UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Reply to:
301 E. Stewart Ave., #203
Las Vegas, NV 89101

Tel: (702) 388-6125

TO: Joseph Holonich, Director, HLPD, M/S 4 H 3

FROM: Sr. On-Site Licensing Representatives Office, Las Vegas

DATE: JUNE 22, 1993

SUBJECT: OFFICE OF GEOLOGIC DISPOSAL (OGD) WEEKLY HIGHLIGHTS FOR THE WEEK ENDING JUNE 11, 1993; YUCCA MOUNTAIN SITE OFFICE (YMSO) FIELD ACTIVITY REPORT FOR THE WEEKS ENDING MAY 21 AND JUNE 4, 1993

Please find enclosed the above-referenced reports.

There is nothing requiring specific management attention in the report.

cc: w/enc.: Charlotte Abrams, M/S 4 H 3
Rosetta Virgilio, M/S 3 D 23
Dean Kunihiro, Region 5

JSP:nan
Enclosure as stated

NOTE TO CHARLOTTE: Also enclosed is LLNL's May Project Status Report

102
WM-11
NH03

Lawrence Livermore National Laboratory

LLYMP9306050
June 17, 1993

WBS 1.2.9
"QA: N/A"

Carl Gertz, Project Manager
Department of Energy
Yucca Mountain Project Office
P.O. Box 98518
Las Vegas, Nevada 89193-8518

SUBJECT: Yucca Mountain Project Status Report - May 1993
SCP: N/A

Attached is the May Project Status Report for LLNL's participation in the Yucca Mountain Project.

If further information is required, please contact Elizabeth Campbell of my staff at 510-422-7854 or Jim Blink in Las Vegas at 702-794-7157.

Sincerely,

W. L. Clarke
LLNL Technical Project Officer
for YMP

WC/EC

cc:
Distribution

DISCLAIMER

The LLNL Yucca Mountain Project cautions that any information is preliminary and subject to change as further analyses are performed or as an enlarged and perhaps more representative data base is accumulated. These data and interpretations should be used accordingly.

LAWRENCE LIVERMORE NATIONAL LABORATORY YUCCA MOUNTAIN PROJECT

MAY 1993 TECHNICAL HIGHLIGHTS AND STATUS REPORT

TABLE OF CONTENTS

1.2.9 Project Management

WBS 1.2.9.1	Management and Coordination (Clarke)
WBS 1.2.9.1.2	Technical Project Office Management (Clarke)
WBS 1.2.9.2	Project Control (Podobnik)
WBS 1.2.9.2.2	Technical Project Office Management (Podobnik)

1.2.11 Quality Assurance

WBS 1.2.11.1	Quality Assurance Coordination and Planning (Monks)
WBS 1.2.11.2	Quality Assurance Program Development (Monks)
WBS 1.2.11.3	Quality Assurance Verification (Monks)
WBS 1.2.11.3.1	Quality Assurance Verification - Audits (Monks)
WBS 1.2.11.3.2	Quality Assurance Verification - Surveillance (Monks)
WBS 1.2.11.5	Quality Assurance - Quality Engineering (Monks)

1.2.12 Information Management

WBS 1.2.12.2.2	Local Records Center Operation (LRC) (Bryan)
WBS 1.2.12.2.5	Document Control (Bryan)

1.2.13 Environment, Safety and Health

WBS 1.2.13.1	Environment, Safety and Health Coordination and Planning (Blink)

1.2.15 Support Services

WBS 1.2.15.2	Administrative Support (Campbell)
WBS 1.2.15.3	YMSCP Support for the Training Mission (Bryan)

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

MAY 1993

EXECUTIVE SUMMARY
(Items Proposed for Reporting in YMPO or OGD Reports)

1) **1.2.2.2.4 (Engineered Barrier System (EBS) Field Tests).** (Large Block Test (LBT) Environmental management approval was received on May 25 to clear potential test area. REECo completed the clearing and rock surface cleaning activity on June 2.

