



NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT



MONTHLY REPORT

JULY 1984

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UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE

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SUMMARY

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT

JULY 1984

KEY ACTIVITIES

WBS 2.1, SYSTEMS

The Office of Civilian Radioactive Waste Management sent the final draft of the "Generic Requirements for a Mined Geologic Disposal System" (GR) to the Office of Geologic Repositories (OGR) for concurrence. Issues regarding preclosure waste package, decommissioning, and radioactive waste retrieval require further resolution.

The Performance Assessment National Review Group (PANRG) met in Gaithersburg on July 19-23. At the meeting, presentations were made on the conceptual model of the hydrologic system at Yucca Mountain; flow and transport codes being used by Performance Assessment were discussed.

The TRACR3D code was used to successfully reproduce test-case results for an unsaturated flow problem; this resolved a long-standing problem of reproducibility of results using the TRACR3D code.

The drilling plan for FY 1986 was completed for the Program Manager's presentation in Washington, D.C.

WBS 2.2, WASTE PACKAGE

A paper was accepted for presentation at the 1984 GSA National Meeting. The paper is titled, "Dachiardite Formation by Hydrothermal Alteration of a Devitrified High-Silica Rhyolite. And, a paper, "Hydrothermal Interaction of Topopah Spring Tuff with J-13 Water as a Function of Temperature" was accepted for presentation at the 1984 MRS Annual Meeting.

An improved two-dimensional block stability model was completed, and a three-dimensional model is being developed with which the stability of rock blocks adjacent to emplacement holes can be analyzed.

Testing of DWPF and PNL 76-68 glass in a gamma radiation field was completed to 14 days; and, the results indicate that the DWPF glass is more durable than the PNL 76-68 glass.

The matrix study of four-point loaded, bent-beam specimens on welded, furnace-heat treated, and cold-worked alloys has reached 3000 hours of exposure in 100°C J-13 water and steam and shows no evidence of crack initiation in any of the specimens.

In situ electrochemical corrosion potential measurements were begun in the gamma pit facility to determine the changes in corrosion potential with irradiation. The measurements concerned the stability of the saturated calomel electrode in the gamma radiation field; and, it appears that the reference electrode is stable for relatively short exposure to this high field.

WBS 2.3, SITE

Pumping, sampling, and analyses have been completed of groundwater from the isolated upper permeable zone in Well USW H-6. The remaining drilling fluids cleared quickly from the groundwater, and the test was terminated earlier than planned.

A new version of the EQ3/6 chemical-equilibrium computer program was brought up on the LTSS system at LANL that allows calculations at constant gas fugacity, which may be representative of conditions in the unsaturated zone where the aqueous phase is in contact with the gas reservoir.

A new version of the WAFE code was completed and verified, and it is now Fortran-77 compatible. Therefore, it will run on any computer system that supports the Fortran-77 standard. The WAFE code will be used to calculate heat effects near waste containers.

A report on fracture mineralogy in the unsaturated portion of USW G-4 has been completed entitled, "Minerals in Fractures of the Unsaturated Zone from Drill Core USW G-4, Yucca Mountain, Nye County, Nevada." The report indicates that the fracture mineralogy of unsaturated-zone samples may differ radically from the host-rock mineralogy.

WBS 2.4, REPOSITORY

Two reports were published that complete a milestone obligation for Waste Handling Operations Plan: "NNWSI Repository Operational Procedure for Receiving, Packing, Emplacing, and Retrieving High-Level and Transuranic Waste," and "NNWSI Repository Worker Radiation Exposure, Volume I, Spent Fuel and High-Level Waste Operations in a Geologic Repository in Tuff."

The program plan for the coordination of surface and underground facilities design was reviewed and revised to reflect group comments at a joint meeting of all project leaders on July 24. Only July 30, a meeting was held at the Bechtel offices in San Francisco to present the program plan to Bechtel and Parsons Brinkerhoff. If adopted, this program plan will require contract modifications to extend the period for conceptual-design engineering through FY 1985 and will culminate with the delivery of a Draft Conceptual Design Report to WMPO at the end of March 1986.

An equipment and operations cost study for vertical and horizontal emplacement was completed for input into a two-stage repository study developed for DOE/HQ. On July 24, a draft report was submitted to WMPO entitled "Two-Stage Repository Development at Yucca Mountain: An Engineering Feasibility Study," which assessed the feasibility of having the first stage of a two-stage repository completed to accept spent-fuel nuclear waste by January 31, 1998, as mandated by the NWPA. The conclusion reached was that the first stage, including waste-handling facility to accommodate spent-fuel receipt of 400 MTU/yr, could be completed before January 31, 1998.

Two reports have been completed: one identifies areas outside of the central area that will be evaluated for underground facility development; and, the other report determines that 1520 acres will be needed for the repository.

This report also identifies emplacement techniques that allow low-heat-producing waste to be emplaced at densities sufficient to ensure that reprocessing or inclusion of defense waste in the inventory will not increase the area requirement.

Phase I of a contract with the Robbins Co. has been completed, which presents the conceptual design of a horizontal-hole drill that could simultaneously install a steel liner during hole drilling. A report will be issued in September that summarizes the results.

A diamond-tipped chain saw has successfully cut a slot 2m x 2m x 1.2cm in moderately welded tuff in the G-Tunnel underground facility. This is a major step in demonstrating the technical feasibility of large-scale field measurements because of the objectives of the Rock Mechanics field-test program has been to develop a better, more cost-effective method of measuring a field value for the modulus of deformation of a fractured rock mass.

WBS 2.5, REGULATORY/INSTITUTIONAL

On July 16-20, the NRC conducted their first data review of the data that supports the design of a nuclear-waste repository in tuff. Fourteen NRC reviewers participated in the review which provided an opportunity for DOE, SNL, and NRC to evaluate data, procedures, and status of data-gathering activities. The review strongly indicated that the use of G-Tunnel test area should be continued for development of test techniques and of procedures to be used in the Exploratory Shaft.

A NNWSI Project/NRC Geochemistry Workshop was held in Los Alamos on July 10-12.

At an SCP Coordinating Group meeting that was held in St. Louis on July 17, a draft set of NNWSI Project positions on the SCP format and content was developed that will serve as a basis for discussion with the NRC. A meeting between NRC and DOE was held on July 26 to discuss the SCP.

In preparation for meetings between EPA and DOE regarding Working Draft #4 of 40CFR191, a summary of NNWSI Project comments that were furnished previously to

DOE/HQ was prepared that identified impacts that the proposed standard could have on the siting process.

At an NRC/ACRS subcommittee meeting in July on the proposed 10CFR60 unsaturated zone amendment, there was some concern that an unsaturated zone amendment could cause a public perception that the NRC was favoring an unsaturated zone site. The NRC staff was unable to explain the need for such an amendment; it was specified in 10CFR60 that such an amendment would be forthcoming.

WBS 2.6, EXPLORATORY SHAFT

A first draft of the design criteria for a 6 ft diameter second shaft was completed and submitted to DOE/HQ for comment.

WBS 2.7, TEST FACILITIES

Spent Fuel Test Climax (SFT-C)

The final draft of the contractor report on measurement of the in situ state of stress at the Climax stock was approved for publication. The report documents and extensive campaign of in situ stress measurements that was conducted to determine the pretest undisturbed state of stress and to examine the influence of heating and nearby underground openings on the state of stress.

Analysis of post-test borehole deformation modulus data has been completed and the results indicate that the deformation modulus is markedly decreased in the vicinity of boreholes where the rock was heated to about 60°C to 65°C for a period of three years. This observation has led to consideration of lower temperature effects on the rock mass.

A laboratory study was completed on the effects of gamma irradiation on the strength and elasticity of Climax granite; the results of the study were documented in "The Effect of Gamma Irradiation on the Strength and Elasticity of Climax Stock and Westerly Granites."

Components of the Data Acquisition System (DAS) were reconfigured and reracked to form a stand-alone system that will be used both to analyze SFT-C data and for development work on this and other Earth Sciences Department projects.

E-MAD, Fuel Temperature Test (FTT) Operation

Results of the analysis of gas samples taken before and after the June 26 and July 6 atmosphere exchange have been received from one of the two laboratories performing the analyses; and no fission products were detected in any of the 0.45 micron full-volume filter samples.

WBS 2.9, PROGRAM MANAGEMENT

In July, audits were made of the USGS calibration facility in Denver and LANL's Metrology/Calibration Facility.

The draft Quality Assurance Procedure interview form was finalized.

FUNDING OVERVIEW

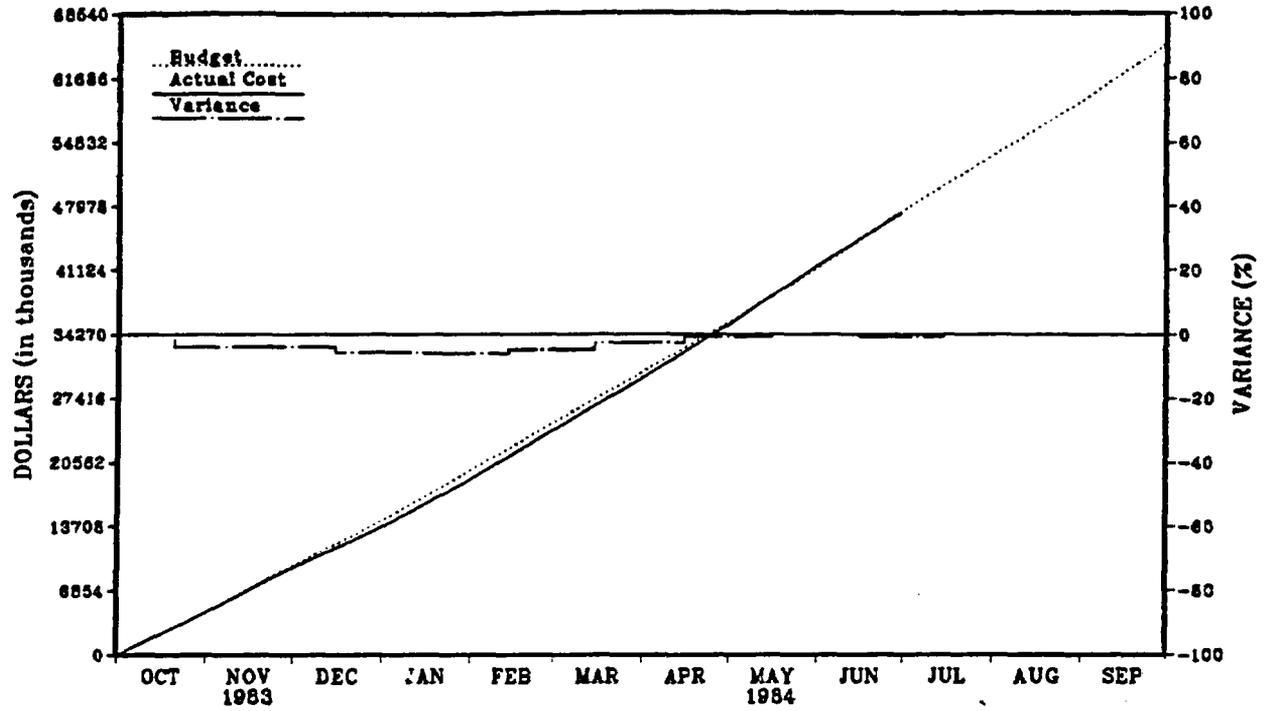
The month-end programmatic estimated costs were \$52,546,000 against a plan of \$53,332,000 resulting in a cost underrun of \$786,000 through the month of July.

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

	<u>Plan</u>	<u>Cost</u>	<u>Variance</u>
2.1 Systems	\$3,059,000	\$2,682,000	\$377,000
2.2 Waste Package	3,976,000	3,764,000	212,000
2.3 Site	18,768,000	19,376,000	<608,000>
2.4 Repository	10,107,000	9,361,000	746,000
2.5 Regulatory & Institutional	2,250,000	2,573,000	<323,000>
2.6 Exploratory Shaft	2,094,000	1,949,000	145,000
2.7 Test Facilities	5,258,000	5,197,000	61,000
2.9 Program Management	6,510,000	6,328,000	182,000
NTS Allocation	730,000	775,000	<45,000>
State Grant	<u>580,000</u>	<u>541,000</u>	<u>39,000</u>
Total	\$53,332,000	\$52,546,000	\$786,000

The plan is based on a \$67M on FY 1984 funding authorization.

NNWSI Project GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	4559.	9581.	14393.	19713.	24850.	30297.	35570.	41487.	47535.	53332.	59186.	65285.
Cost (x1000)	4385.	9207.	13579.	18556.	23681.	29452.	35221.	41435.	47166.	0.	0.	0.
Variance (x1000)	174.	374.	814.	1157.	1169.	845.	349.	32.	369.	0.	0.	0.
% Variance	-4.	-4.	-6.	-6.	-5.	-3.	-1.	0.	-1.	0.	0.	0.

NNWSI PLANNING & SCHEDULING
BUDGET BASELINE
JULY, 1984

<u>CONTRACTORS</u>	<u>BEGINNING FUNDING</u>	<u>CHANGE</u>	<u>ENDING FUNDING</u>
SNL	\$ 17,757	-	\$ 17,757
LLNL	8,298	-	8,298
LANL	9,090	-	9,090
USGS	7,777	-	7,777
SAI	5,861	-	5,861
REEC _o	9,538	-	9,538
H&N	470	-	470
F&S	1,168	-	1,168
WESTINGHOUSE	2,746	-	2,746
WSI	200	-	200
PAN AM	30	-	30
MISCELLANEOUS	579	-	579
NTS ALLOCATION	850	-	850
RESERVE	<u>46</u>	<u>-</u>	<u>46</u>
TOTAL (BA)	\$ 64,410	-	\$ 64,410
FORWARD FINANCING	(500)	-	(500)
CAPITAL EQUIPMENT	<u>3,090</u>	<u>-</u>	<u>3,090</u>
TOTAL (BA)	\$ 67,000	-	\$ 67,000



PROJECT STATUS

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

The final draft of the "Generic Requirements for a Mined Geologic Disposal System" (GR) was sent by the Office of Civilian Radioactive Waste Management to the Office of Geologic Repositories (OGR) projects in early July for concurrence. Staff from SNL and LLNL provided written comments to WMPO on July 18 along with a recommendation that the NNWSI Project withhold concurrence until revisions could be made. Subsequent discussions with OGR staff at DOE/HQ resolved most of the issues responsible for the nonconurrence recommendation. Issues relating to the preclosure waste package, decommissioning, and radioactive waste retrieval remained unresolved at the end of July pending discussions with M. Frei at DOE/HQ-GRD.

