3	Yucca Mtn	USW G-1	Tct	10	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-11/02/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW G-1, USW VH-1 and USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	2	SNL
2	Yucca Mtn	USW G-1	Tcb	6	SNL
3	Yucca Mtn	USW G-1	Tct	1	SNL
4	Yucca Mtn	USW VH-1	Tcp	1	SNL
5	Yucca Mtn	USW VH-1	Tcb	11	SNL
6	Yucca Mtn	USW G-2	Trt	8	SNL
7	Yucca Mtn	USW G-2	Tfb	15	SNL
8	Yucca Mtn	USW G-2	Tfb	19	SNL
9	Yucca Mtn	USW G-2	Tfb	10	SNL
10	Yucca Mtn	USW G-2	Tt	3	SNL

* *

DATA SET ID: L03.A-01/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization in support of thermal conductivity testing on lithophysal Topopah Spring Member from Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	6	SNL

* *

DATA SET ID: L03.B-01/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determination of grain density of bentonite clay as a function of sample hydration.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Clay	N/A	N/A	1	SNL

* *

DATA SET ID: L03.A-01/05/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: An experimental comparison of water immersion and gas intrusion pycnometer techniques.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	12	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-01/06/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support for mechanical testing on tuff samples from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	1	SNL
2	Yucca Mtn	USW G-1	Tct	9	SNL

* *

DATA SET ID: L03.A-02/22/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	2	SNL
2	Yucca Mtn	USW G-1	Tcb	5	SNL
3	Yucca Mtn	USW G-1	Tct	3	SNL

* *

DATA SET ID: L03.A-04/06/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Tiva Canyon Member outcrops at Yucca Mountain in cooperation with Bob Scott, USGS.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	Outcrop	Tpc	71	SNL

* *

DATA SET ID: L03.A-04/28/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of USW GU-3 stratigraphy and laboratory comparison, (H&N Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	4	SNL
2	Yucca Mtn	USW GU-3	Tpt	8	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-05/07/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization/support of G-Tunnel heater tests.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-SDH #1	Tig	3	SNL
2	G-Tunnel	U12g-SDH #3	Tilt5	3	SNL

* *

DATA SET ID: L03.A-05/27/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of USW GU-3 stratigraphy and laboratory comparison, (H&N Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpt	5	SNL
2	Yucca Mtn	USW GU-3	Tht	2	SNL
3	Yucca Mtn	USW GU-3	Tcp	2	SNL
4	Yucca Mtn	USW GU-3	Tcb	9	SNL

* *

DATA SET ID: L03.A-06/21/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of USW GU-3 stratigraphy and laboratory comparison, (Terra Tek Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	16	SNL
2	Yucca Mtn	USW GU-3	Tpt	42	SNL
3	Yucca Mtn	USW GU-3	Tht	5	SNL
4	Yucca Mtn	USW GU-3	Tcp	20	SNL
5	Yucca Mtn	USW GU-3	Tcb	30	SNL

* *

DATA SET ID: L03.A-07/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of samples of the Tiva Canyon, Topopah Spring, and Calico Hills Members from an outcrop at Yucca Mountain in cooperation with Bob Scott, USGS.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	Outcrop	Tpc	21	SNL
2	Yucca Mtn	Outcrop	Tpt	34	SNL
3	Yucca Mtn	Outcrop	Tht	6	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-07/02/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of zeolites and G-Tunnel Tuff.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Zeolites	N/A	N/A	4	SNL
2	G-Tunnel	U12g-SDH#3	Tilt5	4	SNL
3	G-Tunnel	U12g-SDH#1	Tig	4	SNL

* *

DATA SET ID: L03.A-08/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine long term ambient, vacuum and pressure generated saturation levels in support of analyses of hydrology experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	2	SNL
2	Yucca Mtn	USW G-1	Tht	2	SNL
3	Yucca Mtn	USW G-1	Tcb	1	SNL
4	Yucca Mtn	USW G-1	Tct	1	SNL

* *

DATA SET ID: L03.A-09/02/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Tiva Canyon and Topopah Spring Members in USW GU-3.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	14	SNL
2	Yucca Mtn	USW GU-3	Tpt	8	SNL

* *

DATA SET ID: L03.A-09/07/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization/support of mechanical and thermal testing on samples from USW G-2, USW GU-3, UE-25b#1H, and G-Tunnel.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tpt	2	SNL
2	Yucca Mtn	USW G-2	Tcb	2	SNL
3	Yucca Mtn	USW G-2	Tct	3	SNL
4	Yucca Mtn	USW GU-3	Tpt	4	SNL
5	Yucca Mtn	USW GU-3	Tht	2	SNL
6	Yucca Mtn	USW GU-3	Tcp	1	SNL

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-09/07/82 STATUS: COMPLETED

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
7	Yucca Mtn	USW GU-3	Tcb	2	SNL
8	Yucca Mtn	UE-25b#1H	Tcb	1	SNL
9	Yucca Mtn	UE-25b#1H	Tct	3	SNL
10	Yucca Mtn	USW G-1	Tcb	5	SNL
11	Yucca Mtn	USW G-1	Tct	2	SNL
12	G-Tunnel	U12g-HB-MPBX	Tig	6	SNL

* *

DATA SET ID: L03.A-10/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine dry bulk densities and grain densities in support of hydrologic calculations; used in porosity and saturation calculations.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	8	SNL
2.	Yucca Mtn	USW GU-3	Tpt	5	SNL
3	Yucca Mtn	USW GU-3	Tcp	3	SNL
4	Yucca Mtn	USW GU-3	Tht	3	SNL

* *

DATA SET ID: L03.A-11/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of USW G-4 stratigraphy.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	3	SNL
2	Yucca Mtn	USW G-4	Tht	5	SNL
3	Yucca Mtn	USW G-4	Tcp	5	SNL

* *

DATA SET ID: L03.B-11/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of mechanical testing on samples of the Topopah Spring Member from USW GU-3.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpt	14	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.C-11/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units in USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	3	SNL
2	Yucca Mtn	USW G-4	Tpp	1	SNL
3	Yucca Mtn	USW G-4	Tpt	33	SNL
4	Yucca Mtn	USW G-4	Tht	16	SNL
5	Yucca Mtn	USW G-4	Tcp	17	SNL

* *

DATA SET ID: L03.A-01/27/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of USW G-4 stratigraphy and laboratory comparison, (Terra Tek Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tcp	4	SNL
2	Yucca Mtn	USW G-4	Tcb	22	SNL
3	Yucca Mtn	USW G-4	Tct	11	SNL

* *

DATA SET ID: L03.B-01/27/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of USW G-4 stratigraphy and laboratory comparison, (H&N Data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tcp	1	SNL
2	Yucca Mtn	USW G-4	Tcb	8	SNL
3	Yucca Mtn	USW G-4	Tct	3	SNL

* *

DATA SET ID: L03.A-01/31/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of lithophysal Topopah Spring Member from USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	20	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-02/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine dry bulk and grain densities of USW G-4 samples.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	2	SNL
2	Yucca Mtn	USW G-4	Tpp	1	SNL
3	Yucca Mtn	USW G-4	Tpt	8	SNL
4	Yucca Mtn	USW G-4	Tht	4	SNL
5	Yucca Mtn	USW G-4	Tcp	6	SNL
6	Yucca Mtn	USW G-4	Tcb	2	SNL
7	N/A-Zeolite	N/A	N/A	1	SNL

* *

DATA SET ID: L03.A-07/11/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization/support of mechanical testing on the Topopah Spring Member samples from Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	28	SNL

* *

DATA SET ID: L03.A-02/01/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine saturation levels in support of analysis of hydrology experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tpt	4	SNL
2	Busted Butte	Outcrop	Tpt	2	SNL

* *

DATA SET ID: L03.A-04/17/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of tuff units from USW G-1 and G-Tunnel.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	2	SNL
2	Yucca Mtn	USW G-1	Tht	2	SNL
3	Yucca Mtn	USW G-1	Tcb	1	SNL
4	G-Tunnel	U12g-FH #2A	Tig	6	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-08/31/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of lithophysal Topopah Spring Member from Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	20	SNL

* *

DATA SET ID: L03.A-09/17/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Dry bulk density measurments in support of analyses of hydrology experiments.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	2	SNL
2	Yucca Mtn	USW G-4	Tht	1	SNL
3	Yucca Mtn	USW G-4	Tcp	1	SNL

* *

DATA SET ID: L03.A-10/15/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Grain density measurements in support of hydrologic property analysis to be used to determine porosities and saturations of samples.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	2	SNL
2	Yucca Mtn	USW G-4	Tpt	8	SNL
3	Yucca Mtn	USW G-4	Tht	5	SNL
4	Yucca Mtn	USW G-4	Tcp	5	SNL
5	Yucca Mtn	USW G-4	Tcb	2	SNL
6	Yucca Mtn	USW GU-3	Tpc	8	SNL
7	Yucca Mtn	USW GU-3	Tpt	5	SNL
8	Yucca Mtn	USW GU-3	Tht	3	SNL
9	Yucca Mtn	USW GU-3	Tcp	3	SNL

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Francis B. Nimick, Div. 6313

Physical Properties (Supporting Information) (Con't)

DATA SET ID: L03.A-01/18/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of the Topopah Spring Member tuff on holes UE-25a#1, USW G-2 & USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tpt	23	SNL
2	Yucca Mtn	USW G-2	Tpt	7	SNL
3	Yucca Mtn	USW G-4	Tpt	2	SNL

* *

SANDIA NATIONAL LABORATORIES
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LABORATORY TEST

SNL CONTACT: Francis B. Nimick, Div. 6313

Mineralogy (Supporting Information)

DATA SET ID: L04.A-10/15/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of mechanical and thermal testing on tuff samples from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	2	SNL &or LANL

* *

DATA SET ID: L04.A-10/19/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of mechanical thermal testing on tuff units from USW G-1 and USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	5	SNL
2	Yucca Mtn	USW G-2	Tht	1	SNL

* *

DATA SET ID: L04.A-10/23/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Test support.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	2	SNL

* *

DATA SET ID: L04.A-03/29/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of thermal expansion and thermal conductivity samples from USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tht	17	SNL
2	Yucca Mtn	USW G-2	Tpt	4	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mineralogy (Supporting Information) (Con't)

DATA SET ID: L04.B-03/29/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of thermal properties testing on tuff samples from USW G-1 and USW G-2.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	3	SNL
2	Yucca Mtn	USW G-2	Tht	17	SNL
3	Yucca Mtn	USW G-2	Tpt	4	SNL

* *

DATA SET ID: L04.A-04/26/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of thermal & mechanical testing on tuff samples from USW G-1.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tht	11	SNL
2	Yucca Mtn	USW G-1	Tcb	20	SNL

* *

DATA SET ID: L04.A-08/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: X-ray diffraction.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcb	3	SNL&/or LANL
2	N/A-Zeolites	N/A	N/A	4	SNL&/or LANL

* *

DATA SET ID: L04.A-05/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of components of lithophysal samples from Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	10	SNL

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mineralogy (Supporting Information) (Con't)

DATA SET ID: L04.A-08/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Minerologic chatacterization of the welded Topopah Spring Member.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	12	SNL
2	G-Tunnel	SDHF	Tilt5	2	SNL

* *

DATA SET ID: L04.A-01/31/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of hydrologic properties testing on tuff samples from USW GU-3 and USW G-4.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	1	SNL
2	Yucca Mtn	USW G-4	Tpc	2	SNL
3	Yucca Mtn	USW GU-3	Tpt	4	SNL
4	Yucca Mtn	USW GU-3	Tht	2	SNL
5	Yucca Mtn	USW G-4	Tpt	4	SNL
6	Yucca Mtn	USW G-4	Tht	1	SNL
7	Yucca Mtn	USW G-4	Tcp	2	SNL
8	N/A-Zeolite	N/A	N/A	1	SNL

* *

DATA SET ID: L04.A-02/09/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of SNL mechanical testing on large-diameter lithophysal samples from Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	10	UNM

* *

DATA SET ID: L04.A-02/13/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of mechanical testing (SNL) on samples of the Topopah Spring Member from Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	11	UNM

* *

SNL CONTACT: Francis B. Nimick, Div. 6313

Mineralogy (Supporting Information) (Con't)

DATA SET ID: L04.A-05/01/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Support of thermal properties testing on lithophysal Topopah Spring Member from Busted Butte.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	6	SNL

* *

DATA SET ID: L04.A-01/10/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of samples in support of heat capacity measurements, (X-ray, bulk chemical, and petrologic data).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tpt	1	UNM
2	Yucca Mtn	UE-25a#1	Tht	1	UNM
3	Yucca Mtn	USW G-1	Tpt	3	UNM
4	Yucca Mtn	USW G-2	Tpt	1	UNM
5	Yucca Mtn	USW G-2	Tpt	3	UNM
6	Yucca Mtn	USW GU-3	Tpt	2	UNM
7	Yucca Mtn	USW G-4	Tpt	7	UNM
8	Yucca Mtn	USW G-4	Tht	2	UNM

* *

DATA SET ID: L04.A-06/26/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterization of rock sample from drill hole RF-3 to determine rock type and origin for use in the interpretation of surface facility siting studies.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	RF-3	Tmr	1	UNM

* *

DATA SET ID: L04.A-02/21/86 QA LEVEL II STATUS: PLANNED
DESCRIPTION: Petrographic and X-ray characterization of samples for detailed analysis of porosity-strength and porosity-Young's Modulus relationships.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	UE-25a#1	Tpc	0	UNM
2	Yucca Mtn	USW G-1	Tht	0	UNM
3	Yucca Mtn	USW G-1	Tcb	0	UNM

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SNL CONTACT: Francis B. Nimick, Div. 6313

Mineralogy (Supporting Information) (Con't)

DATA SET ID: L04.A-02/21/86 STATUS: PLANNED

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
4	Yucca Mtn	USW G-1	Tct	0	UNM
5	Yucca Mtn	USW GU-3	Tpt	0	UNM
6	Yucca Mtn	USW G-4	Tpt	0	UNM

* *

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Gas Permeability (Saturated Matrix)

DATA SET ID: L05A1.A-09/05/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine gas permeability in support of unsaturated flow calculations; to be used in near-field modeling calculations.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	1	SNL

* *

Water Permeability (Saturated Matrix)

DATA SET ID: L05B1.A-01/28/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Permeability measurements in support of the tuff radionuclide migration field experiment.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	RNM#7	Tilt5	2	SNL

* *

DATA SET ID: L05B1.A-10/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine saturated matrix permeability in support of hydrologic calculations; data used for preliminary estimation of hydrology of units above the water table.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	8	SNL
2	Yucca Mtn	USW GU-3	Tpt	5	SNL
3	Yucca Mtn	USW GU-3	Tcp	3	SNL
4	Yucca Mtn	USW GU-3	Tht	3	SNL

* *

DATA SET ID: L05B1.A-02/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine saturated permeability in support of hydrologic calculations, matrix permeabilities needed in modeling efforts.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	2	SNL
2	Yucca Mtn	USW G-4	Tpp	1	SNL
3	Yucca Mtn	USW G-4	Tpt	8	SNL

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Water Permeability (Saturated Matrix) (Con't)

DATA SET ID: L05B1.A-02/01/83 STATUS: COMPLETED

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
4	Yucca Mtn	USW G-4	Tht	4	SNL
5	Yucca Mtn	USW G-4	Tcp	6	SNL
6	Yucca Mtn	USW G-4	Tcb	2	SNL
7	N/A-Zeolite	N/A	N/A	1	SNL

* *

DATA SET ID: L05B1.A-08/04/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine matrix saturated conductivities in support of hydrology calculations for initial variability investigations.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	2	SNL
2	Yucca Mtn	USW G-4	Tht	1	SNL
3	Yucca Mtn	USW G-4	Tcp	1	SNL
4	Yucca Mtn	USW G-4	Tcb	1	SNL

* *

DATA SET ID: L05B1.A-11/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine saturated permeability of the matrix in support of hydrologic experiments/analysis; used for equipment check and in determining data variation.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	1	SNL

* *

DATA SET ID: L05B1.A-04/12/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Determination of fracture geometry as it might influence fluid flow.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	0	LBL
2	Yucca Mtn	USW G-4	Tpt	0	LBL
3	Yucca Mtn	USW G-4	Tht	0	LBL

* *

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Water Permeability (Saturated Matrix) (Con't)

DATA SET ID: L05B1.A-04/13/84 QA LEVEL III STATUS: PLANNED
DESCRIPTION: Investigate matrix hydrologic properties in support of hydrologic calculations of Lawrence Berkley Laboratory (LBL) for use in the computer code TOUGH.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tht	0	LBL

* *

DATA SET ID: L05B1.A-05/14/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Measure saturated hydraulic conductivities in support of hydrologic calculations and to determine permeability variation.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	2	SNL
2	Yucca Mtn	USW G-4	Tpt	3	SNL
3	Yucca Mtn	USW G-4	Tht	1	SNL
4	Yucca Mtn	USW G-4	Tcp	2	SNL
5	Yucca Mtn	USW G-1	Tpt	1	SNL
6	Busted Butte	Outcrop	Tpt	1	SNL

* *

DATA SET ID: L05B1.A-11/05/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine saturated permeabilities in support of hydrologic property variability investigations.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	8	SNL
2	Yucca Mtn	USW G-1	Tht	3	SNL
3	Yucca Mtn	USW G-1	Tcp	6	SNL
4	Yucca Mtn	USW GU-3	Tpt	5	SNL
5	Yucca Mtn	USW G-4	Tpc	3	SNL
6	Yucca Mtn	USW G-4	Tpp	1	SNL
7	Yucca Mtn	USW G-4	Tpt	9	SNL
8	Yucca Mtn	USW G-4	Tht	4	SNL
9	Yucca Mtn	USW G-4	Tcp	1	SNL

* *

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Water Permeability (Saturated, Fractured Samples)

DATA SET ID: L05B2.A-02/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine fracture permeability as a function of time and stress in support of other hydrologic experiment design and analysis.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	1	SNL

* *

DATA SET ID: L05B2.A-08/04/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine fracture saturated permeabilities in support of hydrology calculations for rock mass permeabilities.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	3	SNL
2	Yucca Mtn	USW G-4	Tht	1	SNL
3	Yucca Mtn	USW G-4	Tcp	1	SNL