2) **1.2.2.2.4 (Engineered Barrier System (EBS) Field Tests).** (Large Block Test (LBT) The final drawings of the load-retaining frame has been completed. Procurement of the frame will begin next month. The surface material of the site at Fran Ridge has been removed. Inspection of the site will take place June 1-2. The preparation work for laboratory tests on smaller blocks and quarrying of the large block continued. Preliminary scoping model calculations indicate that it is possible to generate both a dry-out zone and a condensate zone in the block.

3) **1.2.2.3.1.1 (Waste Form Testing - Spent Fuel).** The eight UO_2 dissolution experiments begun in April as a part of the LLNL test matrix were completed. These eight experiments are at temperatures of 50°C and 75°C, and at subatmospheric oxygen levels of 0.2% and 2%. This completes the initial test matrix of nineteen experiments at alkaline conditions. Additional experiments at related conditions were also run to yield 27 experiments finished since early last year. Detailed analysis of the final results of the full test matrix is required before formal conclusions can be made.

4) **1.2.2.3.1.1 (Waste Form Testing - Spent Fuel).** Thermogravimetric Apparatus (TGA). TGA #2 has been brought out of storage and is now fully operational. Oxidation tests of unirradiated depleted UO_2 are expected to start shortly after a dry run and refamiliarization with procedures are completed. The thermocouples in TGA #1 are being calibrated, and this TGA should also be operational shortly.

5) **1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment).** Validating the performance of high-AML systems is facilitated by addressing several fundamental hypotheses:

1) whether heat conduction dominates heat flow,

2) whether a region of above-boiling temperatures surrounding the repository corresponds to the absence of mobile liquid water at the WP environment,

3) whether fracture density and connectivity are sufficient to promote rock dry-out due to boiling and condensate shedding,

4) whether re-wetting of the dry-out zone back to ambient saturation significantly lags behind the end of the boiling period, and

5) whether large-scale, buoyant, gas-phase convection may eventually dominate moisture movement in the UZ.

Analyses have shown that hypotheses 1 and 5 are also important to the performance of low-AML systems. Analysis of large-scale in situ heater tests indicate that after 2 yrs of full-power heating with 21 5.5-kW heaters (3 heater drifts with 7 heaters per drift), temperature measurements will be useful in resolving the first and fifth hypotheses. After 4 yrs of full-power heating, resolution of hypotheses one and five will be even more likely. After 4 yrs of full-power heating, there may be enough information to resolve the second and third hypothesis tests. Partial validation of the fourth hypothesis test will probably require a minimum of 6 to 7 yrs.

6) **1.2.2.3.2 (Metal Barriers).** The carbon steel tubing string removed from Well WH-5 on the north side of Yucca Mountain was examined. The 1100 m long string, which was used as a conduit for an instrument package, was in place for over 10 years and included almost 400 m of exposure below the water table. The section exposed above the water table had little corrosion, but the immersed section showed abundant corrosion products, apparently ferric oxide. Samples will be obtained for characterization to determine the corrosion penetration of the steel, the pattern of attack (generalized or localized), and the nature of the corrosion products. This information will be incorporated in the evaluation of steel as an overpack material in different waste package designs being considered by the project.

7) **1.2.2.3.2 (Metal Barriers).** LLNL is preparing an experimental plan for studying the degradation (oxidation and corrosion) of materials in humid environments. The emphasis of this work will be on carbon steel and other iron-base materials and will focus on the effect of humidity and temperature in the transition from oxidation under "dry" conditions to corrosion under "wet" conditions. A system was designed for generating different humidity levels. This system will be used in conjunction with the thermal gravimetric analysis unit that was recently ordered as part of the YMP capital acquisition.

1.2.1 SYSTEMS ENGINEERING

1.2.1.1 Systems Engineering Coordination and Planning

No significant activities.