Revisions were made to several of the Test Result Groups that constitute the Tuff data base. The sorption/desorption data from circulating and batch experiments, as reported in LA-9328-NS, were revised to include pH and tracer-feed-preparation information reported with the sorption/desorption data in other reports. New and revised hole information as authorized by Holmes and Narver was added to the data base.

NNWSI Project staff made presentations at the Performance Assessment National Review Group (PANRG) meeting that was held in Gaithersburg, Maryland, on July 19-23, 1984. The conceptual model of the hydrologic system at Yucca Mountain was presented along with presentations and discussions on flow and transport codes being used by Performance Assessment.

Internal peer review was completed for a draft report, "Preliminary Bounds on the Expected Postclosure Performance of the Yucca Mountain Repository Site, Southern Nevada," (SAND84-1492) by S. Sinnock, Y. T. Lin, and J. P. Brannen. The report summarizes the available information on hydrology, geochemistry, and rock characteristics, as pertinent for a bounding performance assessment, and it presents the results of calculations by a simple computer code, SPARTAN.

The draft report, "Effect of Host-Rock Dissolution and Precipitation on Permeability in a Nuclear Waste Repository in Tuff," (SAND84-0192), by J. W. Braithwaite and F. B. Nimick was submitted to WMPO/NV on July 18 for policy review. This report is a reference in the NNWSI Project Environmental Assessment (EA) document.

The TRACR3D code, which was developed at LANL to model radionuclide transport in the liquid and vapor phases through isothermal, porous media, was used to successfully reproduce test-case results for an unsaturated flow problem on the SNLA computer system. This resolved a long-standing problem of reproducibility of results using the TRACR3D code. The problem was finally traced to sensitivities to machine precision in the unsaturated-flow subroutines. The original six-sample problems that were provided by LANL along with the TRACR3D code are being rerun at both LANL and SNL with the newest version of the code.

FY 1984 Milestones and strategy for code development, verification, and validation were reviewed and modified to reflect the impact of current NNWSI Project priorities, namely the presentations to the Performance Assessment National Review Group (PANRG) and the data-prioritization study for the SCP. The revised milestones were submitted to WMPO/NV.

The drilling plan for FY 1986 was completed for the Program Manager's presentation in Washington.

USGS completed detailed network diagrams to be used in the FY 1985 Planning Package for hydrology, geology, and site stability. A meeting was held with the SAIC planning staff to discuss these network plans. Major concerns centered around the lack of updating status and milestones in the out-years.

Updating status requires more definitive reporting in the weekly and monthly reports by the various PIs that addresses the key events, milestones, and deliverables.

PLANNED WORK

The Systems Analysis task will perform an integrated assessment of the isolation performance of the entire nuclear waste disposal system proposed for Yucca Mountain. The task will also evaluate the sensitivity of the integrated analysis to various parameters that are used.

In support of the SCP, priorities are being assigned to the information needed by the NNWSI Project Performance Assessment. The initial activity of the Engineered Barrier System (EBS) task was to identify the important first-level parameters that can affect the NRC requirements related to 300-year to 1000-year containment and to the release rate of one part in 100,000 per year at the EBS boundary. After meshing these first-level parameters with those related to groundwater travel time and release to the accessible environment, the more detailed information needs appropriate for each parameter will be defined. Then, using available models and tools, the actual data-priority study will begin.

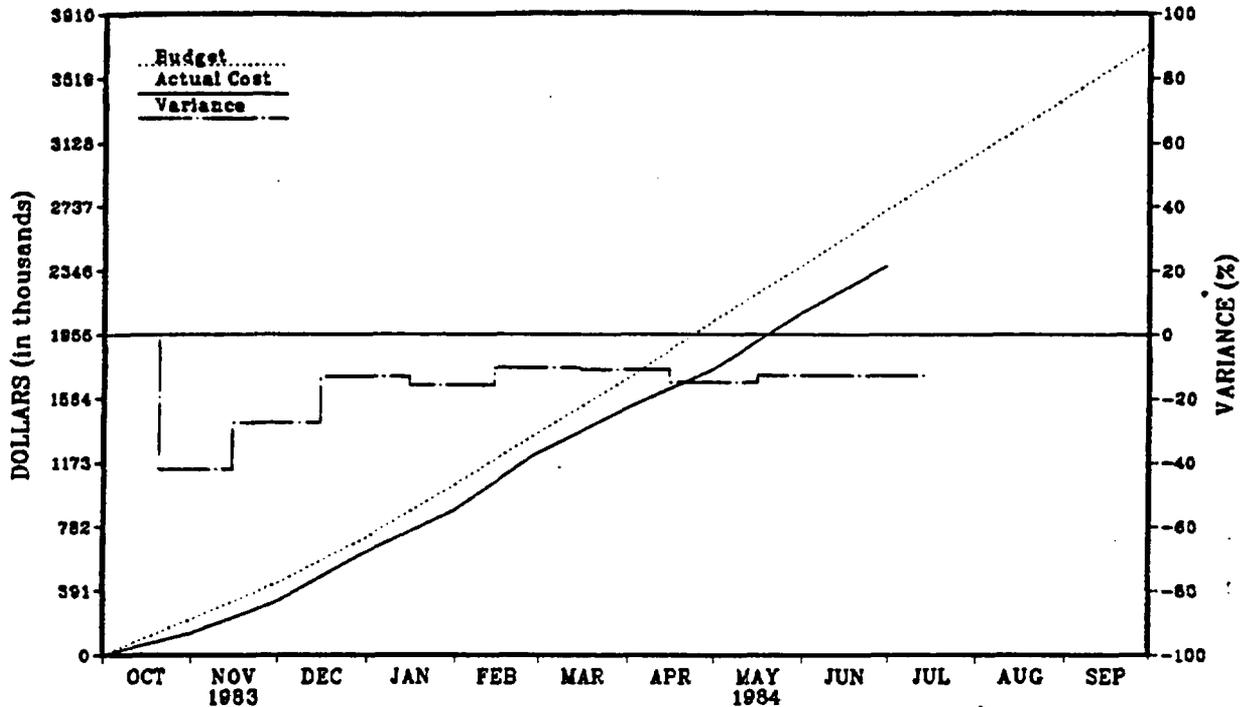
A meeting was held on July 23 to discuss available vapor-transport codes for use in modeling hydrothermal environments near the waste package. It was agreed that a common problem could be defined to satisfy the need for analysis for ES test calculations, SNL Performance-Assessment calculations, and LLNL Waste-Package design calculations. Use of the three codes, WAFE, TOUGH, and NORIA to generate the solutions would serve also as a valuable benchmark study. A formulation of the test problem will be issued by September 1984.

The goal of the data priority study by Performance Assessment for the SCP study is to assign priority levels to data and parameters needed to assess the ability of the site to meet the long-term performance requirements. The prioritization will include a qualification of how well certain parameters must be known and what regimes must be included. The strategy is to investigate the relative sensitivity of predicted rates and releases from the EBS, groundwater travel times, and releases to the accessible environment to ranges of input parameters and model assumptions.

PROBLEM AREAS

None.

WBS 2.1, Systems GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	220.	442.	724.	1043.	1362.	1692.	2046.	2387.	2726.	3059.	3398.	3724.
Cost (x1000)	127.	320.	628.	877.	1219.	1504.	1741.	2083.	2378.	0.	0.	0.
Variance (x1000)	93.	122.	96.	166.	143.	188.	305.	304.	348.	0.	0.	0.
% Variance	-42.	-28.	-13.	-16.	-10.	-11.	-15.	-13.	-13.	0.	0.	0.

Variance Explanation: Continued delays in staffing additional personnel have reduced data base costs. In addition, there has been a reduction in costs because of EA efforts.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
SNL	2.1	PRELIMINARY PERFORMANCE ASSESSMENT FOR EA			▲	◆								
SNL	2.1	PRELIMINARY SYSTEM DESCRIPTION DOCUMENT										▲		◆
SNL	2.1	USERS MANUAL FOR DATA BASE SYSTEM FOR PARTICIPANTS										▲		◆

▲ PLANNED MILESTONE COMPLETION DATE
 ▲ COMPLETED AS SCHEDULED

◆ REVISED MILESTONE COMPLETION DATE
 ◆ COMPLETED AS REVISED

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

The abstracts for a paper entitled "Dachiardite Formation by Hydrothermal Alteration of a Devitrified High-Silica Rhyolite," by Knauss and Beiriger was accepted for presentation at the 1984 GSA National Meeting. Precise cell constants for the Ca-rich zeolite were determined this month using the Guinier camera. Numerous SEM photos were taken this month illustrating crystal habit, twinning, and relationships with coexisting mordenite, clays, and other secondary minerals produced in the experiments.

A report entitled "Reaction of the Topopah Spring Tuff with J-13 Well Water at 120°C" by V. Oversby was completed and distributed for technical review.

The paper entitled "Hydrothermal Interaction of Topopah Spring Tuff with J-13 Water as a Function of Temperature" by Knauss, Delaney, Beiriger, and Peifer, was accepted for presentation at the 1984 Monitored Retrievable Storage (MRS) Annual Meeting in November 1984.

Development of an improved two-dimensional block stability model was completed this month, and work continued on a fully three-dimensional model with which the stability of rock blocks adjacent to emplacement holes can be analyzed. Both models take into account several key parameters that influence block behavior. Parametric studies have since been started with the two-dimensional model in order to define its limitations. The completed models will be checked

by back-calculating the stability of individual blocks that have been measured in the field. When thermally induced stress changes have been incorporated, the model will be used in assessing emplacement hole stability as part of the waste package environment.

Sampling has been completed for the Series II tests using H. B. Robinson fuel and J-13 water to thirty days of reaction time. Uranium in solution at 30 days is approximately 60 ppb in the case of bare fuel. All of the uranium is truly in solution, i.e. it passes through an 18 Angstrom filter. The solutions from the deionized water Series I tests at six months duration showed that most of the uranium was colloidal. The difference observed between the thirty-day J-13 results and the six-month deionized water results for uranium speciation may be due to the difference in water chemistry or to the incubation period for colloid formation.

Parametric testing of DWPF glass to determine the effects of solution volume relative to glass surface area has been completed, and results are being compiled for a final report on the DWPF parametric testing.

Testing of DWPF and PNL 76-68 glass in a gamma radiation field was completed to 14 days. Results indicate that the DWPF glass is more durable than the PNL 76-68 glass. The pH of solutions in contact with the DWPF glass in the gamma field is becoming more acidic, while the pH of solutions in contact with the PNL 76-68 glass is becoming more basic. The presence of tuff and/or stainless steel in the system reduces the level of plutonium in solution.

The rock core that is being used in the analog test (glass inside a rock cavity with partially saturated water flow) was equilibrated with J-13 water at 90°C flowing at the rate of 1.5 ml/day. Following equilibrium, the core was cooled, opened, and examined. There was no detectable water release during cooling. Some water had accumulated in the cavity (intended to contain the glass sample). While it would be preferable not to collect any water in the cavity, the amount of water found probably will not affect the test results significantly. The system was reassembled with a heated input line for water, with a waste package sample placed in the cavity. The flow rate was lowered to 0.2 ml/day, which is closer to the expected flow rate for the repository case.

The matrix study of four-point loaded, bent-beam specimens (ASTM G-39 Test Procedure) on welded, furnace-heat treated, and cold-worked alloys has reached 3000 hours of exposure in 100°C J-13 water and steam and shows no evidence of crack initiation in any of the specimens. The alloys include types 304, 304L, 316L, and 321 stainless steels. Parallel studies conducted on the same alloys in the cold-worked, welded, and unsensitized conditions have reached 1000 hours of exposure in the same environments with no sign of crack initiation in any of these specimens.

An additional plate of each of the materials in the cold-worked condition has been reserved for future use in preparing specimens for the Gleeble. The Gleeble is an instrument that resistance heats small metal coupons, usually to simulate a weld or weld heat-affected-zone (HAZ). Thermocouples are spot-welded to the specimen, which is usually of a geometry resembling a small tensile specimen. A computer program is used to establish temperature control. Temperature can be ramped up or down, in steps or at a constant rate. Gleeble specimens offer an alternative way of creating a time-temperature history in a specimen that subsequently will be exposed to the repository-relevant test environment. The Gleeble specimens simulate continuous cooling conditions as opposed to isothermal conditions obtained in a furnace heat treatment.

Specimens of 316L stainless steel have been heat treated to simulate conditions that a fabricated canister would experience during the waste-form filling and storage operations. Cold-worked material is given a 15-minute treatment at 1000°C to simulate welding. This is followed by either a water or air quench, which is then followed by a treatment at 250°C to produce a low temperature sensitization. The purpose of this sequence of treatments is to effect a structure that represents the combinations of cold work (fabricated canister for spent fuel), high-temperature exposure and cooling (closure weld), and low-temperature exposure (storage in the repository). Some additional specimens are given an 800°C treatment for 17 hours to simulate the glass casting operation for the vitrified waste forms. Another group of specimens has been given the same heat treatments but without the prior cold work. Tests run on this group of specimens will determine the effect of cold work in nucleating sensitized (chromium-depleted) areas in the stainless steel.

A prototype DWPF Type 304L stainless steel canister lid was received from Savannah River Laboratory. The canister lid contained a plug and an upset resistance weld. The weld was radiographed and ultrasonically analyzed for soundness, but the geometry prevented an effective radiograph from being obtained. Ultrasonic pulse-echo tests indicated that one-third of the welded circumference responded differently from that of the remainder. The reason for this difference in response was not explored at the time, but metallographic sections of the affected area showed incomplete fusion, a heavily extruded microstructure, and sensitization along grain boundaries in the most heavily worked regions. Attempts were made to cut specimens for four-point bent-beam stress corrosion tests from the plug-weld-canister lid assembly, but because of the incomplete fusion, these specimens separated readily during machining. An attempt is being made to repeat the machining operation and obtain viable specimens.

In situ electrochemical corrosion potential measurements were begun in late July in the LLNL gamma pit facility to determine the changes in corrosion potential with irradiation. The first measurements concerned the stability of the saturated calomel electrode in the gamma radiation field (up to 3×10^6 rads/hr). It appears that the reference electrode is stable at least for relatively short exposure (a few hours) to this high field. Measurements of the corrosion potentials of the candidate stainless steel canister materials will follow. These measurements will be performed in J-13 water and in concentrated J-13 water in which boil-down has allowed the concentration of the different ionic species to increase by a factor of 100. Other electrochemical potentials, i.e. the pitting and the protection potentials, then will be determined in these environments under irradiated conditions.