* *

DATA SET ID: L05B2.A-11/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine fracture saturated permeability in support of hydraulic experiments; initial data for scoping of fracture permeability values.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	1	SNL

* *

Thermal Dependence of Permeability (Saturated Matrix)

DATA SET ID: L05C1.A-09/05/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine liquid permeability at different temperatures in support of near-field hydrologic calculations; initial data.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	1	SNL

* *

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SNL CONTACT: Elmer A. Klavetter, Div. 6313

Thermal Dependence of Permeability (Saturated, Fractured Samples)

DATA SET ID: L05C2.A-10/31/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Determine thermal dependence of fracture permeability in support of near-field hydrologic analyses and modeling; initial data.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	0	SNL

* *

DATA SET ID: L05C2.A-11/15/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Determine fracture permeability response to temperature in support of near-field hydrologic analyses; initial data.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	0	SNL

* *

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SNL CONTACT: Elmer A. Klavetter, Div. 6313

Unsaturated Water Retention Characteristics (of Tuff)

DATA SET ID: L07.A-03/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine drying and imbibition characteristics of tuff in support of unsaturated hydrologic analyses; instrumentation check for initial hydrologic investigation.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	U12g-HEH-1B	Tig	1	SNL

* *

DATA SET ID: L07.A-10/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine water retention characteristics in support of hydrologic calculations for initial investigation of hydrologic properties above the water table.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW GU-3	Tpc	8	SNL
2	Yucca Mtn	USW GU-3	Tpt	5	SNL
3	Yucca Mtn	USW GU-3	Tcp	3	SNL
4	Yucca Mtn	USW GU-3	Tht	3	SNL

* *

DATA SET ID: L07.A-02/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine water retention characteristics in support of unsaturated hydrologic calculations. Resulting capillary pressure vs saturation data used in modeling efforts.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	2	SNL
2	Yucca Mtn	USW G-4	Tpp	1	SNL
3	Yucca Mtn	USW G-4	Tpt	8	SNL
4	Yucca Mtn	USW G-4	Tht	4	SNL
5	Yucca Mtn	USW G-4	Tcp	6	SNL
6	Yucca Mtn	USW G-4	Tcb	2	SNL
7	N/A-Zeolite	N/A	N/A	1	SNL

* *

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Unsaturated Water Retention Characteristics (of Tuff) (Con't)

DATA SET ID: L07.A-08/04/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine water retention characteristics in support of unsaturated hydrology calculation; initial investigation into property variability.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpt	3	SNL
2	Yucca Mtn	USW G-4	Tht	1	SNL
3	Yucca Mtn	USW G-4	Tcp	1	SNL
4	Yucca Mtn	USW G-4	Tcb	1	SNL

* *

DATA SET ID: L07.A-05/14/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine water retention characteristics of tuff matrix in support of unsaturated hydrologic calculations and to investigate experimental saturation procedures.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	1	SNL
2	Busted Butte	Outcrop	Tpt	1	SNL

* *

DATA SET ID: L07.A-11/05/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine water retention characteristics in support of hydrologic property variability investigations.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	7	SNL
2	Yucca Mtn	USW G-1	Tht	3	SNL
3	Yucca Mtn	USW G-1	Tcp	5	SNL
4	Yucca Mtn	USW GU-3	Tpt	3	SNL
5	Yucca Mtn	USW G-4	Tpc	1	SNL
6	Yucca Mtn	USW G-4	Tpp	1	SNL

* *

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Unsaturated Water Retention Characteristics (of Tuff) (Con't)

DATA SET ID: L07.A-12/04/85 QA LEVEL II STATUS: ONGOING
DESCRIPTION: Experimental series to investigate water movement under both isothermal and non-isothermal conditions in support of water migration analyses and computer code verification and validation process.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	0	SNL

* *

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Pore Size Distribution

DATA SET ID: L08A.A-07/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Estimate pore size distribution in support of radionuclide transport calculations.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	G-Tunnel	EV-5	Tilt5	15	SNL

* *

DATA SET ID: L08A.A-10/20/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Estimate pore size distribution for tuff matrix structural characterization - initial investigation of tuff matrix.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tcp	4	SNL
2	Yucca Mtn	USW G-1	Tcb	4	SNL
3	Yucca Mtn	USW G-1	Tct	10	SNL

* *

DATA SET ID: L08A.A-04/01/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Estimate pore size distribution in support of unsaturated hydrologic property calculations.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-4	Tpc	2	SNL
2	Yucca Mtn	USW G-4	Tpp	1	SNL
3	Yucca Mtn	USW G-4	Tpt	6	SNL
4	Yucca Mtn	USW G-4	Tht	4	SNL
5	Yucca Mtn	USW G-4	Tcp	1	SNL
6	Yucca Mtn	USW G-4	Tcb	2	SNL
7	N/A-Zeolite	N/A	N/A	1	SNL

* *

DATA SET ID: L08A.A-10/07/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine pore size distribution by Mercury Porosimetry techniques in support of hydrologic property analyses (comparison with saturation-pressure head data from psychrometer testing).

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-1	Tpt	12	SNL
2	Yucca Mtn	USW G-1	Tht	5	SNL

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Pore Size Distribution (Con't)

DATA SET ID: L08A.A-10/07/85 STATUS: COMPLETED

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
3	Yucca Mtn	USW G-1	Tcp	3	SNL
4	Yucca Mtn	USW GU-3	Tpc	8	SNL
5	Yucca Mtn	USW GU-3	Tpt	8	SNL
6	Yucca Mtn	USW GU-3	Tht	3	SNL
7	Yucca Mtn	USW GU-3	Tcp	3	SNL
8	Yucca Mtn	USW G-4	Tcp	1	SNL
9	Yucca Mtn	USW G-4	Tpp	2	SNL
10	Yucca Mtn	USW G-4	Tpt	3	SNL
11	Yucca Mtn	USW G-4	Tht	2	SNL
12	Busted Butte	Outcrop	Tpt	1	SNL

* *

SNL CONTACT: Joseph A. Fernandez, Div. 6314

Seal Materials Evaluation

DATA SET ID: L09.A-04/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Measure properties of concrete made using tuff as a coarse aggregate to establish basic properties of tuff concrete for use as a potential sealing component.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Concrete	N/A	N/A	37	SNL/WES

* *

DATA SET ID: L09.B-04/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Characterize constituents of tuff concrete to establish initial premixture compositions.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Concrete	N/A	N/A	14	SNL/WES

* *

DATA SET ID: L09.A-04/06/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Measure the mechanical properties of concrete/mortar in G-Tunnel after exposure to nonwelded tuff.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Concrete	N/A	N/A	108	SNL/WES

* *

DATA SET ID: L09.A-11/27/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Perform analysis on old, cementitious-based materials.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Concrete	N/A	N/A	28	SNL/PSU

* *

DATA SET ID: L09.B-11/27/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine the mineralogical alterations of selected grout and concrete materials under accelerated conditions.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Concrete	N/A	N/A	111	SNL

* *

SNL CONTACT: Joseph A. Fernandez, Div. 6314

Seal Materials Evaluation (Con't)

DATA SET ID: L09.C-11/27/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine the initial composition of materials and fluids used in grout formulation, as well as grout in its initially hardened state, to compare initial compositions to a final composition exposed to elevated temperatures and pressures.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Grout	N/A	N/A	16	SNL

* *

DATA SET ID: L09.A-02/22/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Determine the mechanical, hydrologic and bulk properties of grout at various temperatures and times, including some tests using densely welded Busted Butte outcrop tuff.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Grout	N/A	N/A	872	SNL

* *

DATA SET ID: L09.A-10/24/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Saturated matrix hydraulic conductivities and unsaturated matrix water retention testing on grout and concrete samples.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Grout	N/A	N/A	6	SNL
2	N/A-Concrete	N/A	N/A	6	SNL

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Joseph A. Fernandez, Div. 6314

Backfill Properties

DATA SET ID: L10A.A-03/28/85 QA LEVEL II STATUS: ONGOING
DESCRIPTION: To determine the effect of fine-sized material on hydraulic conductivity of crushed tuff.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Busted Butte	Outcrop	Tpt	0	WES
2	Busted Butte	Outcrop	Tpt	0	WES
3	Busted Butte	Outcrop	Tpt	0	WES
4	Busted Butte	Outcrop	Tpt	0	WES
5	Busted Butte	Outcrop	Tpt	0	WES
6	Busted Butte	Outcrop	Tpt	1	WES
7	Busted Butte	Outcrop	Tpt	0	WES

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Thomas W. Eglinton, Div. 6311

Surface Soil Properties

DATA SET ID: L11.A-05/13/83 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Evaluate material properties for excavation and foundation conditions.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	SFS-3	Qal	3	SNL
2	Yucca Mtn	SFS-4	Qal	2	SNL
3	Yucca Mtn	SFS-5	Qal	3	SNL
4	Yucca Mtn	SFS-7	Qal	3	SNL

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Elmer A. Klavetter, Div. 6313

Geochemistry of Water

DATA SET ID: L12A.A-05/02/85 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Geochemical analyses of water from elevated temperature permeability tests to assess chemical changes in water after flowing through tuff sample.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	N/A-Water	N/A	N/A	2	SNL

* *

SNL CONTACT: Scott Sinnock, Div. 6315

Radiometric Testing

DATA SET ID: L13.A-03/19/79 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Potassium-argon age determinations for basalts in Crater Flat, Nevada. (Krueger Enterprises Inc., Geochem Lab Div)

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Crater Flat	Outcrop	Qb	4	SNL
2	Crater Flat	Outcrop	Tb	4	SNL
3	Crater Flat	Outcrop	Tb	4	SNL
4	Crater Flat	Outcrop	Qb	4	SNL
5	Crater Flat	Outcrop	Qb,Tb	8	SNL

* *

DATA SET ID: L13.B-03/19/79 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Potassium-argon age determinations for basalts in Crater Flat, Nevada.(Department of Geology & Geophysics, University of California, Berkley)

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Crater Flat	Outcrop	Qb	4	SNL
2	Crater Flat	Outcrop	Tb	4	SNL
3	Crater Flat	Outcrop	Tb	4	SNL
4	Crater Flat	Outcrop	Qb	4	SNL
5	Crater Flat	Outcrop	Qb,Tb	8	SNL

* *

DATA SET ID: L13.C-03/19/79 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Potassium-argon age determinations for basalts in Crater Flat, Nevada. (Department of Geosciences, University of Arizona)

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Crater Flat	Outcrop	Qb	4	SNL
2	Crater Flat	Outcrop	Tb	4	SNL
3	Crater Flat	Outcrop	Tb	4	SNL
4	Crater Flat	Outcrop	Qb	4	SNL
5	Crater Flat	Outcrop	Qb,Tb	8	SNL

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
LABORATORY TEST

SNL CONTACT: Steve Bauer, Div. 6314

Thermal Degradation of Densely Welded Tuff

DATA SET ID: L14A.A-04/01/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Measurements of percent moisture content of USW G-2 samples in support of near-field thermal degradation in Topopah Spring Tuff.

SAMPLE GROUP	SAMPLE LOCATION	HOLE/OR STATION	USGS FORM	SAMPLES COMPLETED	RECORDS LOCATION
1	Yucca Mtn	USW G-2	Tpt	4	SNL

* *

SNL CONTACT: Roger M. Zimmerman, Div. 6313

GTUF Geotechnical Measurements

DATA SET ID: F01.A-02/01/81 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Ambient temperature borehole measurements in the Grouse Canyon welded tuff at G-Tunnel to (1) establish baseline reference data, and (2) gain yield testing experience in welded tuff.
RECORDS LOCATION: SNL

* *

SNL CONTACT: Roger M. Zimmerman, Div. 6313

Small Diameter Heater Measurements #1

DATA SET ID: F02A.A-04/12/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Heater experiment that measures temperature distributions and monitors water migration phenomena in welded tuff in G-Tunnel. Data are used to evaluate heat transfer models and to aid in evaluation of waste canister environment.
RECORDS LOCATION: SNL

* *

Small Diameter Heater Measurements #2

DATA SET ID: F02B.A-08/31/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Heater experiment that measures temperature distributions and monitors water migration phenomena in non-welded tuff in G-Tunnel. Data are used to evaluate heat transfer models and to aid in evaluation of waste canister environment.
RECORDS LOCATION: SNL

* *

Small Diameter Heater Measurements #3

DATA SET ID: F02C.A-07/31/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Heater experiment that measures temperature distribution and monitors water migration and thermal expansion phenomena in welded tuff in G-Tunnel. Data are used to evaluate heat transfer and thermomechanical models and aid in evaluation of waste canister environments.
RECORDS LOCATION: SNL

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
FIELD TEST

SNL CONTACT: Roger M. Zimmerman, Div. 6313

G-Tunnel Heated Block Experiment

DATA SET ID: F03.A-02/01/82 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Utilize excavation flatjack pressure changes and heat fluxes in stages of slot cutting, ambient temperature, and of thermal cycle testing to evaluate coupled thermal, mechanical thermomechanical, and hydrothermal behavior of a large block (ca. 8cu. m) of jointed welded tuff. Data are used as input to numerical models and repository conceptual design.
RECORDS LOCATION: SNL &or SAIC

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
FIELD TEST

SNL CONTACT: Roger M. Zimmerman, Div. 6313

G-Tunnel Pressurized Slot Testing

DATA SET ID: F04.A-03/08/83 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Machine thin slots in welded tuff that can be used for direct pressure testing using flatjacks. Use slots to measure tunnel surface stresses, mechanical deformation properties, and evaluate strength properties for use in repository conceptual designs.
RECORDS LOCATION: SNL &or SAIC

* *

SANDIA NATIONAL LABORATORIES
NNWSI DATA CATALOG
FIELD TEST

SNL CONTACT: Roger M. Zimmerman, Div. 6313

G-Tunnel Mining Evaluations

DATA SET ID: F05.A-11/01/84 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Evaluate 1) responses of welded tuff to repository scale excavations for model evaluations; 2) instrument placement and measurement techniques during mining activities; and 3) mining and drift stabilizing techniques for application to repository conceptual designs and to serve as a prototype for exploratory shaft testing.
RECORDS LOCATION: SNL &or SAIC

* *

SNL CONTACT: Roger M. Zimmerman, Div. 6313

G-Tunnel Corehole Logs and/or Fracture Mapping

DATA SET ID: F07.A-02/01/79 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Measure fracture orientations of core from pretest water migration holes to characterize fracture for water migration experiment.
RECORDS LOCATION: SNL &/OR F&S

* *

DATA SET ID: F07.B-02/01/79 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Videotape of pretest water migration holes to characterize fracturing prior to water migration heater experiment.
RECORDS LOCATION: SNL &/or F&S

* *

DATA SET ID: F07.A-06/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Logs of corehole associated with rock mechanics drift to characterize the Grouse Canyon Member of the Belted Range Tuff. (The discontinuities within it and the extent of the rock unit) for the purpose of determining where to site field experiments.
RECORDS LOCATION: SNL &/or F&S

* *

DATA SET ID: F07.B-06/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Maps of rock mechanics drifts to characterize the Grouse Canyon Member of the Belted Range Tuff (the discontinuities within it and the extent of the rock unit) for the purpose of determining where to site field experiments.
RECORDS LOCATION: SNL &/or F&S

* *

DATA SET ID: F07.C-06/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Videotapes of posttest water migration holes to characterize fracturing after water migration heater experiment for comparison with videotapes of fracturing prior to water migration heater experiment.
RECORDS LOCATION: Unknown

* *

SNL CONTACT: Roger M. Zimmerman, Div. 6313

G-Tunnel Corehole Logs and/or Fracture Mapping (Con't)

DATA SET ID: F07.A-08/01/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Logs of coreback holes associated with the water migration experiment to characterize, after test completion, the portion of the rock heated.
RECORDS LOCATION: SNL &/or F&S

* *

SNL CONTACT: Chittor Subramanian, Div. 6311

Weapons Test Seismic Studies

DATA SET ID: F08.A-06/30/66 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Ground motion data from underground nuclear detonations during FY78 were added to data from earlier detonations; the data were used to formulate a tentative equation for predicting ground motion at the Nevada Test Site. Additional measurements to explore an unexplained seismic anomaly in Jackass Flats are described. Methods used in automatic processing of ground motion data are explained (SAND79-1002).
RECORDS LOCATION: SNL

* *

DATA SET ID: F08.B-06/30/66 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: This report assumes reasonable criteria for NRC licensing of a nuclear waste storage facility at the Nevada Test Site, where it would be exposed to ground motion from underground nuclear weapons tests. Prediction equations and their standard deviations have been determined from measurements on a number of nuclear weapons tests. (SAND80-1020)
RECORDS LOCATION: SNL

* *

DATA SET ID: F08.C-06/30/66 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Proceedings of the conference on DOE ground motion and seismic programs on, around, and beyond the NTS. (SAND83-2625)
RECORDS LOCATION: SNL

* *

DATA SET ID: F08.A-04/05/77 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Measurement of ground motion were made at some of seven locations on 28 different underground nuclear weapons tests in Yucca Flats. Each location had measurements at the surface and at a depth ranging from 61m to 76m, permitting an assessment of the effect of depth on ground motion (SAND82-1647).
RECORDS LOCATION: SNL

* *

SNL CONTACT: Chittor Subramanian, Div. 6311

Weapons Test Seismic Studies (Con't)

DATA SET ID: F08.B-04/05/77 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: A least-squares linear prediction method using an optimum finite impulse response filter was used to predict a downhole velocity waveform. A filter was determined from surface and downhole velocity waveforms from several underground nuclear test events at each of a number of locations (SAND82-2478).
RECORDS LOCATION: SNL

* *

DATA SET ID: F08.A-04/11/78 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Measurements of ground motion from ten Pahute Mesa weapons tests were made at seven locations on the Nevada Test Site. Each location had measurements at the surface and at a depth ranging from 61m to 762m, permitting an assessment of the effect of depth on ground motion.(SAND82-0174)
RECORDS LOCATION: SNL

* *

DATA SET ID: F08.A-01/24/79 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Ground motion generated by a magnitude 4.3 earthquake at Massachusetts Mountain on the Nevada Test Site was measured at the control point and compared with ground motion generated at about the same distance by four underground nuclear weapons tests.(SAND81-2214)
RECORDS LOCATION: SNL

* *

DATA SET ID: F08.A-04/16/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Three orthogonal components of acceleration were measured by three canisters, one containing Kistler 303 accelerometers, one containing Q-Flex 1100 accelerometers, and the third containing Q-Flex 1200 accelerometers. Measurements were made of ground motion from six different nuclear weapons tests with the three canisters located at the same station. (SAND81-0784)
RECORDS LOCATION: SNL

* *

SNL CONTACT: Chittor Subramanian, Div. 6311

Weapons Test Seismic Studies (Con't)

DATA SET ID: F08.A-07/25/80 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: The stress and strain imposed on Yucca Mountain by an underground nuclear explosion of 700kt at a distance of 22.8km is estimated. Surface motion measurements at Yucca Mountain from an underground nuclear explosion on Pahute Mesa were scaled to 700 kt assumed to be at the southern part of the Buckboard area. (SAND83-1553)
RECORDS LOCATION: SNL

* *

SNL CONTACT: James T. Neal, Div. 6311

Surface Facility Subsurface Borings

DATA SET ID: F09.A-01/04/84 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: Subsurface borings are obtained to determine alluvial thickness and nature of alluvial/bedrock interface. Data are used for determining seismic suitability of surface facilities, especially waste handling facilities.
RECORDS LOCATION: SNL

* *

DATA SET ID: F09.A-06/11/85 QA LEVEL III STATUS: ONGOING
DESCRIPTION: Subsurface borings are obtained to establish subsurface geometry and material properties beneath the reference conceptual site for repository surface facilities and make recommendations regarding preliminary validation of the site, with particular emphasis on seismic engineering.
RECORDS LOCATION: SNL

* *

SNL CONTACT: Elmer A. Klavetter, Div. 6313

In-situ Tuff Water Migration/Heater Experiments

DATA SET ID: F10.A-02/14/79 QA LEVEL III STATUS: COMPLETED
DESCRIPTION: This in-situ experiment describes an initial assessment of the water generation/migration response of tuff to a thermal input.
RECORDS LOCATION: SNL

* *

Department of Energy
Nevada Operations Office
P. O. Box 14100
Las Vegas, NV 89114-4100

MAY 13 1986

Those on Attached List

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS (NNWSI) PROJECT FY 1986 AUDIT SCHEDULE

The latest revision of the audit schedule of proposed Waste Management Project Office (WMPO) audits for FY 1986 is enclosed for the guidance of the participating organizations and support contractors.