1.2.1.5 Special Studies

D. McCright attended a Thermal Goals Workshop meeting on May 12 at YMPO. Each team captain reported on the recommendations of his team for the goals assigned to that team. The goals were written into the SCP in 1988, but since then new considerations in the repository design and the improved knowledge base of the site necessitate review of the goals to determine the original rationale for the goal, whether the individual goals are still relevant, need to be changed, and what the changes should be. Five thermal goals were assigned that most closely affected the engineered barrier system. Our recommendations were:

1) to retain the 500°C limit on the glass waste form;
2) to generally retain the 350°C limit on the spent fuel cladding but to expand the goal to include factors other than temperature that will affect performance,
3) to eliminate the 275°C limit on the borehole wall,

4) to retain, with some slight wording changes, the goal that stated that the actual thermal load could be less than the design limit, and

5) to retain, with an important wording change, the goal that the repository should be designed to maximize the time that the outer waste package surface remains above the boiling point (the SCP goal stated that the borehole wall should remain above boiling for as long as possible). The recommendations of each team were incorporated into a report prepared by S. Saterlie of the M&O for YMPO.

1.2.1.6 Configuration Management

The following three Cost and Schedule Change Requests (C/SCRs) were submitted for CCB consideration:

1) Add LLNL and LANL to WBS element 1.2.3.5.2.2 and delete LLNL from WBS element 1.2.3.5.2.1,

2) Add LLNL into WBS elements 1.2.3.1 and 1.2.5.1, and

3) Modify the WBS 1.2.15.2 description of work.

1.2.2 WASTE PACKAGE

1.2.2.1 Waste Package Coordination and Planning

B. Viani, A. Meike, S. Martin, R. Silva and C. Palmer participated in the YMP Colloid Workshop held May 3-5 in Santa Fe, NM. B. Viani presented results of the analysis of inorganic colloids in NTS ground waters. A strategy for addressing issues related to colloid transport of radionuclides was developed. An initial draft of a strategy document is currently being edited.

W. Glassley attended an International Atomic Energy Agency meeting in Vienna, Austria, to participate in planning and design of a Cooperative Research Program concerning extrapolation of short term studies to long time periods.

1.2.2.2 Waste Package Environment

1.2.2.2.1 Chemical and Mineralogical Properties of the Waste Package Environment

The contract for the work on the New Zealand natural analog site was finalized. The scope of work calls for an initial screening process to select specific sites for study. Site selection, on the basis of simulation requirements and types of problems to be considered, is underway. Contact with corporate entities has also been established. This is required to obtain access to some restricted data that are being used for commercial purposes. Discussions are underway with these entities to determine how best to use the data.

Work on the revised Study Plan 8.3.4.2.4.1, "Characterization of the Chemical and Mineralogical Changes in the Post-Emplacement Environment" continued. The revised Study Plan is expected to be completed by the end of June.

The abstract entitled "Validation of Geochemical Codes Using Natural Systems: New Zealand Geothermal Systems" by C. Bruton, W. Bourcier and W. Glassley for

submittal to the MRS Fal ıeeting in Boston, MA on Noven _ r 29-December 3, has completed internal review and was submitted to YMPO for approval.

The paper entitled "Simultaneous Precipitation Kinetics of Kaolinite and Gibbsite at 80°C and pH3" by K. Nagy and A. Lasaga (Yale University) for submittal to "Geochimica et Cosmochimica Acta" is in internal review.

1.2.2.2.2 Hydrologic Properties of the Waste Package Environment

Model Calculations

Over the past several months, LLNL has been examining the sensitivity of thermo-hydrological performance of the repository-unsaturated zone (UZ) - saturated zone (SZ) system to a broad range of thermal loading design parameters, thermo-hydrological properties and boundary conditions. It has been demonstrated that because of the very small matrix permeability in most of the UZ, the only significant source of liquid water reaching a waste package (WP) and transporting radionuclides to the water table is from nonequilibrium fracture flow from three potential origins:

1) meteoric sources,
2) drainage of condensate generated under boiling conditions, and
3) drainage of condensate generated under sub-boiling conditions by either small-scale or mountain-scale (i.e., large-scale), buoyant vapor flow.

The first source of liquid water arises from the ambient system; the second and third sources are generated by repository heat. Analyses indicate that even for low Areal Mass Loadings (AMLs, expressed in metric tons of heavy initial metal per acre, MTU/acre), the third source of water can persist for tens of thousands of years, given sufficiently large bulk permeability, k_b.