Test results obtained to date from evaluation of increases in resistance to localized attack in aggressive environments indicate that the low carbon, high nitrogen austenitic stainless steels (LN grades) should be much more resistant to localized corrosion attack. The pitting potentials for these grades are more positive than those for the L grades. In addition, the passive current densities for the LN grades are lower, and the potential region where a passive state prevails is larger for the LN grades. These observations indicate that

the LN materials form more stable passive films. The role of nitrogen in increasing the passive film stability is being explored through the use of Auger electron spectroscopy.

U-bend specimens of 304 and 304L stainless steel in both the solution-annealed and sensitized conditions have been exposed to tuff-conditioned J-13 well water and vapor in the PNL gamma pit (cobalt 60 source). The 50°C, 6×10^5 rad/hr test and the 90°C, 3×10^5 rad/hr test were disassembled and the specimens were examined after seven months and five months of exposure, respectively. Both tests yielded cracked U-bend specimens. To date, all of the cracked specimens have been sensitized 304, and the cracked specimens were exposed to vapor plus rock region of the test vessel. The 90°C test has produced five failures; the 50°C test has produced three failures. The uncracked specimens will be returned to the test vessels for continued exposure to the irradiated environments.

Five slow-strain-rate tests were completed. Emphasis is being placed on a strain rate intermediate to those used in the past to determine whether it will distinguish between sensitized and non-sensitized material as well as the slow strain rate used previously. The intermediate rate is 5×10^{-6} /sec, compared to the previously used rate of 2×10^{-7} /sec. If the intermediate strain rate proves useful, the one-month test required at 2×10^{-7} /sec could be reduced to a test of a few days' duration. So far reference data have been obtained, i.e., data using air environments and non-sensitized steel in J-13 water. Heavily sensitized specimens (24 hours at 600°C) of high-carbon 304 stainless steel will be exposed to the J-13 test environment to indicate the sensitivity of this intermediate strain rate in indicating stress corrosion susceptibility.

Coupons of CDA 110 (Electrolytic Pitch Copper), CDA 706 (90/10 Cupro-nickel), CDA 715 (70/30 Cupro-nickel), and Monel 400 (a nickel-base alloy containing about 30 percent copper) were exposed to 100°C J-13 water and steam. These tests have now accumulated nearly three months of exposure, and the coupons will be examined in August for weight loss and for any indication of localized patterns of attack. The purpose of this experiment was to gather some

background data on the corrosion of these copper-containing materials in the J-13 water environment (unirradiated). Some of the alloys currently under test are on the Copper Research Association's recommended list.

A spread-sheet program has been completed which estimates waste package and related repository costs for the current reference and some alternative canister designs in vertical emplacement configuration. The program and a summary of calculations will be published in the conceptual design report.

The continuing review and verification of the WAPPA mechanical submode (FMODEL) precipitated several changes and additions to the code to examine and extend its capabilities. First, the stress components are now calculated at the outer radius. The inner radius is the more critical for the primary load case expected in a salt repository (i.e., lithostatic pressure); however in the absence of such external pressures (i.e., expected NNWSI Project emplacement conditions), stresses at the outer radius also must be considered. Second, WAPPA's detailed system diagnostic printout was not operational. A small program change allowed this diagnostic information to be printed and examined. Third, the crack rupture and stress corrosion crack growth submodels are not currently activated because no provision exists to read the initial crack size. A modification to correct this omission should be completed next month.

Waste package staff prepared a presentation for the Performance Assessment National Review Group (PANRG) describing the experimental work and modeling being done at LLNL to determine the radionuclide source term for NNWSI Project Performance Assessment.

A pre-baseline review of the "Generic Requirements for a Mined Geologic Disposal System" document, Volume I dated July 6, 1984, was completed. Comments were forwarded to SNL for inclusion in the NNWSI Project response.

PLANNED WORK

A series of tests reacting actinide-doped PNL 76-68 glass with J-13 water in tuff reaction vessels were started in July. Reaction times of 30, 90, and 180 days are planned at 90°C. All runs are being conducted in duplicate. Some

tests use glass on teflon supports, and others use stainless steel supports. The thirty-day tests were terminated on July 30.

A test matrix for preparing stress corrosion specimens on the Gleeble has been planned. Types 316L and 321 stainless steel specimens will be heated to 900°C and cooled at accurately controlled rates of 0.2, 0.5, and 1°C/sec. The specimens will be simultaneously strained 2 percent. Literature references have indicated that this combination of thermal cycling and strain produce sensitization in high carbon 304 stainless steels. Type 304 stainless steel specimens will also be prepared on the Gleeble for inclusion in this stress corrosion study in an attempt to produce an early failure and will thereby enable the test sensitivity to be estimated.

Samples will be prepared to investigate the effect of mixtures of silica gel of various grain sizes on the properties of packing material based on crushed tuff. Initial tests will be done using various proportions of gel (5 percent, 10 percent, and 15 percent) and a single compression pressure (probably 20,000 psi). If any of the mixtures give promising results, a full pressure-density test will be done and a specimen will be prepared for thermal conductivity measurements.

In FY 1985, WAPPA submodels will be incorporated into a waste package system model (with a flow/transport submodel and data bases for metal corrosion and waste for release rates) to predict the long-term performance of the NNWSI Project waste-package subsystems.

Interpretation of the geotomographs resulting from the HFEM data will proceed. A first draft of the report describing the suitability of HFEM techniques for monitoring saturation changes in fractured, welded tuff will tentatively be completed in August. Review of other types of instrumentation and measurement techniques will continue.

PROBLEM AREAS

None.

2.3 SITE

OBJECTIVE

The objective of this task is to determine whether or not Yucca Mountain is a suitable location for a repository for high-level waste. The effort is divided into two areas of study. The first is the development of the understanding of the characteristics of the rock mass that lies below the surface of Yucca Mountain. This encompasses the study of 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 the development of an understanding of the processes and events that could occur in the environs surrounding Yucca Mountain that could serve as a potential disruptive force to impact a repository. These efforts include the study of the tectonics, seismicity, volcanism, regional hydrology, paleohydrology, and paleoclimatology.

ACTIVITIES

The pumping, sampling, and analyses were completed of groundwater from the isolated upper permeable zone, which is 1994 ft to 2120 ft below the surface in Well USW H-6. Remaining drilling fluids cleared from the groundwater very quickly, and the test was terminated earlier than planned. From these pumping tests, an estimate can be made of the composition of recharge waters upgradient from Yucca Mountain.

Analyses of the chloride contents of soil samples collected last month from a trench at the Exploratory Shaft (ES) site indicate that ^{36}Cl determinations should provide useful infiltration data. Terrain-conductivity measurements taken during the same field trip have been used to select a site for measuring

rainfall infiltration into fractured tuff during the past 25 years by means of the ^{36}Cl "bomb-pulse" technique. The fractured tuff site is at the mouth of Coyote Wash. The site has been found to be free of archaeological artifacts, endangered plants, and endangered animal habitats.

LANL staff members made presentations at the NNWSI Project/NRC Geochemistry Workshop in Los Alamos on mineral stability and the degree of equilibrium between tuff and the pore fluid or groundwater.

A new version of the EQ3/6 chemical-equilibrium computer program was brought up on the Livermore Time-Sharing System at Los Alamos. This version allows calculations at constant gas fugacity; this boundary condition may be representative of conditions in the unsaturated zone where the aqueous phase is in contact with a gas reservoir.

Detailed mapping of the southern part of Yucca Mountain has identified the presence of a pre-Topopah Spring tuff topographic high against which the Topopah thins to approximately one third its characteristic thickness within the repository site. This old high, located within the northern part of the Lathrop Wells 1:24,000 quadrangle, has previously been interpreted as a fault-bounded horst of the Crater Flat tuff of the pre-Topopah age. A detachment-floored model of this structure of Yucca Mountain and the expected relation of the mapped surface faults and fractures to the putative fundamental structure at depth has begun.

The third groundwater sampled from Yucca Mountain is now being used in batch sorption experiments in LANL's study of groundwater composition effects. The water is from Well H-3 and has a pH close to 9 which is much higher than other groundwater studied from the site.

LANL presented the following at the NNWSI Project/NRC Geochemistry Workshop July 10-12:

- Two-dimensional, two-phase WAFE calculations that modeled heat effects in the rock matrix surrounding a heat source produced in a radioactive waste container. These calculations suggest that, for the

proposed container wattage, transport in the matrix cannot occur until the heat source has cooled below 100°C because higher temperatures reduce matrix saturation to zero. Calculations also demonstrated the dependence of results on material properties.

- How computer modeling can relate to and predict experimental results and the importance of realistic conceptualization (e.g., on the microscopic level) in making accurate predictions.
- A discussion of a TRACR3D fracture flow calculation and its application to future calculations modeling the proposed ES experiment.

A new version of the WAFE code was completed and verified on the Los Alamos CTSS, LTSS, and YMS computer operating systems. This current version is now Fortran 77 compatible; consequently, it will run on any computer system that supports the Fortran 77 standard. A copy of this new version sent to LLNL this month should minimize LLNL's conversion efforts. The WAFE code, which calculates transient, two-phase, multi-component mass and heat transport, will be used by LLNL to calculate heat effects near waste containers.

Material properties for Yucca Mountain, supplied by SNL, have been reduced to TRACR3D format.

A report on fracture mineralogy in the unsaturated portion of USW G-4 has been completed. The report is titled "Minerals in Fractures of the Unsaturated Zone from Drill Core USW G-4, Yucca Mountain, Nye County, Nevada." The fracture mineralogy of unsaturated-zone samples may differ radically from the host-rock mineralogy. For example, the sorptive zeolite mordenite is found in fractures throughout the potential Topopah Spring host rock. At least four episodes of fracture-associated mineral formation have been identified. Future work on the fracture minerals may help to constrain the processes and timing of past fracture transport.

The northeastern end of Yucca Mountain was studied for evidence of natural alteration. As a result of this field work, it was found that some exposures show abundant hydrothermal alteration localized in the transition zone between

devitrified, densely welded tuff (candidate host rock) and the underlying vitrophyre. These studies are expected to provide additional information on the effects of hot water percolating through the interval below the candidate host rock.

Trace element modeling has been completed for the basalt cycles of the NTS region. Major element data have been back calculated to parental compositions through subtraction of olivine, clinopyroxene, and minor ilmenite. Linear-regression corrections were made to incompatible trace element data to normalize the data to parental MgO contents. These corrected data were normalized to Mid-Ocean Ridge Basalt (MORB) and chondrite abundances and show distinct mantle sources for the older rift basalts from the silicic episodes and younger rift basalts. This is also supported by strontium and neodymium isotopic data but not by lead isotopic data. All data are consistent with no major changes in conditions of magma generation during the last 4.0 m.y.

During July, a station was installed at the surface and at a depth of 367.9 m in exploratory borehole USW G-20. Sixty ground-motion measurements were made on one underground test during July. Of these, twelve were downhole measurements. The measurements included the first to be made at USW G-2 and at RF-1.

The LLNL copy of the SUPCRT data base was revised according to the "SUPCRT Update Notice" of June 26, 1984. SUPCRT is a product of the Department of Geology and Geophysics, University of California, and is a major source of data for the EQ3/6 thermodynamic data base. All of the SUPCRT data used in the MCRT and EQ3/6 data files were recalculated. These new data have been incorporated into the MCRT data base, but not into the EQ3/6 data base.

The recovery tests following the weeks of pumping from the Bullfrog Member in test well UW H-6 was completed.

The boundary conditions for the unsaturated zone hydrology conceptual mode have been tested individually by SAIC (Golden). The mode is theoretically capable of handling five different boundary conditions: specific pressure head (Dirichlet), specific flux (Neuman), rain or evaporation, seepage and incipient

ponding. The present conceptual model requires only three boundary conditions: Dirichlet, Neuman, and evaporation. Dirichlet and Neuman have been tested successfully using fictitious numbers over short time periods. The data for the model were reduced and simplified to represent a special case that simulates the hydrology of a multi-texture, multi-layer geology. The UZ conceptual modeling effort is now to a point at which where a multitude of computer runs will be made to examine the results with respect to both the input and common sense.

Test well USW UZ-6 was drilled to a depth of 338 ft, but because of caving problems, drilling was suspended temporarily. Consequently, a meeting was held in Las Vegas on July 19 to discuss necessary changes in USW UZ-6 drilling criteria. A new hole has been drilled from 375 ft to 600 ft after casing off the caved zone. A TV camera run to 420 ft (the camera was stopped by a boulder in the hole at this depth) indicated that hole conditions are considerably better in this zone than in the upper part of the hole.

Twenty holes had been completed by the end of July in the shallow neutron holes series for the associated zone investigation.

Drilling at Walker Lake continued through July and was completed at the end of the month with hole depth about 507 ft below lake/bottom interface. The barge was moved a small distance to allow Livingston cores to be taken from an undisturbed location. The initial core samples are being distributed for analysis by contractors. Over 300 ft of core was recovered below the sediment-water interface. Sample processing for pore fluids has begun with good recovery from the first samples. To date 102 precipitation samples have been collected for $\delta^{18}O$ and δD analysis.

PLANNED WORK

As part of the natural isotopichemistry project, samples of tuff will be collected in August at the fracture-tuff site. The ^{36}Cl analyses, which require the use of the University of Rochester tandem accelerator, are scheduled for September. Interpretation of the ^{36}Cl date in terms of rainfall infiltration will follow collection of the ^{36}Cl data.

As part of LANL's Dynamic Transport Processes Project; the anion-exclusion run will be repeated to provide more exact exclusion volumes. Peractinonate will be eluted to compare peractinonate transport with that of other anions.

The analysis of fracture flow data for sorbing tracers will begin next month.

A multi-layered Yucca Mountain TRACR3D calculation involving four different scenarios, which assume both porous and fracture flow, are being made jointly with SNL.

During August, drafts of the milestone reports on petrologic variation within the Topopah Spring Member and on the distribution of Fe, Ti-oxide minerals at Yucca Mountain are planned for completion. These milestone completions are delayed by about one month.

Drafts of reports on alteration within the Topopah Spring basal vitrophyre and on the preliminary 3-D mineralogic model of Yucca Mountain should be completed also in August.

PROBLEM AREAS

The control unit and thermogravimetric analysis module of the DuPont thermal-analysis system have been sent back to the supplier for analysis. Both of these items will be replaced so that studies of mineral-stability kinetics can continue.