Although these audit dates are tentative, every effort should be made on the part of the Project Participants to maintain these dates as closely as possible.

Please review the enclosed schedule and provide WMPO with any comments, additions, or deletions. Questions concerning the audit schedule should be brought to the attention of James Blaylock for resolution, FTS 575-1125.

Mitchell P. Kemmil
for Donald L. Vieth, Director
Waste Management Project Office

WMPO:JB-1263

Enclosure:
As stated

QA AUDIT SCHEDULE FOR FY 86

AUDIT NO.	TARGET DATE	ORGANIZATION	ACTIVITIES	REQUIREMENTS
86-1	February - WK of 3rd	LLNL	NNWSI Project Activity	NVO-196-17 (Rev. 3) and Implementing QA Procedures
86-2	March - WK of 10th March - WK of 17th	a-USGS/Denver b-USGS/Menlo Park	NNWSI Project Activity NNWSI Project Activity	NVO-196-17 (Rev. 3) and Implementing QA Procedures
86-3	April - WK of 14	REECo	NNWSI Project Activity	NVO-196-17 (Rev. 3) and Implementing QA Procedures
86-4	June - WK of 16th	F&S	NNWSI Project Activity	NVO-196-17 (Rev. 3) and Implementing QA Procedure
86-5	July - WK of 14th	Los Alamos	NNWSI Project Activity	NVO-196-17 (Rev. 4) and Implementing QA Procedure
86-6	August - WK of 4th	WMPO/NV	a-Audits and Surveillances b-Organization, Indoctrination, and Training c-Document Review Approvals and Peer Review d-NCR, CAR, Trend Analysis and Supplier Evaluations e-Document Control and Records	NVO-196-18 (Rev. 2) and Implementing QMPs

AUDIT NO.	TARGET DATE	ORGANIZATION	ACTIVITIES	REQUIREMENTS
86-7	August - WK of 18th	H&N	NNWSI Project Activity	NVO-196-17 (Rev. 4) and Implementing QA Procedure
86-8	September - WK of 8th	SNL	NNWSI Project Activity	NVO-196-17 (Rev. 4) and Implementing QA Procedure
86-9	October - WK of 6th	SAIC/T&MSS	NNWSI Project Activity	NVO-196-17 (Rev. 4) and Implementing QA Procedure

CRWM OGR

Sandia National Laboratories

OGR FUEL CONSOLIDATION STUDY

Status Report - ~~4/23/86~~

CHRONOLOGY

10/84 - First "baselined" Generic Requirements document requires at-repository consolidation

1/85 - Weston offers informal arguments that consolidation is cost-effective on a <u>generic</u> basis

5/85 - Sandia responds to Weston position, noting that consolidation is probably <u>not</u> cost-effective for the Yucca Mountain repository

11/85 - DOE Rod Consolidation Workshop in Washington

12/85 - Sandia assists Weston in formulating ground rules for OGR consolidation study

12/85 - Weston defines scope of work for OGR study

2/86 - DOE "start work" authorization

3/86 - OGR Rod Consolidation Coordination Meeting in Denver

4/86 - DOE task <u>definition for OGR</u> study

6/86 - 9/89 - PCDP managed by DOE/ID

OGR CONSOLIDATION STUDY

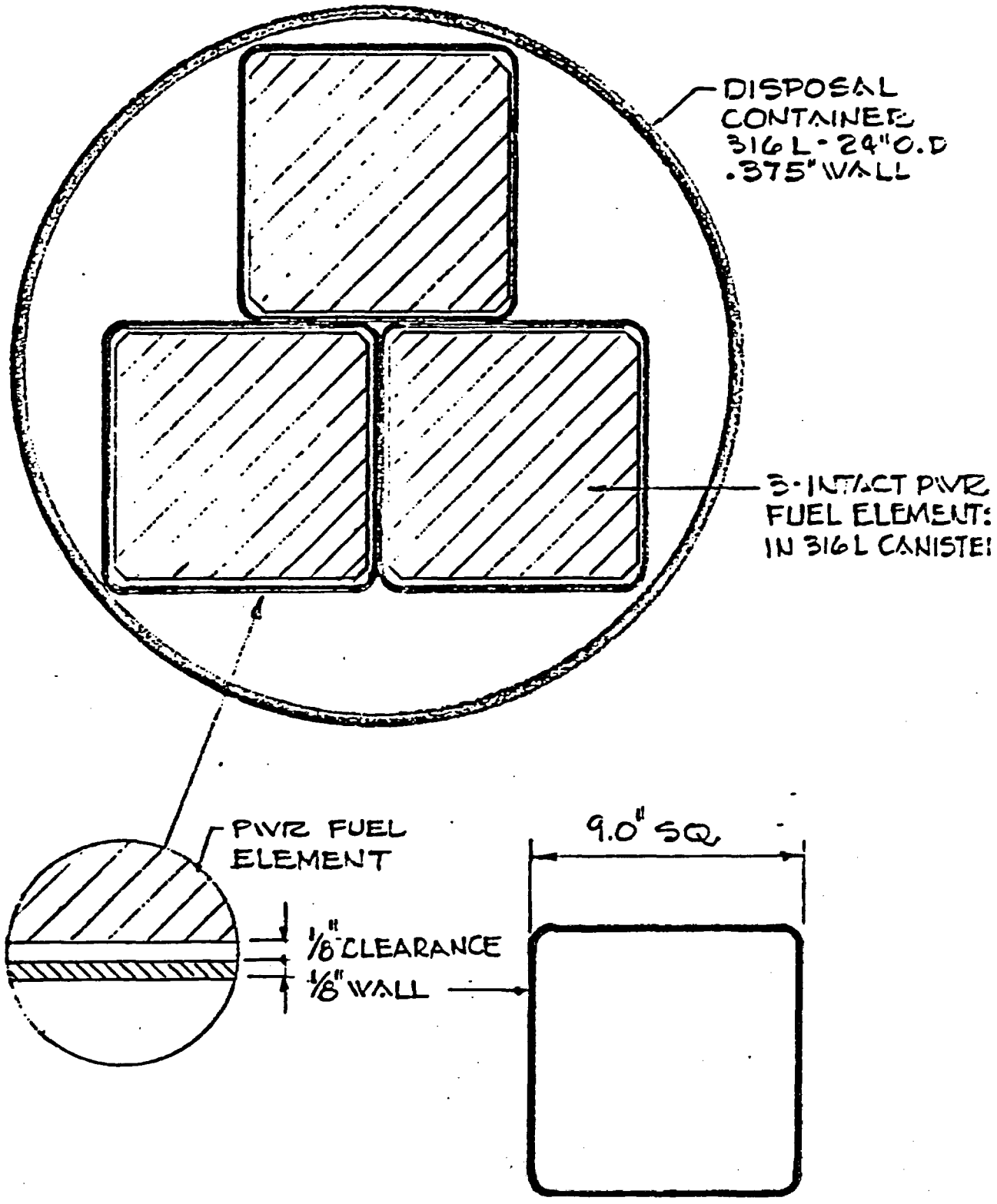
	Consolidated Fuel	Intact Fuel
Authorized System (no MRS)	Case 1 • 90% consolidated • 2-stage WHB • NNWSI "reference" disposal containers *	Case 2 • No consolidation • 1-stage WHB (optional) • NNWSI "hybrid" disposal containers
Improved Performance System (MRS)	Case 3 • At-MRS consolidation • 1-stage WHB • New NNWSI disposal containers	Case 4 • No consolidation • 1-stage WHB • Enlarged "hybrid" disposal containers

* Higher loading for consolidated BWR fuel

NNWSI TASKS & SCHEDULE

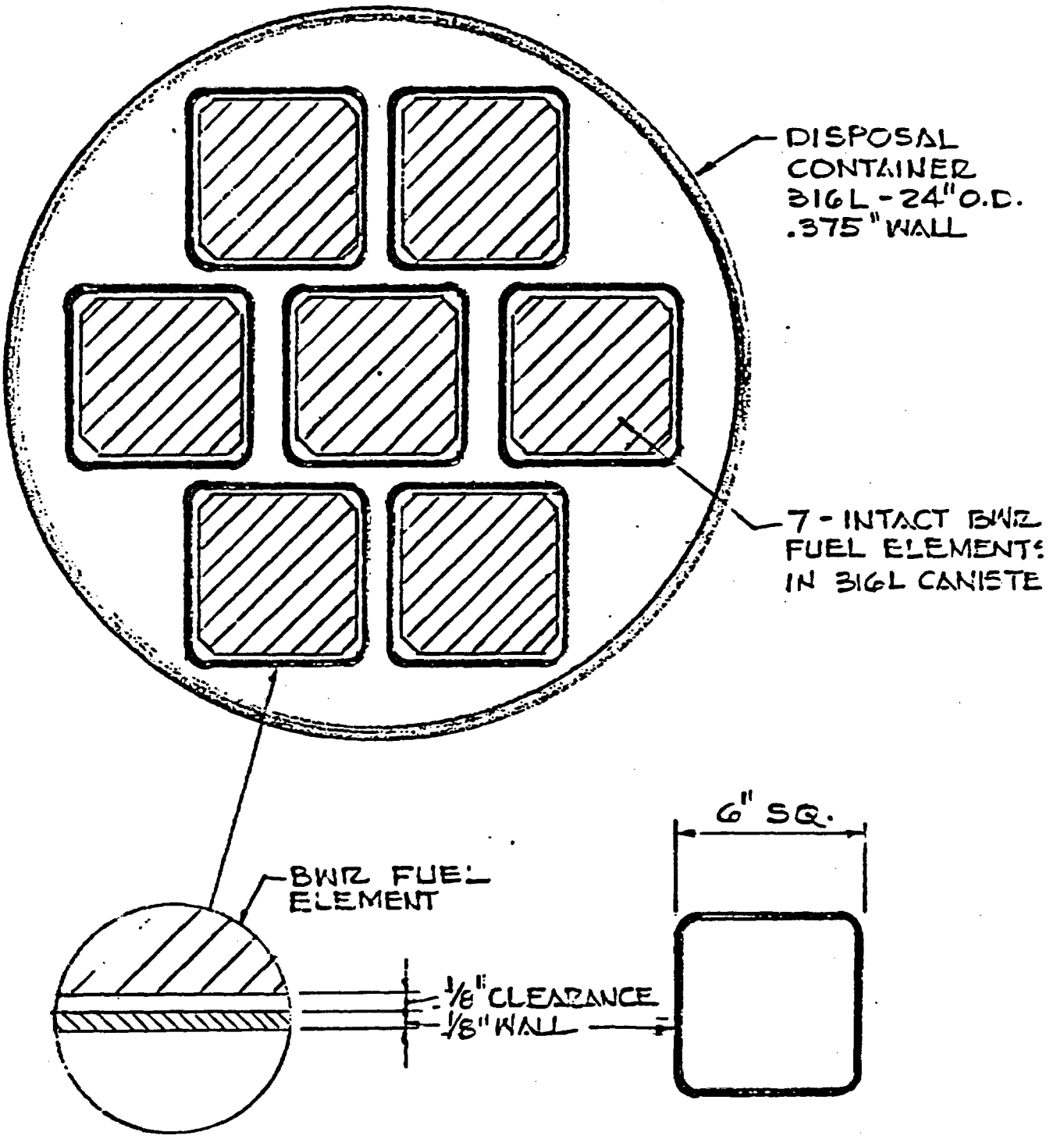
	Start	Complete
1. Case 3 container design (SNL & LATA)	4/1	4/30
2. Container emplacement schedules (SNL)	4/1	4/15
3. Case 1 surface facility life-cycle cost (SNL, BNI, LATA)	4/28	6/30
4. Case 2 WHB design and differential cost estimate (SNL, BNI, LATA)	4/28	6/30
5. Cases 3 & 4 WHB design modification, differential cost estimates (SNL, BNI, LATA)	4/28	6/30
6. Cases 1-4 emplacement panel design, Case 1 life-cycle cost estimate, Cases 2-4 differential cost estimates (SNL, PBQ&D, LATA)	4/28	6/30
7. Report (SNL) - Draft	5/1	7/31
Final	7/1	9/15

OGR CASE 3 CONTAINER - 3 INTACT PWR FUEL ELEMENTS



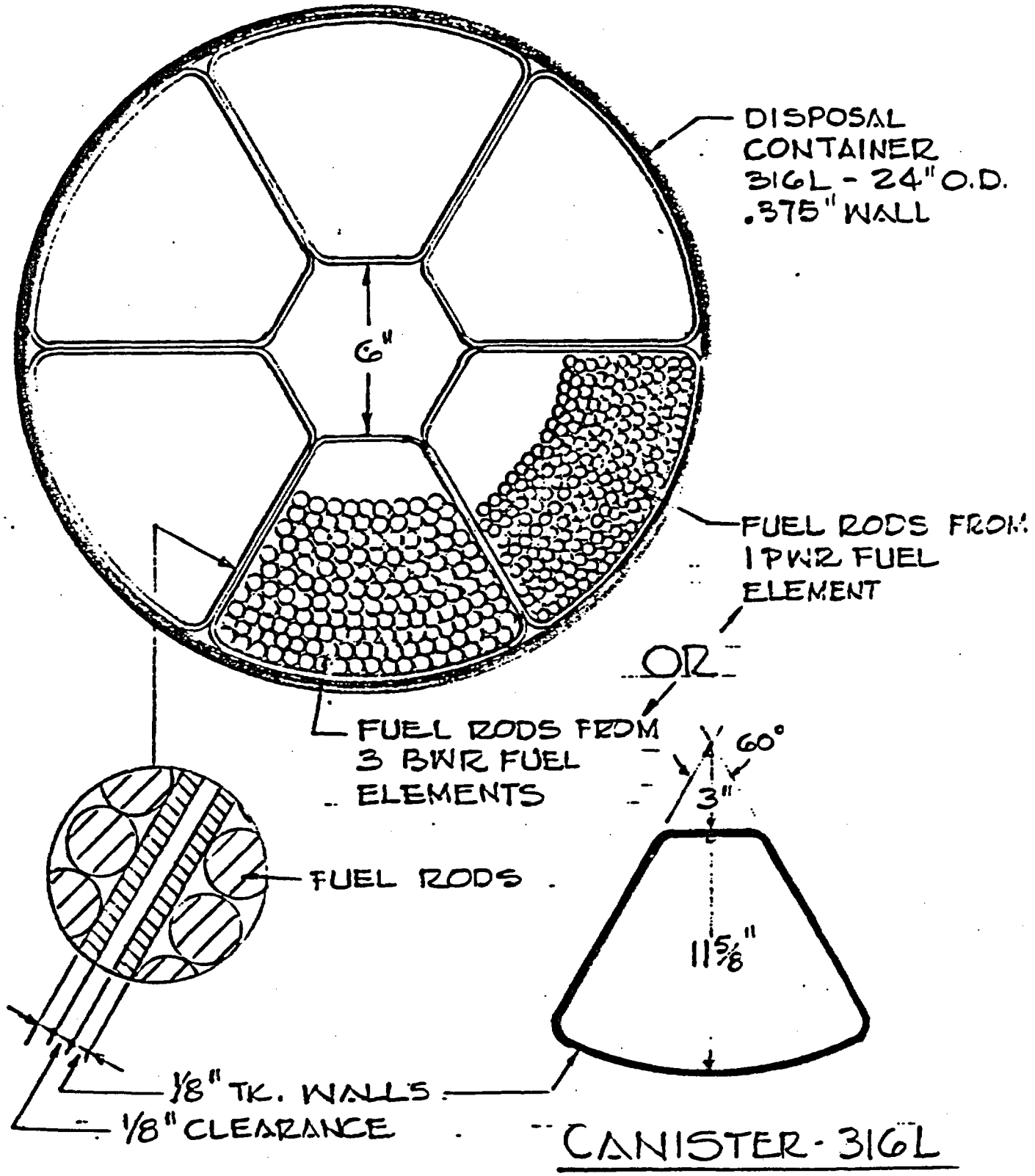
CANISTER - 316L

OGR CASE 3 CONTAINER - 7 INTACT BWR FUEL ELEMENTS



CANISTER - 316L

OGR CASE 3 : CONTAINER - FUEL RODS FROM 18 BWR OR 6 PWR FUEL ELEMENTS



DISPOSAL CONTAINER REQUIREMENTS

	Containers
Case 1 - "Reference" (higher BWR loading)	24925
Case 2 - "Hybrid"	29966
Case 3 - "MRS" (new)	29451
Case 4 - Enlarged "Hybrid"	29966