In addition to generating condensate flow, repository heat can redistribute the ambient liquid in the UZ, with regions of net dry-out below the repository and regions of moisture buildup above the repository. These changes in the saturation distribution can impact ambient fracture flow, possibly amplifying the effects of natural infiltration in regions of saturation buildup and attenuating those effects in regions of net dry-out. For AMLs that result in significant dry-out, large-scale buoyant vapor flow can also increase the rate at which the dry-out zone is re-wetted. Analyses indicate that repository-heat-driven changes in the saturation distribution can persist for more than 100,000 yrs. In addition, analyses show that a region of above-boiling temperature can significantly mitigate the impact of fracture flow on WP performance and radionuclide migration for thousands of years.

In past monthly reports, the use of hypothesis tests in model validation has been discussed. Work continued to refine the use of hypothesis tests and to analyze the timeframe over which these hypotheses will be resolved through the use of the large block heater test at Fran Ridge and large-scale in situ heater tests in the ESF.

For high AMLs, above-boiling conditions can persist at the repository horizon for 10,000 yrs, with re-wetting back to ambient saturation taking more than 100,000 yrs. For sub- to marginal-boiling conditions, condensate drainage and episodic

infiltration are controlled by the heterogeneous distribution of hydrological properties, while for above-boiling conditions, they are largely determined thermodynamically. Consequently, during the above-boiling period, hypotheses concerning the performance of high-AML systems can take advantage of processes that assure radionuclide containment in WPs. During the post-boiling period, when the dry-out zone is re-wetting back to ambient saturation, the hypotheses can address processes that benefit radionuclide containment and those which retard radionuclide migration. The formulation of these hypotheses can be based on three considerations:

1) the spatial and temporal extent of above-boiling temperatures,

2) whether the region of above-boiling temperatures surrounding the repository corresponds to the absence of liquid water at the WP environment, and

3) how long it takes the dry-out zone to re-wet back to ambient saturation.

Validating the performance of high-AML systems is facilitated by addressing several fundamental hypotheses:

1) whether heat conduction dominates heat flow,

2) whether a region of above-boiling temperatures surrounding the repository corresponds to the absence of mobile liquid water at the WP environment,

3) whether fracture density and connectivity are sufficient to promote rock dry-out due to boiling and condensate shedding,

4) whether re-wetting of the dry-out zone back to ambient saturation significantly lags behind the end of the boiling period, and

5) whether large-scale, buoyant, gas-phase convection may eventually dominate moisture movement in the UZ.

These hypotheses can also help organize the performance strategy and goals that will be the basis for design decisions for the WP, engineered barrier system, and repository. The validation of these hypotheses will profoundly reduce the impact of hydrogeological uncertainty on predictions of thermo-hydrological performance.

It is important to note that the primary motivations for extending the duration of the above-boiling period and the subsequent period of sub-ambient saturations are to:

a) minimize the sensitivity of repository performance to hydrological variability,

b) extend the period of radionuclide containment in the engineered barrier system, and

c) during the period of radionuclide migration, reduce the probability of water contacting WPs and reduce the flow rates associated with transport. Another important motivation is to delay the period of significant radionuclide migration until the inventory of radionuclides has been substantially diminished by radioactive decay.

Demonstrating that the first two hypotheses are true is very favorable for performance during the above-boiling period. If conduction dominates heat flow, the adequacy of heat flow models will primarily depend on accurate accounting of the thermal properties and thermal loading conditions, which are more readily determined and much less variable than many parameters of the ambient

hydrogeological system. Moreover, the thermal properties are relatively insensitive to hydrothermally driven geochemical effects. The range of Reference Information Base (RIB) values of thermal conductivity at Yucca Mountain only spans a factor of 2. If conduction dominates heat flow, then it should be possible to reliably predict the region of above-boiling conditions surrounding the repository. Demonstrating that the second hypothesis is true favors performance because the absence of mobile water benefits WP integrity and eliminates advective liquid flow as a mechanism for mobilizing and transporting radionuclides.