A number of problems with the EQ6 have surfaced recently. Diagnosis has shown that most of these are traceable to either an inadequacy of the pre-iteration optimizer, mainly when running the code in the new economy calculational mode, or to difficulties with ITREF, which is a routine used for iterative improvement of linear equations calculations. In either case, the response of the code is to stop before the run has gone the desired distance. These problems have been delaying EQ6 testing and applications.

2.4 REPOSITORY

OBJECTIVE

The objective of this task is to develop the engineering capability to design, construct, operate, and decommission a repository in tuff. Five specific technical areas are involved that include (1) the 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) the engineering analysis and evaluation of the various technical details that are important to the design and operation of a repository; (3) the development of the techniques of sealing a repository as part of decommissioning; and (4) the preparation of a site-specific design that will be accommodated within the development of the equipment to construct the repository, handle the waste and the waste package, and transfer the waste and the waste package within the repository system.

ACTIVITIES

The following two reports were published and complete a milestone obligation for Waste Handling Operations Plan: "NNWSI Repository Operational Procedures for Receiving, Packing, Emplacing, and Retrieving High-Level and Transuranic Waste," (SAND83-1166) and "NNWSI Repository Worker Radiation Exposure, Volume I, Spent Fuel and High-Level Waste Operations in a Geologic Repository in Tuff," (SAND83-7436). This milestone was also reported as being completed on February 29, 1984.

At a joint meeting on July 24, the program plan for coordination of surface facilities and underground facilities design was revised to reflect project-leader comments, was reviewed by all project leaders, and was revised again to reflect group comments. On July 30, a meeting was held at the Bechtel offices in San Francisco to present the program plan to Bechtel and Parsons Brinckerhoff. The contractors were asked to review the program plan and provide comments by mid-August. If adopted, this program plan will require

contract modifications to extend the period for conceptual-design engineering through FY 1985 and will culminate with the delivery of a Draft Conceptual Design Report to DOE/NV-WMPO at the end of March, FY 1986.

An equipment and operations cost study for vertical and horizontal emplacement was completed for input into a two-stage repository study developed for DOE/HQ. On July 24 a draft report was submitted to WMPO entitled "Two-Stage Repository Development at Yucca Mountain: An Engineering Feasibility Study," (SAND84-1351). The report was requested by DOE/HQ to assess the feasibility of having the first stage of a two-stage repository completed to accept spent-fuel nuclear waste by January 31, 1998, as mandated by the Nuclear Waste Policy Act (NWPA). On July 9, in Washington, DC, a presentation of the report status and content including cost information was given to DOE/HQ. The conclusion reached was that the first stage, including a waste-handling facility to accommodate spent-fuel receipt of 400 MTU/yr, could be completed before January 31, 1998. This conclusion was based on DOE-specified guidelines, which directed that delays due to institutional, regulatory, or labor consideration not be addressed.

"Evaluations of the Subsurface Area Available for a Potential Nuclear-Waste Repository at Yucca Mountain" by A. J. Mansure and T. S. Oritz (SAND84-0175) was submitted to WMPO for policy review. This report identifies areas outside of the central area that will be evaluated for underground-facility development. "Underground Facility Area Requirements for a Nuclear-Waste Repository at Yucca Mountain" by A. J. Mansure (SAND84-1153) was submitted to peer review. This report determines that 1520 acres will be needed for the repository. Also, it identifies emplacement techniques that allow low-heat-producing waste to be emplaced at densities sufficient to ensure that reprocessing or inclusion of defense waste in the inventory will not increase the area requirement.

A report titled "The Underground System for Emplacing and Retrieving Contract-Handled Transuranic Waste in a Nuclear Waste Repository at Yucca Mountain," by R. Stinebaugh (SAND-0343); and the report titled "Final Report--Repository Drilled Hole Methods Study," (SAND83-7085) have been released for publication.

Phase I of a contract with the Robbins Co. has been completed. Phase I requested the conceptual design of a horizontal-hole drill that could simultaneously install a steel liner during hole drilling. A report will be issued in September. Phase II of this contract is being negotiated and requires the generation of fabrication drawings and specifications for the drill conceptualized in Phase I.

S. J. Bauer and J. Holland submitted "Calculation of Overburden-Induced Stresses at Rainier Mesa, Nevada," (SAND84-1638A) for peer review. The abstract summarizes recent linear elastic finite-element calculations pertaining to in situ stress at Rainier Mesa and will be presented at the fall meeting of the American Geophysical Union. The work establishes some credibility in using this calculational technique in combination with field measurements to predict the spatial variation of the gravity-loading-induced component of in situ stress. A similar numerical exercise is currently underway for Yucca Mountain and vicinity that will enhance understanding of in situ stresses and will assist in situ stress assessment for the SCP.

A memo summarizing the potential for very-near-field thermal degradation in Topopah Spring tuff, was completed by S. J. Bauer and B. M. Schwartz. Experiments and analysis show no apparent thermal degradation in tuff after subjecting water-saturated samples to dynamic heating and dewatering, which was caused by placing them in an oven preheated to 225°C. This work will contribute to the Special Geoengineering Properties subsection of the SCP.

A diamond-tipped chain saw, fabricated and operated by North Pacific Research (NPR), was used successfully to cut a slot 2m x 2m x 1.2cm in moderately welded tuff in the G-Tunnel underground facility. This accomplishment is a major step in demonstrating the technical feasibility of large-scale field measurements. One of the objectives of the Rock Mechanics field-test program has been to develop a better, more cost-effective method of measuring a field value for the modulus of deformation of a fractured rock mass.

Final preparations were completed and the heat was turned on for the second phase of the small-diameter heater experiments. For this phase, the heater was oriented horizontally. The power level was set at 400 W on July 31 and is to

be stepped to 800 W, 1000 W, and 1200 W after successive eight-day periods. Instruments are being used to measure thermal, hydrothermal, and thermo-mechanical responses at a relatively small scale. Instrumentation includes thermocouples, pressure transducers, a multiple-point borehole extensometer, a neutron probe, and environmental monitoring sensors. Numerical-modeling calculations are underway as a parallel effort.

RE/SPEC performed thermal scoping calculations for the experiment using emissivities that were measured rather than assumed. The measured emissivity for the heater-surface was 0.31 where 0.6 had been assumed. Calculations showed that heater surface temperatures were higher due to the magnitude of the measured emissivity. Numerical calculations for the experiment using the stepped power levels are underway.

The results of an analysis of models used to predict matrix wetting-phase relative-conductivity curves for tuff were documented. The analysis compared five models considered to be representative of the general approaches to calculating relative-conductivity values from saturation vs. pressure-head data or from mercury-intrusion data. The model of Maulem (1976), currently used in Performance Assessment calculations and other hydrologic calculations, was found to predict values consistent with the other models. If the method for calculating relative conductivities by the Brooks-Corey model (1966) is rigorously followed, then the Maulem methods predictions were intermediate with respect to values predicted by the other models. In the absence of experimental data, it is suggested that either the Maulem or the Brooks-Corey method is suitable for use in calculating relative-conductivity curves for tuff.

Computer software for instrumentation for the experimental apparatus to investigate water movement in fractures has been completed. The standard operating procedure has also been written with fracture-permeability tests to be run after tests of the experimental system as a unit.

The results of long-term saturation tests on five tuff samples were documented. The results show that the samples were essentially saturated after 1.6 years of being immersed in water. The samples have picked up a significant amount of water over the last year. The saturation rate was dependent upon the sample

porosity and degree of welding. ASTM saturation standards were found to be inadequate when tuff samples are required to be saturated.

An introductory meeting was held for the seal design and field-test-planning contractor on July 23 to introduce the new contractor, International Technology Corporation (ITC), to the many elements of the NNWSI Project that could impact the design of sealing components. Work flow diagrams that illustrated the logic and activities to be implemented during the course of the contract were also prepared by SNL and presented to ITC for their review and concurrence.

D. Roy, of the Pennsylvania State University (Penn State) and C. Duffy from LANL made presentations on the geochemical aspects of sealing materials evaluation at an overview meeting for the sealing conceptual design activity at SNL.

Penn State has updated and revised two earlier reports and has submitted a draft report, "Reactivity of a Tuff-Bearing Concrete: CL-40 CON-14."

A first step in completion of a dissolution model for a fracture seal was carried out by Penn State and the results were submitted as "Preliminary Dissolution-Model Calculations for a Fracture Seal."

All 90°C and 150°C experiments with the grout formulation 82-22 and Topopah Spring tuff have been completed and the preliminary X-ray diffraction and scanning electron microscope studies of the products are done. Detailed analyses of these results are in progress and will be reported in a topical report.

PLANNED WORK

Operational procedures are being developed for vertical emplacement of canistered waste; these procedures will be used to estimate operator radiation-dose rates for shielding-design purposes.

Sandia is generating a synopsis document on waste retrieval specific to the proposed NNWSI Project repository. The document will identify regulatory

requirements and the means of compliance. It will identify credible, worst-case retrieval scenarios and present methods of handling the resulting circumstances.

An outline for a comprehensive document on retrieval has been completed by R. J. Flores. The document will address, among other topics, legislative and regulatory requirements, means of compliance, requirements for demonstrations, and allowable residuals.

The sealing-concepts report will be submitted for printing during August or early September.

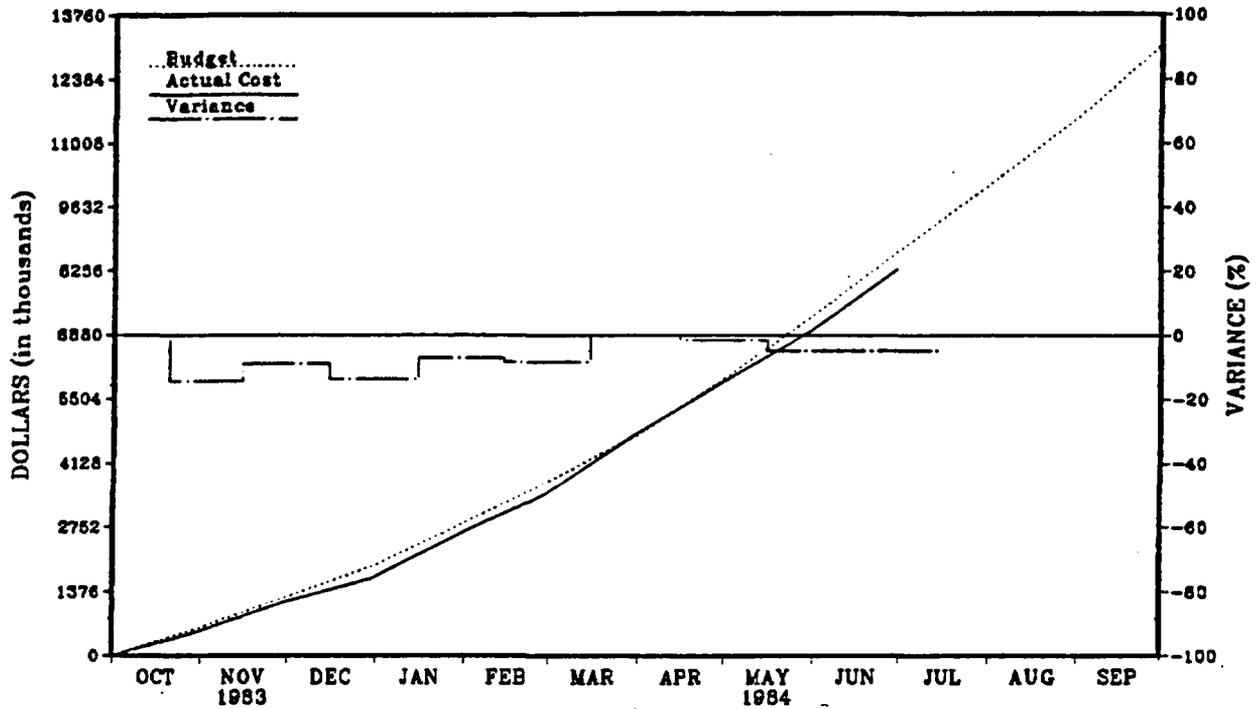
A third draft of "Hydrology/Calculations Contributing to Development of Concepts for Sealing a Proposed Waste Repository at Yucca Mountain, Nevada," (SAND83-2465) was prepared based on SNL comments. This report was then resubmitted for peer review, which was also completed during July. During August, these comments will be incorporated into the next version.

PROBLEM AREAS

A delay in experiments on time-dependent mechanical properties of NTS tuffs as a function of temperature and stress has occurred due to the equipment move. This delay and the longer than anticipated tests on Calico Hills tuff will result in insufficient time to complete work on Topopah Spring tuff before termination date.

A study of the effects of pressure, temperature, strain rate, and saturation on the mechanical properties of the densely welded Topopah Spring has been delayed by approximately four months of equipment problems at RE/SPEC. Testing is now scheduled to begin the third week in August and to be completed in December. No additional costs have been incurred due to the delay.

WBS 2.4, Repository GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	613.	1273.	1951.	2852.	3749.	4765.	5962.	7337.	8713.	10107.	11544.	13113.
Cost (x1000)	525.	1158.	1680.	2646.	3436.	4763.	5867.	6993.	8307.	0.	0.	0.
Variance (x1000)	88.	115.	271.	206.	313.	2.	95.	344.	406.	0.	0.	0.
% Variance	-14.	-9.	-14.	-7.	-8.	0.	-2.	-5.	-5.	0.	0.	0.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	Month											
			O	N	D	J	F	M	A	M	J	J	A	S
SNL	2.4	SUBMIT SUMMARY LOGIC NETWORK FOR REPOSITORY	[Gantt bar with triangle at end of June]											
SNL	2.4	SEAL DEVELOPMENT PLAN FOR REPOSITORY	[Gantt bar with diamond at end of September]											

▲ PLANNED MILESTONE COMPLETION DATE
 ▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
 ◆ COMPLETED AS REVISED

2.5 REGULATORY/INSTITUTIONAL

OBJECTIVE

The objective of the Regulatory/Institutional task is to provide the capability for interfacing with all the institutions and to meet the requirements identified in the 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 Environment Policy Act (NEPA) of 1969, and the Nuclear Waste Policy Act (NWPA) of 1982, 10 CFR Part 60 and 40 CFR Part 191. To facilitate understanding, regulatory and institutional activities may be further subdivided into five categories: (1) Site Recommendation Report, (2) Repository Licensing, (3) Site Characterization Report/Site Characterization Plan (SCR/SCP), (4) Environmental Assessment, and (5) State Interactions.