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS

Disposal Container Emplacement Schedule - Case 1

NNWSI "reference" disposal containers: 3 intact or 6 cons. PWRs, 6 intact or 18 cons. BWRs (+ 1 extra hardware waste container for every 6 containers of cons. BWRs)

Year	MTU Spent Fuel	PWR					BWR					
		MTU	Assemblies		Containers		MTU	Assemblies		Containers		
			Intact	Cons.	Intact	Cons.		Intact	Cons.	Intact	Cons.	Hdw.
1998	400	240	52	468	17	78	160	87	786	15	44	7
1999	400	240	52	468	17	78	160	87	786	15	44	7
2000	400	240	52	468	17	78	160	87	786	15	44	7
2001	900	540	117	1053	39	176	360	196	1768	33	98	16
2002	1800	1080	234	2107	78	351	720	393	3535	65	196	33
2003	3000	1800	390	3511	130	585	1200	655	5892	109	327	55
2004	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2005												
2006												
2007												
2008												
2009												
2010												
2011												
2012												
2013												
2014												
2015												
2016												
2017												
2018												
2019												
2020												
2021	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2022	1100	660	143	1287	48	215	440	240	2160	40	120	20
	7000	37200	8060	72560	2686	12091	24800	13535	122039	2254	6759	1135

Total containers - 24925

PDO
4/28/86

AMPAD 22-141 50 SHEETS 22-142 100 SHEETS 22-144 200 SHEETS

Disposal Container Emplacement Schedule - Cases 2 & 4

NNWSI "hybrid" (Case 2) and "enlarged hybrid" containers; 3 intact PWRs + 4 intact BWRs, or 9 intact BWRs

Year	MTU Spent Fuel	PWR			BWR				
		MTU	Assemblies	Hybrid Containers	MTU	Assemblies	Assy's. in Hybrid Cont.	Assy's in BWR Cont.	BWR Containers
1998	400	240	520	173	160	873	692	181	20
1999	400	240	520	173	160	873	692	181	20
2000	400	240	520	173	160	873	692	181	20
2001	900	548	1170	390	360	1964	1560	404	45
2002	1800	1080	2341	780	720	3928	3120	808	90
2003	3000	1800	3901	1300	1200	6547	5200	1347	150
2004	↓	↓	↓	↓	↓	↓	↓	↓	↓
2005									
2006									
2007									
2008									
2009									
2010									
2011									
2012									
2013									
2014									
2015									
2016									
2017									
2018									
2019									
2020									
2021									
2022	1100	660	1430	477	440	2400	1908	492	55
	62000	37200	80620	26866	24800	135304	107464	27840	3100

Total disposal containers - 29966

PDO
4/28/86

Disposal Container Emplacement Schedule – Case 8

NNWSI "MRS" container: 3 intact or 6 cons. PWR, 7 intact or 18 cons. BWR; (+1 hardware container f

Year	MTU Spent Fuel	From MRS												From We		
		PWR						BWR						MTU Spent Fuel	MTU	A
		MTU	Assemblies		Disposal Containers			MTU	Assemblies		Disposal Containers					
			Intact	Cons.	Intact	Cons.	HLW Waste		Intact	Cons.	Intact	Cons.	HLW Waste			
1998	350	210	46	410	15	68	11	140	76	687	11	38	6	50	30	
1999	350	210	46	410	15	68	11	140	76	687	11	38	6	50	30	
2000	325	195	42	380	14	63	11	130	71	638	10	35	6	75	45	
2001	825	495	107	966	36	161	27	330	180	1630	26	90	16	75	45	
2002	1700	1020	221	1990	74	332	55	680	371	3339	53	185	31	100	60	
2003	2800	1680	364	3277	121	546	91	1120	611	5499	87	306	51	200	120	
2004	2650	1590	345	3101	115	517	86	1060	578	5205	83	289	48	360	210	
2005	2560	1530	332	2984	111	497	83	1020	556	5008	79	279	46	450	270	
2006	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
2007																
2008																
2009																
2010																
2011																
2012																
2013																
2014																
2015																
2016																
2017																
2018																
2019																
2020																
2021																
2022	650	390	85	761	28	127	21	260	142	1277	20	71	12			
	63000	31800	6900	62023	2305	10331	1724	31200	15557	104088	1644	5778	857	9000	5400	

Total disposal containers –

PWR (intact)	6207
PWR (cons.)	10331
PWR (Adm.)	1724
BWR (intact)	4444
BWR (cons.)	5788
BWR (Adm.)	957
	29451

Thermal Power of Disposal Containers
(for OGR Consolidation Study)

Case 1 (No MRS, at-repository consolidation)

1. Reference container, 3 intact PWRs: 3×526 = 1578 W
2. Reference container, 6 intact BWRs: 6×167 = 1002 W
3. Reference container, 6 cons. PWRs: 6×526 = 3156 W
4. Reference container, 18 cons. BWRs: 18×167 = 3006 W
5. BWR hardware waste container – 0 W

Case 2 (No MRS, no consolidation)

1. Hybrid container, 3 intact PWRs + 4 intact BWRs:
   3(526) + 4(167) = 2246 W
2. Hybrid container, 9 BWR's: 9×167 = 1503 W

(Thermal power values are the same for Case 4, but the hybrid disposal container has to be larger to accommodate the canisters in which the MRS sends intact assemblies to the repository. I've simply assumed that the enlarged hybrid container is 29 inches in diameter.)

Case 3 (MRS, at-MRS consolidation)

1. "MRS" container, 3 intact PWRs: 3×526 = 1578 W
2. "MRS" container, 7 intact BWRs: 7×167 = 1169 W
3. "MRS" container, 6 cons. PWRs: 6×526 = 3156 W
4. "MRS" container, 18 cons BWRs: 18×167 = 3006 W
5. Hardware waste container – 0

PDC

OGR Fuel Consolidation Study

First Repository Spent Fuel Cask Receival Rate

- 3000 MTU/year spent fuel
- 60% PWR, 40% BWR (MTU basis)
- 0.4614 MTU/PWR assembly, 0.1833 MTU/BWR assembly
- For "consolidation" options, only 90% can be consolidated

Case 1 (No MRS, at-repository consolidation)

Case 2 (No MRS, no consolidation)

- 70/30 rail/truck split (MTU basis)
- 100T rail cask holds 14 PWRs or 36 BWRs
- Truck cask holds 2 PWRs or 5 BWRs
- One rail or truck per shipment (no trains or convoys)

Case 3 (MRS, at-MRS consolidation)

- 90% (MTU basis) shipped from MRS, 10% shipped directly from Western utilities
- Shipments from MRS in 150T rail casks (36 intact or 72 consolidated PWRs, 75 intact or 150 consolidated BWRs)
- Shipments from MRS in 5-cask trains with one additional cask of hardware waste in each 5-cask train of consolidated fuel rods
- 70/30 rail/truck split (MTU basis) for shipments from Western utilities. 100T rail cask holds 14 PWRs or 36 BWRs. Truck cask holds 2 PWRs or 5 BWRs. No trains or convoys.

Case 4 (MRS, no consolidation)

- 90% (MTU basis) shipped from MRS, 10% shipped directly from Western utilities
- Shipments from MRS in 150T rail casks (36 intact PWRs or 75 intact BWRs)
- Shipments from MRS in 5-cask trains
- 70/30 rail/truck split (MTU basis) for shipments from Western utilities. 100T rail cask holds 14 PWRs or 36 BWRs. Truck cask holds 2 PWRs or 5 BWRs. No trains or convoys.

AMPAD 22-141 50 SHEETS 22-142 100 SHEETS 22-144 200 SHEETS

Spent Fuel Cask Receival Rate (3000 MTU/year)

Cases 1 & 2

- 70% rail (2100 MTU)
  - 60% PWR (1260 MTU) → 2731 assys → 195 casks (100T)
  - 40% BWR (840 MTU) → 4583 assys → 127 casks (100T)
- 30% truck (900 MTU)
  - 60% PWR (540 MTU) → 1170 assys → 585 casks
  - 40% BWR (360 MTU) → 1964 assys → 393 casks

Case 3

- 90% MRS (2700 MTU)
  - 60% PWR (1620 MTU)
    - 90% Cons (1458 MTU) → 3160 assys → 44 casks (150T) → 9 trains
    - 10% Intact (162 MTU) → 351 assys → 10 casks (150T) → 2 trains
  - 40% BWR (1080 MTU)
    - 90% Cons. (972 MTU) → 5303 assys → 35 casks (150T) → 7 trains
    - 10% Intact (108 MTU) → 589 assys → 8 casks (150T) → 2 trains
- 10% Western (300 MTU)
  - 60% PWR (180 MTU)
    - 70% rail (126 MTU) → 273 assys → 20 casks (100T)
    - 30% truck (54 MTU) → 117 assys → 59 casks
  - 40% BWR (120 MTU)
    - 70% rail (84 MTU) → 458 assys → 13 casks (100T)
    - 30% truck (36 MTU) → 196 assys → 39 casks

Case 4

- 90% MRS (2700 MTU)
  - 60% PWR (1620 MTU) → 3511 assys → 98 casks (150T) → 20 trains
  - 40% BWR (1080 MTU) → 5892 assys → 79 casks (150T) → 16 trains
- 10% Western (300 MTU)
  - 60% PWR (180 MTU)
    - 70% rail (126 MTU) → 273 assys → 20 casks (100T)
    - 30% truck (54 MTU) → 117 assys → 59 casks
  - 40% BWR (120 MTU)
    - 70% rail (84 MTU) → 458 assys → 13 casks (100T)
    - 30% truck (36 MTU) → 196 assys → 39 casks

PPS 4/30/86

OCRWM
NNWSI
Nevada Nuclear Waste Storage Investigations PROJECT
OGR

Sandia National Laboratories

NNWSI FUEL CONSOLIDATION STUDY

Status Report - 4/23/86

OBJECTIVES

For the Yucca Mountain repository,

1. Estimate relative costs of spent fuel disposal options with and without consolidation.

2. Qualitatively assess "other" operational factors such as off-site health effects and secondary waste generation.

ASSUMPTIONS

- 62000 MTU spent fuel (60% PWR, 40% BWR)
  - 3000 MTU/year receival rate
  - Received as intact fuel assemblies
  - 10 years out-of-reactor
- 8000 MTU DHLW & WVHLW (no commingling)
- One-stage Waste Handling Building
- Two disposal options:
  1. 90% consolidated, 10% intact (NNWSI "reference" disposal container)
  2. No consolidation (NNWSI "hybrid" disposal container)
- Two emplacement configurations:
  1. Vertical
  2. Horizontal
- Costs in constant 1985 dollars

COST FACTORS

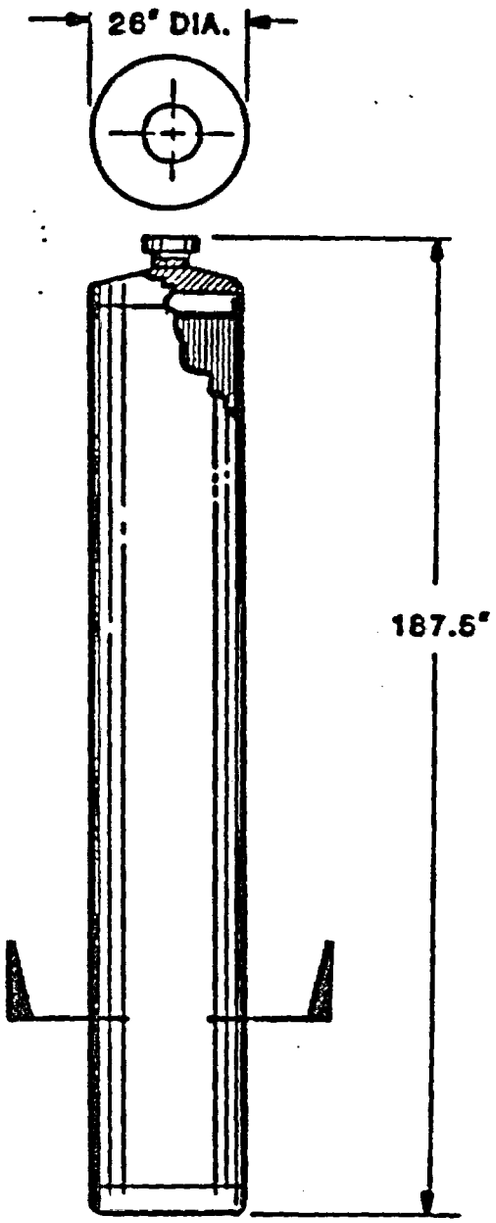
1. Consolidation equipment
2. Disposal containers
3. Waste Handling Building
4. Underground facilities and equipment
5. Operations

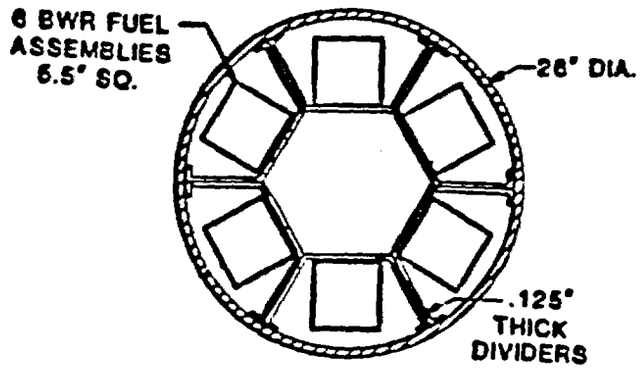
OTHER FACTORS

- Fuel rod breakage
- Worker exposure
- Off-site health effects
- Potential for criticality
- Secondary waste generation

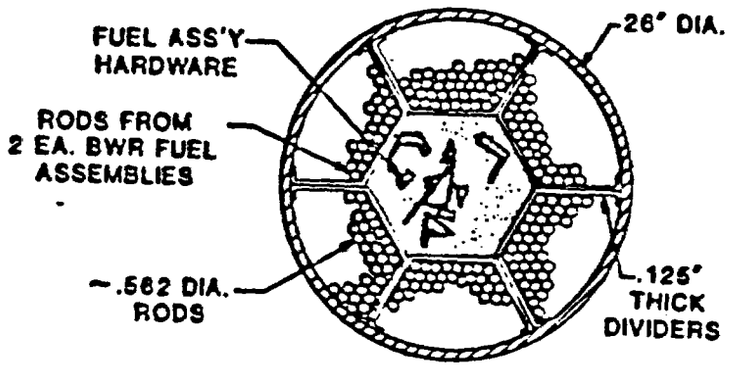
1. CONSOLIDATION EQUIPMENT

- W horizontal consolidation concept
- "Gang" disassembly (3 PWR's or 6 BWR's)
- 4 consolidation cells @ 750 MTU/year
- $4.48 M (installed) equipment cost per cell ($17.9 M total)
- 15% per year cost for maintenance, repair and replacement
- $85.1 M total equipment cost over 25 years of operation

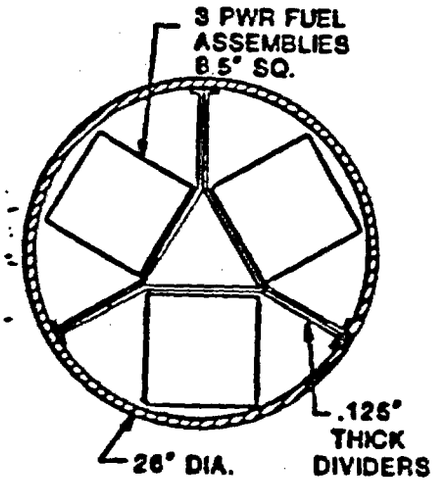




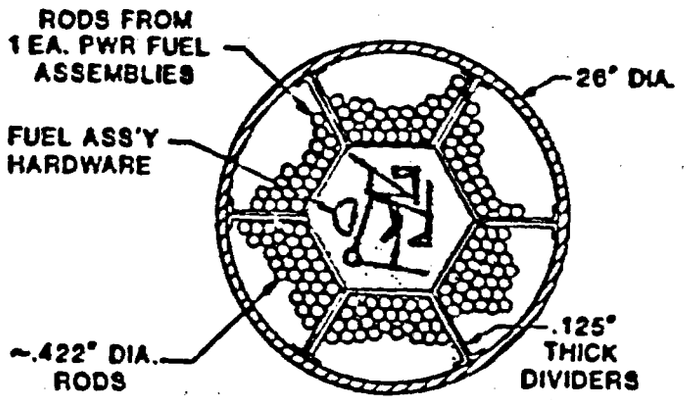
Configuration 1. 6 Intact BWR Assemblies