Demonstrating that the first four hypotheses are true is favorable for post-boiling period performance, which benefits from a persistent zone of sub-ambient saturations surrounding the repository. The first three hypotheses provide the basis for reliably predicting the temporal and spatial extent of the dry-out zone surrounding the repository. The fourth hypothesis provides the basis for predicting how long the dry-out zone persists. Demonstrating that the fifth hypothesis is false is favorable for both above-boiling and sub-boiling performance. Showing that hypothesis five is false will eliminate a major potential source of fracture flow, a major potential mechanism for building up the saturation above the repository, and a major potential mechanism for re-wetting the dry-out zone.

It is critically important that the first and fifth hypothesis tests be resolved even if temperatures never exceed the boiling point. Analyses indicate that it takes on the order of 1000 yrs for large-scale, buoyant, gas-phase convection to affect vapor flow at the center of the repository. It was also found that, given sufficiently large bulk permeability (k_b), large-scale, buoyant gas-phase convection can dominate moisture movement for tens of thousands of years, even for AMLs that never result in boiling conditions. A threshold k_b (called $k_{b,hyd}$) was identified where large-scale, buoyant, gas-phase convection begins to dominate moisture movement in the UZ. Therefore, the fifth hypothesis test is important for all AMLs. It was also found that the threshold k_b (called $k_{b,th}$) where this convection begins to dominate heat flow is about ten times greater than $k_{b,hyd}$. Heat conduction will dominate heat flow unless large-scale, buoyant, gas-phase convection produces a very large vapor flux that results in a very large saturation buildup above the repository horizon and/or a large condensate drainage flux in fractures. Therefore, the first hypothesis test is also extremely important for all AMLs, including those where the average peak temperatures never exceed the boiling point.

Analysis of large-scale in situ heater tests indicate that after 2 yrs of full-power heating with 21 5.5-kW heaters (3 heater drifts with 7 heaters per drift), temperature measurements will be useful in resolving the first and fifth hypotheses. After 4 yrs of full-power heating, resolution of hypotheses one and five will be even more likely. After 4 yrs of full-power heating, there may be enough information to resolve the second and third hypothesis tests. Partial validation of the fourth hypothesis test will probably require a minimum of 6 to 7 yrs.

Incidentally, the 21 5.5-kW heater test reaches a peak temperature of 213°C after 4 yrs of full-power heating. In order to resolve hypotheses one and five prior to the license application deadline in 2001, it is critically important to conduct the heater test at well above the boiling point. Sub-boiling heater tests will require at least

20 yrs to diagnose whether large-scale, buoyant, gas-phase convection may dominate either the moisture movement or the thermal performance in the UZ.

Large-scale in situ heater tests will be conducted at the repository horizon at Yucca Mountain. Because repository heat can drive substantial hydrothermal flow effects throughout the UZ, additional in situ heater tests conducted at other hydrostratigraphic intervals in the UZ and in the SZ could be extremely valuable in resolving the fundamental hypothesis tests. In situ heater tests will also be extremely useful in determining whether hydrothermal flow effects can drive geochemical and geomechanical changes that significantly alter properties within the engineered and natural barriers.

The large block test (LBT) will provide valuable information pertaining to all five hypotheses, particularly the second, third, and fourth hypotheses. Bench-scale block testing would be able to partially validate only the third and fourth hypotheses. The first and fifth hypothesis are heavily site-scale dependent and will require large-scale in situ heater testing to be resolved. Recent hydrothermal modeling of the LBT is summarized in the WBS 1.2.2.2.4 section of this report.

Laboratory Experiments

Work continued to measure electrical resistivity as a function of moisture content of Topopah Spring Tuff samples from the G-4 and GU-3 holes using J-13 water as pore fluid. The samples from GU-3 are used for the high temperature measurements. The samples from G-4 core are for the determination of electrical resistivity as a function of water saturation at room temperature. The specimens are machined both parallel and perpendicular to the axis of the core. Isotropy in electrical resistivity will be determined. For the GU-3 samples, the experiments are at 40°C, in the increasing saturation phase.

Work continued on an experiment to determine the effect of fracture surface coatings on the imbibition of water into the matrix. Eight Topopah Spring tuff samples machined from outcrops from Busted Butte, NV were prepared for this purpose. Work continues to determine the mineralogy of the coating material, the pore size distribution in the coating layers, and the porosity of the samples.