ACTIVITIES

On July 16-20, 1984, the NRC conducted their first data review of the data supporting the design of a nuclear-waste repository in tuff. Fourteen NRC reviewers participated, including subcontractors and a representative of the State of Nevada. The review provided an opportunity for the DOE, Sandia, and the NRC to evaluate data, procedures, and status of data-gathering activities. The review strongly suggested continuation of the use of the G-Tunnel test area for development of test techniques and procedures to be used for tests planned in the Exploratory Shaft. The review indicated a desire for written procedures, calibration records, and documentation far in excess of that which is normally used in rock-mechanics testing but which is consistent with the developing SNL procedures that support the NNWSI Project work.

During the week of July 23, the NRC visited the USGS in Denver to conduct a Geohydrology Data Review. In addition to the NRC and their contractors, the

State of Nevada and their contractor participated. A document entitled, "Index of USGS Hydrologic Data for NNWSI," was prepared by USGS staff and was forwarded to DOE for use by NRC at the Geohydrology Data Review.

The Los Alamos technical staff participated in the NNWSI Project/NRC Geochemistry Workshop held in Los Alamos on July 10-12. Geochemistry and Mineralogy/Petrology laboratory tours were conducted for NRC and State of Nevada representatives on July 13.

As of August 1, 21 SNL references cited in the NNWSI Project Environmental Assessment (EA) remained to be published before the EA is released for public comment. Copies of the 37 published SNL references in the EA have been provided to DOE.

An SCP Coordinating Group meeting was held in St. Louis on July 17 that resulted in a draft set of NNWSI Project positions on the SCP format and content that will serve as a basis for the discussion with the NRC, which now is scheduled for late September 1984.

In preparation for meetings between EPA and DOE regarding Working Draft #4 of 40CFR191, a summary of NNWSI Project comments that were furnished previously to DOE/HQ was prepared and transmitted to DOE/HQ. The summary identified impacts that the proposed standard could have on the siting process; in particular, the summary identified the problems that could arise from the lack of explicit recognition of the differences between saturated and unsaturated zone disposal.

SAIC staff attended an NRC/ACRS subcommittee meeting on the proposed 10CFR60 unsaturated zone amendment. The committee also heard presentations on DOE's Mission Plan and on the NRC's Internal Waste Management Committee's report. Apparently, there was some concern that an unsaturated zone amendment could cause a public perception that the NRC staff was unable to explain the need for such an amendment; it was specified in 10CFR60 that such an amendment would be forthcoming. ACRS subcommittee written comments are not expected until late August, which will further delay the issuance of the unsaturated zone amendment.

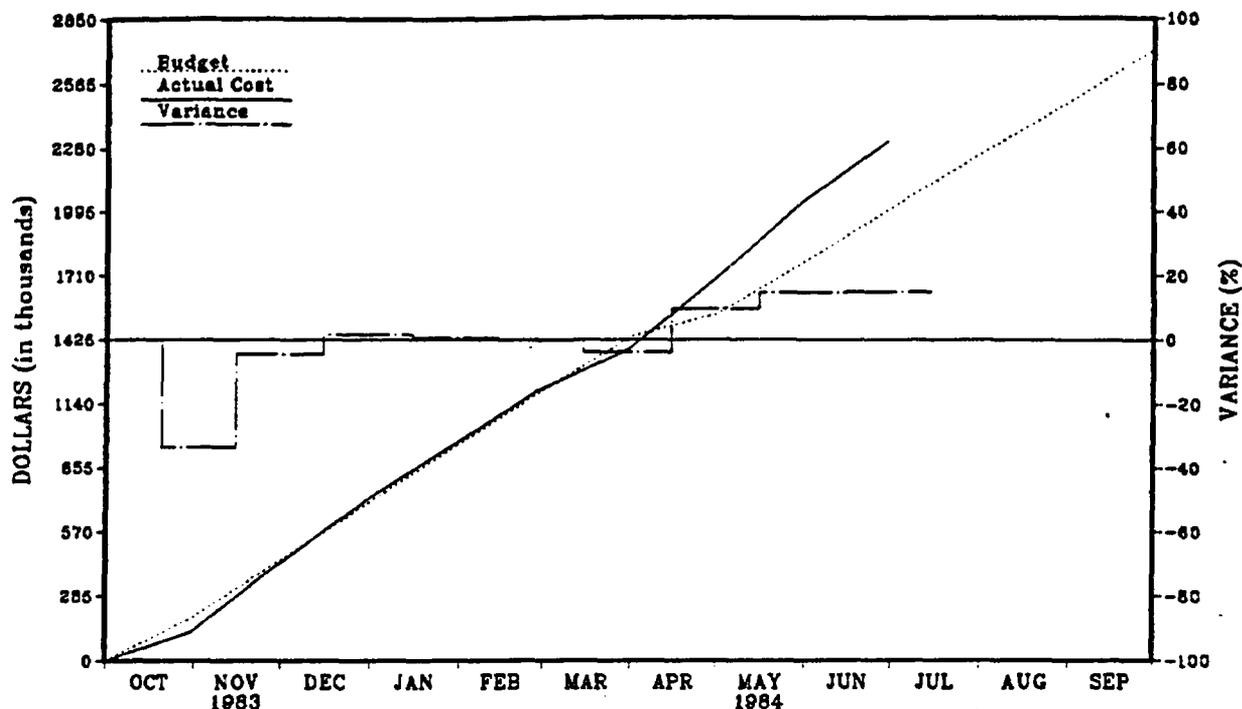
PLANNED WORK

A geology data review tentatively has been scheduled for September 17-28. During that period, the first week will be spent at Yucca Mountain and Menlo Park, and the second week will be spent in Denver.

PROBLEM AREAS

None.

WBS 2.5, Regulatory and Institutional GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	196.	447.	708.	964.	1203.	1440.	1540.	1774.	2010.	2250.	2483.	2715.
Cost (x1000)	130.	427.	719.	969.	1199.	1383.	1688.	2034.	2308.	0.	0.	0.
Variance (x1000)	66.	20.	-11.	-5.	4.	57.	-148.	-260.	-298.	0.	0.	0.
% Variance	-34.	-4.	2.	1.	0.	-4.	10.	15.	15.	0.	0.	0.

Variance Explanation: Overrun is due to schedule changes and redirection of activities to the EA. The original budget authorization did not allocate adequate funds for the EA effort. A revised schedule and cost plan are under review.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S	
SAI	2.5	DRAFT EA	▶												
WMPO	2.5	NNWSI REFERENCES FOR EA COMPLETE	▶										◊		
SAI	2.5	DRAFT SCP TO HQ	▶												△

△ PLANNED MILESTONE COMPLETION DATE
▶ COMPLETED AS SCHEDULED

◊ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

2.6 EXPLORATORY SHAFT

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, the effort will be conducted to define not only the nature of the unsaturated zone with regard to water content and water movement, but the nature of the natural barriers between the repository horizon and the static water level as well.

ACTIVITIES

Representatives of Los Alamos and SAIC met on July 11 in Los Alamos to discuss updating of the ESF construction and testing network, to reconcile the network with the bar charts in Chapter 8 of the Exploratory Shaft Test Plan (ESTP), and to decide on a procedure for updating the ESF cost estimate.

A first draft of the design criteria for a 6 ft diameter second shaft was completed and sent to DOE/NV for comment.

The ESTP Committee members have been evaluating the impacts of the second shaft on their proposed tests and test schedules. The committee will prepare an impact statement as a result of these evaluations. A first effort was made at updating the logic and schedule for the ESTP and ES testing.

PLANNED WORK

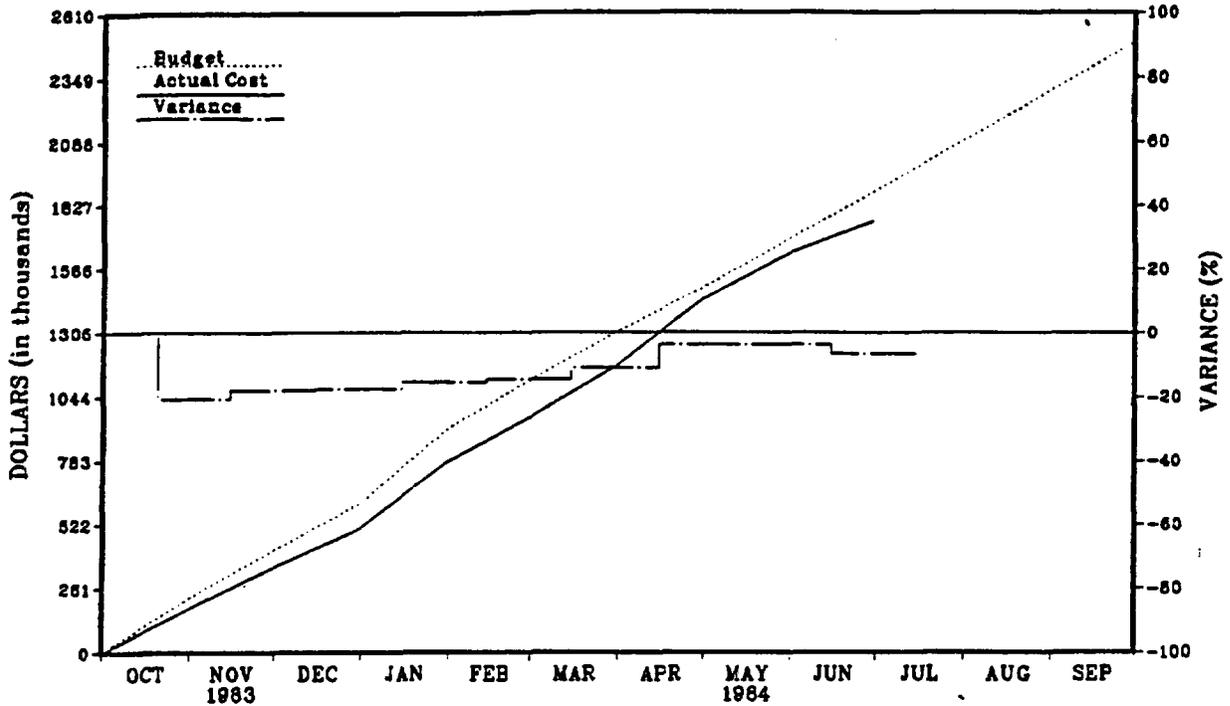
Revision of the Test Plan will proceed and will reflect both the input received from the March ESTP retreat and the comments of LLNL reviewers. The next ESTP Committee meeting is planned for August 16-17; the status of revisions and test plan development efforts should be discussed at that time.

Recommendations will be generated for a new ESF cost-estimating and control system being developed by SAIC. The system will be coupled to the ESF construction and testing network.

PROBLEM AREAS

None.

WBS 2.6, Exploratory Shaft GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	224.	421.	612.	917.	1113.	1313.	1492.	1695.	1887.	2094.	2297.	2490.
Cost (x1000)	178.	348.	504.	773.	949.	1189.	1436.	1629.	1762.	0.	0.	0.
Variance (x1000)	46.	75.	108.	144.	164.	144.	56.	66.	125.	0.	0.	0.
% Variance	-21.	-18.	-18.	-16.	-15.	-11.	-4.	-4.	-7.	0.	0.	0.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
LANL	2.6	COMPLETE ESTP & SUBMIT TO HQ FOR FINAL REVIEW AND APPROVAL											△	◇

△ PLANNED MILESTONE COMPLETION DATE
 ▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
 ◆ COMPLETED AS REVISED

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 Deployment (GRD) Projects. The two major facilities operated under this WBS element include the Climax Spent Fuel Test Facility and the E-MAD Facility.

ACTIVITIES

Spent Fuel Test-Climax (SFT-C)

The draft final contractor report on measurement of the in situ state of stress at the Climax stock was reviewed and approved for publication. This report documents an extensive campaign of in situ stress measurements that was conducted between June-September 1983 and February-April 1984. In addition to determining the pretest undisturbed state of stress, the measurements program also examined the influence of heating and nearby underground openings on the state of stress.

It became evident during the in situ stress measurements that data variability was quite high and, in general, was greater than could be attributed to experimental errors and such factors as anisotropy of deformation moduli (as measured on the overcored rock specimen). A study has been undertaken to determine the influence of nearby geological features on the measurements. As a first step, discussions were initiated with members of the University of Illinois faculty who are examining how alteration zones in a rock mass may influence the measurements of in situ stresses. Geological logging of borehole ISS-11, which will support this study, was completed this month.

Analysis of post-test borehole deformation modulus data was completed. The results of this study indicate that the deformation modulus is markedly decreased in the vicinity of boreholes where the rock was heated to about 60°C

to 65°C for a period of three years. This observation has led to consideration of lower temperature effects on the rock mass. The pillars between the heater drifts and the canister storage drift were heated to 30°C to 35°C during the test. They were also the site of earlier deformability measurements, so data is available to be analyzed for a possible thermal effect. This analysis is planned for August.

Analysis of seismic survey data is nearing completion. Spectral analyses of shear waves acquired during the petite sismique survey were completed. A potential aliasing problem was identified which required a frequency response calibration of the signal enhancement seismograph used for this field study. Preliminary analyses indicate that the problem is not significant. The seismic survey has also indicated a path-length dependence on shear wave dispersion. While the petite sismique technique operates in the frequency domain, the method of data collection facilitated calculation of the dynamic moduli of the rock mass in the time domain. The in situ dynamic moduli values were found to be very similar to the laboratory static moduli values.

Documentation of the radiation dose received by the rock mass in the vicinity of spent fuel storage boreholes was completed and summarized in the following two reports: "Climax Spent Fuel Dosimetry, Short Term Exposure" and "Climax Spent Fuel Dosimetry Progress Report, September 1982 - January 1984," both by W. Quam and T. Devore. In addition to documenting the radiation-absorbed dose for the particular configuration of the SFT-C, these data will be used in comparison with calculated radiation doses; thus they will provide a validation of the code against this data set.

A laboratory study was completed on the effects of gamma irradiation on the strength and elasticity of Climax granite. The results of this study were documented in "The Effect of Gamma Irradiation on the Strength and Elasticity of Climax Stock and Westerly Granites," by W. Durham, J. Beiriger, M. Axelrod, and S. Trettenero. Radiation effects were not anticipated on the laboratory scale, but a study was conducted two years ago to confirm the expected null effect. Surprisingly, a statistically significant effect was observed. Because the data set was highly variable and because of the unexpected nature

of the results, the experiment was repeated. The second study was statistically designed and included Westerly granite as a known low-variability rock type. No radiation effect was observed on strength or elastic moduli of either the Climax or the Westerly granites.