Configuration 2. 12 Consolidated BWR Assemblies

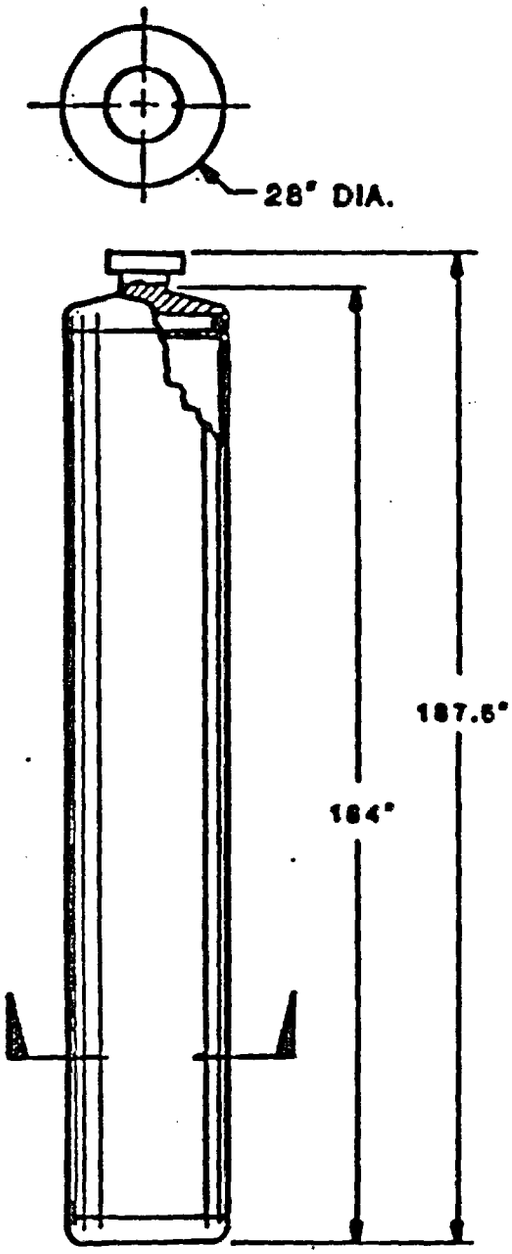


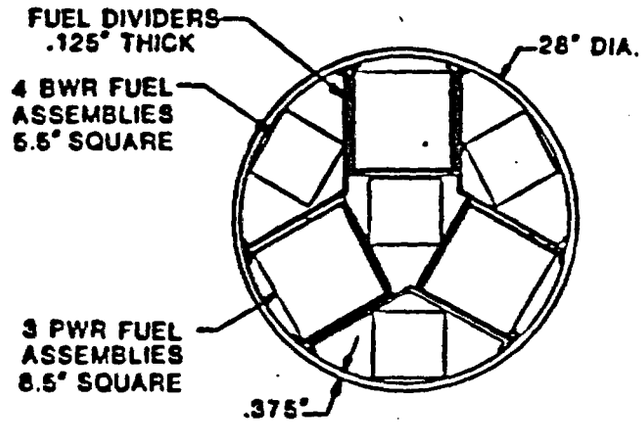
Configuration 4. 3 Intact PWR Assemblies



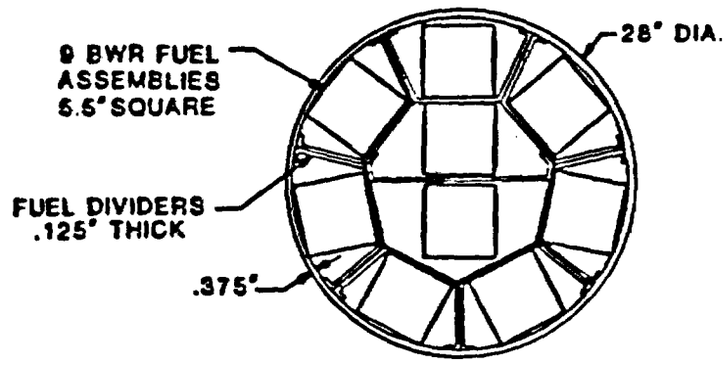
Configuration 3. 6 Consolidated PWR Assemblies

Figure 1. NNWSI Reference Spent Fuel Container





Configuration 1. 3 Intact PWR Assemblies and 4 Intact BWR Assemblies



Configuration 2. 9 Intact BWR Assemblies

Figure 2. NNWSI Hybrid Spent Fuel Container

2. DISPOSAL CONTAINERS

- **Container requirements**

Option 1 (Consolidation)				Option 2 (No Consolidation)	
PWR		BWR		Hybrid	BWR
Intact	Cons.	Intact	Cons.		
2686	12070	2230	10003	26845	2894
Total = 26989				Total = 29739	

- **Container cost**

		Unit Cost	Total Cost
"Reference"	PWR	$8253	$233.1 M
	BWR	$9096	
"Hybrid"		$10000 (est.)	$297.4 M

- **Hardware waste canister cost** (Option 1)

Unit Cost	Total Cost
$200 (est.)	$4.4 M

- **Dolly cost** (Horizontal emplacement options)

Unit Cost	Total Cost
$1765	$47.6 M (Option 1) $52.5 M (Option 2)

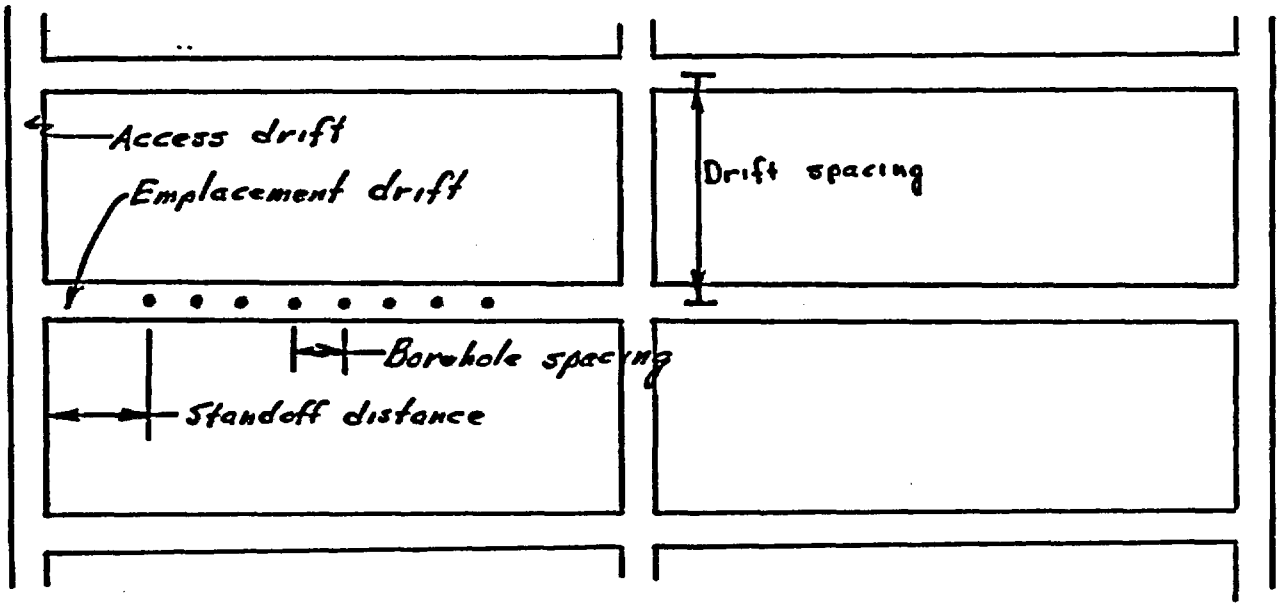
3. WASTE HANDLING BUILDING
(millions of 1985 dollars)

	Option 1 (Consolidation)	Option 2 (No Consolidation)
Construction		
Direct	49.7	32.3
Indirect	39.8	25.8
Materials	31.4	22.9
Capital equipment	70.0	34.0
Sales tax	3.8	2.1
Construction management	19.1	11.5
Contingency	85.5	51.5
	299.3	180.1
Engineering		
Engineering cost	51.6	31.1
Engineering contingency	20.6	12.4
	72.2	43.5
Total WHB cost	371.5	223.6

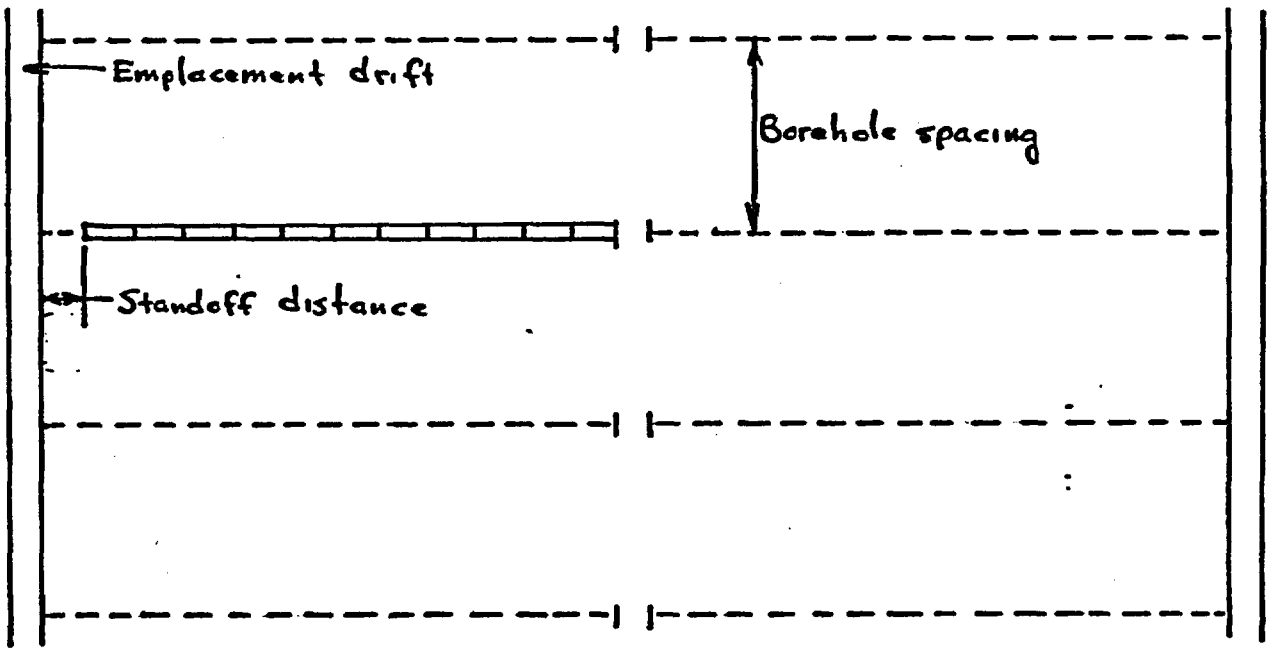
EMPLACEMENT PANEL DESIGN CRITERIA

- Initial areal power density { PWR - 55.6 kW/acre; BWR - 50.3 kW/acre }
- Borehole wall temperature may not exceed 220°C (determines borehole spacing for vertical emplacement)
- Rock temperature 1 meter from borehole may not exceed 200°C
- Panel access drift temperature may not exceed 50°C at 50 years (determines borehole spacing for horizontal emplacement)

VERTICAL EMPLACEMENT PANEL (Plan view)



HORIZONTAL EMPLACEMENT PANEL (Plan view)



UNDERGROUND FACILITY CHARACTERISTICS

	Vertical Emplacement		Horizontal Emplacement	
	Option 1-V (Cons.)	Option 2-V (No Cons.)	Option 1-H (Cons.)	Option 2-H (No Cons.)
Borehole Diameter (inches)	29	31	33	35
Borehole Spacing (feet)	10.5	10.0	97	88
Borehole Length (feet)	35	25	682	682
Containers per Borehole	1	1	34	34
Emplacement Drift Spacing (feet)	153	147	NA	NA
Containers per Drift	110	117	NA	NA
Standoff Distance (feet)	75	68	102	102
Total Emplacement Drift Length (feet)	315000	326000	46900	46900
Total Tons of Rock Mined	13.6×10^6	13.9×10^6	3.9×10^6	3.9×10^6

4. UNDERGROUND FACILITIES & EQUIPMENT

	Vertical Emplacement Option 1-V (Cons.)	Vertical Emplacement Option 2-V (No Cons.)	Horizontal Emplacement Option 1-H (Cons.)	Horizontal Emplacement Option 2-H (No Cons.)
Labor	73.9	74.1	61.3	61.6
Equipment	65.6	65.8	54.7	54.8
Materials	41.0	41.3	34.9	35.4
State tax	4.0	4.0	3.4	3.4
Const. Mgmt.	18.1	18.1	15.1	15.2
Engineering	27.1	27.2	22.7	22.8
Contingency	68.9	69.2	57.6	57.9
	298.6	299.7	249.7	251.1

5a. SURFACE FACILITY OPERATIONS
(millions of 1985 dollars)

	Option 1 (Consolidation)	Option 2 (No Consolidation)
Operational Phase		
Labor (*)	298.8	206.3
Materials (operations)	21.8	16.3
Materials (maintenance)	262.6	158.1
Electric power	18.6	13.9
Employee transportation	6.6	5.0
Contingency	234.3	159.8
	842.7	559.4
Decommissioning Phase	29.9	18.0

(*) includes salaries of 18 workers in surface facilities other than WHB

5b. UNDERGROUND OPERATIONS
(millions of 1985 dollars)

	Vertical Emplacement		Horizontal Emplacement	
	Option 1-V (Cons.)	Option 2-V (No Cons.)	Option 1-H (Cons.)	Option 2-H (No Cons.)
Operational Phase				
Labor	358.2	365.7	254.5	260.6
Equipment	188.2	195.4	131.9	136.0
Materials	242.1	251.3	207.4	217.8
State tax	16.1	16.8	12.7	13.3
Engineering	15.8	16.2	11.9	12.3
Contingency	246.1	253.6	185.5	192.0
	1066.5	1099.0	803.9	832.0
Caretaker Phase				
Labor	70.2	70.5	53.4	53.5
Equipment	19.9	19.9	19.2	19.3
Materials	19.8	19.9	18.0	18.0
State tax	1.5	1.5	1.4	1.4
Engineering	2.2	2.2	1.8	1.8
Contingency	34.1	34.2	28.1	28.2
	147.7	148.2	121.9	122.2
Decommissioning Phase				
Labor	3.6	3.6	3.3	3.3
Equipment	2.4	2.4	2.0	2.0
Materials	3.7	3.7	3.7	3.7
State tax	0.2	0.2	0.2	0.2
Engineering	1.5	1.5	1.4	1.4
Contingency	3.7	3.7	3.5	3.5
	16.1	16.1	15.0	15.0

COST SUMMARY
(millions of 1985 dollars)

	Vertical Emplacement		Horizontal Emplacement	
	Option 1-V (Cons.)	Option 2-V (No Cons.)	Option 1-H (Cons.)	Option 2-H (No Cons.)
Consolidation Equip.	85.1	0.0	85.1	0.0
Disposal Containers	233.1	297.4	233.1	297.4
Hdw. Waste Canisters	4.4	0.0	4.4	0.0
Dollies	0.0	0.0	47.6	52.5
Waste Handling Bldg.	371.5	223.6	371.5	223.6
UG Fac. & Equip.	298.6	299.7	249.7	251.1
Operations				
Surface				
Op. Phase	842.7	559.4	842.7	559.4
Decom.	29.9	18.0	29.9	18.0
Underground				
Op. Phase	1066.5	1099.0	803.9	832.0
Caretaker	147.7	148.2	121.9	122.2
Decom.	16.1	16.1	15.0	15.0
	3095.6	2661.4	2804.8	2371.2
	$\Delta = 434.2$		$\Delta = 433.6$	

OTHER FACTORS

	Option 2 (No Cons.) Compared With Option 1 (Cons.)
Fuel rod breakage	+
Worker exposure - surface	+
- underground	0
Off-site health effects	0
Potential for criticality	−
Secondary waste generation	+

CONCLUSIONS

1. Measured in terms of number of disposal containers required, the penalty for not consolidating is only 10%.

2. For repositories designed around a 1-stage WHB, spent fuel disposal <u>without</u> consolidation saves $400+ million.

3. Estimates of construction time indicate that the NWPA 1998 startup schedule can be met with a 1-stage WHB designed for disposal without consolidation.

4. Other operational factors favor disposal without consolidation.

Science Applications International Corporation

L86-PMSD-JHF-110

May 12, 1986

TO: Distribution

SUBJECT: May 1986 PM-TPO Meeting

Enclosed is an agenda for the May Project Manager-Technical Project Officers meeting which will be held on May 21-22 in Room 450 at SAIC, 101 Convention Center Drive (Valley Bank Center). Please note that this will be a two-day meeting.

Please note that some changes are pending that may or may not be made. Presentors have been notified.

SCIENCE APPLICATIONS
INTERNATIONAL CORPORATION

Joy H. Fiore, Manager
Project Services Branch

JHF:els

Enclosure:
Agenda

AGENDA

LOCATION: 101 Convention Center Drive
Las Vegas, Nevada

DATE: May 21-22, 1986

NNWSI PROJECT MANAGER-TECHNICAL PROJECT OFFICER MEETING

TIME	WHAT	HOW	WHO	EXPECTED OUTCOME	REF MATERIAL & COMMENTS
Wednesday, May 21					
7:30-7:32AM	Introduction/Roles	Introduce ourselves, describe roles.	All	Know one another, understand roles.	
7:32-7:40	Agenda, Outcomes	Review day's agenda and expected outcomes.	Joy	Modify and/or agree to agenda and outcomes.	Agenda sent 5/12/86.
7:40-7:45	April Minutes	Comment, modify and/or approve minutes.	Don/TPO's	Agree to approve minutes.	Minutes sent 5/7/86.
7:45-8:15	Action Items	Review all open action items.	Joy/Don/TPO's	Delete completed action items, update status of open items.	Action Items Log sent 5/1/86.
8:15-9:15	FYIs - TBA				
9:15-9:30	Break				
9:30-10:15	Geochemical Model Code (1.2.3.8.L)	Present status of work, integration with other work; identify problems, if any.	Don Emerson	Understand status of work and how it interacts with other efforts; agree to next steps to resolve any problem areas identified.	

AGENDA

LOCATION: 101 Convention Center Drive

Las Vegas, Nevada

DATE: May 21-22, 1986

NNWSI PROJECT MANAGER-TECHNICAL PROJECT OFFICER MEETING

TIME	WHAT	HOW	WHO	EXPECTED OUTCOME	REF MATERIAL & COMMENTS
Wednesday, May 21 continued...					
10:15-11:15	Solubility and Groundwater Chemistry (1.2.3.4.1.4.A and 1.2.3.4.1.1.A) Subject to change	Present status of work, integration with other work; identify problems, if any.	Jerry Kerrisk	Understand status of work and how it interacts with other efforts; agree to next steps to resolve any problem areas identified.	
11:15-11:30	Q & A period for Technical Presentations	Ask questions and discuss open items, if any.	Don/TPOs/ Jerry/Don	Understand responses to questions.	
11:30-12:30	Lunch Maybe at 10:15-11:15				
12:30-1:15PM	Isotope Geology (1.2.3.2.3.2.G)	Present status of work, integration with other work; identify problems, if any.	~~Don Muhs~~ John Stuckless	Understand status of work and how it interacts with other efforts; agree to next steps to resolve any problem areas identified.	
1:15-2:00	Natural Isotope Chemistry (1.2.3.4.1.2.A)	Present status of work, integration with other work; identify problem, if any.	Dave Finegan	Understand status of work and how it interacts with other efforts; agree to next steps to resolve any problem areas identified.	
2:00-2:15	Questions and Answers on Technical Presentations	Ask questions and discuss open issues, if any.	Don/TPOs/ Dave/Don	Understand responses.	