Post-test calculations were undertaken to incorporate recently acquired material properties and state-of-stress data and to evaluate the ability of new models to calculate thermal and thermomechanical responses of the rock mass to simulated repository conditions.

Components of the data acquisition system (DAS) were reconfigured and reracked to form a stand-alone system. This system will be used both to analyze SFT-C data and for development work on this and other Earth Sciences Department projects.

E-MAD

Fuel Temperature Test (FTT) Operation

The month-15 operation of the air-filled metal cask simulation was completed on July 6. The system was shut down over the July 7-8 weekend because of the scheduled facility power outage. The system was restarted on July 9, and heatup for the month-16 temperature profile was initiated. The month-16 criteria was finally achieved on July 13. The maximum temperature of fuel assembly B03 is 233.5°C.

Gas samples were taken and the FTT system atmosphere was exchanged on July 6. The samples included four 500 ml gas samples (two before and two after the atmosphere exchange), full-volume filtration of the FTT atmosphere through a 0.45 micron filter during the atmosphere exchange, and full-volume filtration of the sampling accumulator after the atmosphere exchange.

Analysis results of the gas samples taken before and after the June 26 and July 6 atmosphere exchange have been received from one of the two laboratories performing the analyses. No fission products were detected in any of the 0.45 micron full-volume filter samples. In the gas sample taken before the first

exchange, the Krypton-85 activity was measured at 28,000 picocuries per cubic centimeter (pCi/cc); it decreased to less than 12 pCi/cc in the sample taken after the evacuated FTT was vented to atmosphere. After ten days, the sampling operations were again performed. Krypton activity before the atmosphere exchange was measured at 211 pCi/cc. After the exchange, there was none detected.

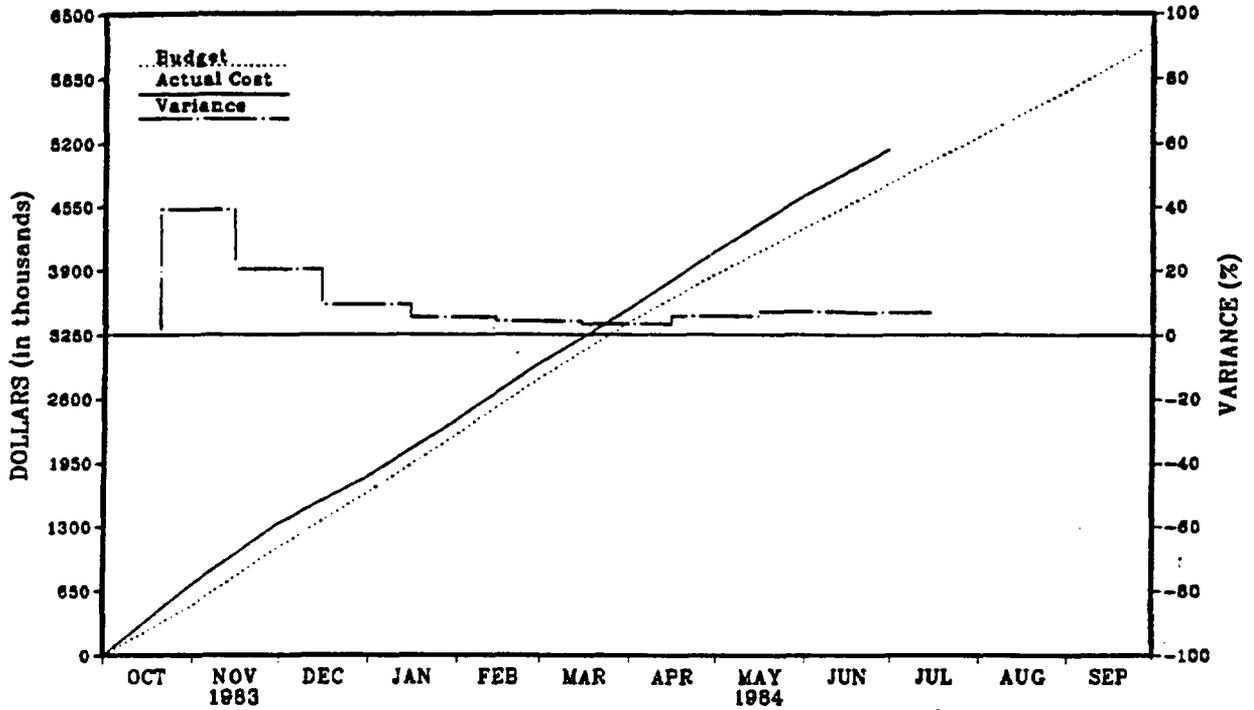
PLANNED WORK

None.

PROBLEM AREAS

None.

WBS 2.7, Test Facilities GOVERNMENT FISCAL YEAR 1984



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Budget (x1000)	506.	1100.	1651.	2249.	2815.	3389.	3870.	4337.	4797.	5258.	5728.	6198.
Cost (x1000)	705.	1323.	1803.	2373.	2932.	3503.	4090.	4646.	5125.	0.	0.	0.
Variance (x1000)	-199.	-223.	-152.	-124.	-117.	-114.	-220.	-309.	-328.	0.	0.	0.
% Variance	39.	20.	9.	6.	4.	3.	6.	7.	7.	0.	0.	0.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	MONTHS											
			O	N	D	J	F	M	A	M	J	J	A	S
LLNL	2.7	TERMINATION OF ROUTINE ACCESS AND LLNL TOUR SUPPORT TO SFT-C						△						◇
LLNL	2.7	COMPLETE DECISION ANALYSIS ON USE OF CLIMAX FACILITY												(OPEN)

△ PLANNED MILESTONE COMPLETION DATE
 ▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
 ◆ COMPLETED AS REVISED

2.8 LAND ACQUISITION

OBJECTIVE

The objective of this task is to maintain access to the 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 the 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.

2.9 PROGRAM MANAGEMENT

OBJECTIVE

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

ACTIVITIES

A meeting of the NNWSI Project QA committee was held July 11, 1984. Gary Romero attended as the SNLA representative. A draft copy of WMPO Interim Change Notice (ICN) No. 0001 was reviewed. The ICN reflects the WMPO evaluation of action items that resulted from a June 5-6 meeting that was held to review NVO-196-17, Rev. 2, the project QA plan.

An audit of the ES portion of the NNWSI Project was accomplished by DOE/AL, DOE/NV, and SAIC on July 16-18. The audit verifies compliance with ANSI/ASME NQA-1, LANL's Quality Assurance Manual, and NVO 196-17.

LANL staff participated in an internal audit of the LANL Metrology/Calibration Facility.

Manuscripts have been completed for 16 QA Technical Detailed Procedures.

The draft Quality Assurance Procedure interview form was finalized according to input from SAIC and the USGS, and potential activities were identified that require technical procedures to evaluate the effectiveness of this form.

On July 18-19 an internal audit was conducted in Denver of the USGS/NNWSI Project calibration program. Various principal investigators were interviewed and their labs were inspected.

The Quality Assurance Section Chief conducted the following surveillance activities:

- o G-Tunnel activities on July 10, 1984
- o Drilling activities on July 11, 1984

The following dates have been established for the WMPO audits:

Audit No.	Audit	Date
84-1	USGS	Closed May 5, 1984.
84-2	LLNL	Closed May 3, 1984.
84-3	SNL	Closed June 6, 1984.
84-4A	F&S	Responses from F&S on the Audit Findings were received and found satisfactory. Follow-up verification is scheduled for August 1984.
84-4B	H&N	Responses received from H&N were found to be satisfactory. Followup verification is scheduled for the end of September.
84-5	USGS	The audit report was issued to USGS.
84-6	LANL	Audit completed July 16-18, 1984. Report is in preparation.

84-7	Westinghouse	Implementation is scheduled for August 28-30, 1984. Preparation is under way.
84-8	REEC0	Implementation is scheduled for August 7-9, 1984. Preparation is under way.
84-9	SAI/T&MSS	September 1984.
84-10	WMPO/Internal	September 1984.

During July, the QASC participated in the following activities:

- July 24, 1984, reviewed the draft HQ-0GRD QA Plan and provided comments to WMPO, which included input from the QAD.
- July 19, 1984, Provided input to DOE/HQ Quality Assurance Coordination Group (QACG) questionnaire on the Qualification and Certification of Inspection and Test Personnel.
- July 24-25, 1984, attended the DOE/HQ QACG meeting that was held in Richland, Washington. Minutes of the meeting will be issued by Ed Sulek, secretary for the group. The next meeting of the QACG is scheduled to be held in Washington, D.C., on October 20, 1984.
- July 30, 1984, participated in a QA status review meeting at WMPO to discuss the status of the QA plans and implementing procedures; records management plan progress; and general areas of concern regarding the implementation of the QA program by all the project participants.

PLANNED WORK

The Participating Organizations and NTS Support Contractors have been instructed to revise their QAPPs and QA administrative procedures to meet the new QA requirements invoked by NVO-196-17, NNWSI Project QAP. The target date for their submittal to WMPO has been established as September 1984. The results of the review of the plans will be reported at that time.

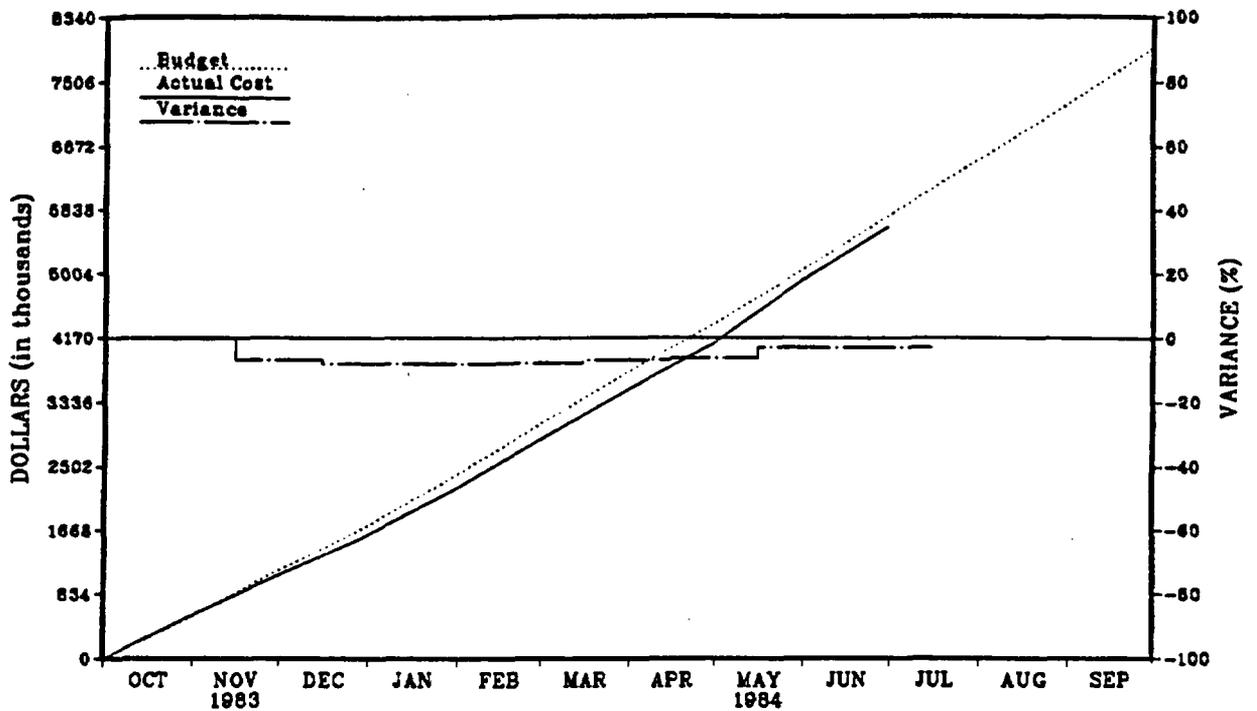
At the July 11, 1984, NNWSI Project QA Committee Meeting, most participants were concerned with the use of data that was generated before the NNWSI Project QAP was issued which has been used to support current activities. On the basis of this concern, the QASC will generate an NNWSI Project SOP that will establish the responsibilities and requirements for handling this situation. The target date for the first draft of this procedure is September 20, 1984.

All quality assurance and technical procedures in the NNWSI Quality Assurance procedure book will be revised to comply with the requirements of NVO 196-17, R2.

PROBLEM AREAS

None.

WBS 2.9, Program Management GOVERNMENT FISCAL YEAR 1984



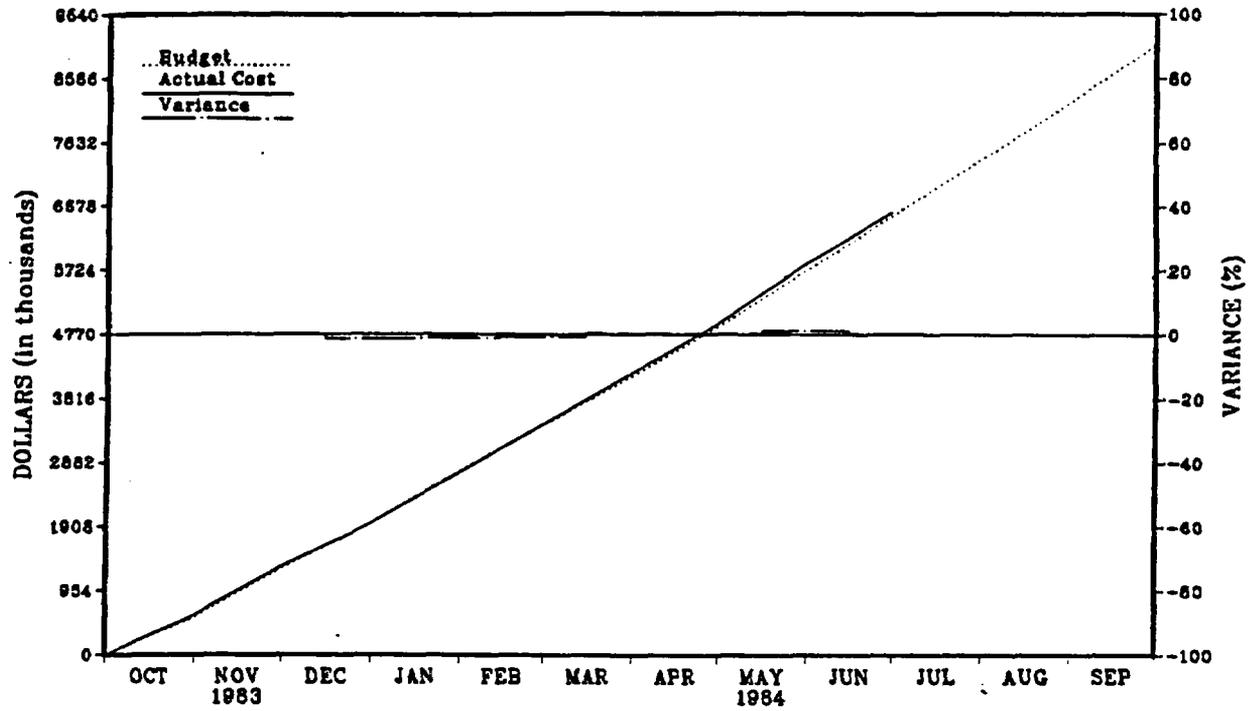
Budget (x1000)	552.	1153.	1738.	2404.	3087.	3761.	4366.	5079.	5787.	6510.	7231.	7945.
Cost (x1000)	551.	1073.	1599.	2208.	2828.	3495.	4091.	4923.	5617.	0.	0.	0.
Variance (x1000)	1.	80.	139.	196.	239.	256.	275.	156.	170.	0.	0.	0.
% Variance	0.	-7.	-8.	-8.	-8.	-7.	-6.	-3.	-3.	0.	0.	0.



PARTICIPANT

BUDGET vs COST

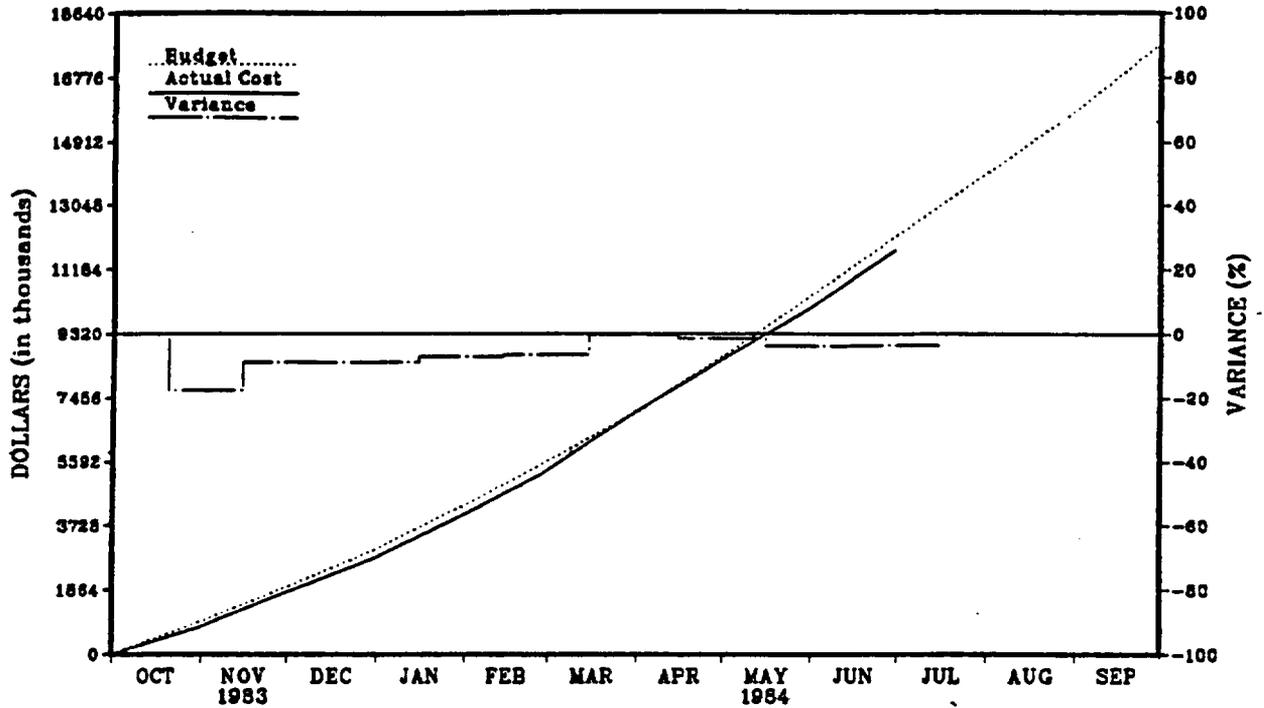
Los Alamos National Laboratory GOVERNMENT FISCAL YEAR 1984



	OCT	NOV 1983	DEC	JAN	FEB	MAR	APR	MAY 1984	JUN	JUL	AUG	SEP
Budget (x1000)	568.	1298.	1971.	2738.	3437.	4183.	4907.	5757.	6588.	7400.	8245.	9090.
Cost (x1000)	568.	1298.	1944.	2703.	3402.	4179.	4923.	5830.	6595.	0.	0.	0.
Variance (x1000)	0.	0.	27.	35.	35.	-16.	-16.	-73.	-27.	0.	0.	0.
% Variance	0.	0.	-1.	-1.	-1.	0.	0.	1.	0.	0.	0.	0.

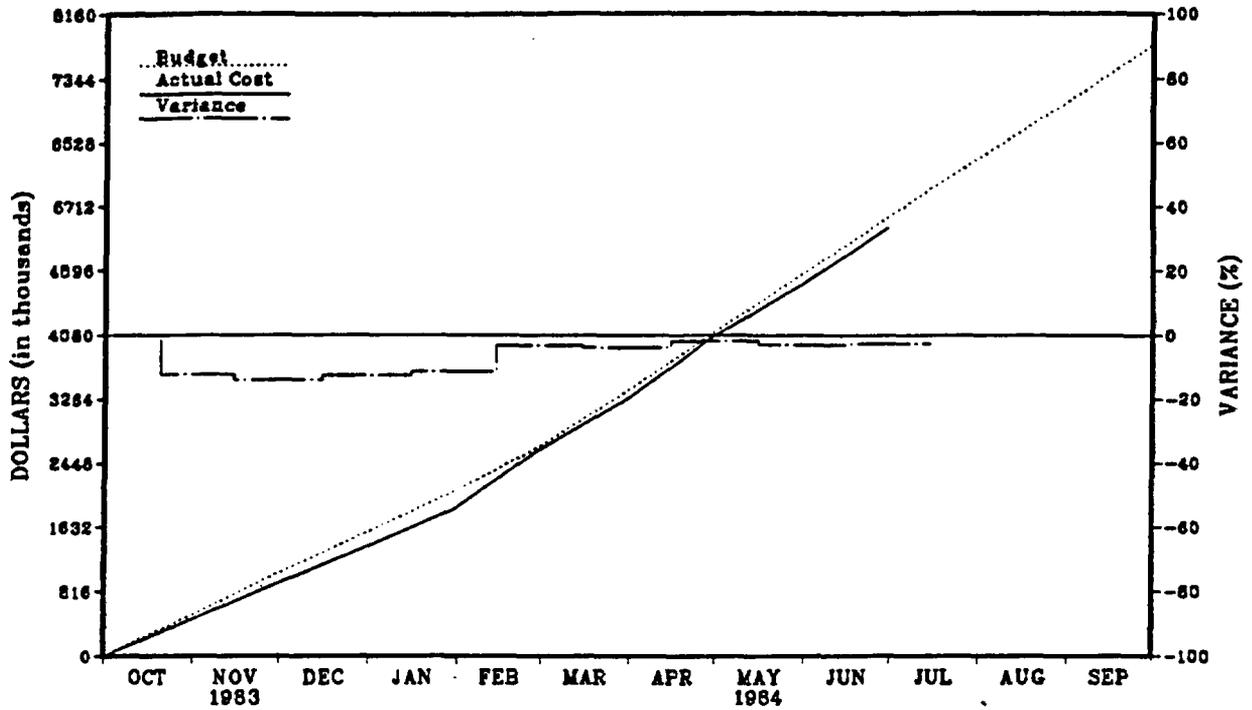
Sandia National Laboratories

GOVERNMENT FISCAL YEAR 1984



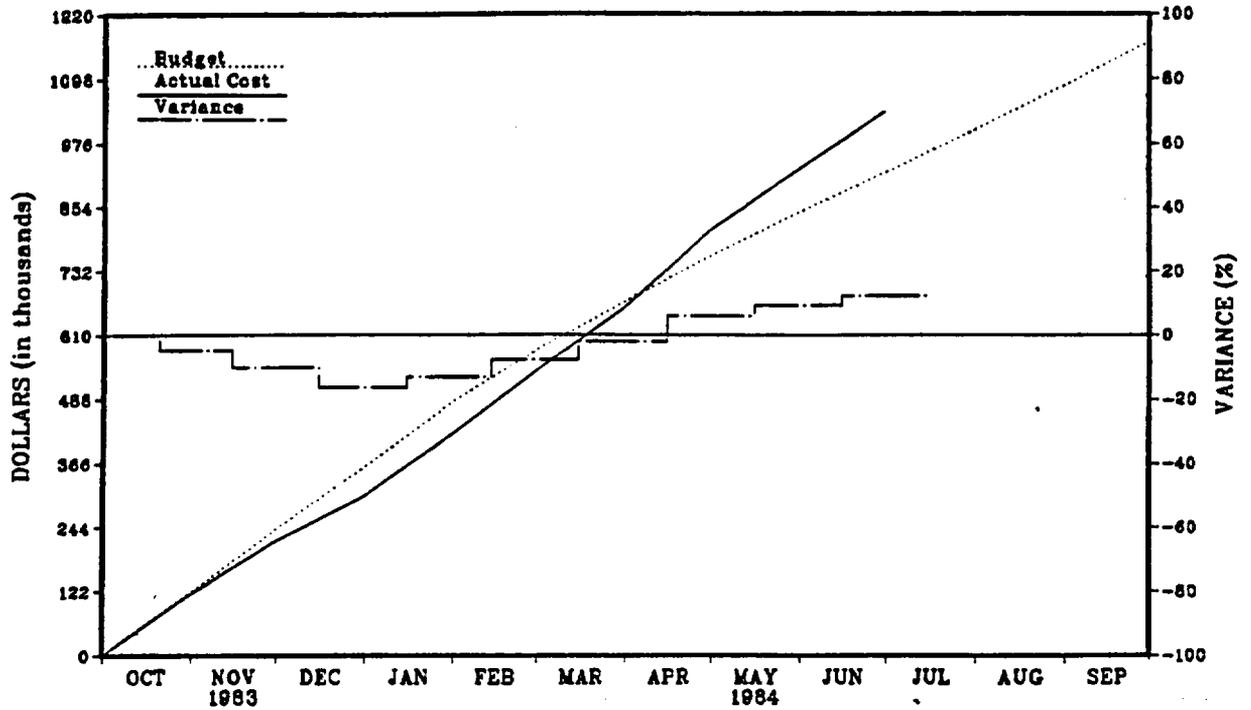
Budget (x1000)	960.	1971.	3068.	4330.	5629.	7060.	8676.	10454.	12195.	13994.	15822.	17767.
Cost (x1000)	790.	1796.	2788.	4025.	5259.	7043.	8536.	10059.	11745.	0.	0.	0.
Variance (x1000)	170.	175.	280.	305.	370.	17.	139.	395.	450.	0.	0.	0.
% Variance	-18.	-9.	-9.	-7.	-7.	0.	-2.	-4.	-4.	0.	0.	0.

U. S. Geological Survey GOVERNMENT FISCAL YEAR 1984



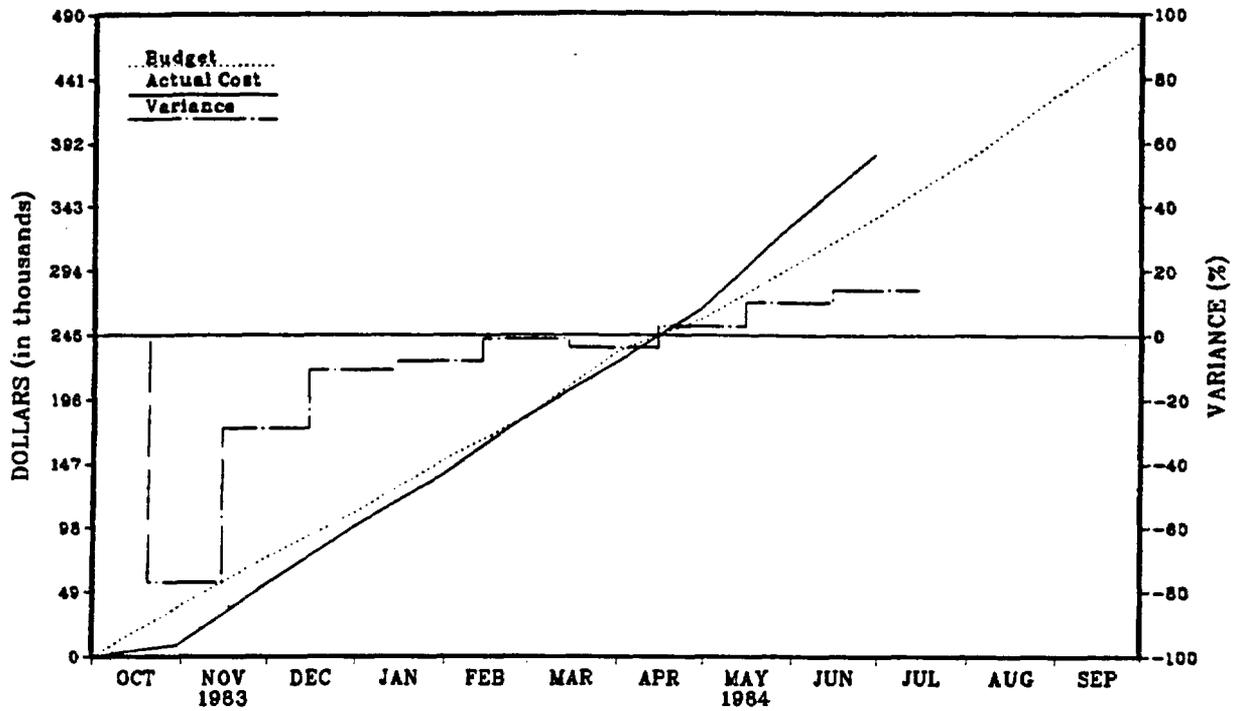
Budget (x1000)	524.	1060.	1583.	2108.	2676.	3402.	4145.	4883.	5608.	6334.	7065.	7777.
Cost (x1000)	459.	911.	1363.	1868.	2565.	3268.	4065.	4732.	5451.	0.	0.	0.
Variance (x1000)	65.	149.	220.	240.	91.	134.	80.	151.	157.	0.	0.	0.
% Variance	-12.	-14.	-11.	-11.	-3.	-4.	-2.	-3.	-3.	0.	0.	0.