AGENDA

LOCATION: 101 Convention Center Drive

Las Vegas, Nevada

DATE: May 21-22, 1986

NNWSI PROJECT MANAGER-TECHNICAL PROJECT OFFICER MEETING

TIME	WHAT	HOW	WHO	EXPECTED OUTCOME	REF MATERIAL & COMMENTS
Wednesday, May 21 continued...					
2:15-2:30	Break				
2:30-4:30	Ernie Hill Presentation Probably will be at 1:45-3:45	Present experience with ASLBP to provide participants with understanding of ASLBP's role in licensing process and its relationship with the applicant. Discuss responsibilities of DOE and its contractors in licensing proceedings	Ernie Hill/ Don/TPOs	Understand the ASLBP's role and DOE and its contractor's role in the licensing process.	
4:30-5:00	Weekly Reports Probably moved to 3:45-4:00	Revisit Weekly Informal Report issue - to have or not to have?	Don/TPOs	Agree to usefulness, whether to continue or discontinue.	
4:00-5:00	Executive Session ESTP Cost Figures - Don Q.				
7:00-??	EA Party	Party will be held only if EA has been issued by 5/21.			
**********	**********	**********	**********	**********	**********
Thursday, May 22					
7:30-7:40AM	Agenda/Outcomes	Review day's agenda and expected outcomes.	All	Modify and/or agree to day's agenda/outcomes.	

AGENDA

LOCATION: 101 Convention Center Drive

Las Vegas, Nevada

DATE: May 21-22, 1986

NNWSI PROJECT MANAGER-TECHNICAL PROJECT OFFICER MEETING

TIME	WHAT	HOW	WHO	EXPECTED OUTCOME	REF MATERIAL & COMMENTS
Thursday, May 22 continued					
7:40-8:00	CCB Meeting	Agenda issued by CCB Secretary	Chuck/Don/ TPOs	Approve C/SCR's or determine their status.	CCB Agenda sent 5/9/86.
EXECUTIVE SESSION					
8:30-12:30PM	Budget Reviews	Discuss feedback from May 15-16 budget review, adjust WPAS numbers, resolve problems identified at review.	Don/TPO's/ Alan/WMPO Branch Chiefs	Revised WPAS for resubmittal to HQ.	
12:30-1:30	Lunch				
OPEN SESSION					
1:30-2:30	Fuel Consolidation	Present background of Project studies on fuel consolidation, describe impact on repository design. Discuss HQ guidance.	Tom	Understand status and and potential impacts on repository design.	
2:30-3:00	PM-TPO Meetings	Revisit how meetings are prepared, develop criteria for putting items on agenda, Discuss length (days). Discuss outlined process for developing agenda distributed at last meeting.	Don/TPOs/Joy	Agree to prioritized criteria for putting items on agenda, agree to how many days; agree to process of agenda building.	

AGENDA

LOCATION: 101 Convention Center Drive

Las Vegas, Nevada

DATE: May 21-22, 1986

NNWSI PROJECT MANAGER-TECHNICAL PROJECT OFFICER MEETING

TIME	WHAT	HOW	WHO	EXPECTED OUTCOME	REF MATERIAL & COMMENTS
Thursday, May 22, continued...					
3:00-3:45	Open Items - TBA				
3:45-3:55	Action Items and June Agenda	Review and add/delete to action items and agenda items.	Joy/Don/TPOs	Understand and agree to items.	
3:55-4:00	Meeting Evaluation	Do a quick plus/minus review of meeting.	Don/TPOs	Know how we're all doing.	

MINUTES OF THE MEETING OF THE
NEVADA LEGISLATURE'S COMMITTEE ON HIGH-LEVEL
RADIOACTIVE WASTE IN NEVADA
State Industrial Insurance System
Training Room
1700 W. Charleston Boulevard
Las Vegas, Nevada
March 10 and 11, 1986

The third meeting of the Nevada Legislature's Committee on High-Level Radioactive Waste in Nevada, created pursuant to Senate Bill 55, chapter 211, Statutes of Nevada, 1985, was held on March 10 and March 11, 1986, commencing at 9:30 a.m., in the Training Room of the State Industrial Insurance System building in Las Vegas, Nevada.

March 10, 1986

COMMITTEE MEMBERS PRESENT:

Senator Thomas J. Hickey, Chairman
Assemblyman James W. Schofield, Vice Chairman
Senator James I. Gibson
Senator Kenneth K. Redelsperger
Assemblyman Jane F. Ham
Assemblyman John E. Jeffrey
Assemblyman Gaylyn J. Spriggs

LEGISLATIVE COUNSEL BUREAU STAFF PRESENT:

Donald M. Bayer, Senior Research Analyst, High-Level Radioactive Waste
Colleen McMullen, Deputy Legislative Counsel
Marilyn K. White, Research Secretary

Chairman Hickey called the meeting to order and introduced the members of the committee. The meeting agenda is attached as Exhibit A. Chairman Hickey proceeded with his introductory comments (attached as Exhibit B) which outlined a brief history and function of the committee.

Chairman Hickey called for approval of the minutes of the committee's second meeting.

ASSEMBLYMAN SCHOFIELD MOVED FOR APPROVAL OF THE MINUTES OF THE COMMITTEE'S NOVEMBER 13, 1985, MEETING. MOTION SECONDED BY SENATOR GIBSON AND CARRIED UNANIMOUSLY.

Chairman Hickey introduced former Nevada Governor Grant Sawyer, chairman of the commission on nuclear projects. Governor Sawyer spoke from his written remarks (attached as Exhibit C) regarding the legislative charges and relationship of the commission on nuclear projects and this committee.

Governor Sawyer was asked by Senator Hickey how he viewed the relationship between the commission and this committee. Governor Sawyer stated that all the members of both the commission and committee are involved in one of the most important matters to come before the state in a long time. The members have a very grave and extremely important objective. He said, "We are all citizens of this state and we are equally sincere and interested in protecting this state. I have no doubt but that the members of our commission and your committee, having the same objectives, the same interests, the same sincerity, will cooperate and get along well." Senator Hickey concurred.

Robert R. Loux, director, agency for nuclear projects, provided the committee with various legal documents and correspondence (attached as Exhibit D). Mr. Loux reviewed a decision which was rendered in a lawsuit relative Nevada's desire to conduct independent onsite technical studies at Yucca Mountain. He said that the court ruled (1) the state is entitled, under the Nuclear Waste Policy Act of 1982 (NWPA), to conduct onsite, independent studies and (2) the United States Department of Energy (DOE) grant guidelines which prohibited those independent studies are not lawful. The court remanded the DOE to revise the guidelines.

Mr. Loux said his office waited for 2 months for communication from the DOE as to what action it would take. Statements were made that DOE would not appeal the decision and would promulgate new grant guidelines and subject the request for independent study back through the new guideline process. Mr. Loux said that Nevada's attorney general issued an opinion that--that procedure was not what the court had directed. Based upon conversations of January 28, 1986, the attorney general refiled and requested that the court clarify its decision and enforce the mandate that the studies be funded. That motion was subsequently denied on February 28, 1986, indicating that the Federal Government had not been dilatory in providing money to the state for independent study and that the negotiations should continue.

Negotiations have continued with DOE's Nevada Project Office and additional information has been submitted. Mr. Loux reviewed the five tests outlined in the court's decision of December 2, 1985:

1. Are the technical studies necessary for state's statement of reason;

2. Do the tests need to be initiated prior to site characterization;

3. Are the tests scientifically justified;

4. Are the contractors technically competent; and

5. Would the studies interfere with or delay DOE's activities.

Mr. Loux stated that he has provided DOE's Nevada Project Office with the appropriate information, and hopes to have the full grant request funded by March 1, 1986. [Upon later questioning by Mrs. Spriggs, Mr. Loux clarified this date as April 1, 1986.] The grant under which his office was originally operating expired at the end of December 1985. Subsequently, two no-cost extensions have been approved and unexpended funds are being used to carry through to the end of March 1986.

Mr. Loux further expanded on Governor Sawyer's remarks relating to the activities of the commission on nuclear projects and the type of information which has been provided to same. He said the commission has also approved three resolutions (attached as Exhibit E) regarding the Repository Siting Program. He reviewed the resolutions with committee members.

With the recent hiring of five persons, the agency for nuclear projects is at its full staffing level, Mr. Loux reported. He reviewed the names and responsibilities of the recently hired personnel.

Mr. Loux stated that the DOE has delayed the issuance of the environmental assessments (EA's) until approximately April 20, 1986. The delay is to accommodate additional review of the ranking methodology with the National Academy of Sciences. He

thinks it will be informative to see what recommendations will be made to DOE. A briefing will be held on March 21, 1986, to provide the states with information on the EA methodology and related materials. Representatives from Mr. Loux's office will be in attendance at that briefing. He will also formally request that a briefing be held in Nevada before the issuance of the EA's.

A audit by the legislative counsel bureau of the agency for nuclear projects is in the final stages. It is primarily a compliance audit and an exit interview will take place on March 13, 1986, Mr. Loux reported.

Mr. Loux presented a handout (attached as Exhibit F) containing remarks made by Malachy R. Murphy, special deputy attorney general, on behalf of the State of Nevada to the U.S. Nuclear Regulatory Commission (NRC) on January 24, 1986. He reviewed the four areas of concern outlined in the remarks.

Additionally, Mr. Loux provided a packet of information (attached as Exhibit G) from an attorneys general forum which was held in Carson City, Nevada, on December 17, 1985. The forum was sponsored by the office of the attorney general to provide continuing education credits to the legal community and education to attorneys general who may not currently be involved with the issues of high-level, low-level and hazardous materials.

Continuing with his testimony, Mr. Loux briefly discussed:

1. The debate on the renewal of the Price-Anderson Act;

2. The Simpson-McClure Bill and Senator Daniel J. Evans (R-Washington) proposed amendments;

3. Legislation proposed by Senator Howard M. Metzenbaum (D-Ohio); and

4. A meeting with Representative Morris K. Udall (D-Arizona).

Mr. Loux noted Representative Udall recommended that he continue to work with the legislation currently proposed. Representative Udall also suggested a separate piece of legislation next year which would address the liability for high-level radioactive waste incidents separate from the Price-Anderson Act.

Mr. Loux stated that the DOE recently announced the number of sites in the second round program which include Georgia, Maine, Minnesota, New Hampshire, North Carolina, Virginia and Wisconsin. He noted that there has been an outcry from those states, as well as the first round states, regarding their potential selection as a repository site. Mr. Loux also noted that there has been discussion with regard to amending the NWPA to construction of a single repository. He stated Representative Udall told him that "he thought the likelihood of a second repository was very slim."

Chairman Hickey expressed concern about funding for litigation. Mr. Loux said that there is nothing being proposed at the present time. He noted that the court did not deal with the funding for litigation issue and he is uncertain as to how the matter will proceed.

Mr. Loux said limiting use of nuclear waste funds for judicial review is an attempt to cut Nevada off from seeking review in the courts. States such as Nevada do not have the needed resources to litigate. He indicated that he senses interest on the part of DOE to pursue its objectives but at the same time limit Nevada's role, which he does not think is the intent of the law.

Responding further to Chairman Hickey, Mr. Loux commented that state involvement in reviewing and commenting on the grant guidelines prior to finalization will be an issue for consideration during a meeting with DOE in April 1986.

Chairman Hickey said that he hopes to organize legislators and governors from the first round states to start dealing with those issues on which they agree. He is also interested in involvement in rewriting grant guidelines.

Chairman Hickey inquired if any development has occurred on Consultation and Cooperation (C&C) Agreements. Mr. Loux responded that nothing has been developed by Nevada and he thinks such work should begin with the advent of site characterization.

Chairman Hickey commented that he noticed, at a meeting in Tucson, Arizona, a perception by some that Nevada is not cooperative. In following discussion, Mr. Loux said that he has serious doubts that the issues on which Nevada has been involved in court action would have ever been resolved in a C&C Agreement negotiation.

Chairman Hickey mentioned that he is giving consideration to the establishment of an additional subcommittee to work on the technical aspects of the program with regard to NRC.

Mrs. Spriggs asked if there are some issues where a C&C Agreement could be started. Mr. Loux said that has been done informally with the DOE Nevada Project Office. The relationship with that office is quite good, especially regarding the technical issues. The issues with which he has concern involve DOE Headquarters. Issues such as involvement in the EA's and preliminary determination of suitability might be the only issues focused upon in a C&C Agreement. From that perspective, Mr. Loux said he is not sure there is any benefit in initiating that discussion with DOE Headquarters at the present time.

Mrs. Spriggs stated that since Nevada is perceived as not cooperating, perhaps initiating a formal process on issues which can be resolved would show the state's willingness to work with DOE. Mr. Loux commented that while her point was a good one, he is concerned that inability to reach agreement with DOE might make Nevada look even more unreasonable. Mr. Loux emphasized that the working relationship with DOE's Nevada Project Office is quite good on the day-to-day issues.

In response to a question by Mr. Schofield, Mr. Loux said he has two concerns:

1. The timing involved--he believes all the issues are not identified; and

2. The thorough cataloging of issues which need to be developed and priorities established prior to negotiations with DOE. Preliminary work is being done in the form of developing a listing of issues which need to be resolved.

Responding to Senator Gibson, Mr. Loux advised that:

1. Less than $20,000 may be involved in litigation expenses;

2. Approximately $1,898,000 was available in the grant which expires on March 1986; and

3. For 12 months, he had anticipated $4.9 million and that amount has been reduced to $4.6 million to accommodate a 9-month grant year to keep on a calendar year schedule with DOE.

There was general discussion between Senator Gibson and Mr. Loux regarding resource levels over the next few years.

Mr. Loux said the waste fund has been and will be subjected to cuts because of Gramm-Rudman. It does not appear to him that the cuts will necessarily be passed down in his grants. Senator Gibson commented that cuts have affected the highway trust fund which is also a separate fund. Mr. Loux advised that he has not received information from DOE which would indicate cuts at this point.

Carl A. Johnson, technical manager, agency for nuclear projects, stated that there are four main areas of the technical program. He said that he would be discussing the (1) technical staffing, (2) technical advisory group, (3) status of state technical reports and (4) proposed independent technical study program. He spoke about the two additional technical staff members, the qualifications of those individuals and their responsibilities. He noted that consideration is also being given to an additional position in the form of an environmental scientist.

Mr. Johnson commented that the DOE Nevada Project Office has approached the agency for nuclear projects about working with it in developing environmental mitigation and monitoring (M&M) plans for characterization activities.

A technical advisory group has been set up to provide review and guidance on the state's technical program. He is looking at disciplines for that particular group in the areas of engineering, geology, hydrology, materials science, rock mechanics and seismology. Currently, only two members have been selected for the advisory group and are under contract. Mr. Johnson said that it is hoped the membership will be completed by the end of 1986.

Mr. Johnson said that one of the objectives of the state's technical program is to review various technical issues and technical publications prepared by DOE and its contractors. After the review is complete, an analysis and evaluation would be done and a review report would be published by the agency for nuclear projects. Draft reports have been compiled in the discipline areas of geochemistry and groundwater modeling. It is his hope that publication of the first group of those reports will be forthcoming by the summer of 1986.

Mrs. Spriggs inquired if it is possible to hire persons with expertise in more than one discipline or is it the intent to hire one individual for each discipline. She also inquired if those persons will be on a "consultant-basis" and how they will interact with the state. Mr. Johnson responded that it is possible to hire people with expertise in more than one discipline. He said he is specifically looking for people who have expertise and reputations mainly in one area. He noted that the advisory group would meet once or twice a year and review the technical aspects of the state's program and make recommendations to the agency. The individuals would also provide individual guidance and review on aspects of the program in the individual's area of expertise. Utilization is already being made of the two people presently under contract by providing advice and guidance on regulatory plans.

Chairman Hickey stated that he thinks the technical advisory group is important. He noted it is important to protect the individuals from the political pressure as the program needs to have integrity and be objective. He inquired how this would be addressed. Mr. Johnson responded that it would be handled by setting up the group in such a way that it meets, reviews and interacts with the agency's scientists--separated from the political aspects of the program.

Chairman Hickey requested the opinion of Mr. Johnson as to his preference of contractors versus direct employment. Mr. Johnson stated that the particular individuals on the technical advisory group would be strictly consultant-contractors and separate from the day-to-day activities of the technical staff. The technical advisory group would review information developed by staff and help to guide the technical program.

In response to a question by Senator Redelsperger, Mr. Johnson said that in order for the advisory group to properly carry out its role of reviewing and advising the agency on its program, it must be knowledgeable of DOE's program and have some knowledge of what the NRC is doing in the way of technical review work.

Mr. Loux provided clarification on the advisory group and agency's structure, which he noted was not unlike DOE's program. He said that he envisions the state and DOE will each have their own technical program and peer review. He thinks the review of both programs should be left to the NRC to determine which is most correct.

Mr. Johnson provided a brief background on the technical program and a slide presentation which contained the following elements:

1. State program goals;
2. Health and safety objectives;
3. Issues critical to health, safety and the environment;
4. Unsaturated zone moisture monitoring - phase I;
5. Regional groundwater flow;
6. Pluvial climate groundwater conditions;
7. Influence of climatic patterns on hydrologic conditions;
8. Carbon-14 age dating corrections;
9. Faulting and tectonics;
10. Volcanism;
11. Mineral resources;
12. Seismology; and
13. Quality assurance.

(Copies of the individual slides with detailed information are attached to the meeting minutes as Exhibit H.)

Communications Subcommittee
March 10, 1986

Chairman Gibson called the subcommittee to order and stated that the purpose of the meeting is to obtain general status reports on communication related matters and procedures.

Roger W. Gale, Director, Office of Policy and Outreach, Office of Civilian Radioactive Waste Management (OCRWM), DOE, said he wished to discuss the National Waste Management Program and communications. He stated that he did not think any other state in either the first or second repository programs has contributed as much as the State of Nevada in helping DOE, on a national basis,

improve its work and show foresight in addressing issues that will be of importance to DOE. He briefly discussed the local and community guidelines. Mr. Gale stated, "Although we feel it was unfortunate that we had to go to court to resolve grant issues--again, that is an area where the state has chosen to take the lead and identify and try to clarify the scope of the work that's acceptable for us and the states under the NWPA--I think the very forward and aggressive and constructive role that the legislature has been playing, and I suspect will continue to play, has also been a very good model for other states as they begin to focus more of their own internal state energies on building a better communications system with DOE and with their own constituents."

Mr. Gale said that while Nevada is not directly involved in the second repository siting action, DOE has found a group of states which have very strong, negative feelings--and unpredictably strong demands for improved communication. Therefore, DOE's attention is very much focused on communications.

Mr. Gale said that he would divide his discussion into three areas: (1) a question of information, (2) involvement and (3) participation. He said DOE realizes it has a strong obligation to provide accurate, complete, thorough and timely information. Over the past 2 years, much effort has been made to improve the flow of information. He cited examples such as (1) a bulletin which is published 10 times a year, (2) a biweekly milestone which updates the major program schedule and meetings, (3) a monthly policy reader, (4) an electronic information system available for computer access and (5) an electronic mail system. Mr. Gale emphasized that much of the credit for this improvement is legitimately to the states and the Tribes, not the DOE.

In the area of involvement, DOE has tried to improve the frequency, intimacy and regularity of relations with the states and Tribes. Mr. Gale noted the importance of communication through the use of meeting participation.

Areas which need improvement include: (1) litigation and (2) reticence on the part of the states in working together to solve problems of common concern. Continuing expressions of disappointment have been made on the part of states and tribes about the point at which DOE is willing to permit state and tribal involvement in decisionmaking. Mr. Gale noted that while the technical contributions of the states have been very valuable and essential to the process, there is not yet in place a stable working relationship with the state technical people. He said it was heartening to learn of Nevada's development of a strong technical capability as presented previously in the meeting. As the site characterization process begins in whatever state, he said that DOE looks, with some optimism, at being able to build a stable relationship with professional, technical people on both sides being able to have a regular arrangement of meeting and critiquing each others work.

Mr. Gale spoke briefly about discussions at a recent meeting of the NRC, at which two of the commissioners spoke forcefully about the need to validate the data from DOE and the states in a computerized licensing system.

Mr. Gale said that as DOE moves into site characterization, it looks forward to a very strong project office-state relationship, with DOE setting broad policy and guidelines and the project offices implementing them in tandem with the states and Tribes.

Mr. Gale said, "If one has to take a look at the program now, 3 years after passage of the NWPA, and ask questions in the communications area and its more fundamental areas about whether the Act is working--whether all of us (states, DOE, Tribes) are, in

fact, doing our jobs adequately, I think the bottom-line answer is, 'yes, we are'. We all need to improve what we do. I think that word 'improvement' is the key word in all that we do. Success in this program, I think, is based entirely on constantly improving the level of performance on our part and on your part. To the extent that we are able to work together to highlight those areas where performance and improvements in that performance are required, we will all succeed in meeting the objectives that we have."

Mr. Gale noted that DOE is often criticized for moving too rapidly in the program and for not taking sufficient advantage of state and public input. He said that he feels that the program is designed in such a way that it can stay on schedule and take care of that involvement. Congress put DOE on a "fast track" and it knew that the job could be done in a quality fashion and a successful fashion.

Concluding his presentation, Mr. Gale said that 19 or 20 new publications have been produced in the last 6 months and 27 additional ones have been identified and will be produced in the next 18 months. A products plan will be sent out by DOE to the states and Tribes for comment and input for future publications. Mr. Gale said that DOE thinks it is important to do, particularly because it has not been very publicly oriented in recent years.

Chairman Gibson asked to whom does Mr. Gale report. Mr. Gale responded that he reports to Ben C. Rusche, Director, OCRWM, DOE. Chairman Gibson inquired with regard to litigation if there are other lawsuits pending similar to those lawsuits filed by Nevada. Mr. Gale responded, "No. The only suit we have had filed on grant-related issues is the one that was filed by the State of Nevada."

Responding to a question by Chairman Gibson, Mr. Gale stated that DOE has a number of suits which contest the siting guidelines. He noted that Nevada is one of the plaintiffs in those cases. Those various cases have been consolidated and it is now in the Ninth Circuit Court. A very complex suit is pending with the State of Tennessee regarding the siting of the Monitored Retrievable Storage (MRS) in that state. Recently, suits have been filed by the states of Maine and New Hampshire regarding the comment period on the Draft Area Recommendation Reports--DOE has provided for a 90-day comment period and the states have asked for a longer period. A couple of suits with utilities regarding fees have recently been settled. The State of Texas had a suit on grounds of DOE not satisfactorily doing the siting requirements in that area--the circuit court denied its claim. Texas asked for a U.S. Supreme Court review and it was denied.

Chairman Gibson inquired if DOE has C&C Agreements with anyone other than the State of Washington. Mr. Gale said that DOE does not have one with Washington; however, DOE has discussed agreements with Washington and has drafted agreements with Washington and the Yakima Indians. In the fall of 1985, DOE discussions began with the Umatilla Indians. None of those negotiations have come to a conclusion, he noted.

Mrs. Ham mentioned that she has heard the American Nuclear Society (ANS) has a program on public education and inquired if Mr. Gale knew anything about the program. Mr. Gale responded that he knows it has programs but does not know any details.

In addition to his verbal testimony, Mr. Gale submitted a written statement (attached to the minutes as Exhibit I).

Chris L. West, Public Affairs Officer, DOE Nevada Project Office, read from his prepared remarks (attached as Exhibit J). His presentation highlighted:

1. The evolution of the Nevada public outreach and information program and specific areas in which its efforts have been concentrated since the passage of the NWPA in 1982;

2. Discussion of town hall meetings and formal public hearings and briefings;

3. Information on DOE's Technical Library and Public Reading Room in Las Vegas, Nevada, and collections of technical reports established at local libraries in Nevada;

4. Information regarding DOE's mailing list of approximately 700 individuals and organizations for dissemination of information;

5. Discussion of the Nevada Test Site visitor program;

6. Information on the Nevada Project Office Speakers Bureau;

7. Work being done with the news media; and

8. Preparations for the future formal outreach/public participation plan.

Mr. West provided copies of the following documents:

1. A summary of town hall meetings held since 1983 (attached as Exhibit K);

2. A list of public hearings and briefings (Exhibit L);

3. An information packet distributed to visitors of the Nevada Test Site (Exhibit M); and

4. A brochure describing the Speakers Bureau (Exhibit N).

Chairman Gibson inquired if representatives of the local news media have visited the proposed repository site. Mr. West responded in the affirmative.

Regarding the facilities specific outreach program, Chairman Gibson inquired what the time frame is and when a site is anticipated to be chosen. Mr. West responded that the formal designation will be at the time the EA is released. Sometime after that happens, he expects to receive a "formal okay" from Washington, D.C.

Chairman Gibson asked if Mr. West already has a relationship established with the agency for nuclear projects. Mr. West indicated his office is has had some discussions with that agency.

Mrs. Ham asked if the town hall meetings have been well attended and if Mr. West thinks the meetings have been successful. Mr. West responded that considering the size of some of the small communities, he would say the meetings have been successful. He said that he considers a meeting successful anytime he has a couple of people from a local community meet with DOE and express their concerns and allow DOE to react to those concerns.

Chairman Gibson expressed his interest in the objective and content of the town hall meetings. Mr. West stated that the meeting begins with DOE making presentations. Part of the presentation

addresses the weapons testing program and the other part addresses the nuclear waste program. After the formal presentations, the meeting is opened up to questions and answers. He noted that the question and answer sessions often run longer than the presentations. Questions and answers at the current meetings focus almost entirely on the nuclear waste program, as there is great interest in that subject in the small communities.

Chairman Gibson asked if Nevada Governor Richard H. Bryan has visited the Nevada Test Site. Mr. West responded in the affirmative. While he could not provide an exact date, he said it had been within the last year. He also noted other congressional and state representatives who have visited the site. Mr. West extended an invitation to the committee and to the members of the commission on nuclear projects to visit the site.

Mrs. Ham commented that she has heard that "our problem in Nevada is how we are perceived by other states as a vast wasteland." She questioned whether there is any way, through public relations, that Nevada could improve the image and show what Nevada really is like. Mr. West noted that there is not an easy answer to that. Wherever the nuclear waste is located it certainly will be in a protected manner. He thinks that the image and impression which needs to be conveyed is that--no matter where it is located, it will be isolated from man and his environment. It is not going to be something that will interfere with tourism or anything like that. He thinks it is a nonproblem which is inadvertently emphasized by just bringing up the possibility.

Chairman Gibson called upon Mr. Loux (previously identified) and Russell Nielsen, public affairs manager, agency for nuclear projects. Mr. Nielsen said problems which have occurred with the press could be caused by (1) lack of data furnished to the reporter on which to write a proper story or (2) lack of understanding those facts which result in a faulty story. He wants to be sure that the citizens of Nevada have ample information in order that they can arrive at an informed opinion.

Mr. Nielsen commented that his visits to libraries in southern Nevada indicated to him that while the libraries had some information on nuclear waste there were no visible displays. One of the reasons is that the libraries were full and nuclear waste is "not the hallmark of the day with people who visit the libraries." Therefore, he has come to the conclusion that the emphasis should be on public speaking tours and public seminars. Mr. Nielsen stated that the agency's newsletter has received considerable favorable comment and it will be published periodically.

Mr. Nielsen provided and reviewed a handout (attached as Exhibit O) which outlines the objectives, strategies and tasks of the agency's public information program as follows:

1. Identify information/data that people need to understand adequately the high-level waste program;

2. Match up the public's identified information gaps with currently available information;

3. Develop information materials and mechanisms to fill identified gaps and to provide a comprehensive basis for citizen participation;

4. Work with existing communities, civic, church and other groups to promote citizen involvement in state planning and in state and Federal decisionmaking;

5. Work with local governments to assure active participation in the state's public information program and to assure that local governments are knowledgeable in all areas of the waste program;

6. Work with appropriate state legislative committees to provide opportunities for involvement in the state's public information program;

7. Work with the state universities and public school system to promote public interest and involvement in high-level waste issues relative to Nevada;

8. Establish mechanisms for two-way communication between the state and DOE, and with other states' waste project entities; and

9. Establish mechanisms for two-way communication and coordination of activities with other states.

Chairman Gibson commented that he personally feels it is important that the information the state provides is factual. In order to maintain the credibility and effort being made, that should be a priority. He noted that Mr. Nielsen's presentation has reassured him in that regard.

Chairman Gibson said he felt that the first newsletter was informative and well-done. Mr. Nielsen mentioned that he could not take credit for the first newsletter as it was published the day he started work. He noted it is anticipated that the newsletter will be published on a quarterly basis. Chairman Gibson observed that he is aware of the fact that it takes a lot of work to put together that sort of document.

Mrs. Ham inquired if Mr. Nielsen knew anything about the seminars for teachers sponsored by the ANS. Mr. Nielsen said he glanced through the brochure at one time. Mrs. Ham asked if Mr. Nielsen has explored the possibility of working with teachers or schools. Mr. Nielsen responded in the affirmative. He said he is trying to work through the Parent Teachers Association, if possible. Contact will also be made with the University of Nevada System. Mr. Loux commented that he looked at the ANS literature as well. He thought it was well done but he did think it was biased.

Mrs. Ham asked if inquiries have been made into public television. Mr. Nielsen stated that most television stations are going into interviews on weekends and he anticipates being involved with those stations and with public television.

Chairman Gibson opened the meeting up for public testimony upon the conclusion of testimony by Messrs. Loux and Nielsen.

Cleve Anderson, a resident of Las Vegas, Nevada, stated that for the past 33 years his career has been dedicated to the engineering, management and consulting aspects of high-level nuclear waste. Mr. Anderson stated that his testimony would be limited to the high-level wastes generated by the commercial nuclear power program. He continued, reading from his prepared remarks (attached to the meeting minutes as Exhibit P). Mr. Anderson's testimony consisted of the following elements:

1. The dangers of leaving uranium and plutonium in high-level wastes;

2. The burial of plutonium in Yucca Mountain or any other location;

3. The responsibility to destroy plutonium by "burning" it as a reactor fuel; and

4. The removal of plutonium would reduce the size and cost of a repository.

Concluding his remarks, Mr. Anderson stated that Nevada should ask for a thorough review of the plutonium question now.

At the request of Mrs. Ham, Mr. Anderson provided a brief explanation of how a fuel rod becomes a spent fuel rod. Mr. Anderson said that the Federal Government has been removing plutonium from its irradiated fuel since 1944. He said the government wants plutonium immediately, approximately 120 days after the fuel is pushed out of the reactor. In the commercial program, 5 years passes and radiation decay takes care of most of the problems. There was also a brief discussion on storage of spent fuel rods in water.

Chairman Gibson commented that this concluded the testimony before the subcommittee on communications. He reviewed the schedule of the subcommittees on socioeconomics and transportation for the following day.

March 11, 1986

COMMITTEE MEMBERS PRESENT:

Senator Thomas J. Hickey, Chairman
Assemblyman James W. Schofield, Vice Chairman
Senator Kenneth K. Redelsperger
Assemblyman Jane F. Ham
Assemblyman John E. Jeffrey
Assemblyman Gaylyn J. Spriggs

LEGISLATIVE COUNSEL BUREAU STAFF PRESENT:

Donald M. Bayer, Senior Research Analyst, High-Level Radioactive Waste
Colleen McMullen, Deputy Legislative Counsel
Marilyn K. White, Research Secretary

OTHER LEGISLATORS PRESENT:

Assemblyman Myrna T. Williams

Chairman Hickey called the meeting to order. He stated that he was particularly pleased with testimony received the previous day dealing with the public outreach programs. He stressed the importance of the programs being objective and impartial.

Chairman Hickey made additional appointments in the following areas:

1. Finance - Senator Gibson, his contact will be Mr. Loux;

2. Liaison to the commission on nuclear projects - Mrs. Ham, her contact will be former Nevada Governor Sawyer; and

3. Scientific and technical aspects - Mrs. Spriggs, her contact will be Mr. Johnson.

Chairman Hickey requested that each appointed individual provide periodic reports by letter to the other members of the committee.

Chairman Hickey turned the gavel over to Senator Redelsperger, chairman of the subcommittee on socioeconomics.

Chairman Redelsperger commented that an update had been requested from the DOE Nevada Project Office and the agency for nuclear projects. Upon conclusion of those presentations, public testimony and comments from local government would be invited.

Wendy Dixon, Systems and Project Control Branch Chief, DOE Nevada Operations Office, said that she would provide a brief status report on the socioeconomic analyses presently underway. Ms. Dixon submitted a handout of her slide presentation (attached as Exhibit Q). Ms. Dixon's presentation included the following elements:

1. Social and economic analysis required by the NWPA and the final siting guidelines;

2. Socioeconomic profiles of Clark and Nye counties and communities;

3. High-level nuclear waste transport and storage assessment of potential impacts on tourism in the Las Vegas area;

4. Socioeconomic baseline for Yucca Mountain draft EA;

5. Ongoing activities;

6. Other reports which are planned;

7. Socioeconomic M&M plan for site characterization activities; and

8. Repository development schedule.

Mr. Jeffrey inquired if data has been assembled which indicates how many people will be employed by the repository during the construction and the operating phases. Ms. Dixon responded that some "ballpark estimates" have been made. It was determined that the number was close to 4,000 persons. The estimates are available in the draft EA and are broken down into construction, placement and quality assurance workers and others.

Chairman Redelsperger stated that he was pleased to learn that DOE has been coordinating closely with local governments in Clark and Nye counties. He said that there was very little mention of Lincoln County. He mentioned there is a great deal of interest in tourism in the Caliente, Nevada, area and questioned whether DOE was working closely with that locale. Ms. Dixon stated that the review on tourism encompasses the entire state and evaluates impacts on tourism in general. She said all the emphasis so far has been placed on Clark and Nye counties because DOE has been focusing on the areas closest in commuting distance to the Nevada Test Site.

If Nevada is approved for site characterization activities, Ms. Dixon said she is certain the geographical area will expand to other counties.

Mr. Jeffrey requested an estimate of the cost of the site characterization studies for each site. Ms. Dixon said she was not prepared to provide those figures. Mr. Gale responded from the audience that the figures range from $700 million to $1 billion for each site.

Joseph C. Strolin, chief of planning, agency for nuclear projects, provided a copy of a draft of the scope of work (attached to the minutes as Exhibit R) which his agency is currently negotiating as part of a contract to provide the state's socioeconomic impact study.

On February 4 and February 5, 1986, the state was invited to attend a DOE institutional socioeconomic coordinating group meeting held in Dallas, Texas. It was the first time that first round repository states, DOE Headquarters staff, DOE Nevada Project Office staff and affected Indian Tribes were invited to participate in a DOE meeting focusing on the activities revolving around the socioeconomic impact assessment work that DOE staff is doing. Mr. Strolin said that he thought it was a very effective and worthwhile meeting. Some issues discussed were: (1) the C&C Agreement process, (2) environmental impact statement planning, (3) financial assistance and grants to states and Indian Tribes, (4) grants equal to taxes, (5) M&M plan development process, (6) mitigation funding and sources of funding for mitigation and (7) public information and outreach as relates to DOE activities.

At the end of the 2-day meeting, there was a list of over 39 items which were considered as action items to be worked on and discussed at the next meeting to be held in May 1986. It seems to be the start of a promising process for the states and DOE to work together in this area, he noted.

Mr. Strolin said another occurrence which he wished to discuss is the meetings held with DOE regarding the M&M plans discussed previously by Ms. Dixon. He said that Dr. Donald L. Vieth, Director, Waste Management Project Office, DOE, approached the state and local government group which has been set up and asked it to work with DOE on development of the actual M&M plans. A series of meetings were held and it was decided that the group would provide input into the DOE plans, helping to "scope out" the plans and review the drafts. Mr. Strolin said he thinks it is a very healthy start in an area where there has been very little cooperation in the past.

Mr. Strolin commented that since the last meeting of the committee, the agency has received proposals for the socioeconomic impact assessment study. Meetings were held which involved local government representatives and staff from the legislative counsel bureau. Proposals were narrowed down from 13 to 2. Interviews were conducted with the top two firms in January 1986 and a firm was chosen for negotiation. Negotiations are currently in process for specifics of the contract.

Mr. Strolin showed a slide presentation (copies are attached as Exhibit S) which included an overview of what the state expects from the socioeconomic study. The focus of the study is to look at all possible impact areas, both traditional and nontraditional. It must address each affected community. The intent is to fully involve local governments in the process. He reviewed the four organizational phases. Included in the presentation was the time frame for the study.