Fenix and Scisson, Inc.
GOVERNMENT FISCAL YEAR 1984



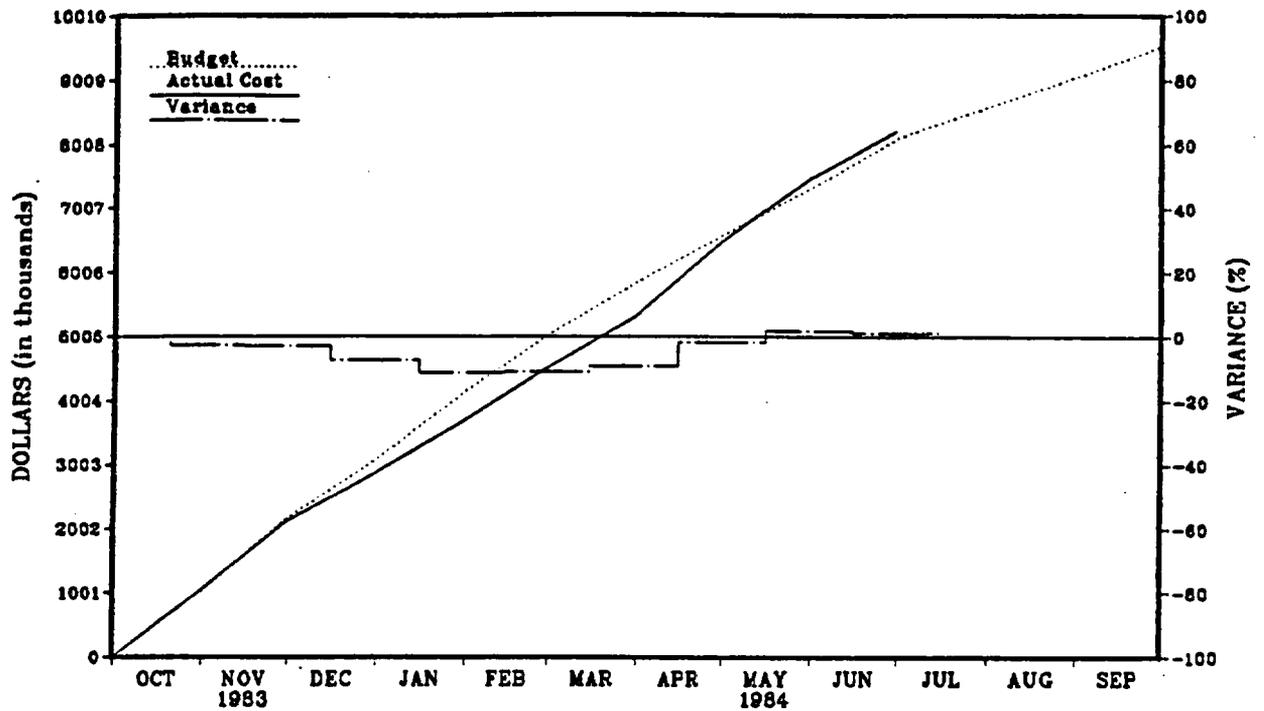
Budget (x1000)	122.	243.	360.	485.	602.	676.	764.	847.	922.	1004.	1087.	1168.
Cost (x1000)	116.	218.	301.	421.	536.	662.	809.	925.	1036.	0.	0.	0.
Variance (x1000)	6.	25.	59.	64.	46.	14.	-45.	-78.	-114.	0.	0.	0.
% Variance	-5.	-10.	-16.	-13.	-8.	-2.	6.	9.	12.	0.	0.	0.

Holmes and Narver, Inc.
 GOVERNMENT FISCAL YEAR 1984



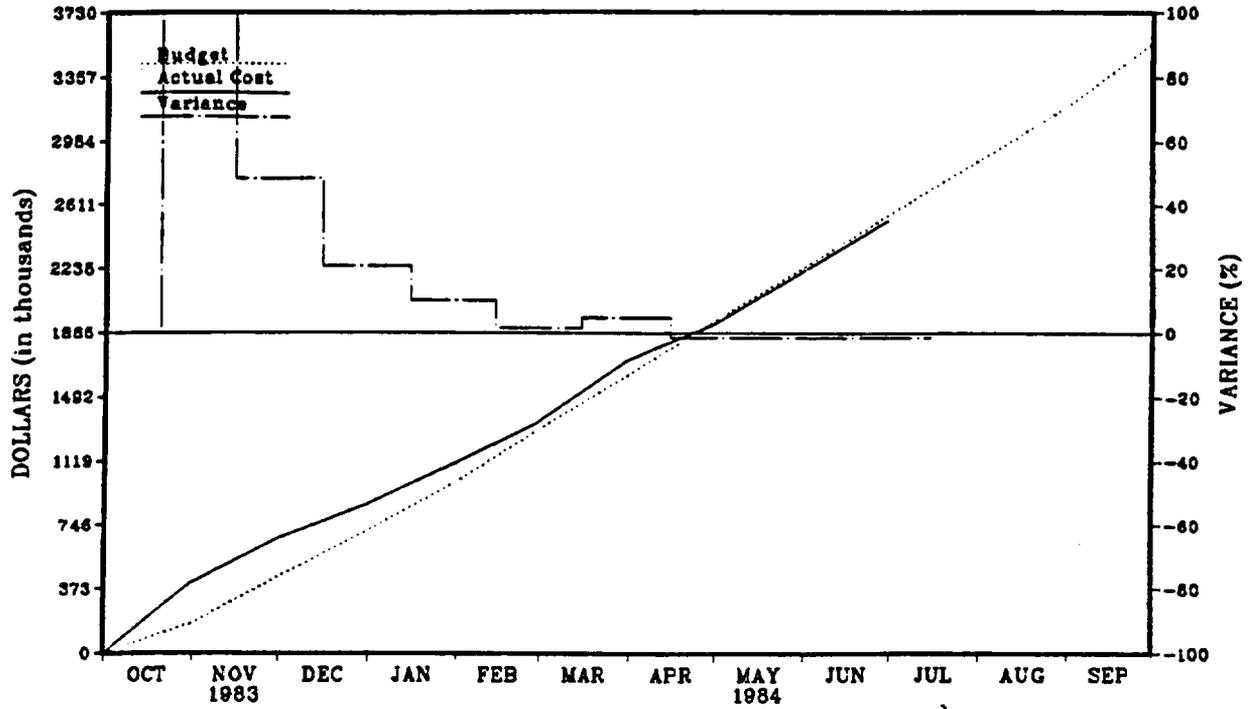
Budget (x1000)	39.	76.	110.	150.	183.	233.	256.	296.	336.	379.	429.	470.
Cost (x1000)	9.	54.	98.	138.	181.	224.	265.	328.	383.	0.	0.	0.
Variance (x1000)	30.	22.	12.	12.	2.	9.	-7.	-30.	-47.	0.	0.	0.
% Variance	-77.	-29.	-11.	-8.	-1.	-4.	3.	10.	14.	0.	0.	0.

Reeco GOVERNMENT FISCAL YEAR 1984



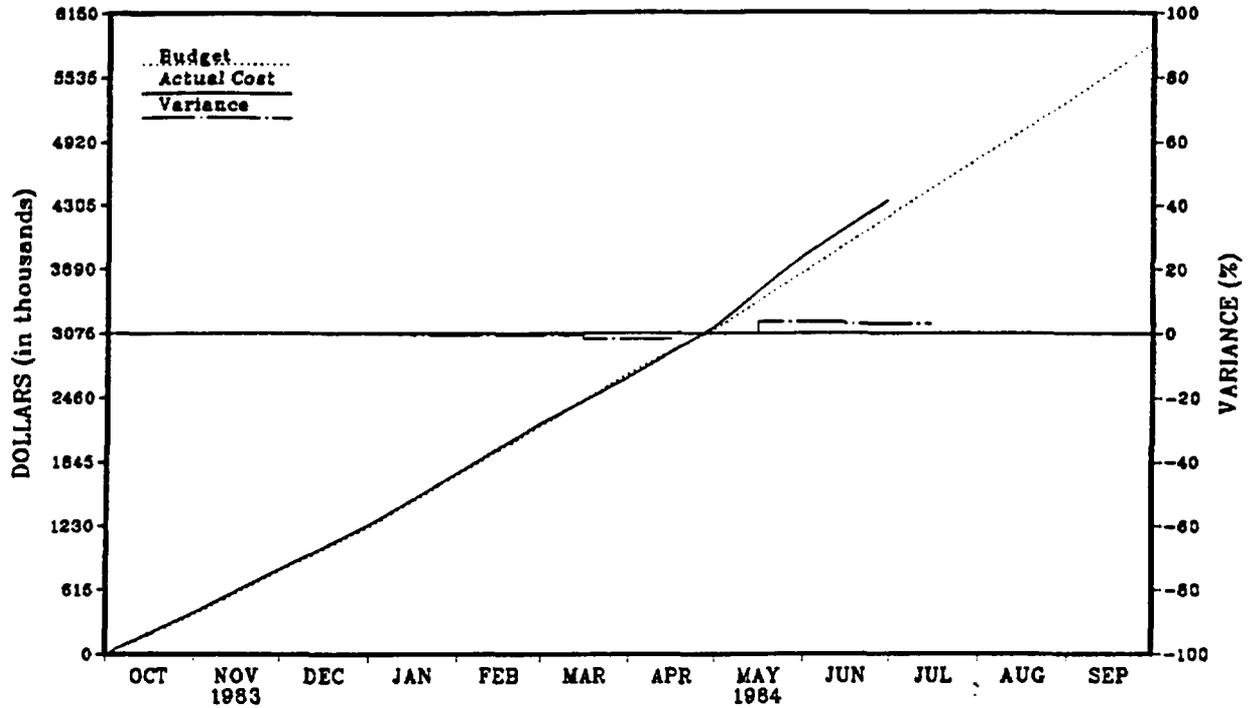
Budget (x1000)	1042.	2182.	3094.	4156.	5043.	5871.	6605.	7346.	8131.	8597.	9063.	9538.
Cost (x1000)	1014.	2115.	2864.	3687.	4485.	5324.	6490.	7470.	8231.	0.	0.	0.
Variance (x1000)	28.	67.	230.	469.	558.	547.	116.	-124.	-100.	0.	0.	0.
% Variance	-3.	-3.	-7.	-11.	-11.	-8.	-2.	2.	1.	0.	0.	0.

Miscellaneous Contractors GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	175.	448.	717.	1003.	1311.	1631.	1942.	2255.	2565.	2877.	3197.	3555.
Cost (x1000)	402.	665.	868.	1106.	1332.	1711.	1913.	2223.	2525.	0.	0.	0.
Variance (x1000)	-227.	-217.	-151.	-103.	-21.	-80.	29.	32.	40.	0.	0.	0.
% Variance	100.	45.	21.	10.	2.	5.	-1.	-1.	-2.	0.	0.	0.

Science Applications, Inc.
 GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	386.	811.	1234.	1727.	2204.	2701.	3128.	3673.	4219.	4766.	5310.	5861.
Cost (x1000)	386.	811.	1232.	1719.	2188.	2650.	3129.	3810.	4350.	0.	0.	0.
Variance (x1000)	0.	0.	2.	8.	16.	51.	-3.	-137.	-131.	0.	0.	0.
% Variance	0.	0.	0.	0.	-1.	-2.	0.	4.	3.	0.	0.	0.

NNWSI LEVEL I MILESTONES

FY 1984

NNWSI NUMBER	WBS	RESP. AGENCY	MILESTONE DESCRIPTION	PLANNED COMPLETION DATE	ACTUAL COMPLETION DATE	REMARKS
M150	2112	SNL	PRELIMINARY PERFORMANCE ASSESSMENT FOR EA	01/15/84	01/15/84	
M151	2111	SNL	PRELIMINARY SYSTEM DESCRIPTION DOCUMENT	08/30/84		BEHIND SCHEDULE
M152	2111	SNL	USERS MANUAL FOR DATA BASE SYSTEM FOR PARTICIPANTS	08/30/84		
----	22	LLNL	SUMMARY LOGIC NETWORK FOR WP DESIGN AND DEVELOPMENT	01/16/84	01/16/84	
M250	2221	LLNL	ESTABLISH INTERIM PRODUCT SPECIFICATIONS	08/30/84		
M251	223	LLNL	PRE-CLOSURE ANALYSIS OF SELECTED CONCEPTUAL DESIGNS	09/28/84		
M352	2317	LANL	DRAFT RPT. ESTIMATING WATER FLOW & RN TRANS. ALONG FLOW PATH	02/02/84	02/02/84	
M353	2352	USGS	GROUNDWATER LEVEL DATA AND PRELIMINARY POTENTIOMETRIC-SURFACE MAPS, YUCCA MOUNTAIN AND VICINITY, NYE COUNTY, NV	06/29/84	03/30/84	
M354	2311	LANL	LETTER REPORT GROUNDWATER CHEMISTRY ALONG FLOW PATHS	08/30/84		
M356	2361	LANL	COMPLETE REPORT ON VOLCANIC HAZARDS ANALYSIS	09/28/84		
M355	232	LANL	PROGRESS RPT. ON 3-D MINERALOGIC MODEL OF YH	08/31/84		
M357	2364	SNL	WEAPONS TEST SEISMIC REPORT	10/30/84		
----	24	SNL	SUBMIT SUMMARY LOGIC NETWORK FOR REPOSITORY	01/16/84	01/16/84	
M447	2431	SNL	SEAL DEVELOPMENT PLAN FOR REPOSITORY	05/30/84		BEHIND SCHEDULE
M592	252	SAI	DRAFT EA	02/29/84	02/29/84	
M523	25	WMPO	NNWSI REFERENCES FOR EA COMPLETE	08/01/84		
M521	254	SAI	DRAFT SCP TO HQ	08/15/84		BEHIND SCHEDULE
M660	2652	LANL	COMPLETE ESTP & SUBMIT TO HQ FOR FINAL REVIEW AND APPROVAL	08/31/84		
M701	271	LLNL	TERMINATION OF ROUTINE ACCESS AND LLNL TOUR SUPPORT TO SFT-C	09/30/84		
M706	271	LLNL	COMPLETE DECISION ANALYSIS ON USE OF CLIMAX FACILITY		OPEN (IN FY84)	