The entire process has been characterized by full involvement of local governments in the southern part of the state including Clark, Lincoln and Nye counties; cities of Henderson, Las Vegas and North Las Vegas, and to a smaller degree Boulder City and Caliente. Mr. Strolin noted that staff of the legislative counsel bureau has been invaluable in helping with the "scoping and evaluating" of proposals. Mr. Strolin commended all members of the state and local government group for their dedication, hard work, honesty and sincerity in their work on the study.

Chairman Redelsperger inquired as to how the negotiations are progressing with Mountain West. Mr. Strolin stated that the firm has acceded to everything the group wanted. Continuing, Mr. Strolin said that if an agreement is reached, it will be within the next 2 weeks and he is hoping to have a contract in place by April 30, 1986.

Chairman Redelsperger asked Mr. Strolin to discuss impacts, if any. Mr. Strolin said the impacts are hard to quantify but he has heard comments from local government people that they exist. He cited an example in Lincoln County, in areas along the railroad tracks, where property values have already been affected. He said it is his guess that there have not been any major economic impacts in Lincoln and Nye counties to date. Until the study is actually conducted, those issues will not be known.

Upon completion of the requested presentations, the meeting was then opened to public comment.

Mrs. Williams (identified previously) requested clarification on the number of people to be employed to maintain the site. Senator Redelsperger commented that due to the unknown design of the repository, the figure has fluctuated. Mrs. Williams expressed concern about (1) the ability of the community to absorb the work force once the construction phase is over and (2) the services required by the number of people.

Chairman Redelsperger requested a representative from DOE to respond. Dr. Vieth (identified previously) said that the date on the construction work force is presented in the draft EA. He could not recall what the figures were. Review has been completed on the document, it is in final form and should be released on April 20, 1986. He offered to make this data and backup documentation available to the committee and any other interested parties.

Dr. Vieth said that DOE's position is to provide the numbers that are in the official EA document. Those numbers are the ones that DOE is prepared to stand behind. He noted that the construction work force will be generally larger than the one that will conduct operations. The conceptual design process is being done but DOE is not down to the final design. Therefore, it is not in a position of giving a highly specific number. Dr. Vieth said, "Again the position is, it will tend to err on the high side of those numbers so that we will have a bounding value for the social and environmental impacts. But, unfortunately, that gives us the impression that we are trying to oversell it from an economic point of view."

Dennis Bechtel, advance planning coordinator, Clark County Department of Comprehensive Planning, said that he is very pleased with the way the state process is going. He said Messrs. Loux and Strolin have "bent over backwards" to accommodate requests of local government. A number of very long sessions have been held and he foresees something very good coming out of the socioeconomic analysis from a local perspective. Mr. Bechtel said that he is glad discussions are being held with DOE on the M&M plan. It is a sign that everyone is beginning to get together on some of the issues.

There being no further testimony to come before the subcommittee on socioeconomics, Chairman Redelsperger returned the gavel to Senator Hickey.

Prior to the convening of the subcommittee on transportation, Chairman Hickey indicated that Mr. Schofield wished to make some comments and requests.

Mr. Schofield stated that he thought the committee should receive additional testimony or actively pursue the questions raised in the testimony of Mr. Anderson the previous day (see minutes of March 10, 1986, pages 11 and 12). Mr. Schofield made the following requests:

1. Verification of the credentials--background, experience, qualifications--of Mr. Anderson;

2. A response by DOE to Mr. Anderson's statements before the committee;

3. Nuclear Regulatory Commission's response to the "misunderstanding of the plutonium removal and the 10,000 year data area;"

4. Verification of the market being glutted with uranium purchased for reactors, either canceled or never completed;

5. Comment from DOE on whether the spent fuel rods are actually wastes that must be disposed of; and

6. Comment on whether the plutonium burial was part of the NWPA or if it was a determination of the responsible parties, namely DOE.

Chairman Hickey noted that the plutonium issue raised the previous day was the first time the subject had come before the committee. He requested development of the plutonium matter by the state agency. Regarding the issue of the NRC licensing for 10,000 years and the comment that the plutonium lasts longer and the criteria was set up without plutonium being involved, Chairman Hickey said that he has requested staff to pursue that issue. He also noted that future involvement is planned with NRC to discuss licensing and other criteria. Chairman Hickey requested a response from Mr. Gale and Dr. Vieth.

Dr. Vieth noted that he has never met Mr. Anderson but that he takes exception to a couple of points raised in Mr. Anderson's testimony the previous day. The situation which resulted in the accident in Russia in the 1950's referenced by Mr. Anderson is a significantly different situation which would exist in a repository at Yucca Mountain, if it were chosen as a repository site. He said DOE would take significant exception to the analogy which was drawn by Mr. Anderson.

Dr. Vieth briefly addressed the issue concerning the proposed cartel or government effort to support the mining industry in uranium by forcing plutonium to be placed into a repository, thereby taking it out of the chain for energy production. He concluded by saying that it is an inaccurate representation. Mr. Gale said that it is the policy of the Reagan Administration, as stated in 1981, that reprocessing of spent fuel by advanced industrialized countries (which have effective safeguards to assure that plutonium separated from that spent fuel would not be used for weapons) was an acceptable activity. Mr. Gale said that in this country, we would support utilities which chose to make the decision to reprocess the spent fuel to recover the uranium and plutonium but would not subsidize the process. Mr. Gale briefly discussed the reprocessing plant in Barnwell, South Carolina.

Mr. Gale said that if utilities in this country wish to reprocess spent fuel, they are free to do so. Reprocessing is being done in some foreign countries. In this country, it is purely an economic decision that the utilities themselves judge. The utilities have chosen not to do so. If that should change, DOE would be capable of accepting the spent fuel as it exists now, or as separated material.

Responding to Senator Hickey about the dollar value of the plutonium in its spent fuel form, Mr. Gale said, in terms of the weapons program, it would not be very high because there are better ways of producing it. The other use of plutonium would be in the breeder economy, if fast breeder reactors were built. Mr. Gale said, "At this stage, there is no economic justification in this country for reprocessing." Dr. Vieth said that DOE could provide information on costs. After further discussion, Mr. Gale said, "I think that when you look at those comparisons with oil and gas, I think you find that the countries which believe they need to reprocess are those which don't have large quantities of oil, gas and coal. For them, it becomes much less a simple calculation of how much it costs to generate electricity using oil versus nuclear as it does a question of security for the nation. By recycling they, in the long run, import less. By importing less, they have stronger national security. That's the motivation for those countries."

Dr. Vieth said, another point that was brought up was whether or not the plutonium or spent fuel was considered for disposal prior to the DOE's involvement in this effort. He said back as far as the early 1970's, those were considerations. That time predated the creation of the DOE. Consideration of plutonium disposal has been written into the U.S. Environmental Protection Agency (EPA) Standard 40 Code of Federal Regulations (CFR) 191. These regulations even identify all the isotopes of plutonium that have to be considered, he said.

Dr. Vieth noted that Mr. Anderson did make a viable point regarding the understanding of how long the geology must be suitable for a repository in order to protect man's environment. He said a range of time frames had to be looked at. The EPA Standard specifies 10,000 years. Therefore, Dr. Vieth must evaluate the geologic formations and the release of radioactive materials in that context. One of the factors that must be reviewed is the half-life of the radioactive element. The one that is controlling is plutonium. It has a half-life of 24,000 years. Dr. Vieth reviewed a series of calculations. He said DOE has always talked about looking at the geology from a point of view of 10,000 years on the short side to a possibility of a long time frame of 1 million years.

Mr. Gale said it is important to note that even if one does reprocess, if plutonium is used in breeder reactors or for other purposes, one does not eliminate the plutonium. It can be recycled multiple times but still exists in the environment and has to be disposed of at some point.

In responding to Mr. Schofield's question--are the spent fuel rods actually wastes that must be disposed of--Mr. Gale noted that historically, DOE would have said, "No." At this stage, considering the economic calculations that have been made, DOE says, "Yes." If there is a dramatic change in the economics of reprocessing, there is no commitment on DOE's part to continue taking spent fuel. Mr. Schofield mentioned the possibility of resource recovery. Mr. Gale said there would be cost penalties for retrieval. The DOE has to be able to retrieve for a 50-year period. If it became economically justifiable, the spent fuel rods would be available. He said it is not likely, but it is not foreclosed.

Mr. Schofield related his question concerning the NRC. Dr. Vieth said he would defer to NRC for response to the question. Chairman Hickey noted that it is his intention to obtain a technical reponse from the state's personnel and also to communicate with NRC to obtain a full understanding of the licensing process and criteria for the licensing process.

Mr. Gale suggested that the committee may wish to hold discussions with EPA, which is the agency that established the Part 91 Standard.

Chairman Hickey turned the gavel over to Mr. Schofield, chairman of the subcommittee on transportation.

Subcommittee on Transportation
March 11, 1986

Chairman Schofield called on Lake H. Barrett, Director of Transporation, Waste Systems Division, DOE, to begin his testimony.

Mr. Barrett provided a general written statement (attached as Exhibit T). He indicated that rather than read the statement, he would instead give a brief overview of his program, the present status of that program, what the interrelationships are with all states and what he sees for the future on various issues. He said he would also discuss some of the quality assurance aspects.

Mr. Barrett said the program is new and has recently been accelerated to start preparing for the transportation of high-level radioactive waste which will occur in approximately 12 years. He explained that high-level radioactive waste is primarily the material that would go to and from an MRS, if an MRS is approved by Congress, and also to a repository. He noted there are currently some shipments by the DOE from a reactor in Virginia to Idaho. The shipments are used for research and development (R&D) purposes on dry cask storage experiments in Idaho. There have also been some shipments of spent fuel from eastern reactors and from Illinois to Washington--none of which have been through Nevada. He noted there will be additional shipments occurring through the remainder of 1986.

Mr. Barrett said two main aspects of the program include: (1) the systems acquisition aspect and (2) the institutional aspect. He noted that DOE has responsibility for transportation--it takes title to the fuel at the reactor site or generation point of high-level waste. It is also written into the NWPA that DOE use private industry to the maximum extent possible. There will be very stringent quality assurance controls placed on contractors, with significant penalties for noncompliance and incentives for good, safe performance.

A Draft Institutional Plan was published in September 1985, Mr. Barrett mentioned. A great deal of feedback was received from states which is being incorporated into the Institutional Plan. The anticipated release date of the plan is May 1986. He briefly discussed its contents.

Mr. Barrett stated that the systems acquisition aspect is the farthest along in DOE's planning at this time. The physical aspects of the activity can be in place in 1996. That is the date which the MRS, if approved by Congress, could go into operation. The first shipments to a repository could begin in 1998.

Mr. Barrett briefly discussed the Transportation Business Plan, outlining criteria and noting the quality assurance. He said reactor cask development designs are presently underway. He also briefly reviewed the Information Package for From Reactor Cask Program.

Responding to Chairman Schofield, Mr. Barrett stated that quality assurance is not an area which "stands by itself." It is interwoven into ongoing activities throughout all the programs. Mr. Barrett offered to provide copies of the quality assurance guidance document to committee members. Mr. Barrett pointed out that NRC also audits and checks the quality assurance program. If it is not satisfied with the program and it is not approved, a certificate of compliance for a cask will not be issued.

Responding to questions by Chairman Schofield and Mrs. Spriggs, and as part of his presentation, Mr. Barrett briefly discussed:

1. Concerns of the states as to the safety of the cask designs and adequate standards and meetings which have been held for discussions on the subject;

2. The time tables for development of prototype casks;

3. Current shipments of spent fuel which will be used in DOE's R&D programs to develop dry cask storage;

4. Present use of casks by DOE which have been certified by NRC;

5. Safety standards of casks presently being used to ship spent fuel to Idaho and what methods will be used to ship to a repository;

6. Use of existing casks as opposed to the design of new ones;

7. Work with Congress for approval of the MRS;

8. Transportation and risk analysis elements of final EA's;

9. Work currently being done on the Transportation Institutional Plan;

10. The multiple opportunities and rights of Nevada to work with DOE regarding transportation issues and infrastructure improvements;

11. Inclusion of three groups (i.e. first repository states and Indian Tribes, second repository states and Indian Tribes and general transportation states) and explanation thereof in the communications network;

12. Inclusion of issue papers into the Institutional Plan and periodic revision of the Plan;

13. Issuance of the Business Plan and the blending of the Institutional Plan and an Operational Plan into one General Plan. [Later in the meeting, Mr. Barrett provided mid-1987 as the issue date of the General Plan.];

14. Involvement of states and Tribes on issues;

15. Involvement of states and Tribes in inspection of vehicles;

16. Development of standard state inspection plans for inspection of a nuclear transport vehicle;

17. Routing selection process and determination;

18. Infrastructure negotiation during mitigation;

19. Overweight truck shipments;

20. Design criteria for trucks;

21. Education program and public communications;

22. Transportation communication effort--national and state programs;

23. Defense waste versus civilian waste transportation systems; and

24. Licensing of casks and transportation of Far East shipments.

Upon conclusion of Mr. Barrett's testimony, Chairman Schofield encouraged consideration of further workshops similar to the one held in Atlanta, Georgia. He said that he thinks the workshops are helpful to both the participants and DOE. Mr. Barrett agreed and said DOE intends to use additional workshops.

Mrs. Spriggs stated that the people of Caliente, Nevada, have a genuine concern because the railroad passes through the town and the City Hall is located within 60 feet of the track. She said she would like to see the residents' concerns addressed. The residents would like to know what kind of emission comes from the cask--or if there is any exposure that close to the track. Mr. Barrett suggested that the DOE Nevada Project Office be requested to visit the town, hold a meeting and answer questions and address the concerns of the residents.

Chairman Schofield said that he would like to encourage the DOE to consider modification of the "Memorandum of Understanding " between DOE and the Department of Transportation (DOT). He said he would like to see reference of input by the state to the DOT. Mr. Barrett suggested that Chairman Schofield provide him with a copy of his suggestions.

Mr. Strolin (previously identified) introduced Russell di Bartolo, planner/research analyst, agency for nuclear projects, and spoke of his qualifications and background.

Mr. di Bartolo showed a 7-minute video presentation prepared by the State of Nebraska using Western Interstate Energy Board developed information on potential regional transportation effects.

Mr. di Bartolo provided a handout of the High-Level Radioactive Waste Transportation Matrix (attached as Exhibit U), dated March 1986, noting that it describes the roles of federal, state, Indian Tribes, interest groups and industry and professional organizations. In the case of governmental agencies, it provides statutory authority, various regulations published by particular agencies, with whom each agency has interagency agreements or contractural agreements and any products or reports which have been published. It is his intention to develop this matrix into a high-level waste transportation resource booklet to be used in the public information process.

Mr. di Bartolo also provided the committee with a reference list (attached as Exhibit V) entitled High-Level Radioactive Waste Transportation, dated March 1986, which has been developed according to various categories. It includes references on background, information and policy; legislation, regulations and rules; institutional information and issues with regard to transportation; business or operational issues; emergency planning, management and response; local planning and involvement; interest group publications; and social impacts/considerations of transportation.

An issues status notebook is also being developed, Mr. di Bartolo noted. He provided a handout (attached as Exhibit W) of a Draft Plan for Addressing High-Level Nuclear Waste Transportation Issues, dated March 1986. He reviewed the contents of the handout including the overall goal, organization of the plan and the six objectives and strategies for those objectives.

Mr. di Bartolo said the agency is interested in creating an ad hoc governmental advisory group on transportation throughout Nevada. The group will be comprised of interested local governments located along or near potential high-level waste transportation routes within the state. The agency would like the group to work under or very closely with the present state and local planning group, which has been effective in moving along the socioeconomic impact study. The agency also wants to include, either as ad hoc committees or an ongoing basis, representatives from state agencies as well as professional or industry associations and interest groups.

All of the information obtained will be compiled into a transportation resource booklet which will provide the citizens of Nevada with an open line to the workings of the agency with regard to high-level waste transportation planning, Mr. di Bartolo said.

Mr. Strolin said he wished to offer clarification on the plan being discussed. It is a guideline for the agency and defines its current thinking regarding how it will engage the transportation issue in a comprehensive and integrated fashion. The agency is not making policy for other state agencies. It is also a very preliminary draft document to identify objectives and strategies and, eventually, actual tasks that the agency can carry out which will promote the kind of comprehensive and integrated approach that it is trying to bring about in the state.

Mr. Barrett stated he wished to offer additional information regarding the videotape shown by Mr. di Bartolo. He said that the figures referenced extreme numbers which were in the draft EA's--6,000 truck shipments. A more realistic number is 1,200, which will be reflected in the final EA's for the repository and MRS documents. Mr. di Bartolo said that when dealing with either truck only or rail only shipments, the numbers are very different and usually go to the extreme.

Mr. Barrett also noted that in the videotape, it was assumed that the western fuel traveled to the MRS in Tennessee and then returned. That is not the case. In the MRS proposal, the western fuel travels straight to the first repository. If there is an MRS, one shipment a day would come to the repository. If there is no MRS, there would be about five shipments a day.

No public testimony was offered on transportation issues and Mr. Schofield returned the gavel to Chairman Hickey.

Mr. Anderson (see minutes of March 10, 1986, pages 11 and 12) said statements about the cartel on uranium came directly from the Secretary of DOE and were not his statements. He mentioned with regard to the coal/oil values of plutonium, that it is the way the industry has "sold nuclear from day one." He said it takes about 1 minute to calculate. Mr. Anderson said, "The overriding thing is that DOE has said that they don't make the decisions here. They're made in Washington. Somehow or other, that cloak of secrecy of how decisions are made, has to be penetrated and obviously you're going in the right direction."

The attendance rosters for the meetings on March 10 and March 11, 1986, are attached as Exhibit X.

There being no further business to come before the committee, the meeting was adjourned.

Respectfully submitted
Marilyn K. White

APPROVED BY:

Senator Thomas J. Hickey, Chairman
Nevada Legislature's Committee on
High-Level Radioactive Waste

Date: 5/28/86

Senator James I. Gibson
Chairman, Subcommittee on
Communications

Date: 6/3/86

Senator Kenneth K. Redelsperger
Chairman, Subcommittee on
Socioeconomics

Date: 5/28/86

Assemblyman James W. Schofield
Chairman, Subcommittee on
Transportation

Date: 5/28/86

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