An experiment was started to determine the moisture retention curve and one-dimensional imbibition using G-4 core. The data from this experiment will be used for calculating relative permeability as a function of water saturation. In the one-dimensional imbibition experiment, J-13 water is introduced to the bottom of a sample that is 2.54 cm in diameter, and 10 cm long. The water is being imbibed into the sample against gravity. Eight pairs of electrodes are mounted along the axis of the sample to determine the distribution of moisture content as a function of time. The imbibition rate of water is determined from the water level in a burette. The water saturation front has reached about 5/8 of the sample length.

The preparation of a fractured and intact Topopah Spring tuff sample from the G-4 hole for the fracture healing study and for determining saturated water permeability has been completed.

Meetings and Publications

W. Nelson and S. Mishra (M&O) visited LLNL on May 3 to discuss analytical and numerical studies of the various regimes of repository-heat-driven thermo-hydrological performance issues with T. Buscheck and J. Nitao.

J. Nitao attended the hydrothermal model task force meeting in Denver on May 17 to make a presentation on recent analytical and numerical studies of the major thermo-hydrological regimes and to discuss the recent USGS data which have been provided for the thermo-hydrological modeling support of the thermal loading systems study.

The abstract by J. Roberts and W. Lin entitled "The Effects of Water Saturation and Water Chemistry on the Electrical Conductivity of Topopah Spring Tuff" was presented at the American Geophysical Union meeting in Baltimore, MD on May 24-28.

1.2.2.2.3 Mechanical Attributes of the Waste Package Environment

YMPO has received comments from the NRC on Study Plan 8.3.4.2.4.3, Rev. 0, "Characterization of the Geomechanical Attributes of the Waste Package Environment". Preparations of responses to the comments and associated revisions to the Study Plan were initiated.

Work continued on Activity Plans for both laboratory and numerical studies of the geomechanics of the near field environment.

Thin sections of several samples of Topopah Spring tuff were prepared from core ends of samples to be tested on the geochemical and hydrologic tasks. The microstructure of these sections will be analyzed using image processing techniques, and results will be shared with other investigators on the project. These results will aid in understanding the fundamental properties of the pore structure and in identifying any changes in pore structure that may occur during laboratory testing.

1.2.2.2.4 Engineered Barrier System (EBS) Field Tests

Large Block Test (LBT)

The Scientific Investigation Plan (SIP) for the Large Block Test was reviewed by YMPO. Comment resolution has been started. Linkage of the SIP to the (draft) Study Plan 8.3.4.2.4.4. has also begun.

The final drawings of the load-retaining frame have been completed. Procurement of the frame will begin next month. Environmental management approval was received on May 25 to clear the potential test area. Inspection of the site will take place June 1-2. REECo will complete the clearing and rock surface cleaning activity on June 2. The preparation work for laboratory tests on smaller blocks and quarrying of the large block continued. Preliminary scoping model calculations

indicate that it is possible to generate both a dry-out zone and a condensate zone in the block.

Review of specifications continued for several diagnostic systems for the LBT. These include an optical extensometer, multiple point displacement extensometer (MPBX) system, a strain gauge emplacement system, stress meters, acoustic velocity systems and a borehole scanner.

A numerical simulation of the LBT continued. The purpose of this work is to aid in the experimental design of the test and to provide a point of reference for evaluation of various thermal and material models for predicting the block response. The focus is on evaluation of options for the placement of heaters and the rate and duration of heating/cooling cycles, and to assist in the design of the type and location of diagnostic instrumentation, especially for the geomechanical measurements. Preliminary results for temperature, stress and displacement fields as a function of time from start of heating were prepared and compared to results from the V-TOUGH model.

T. Buscheck and K. Lee continued the hydrothermal modeling analysis of the large block heater test. The 3 m x 3 m x 4.5-m-high block has an upper boundary with a constant temperature, pressure, and relative humidity (that allows gas to escape the block). Heat and fluid flow is represented between the block and the underlying rock. The model effectively extends infinitely downward below the ground surface. K. Lee is modeling the block with the use of a two-dimensional model which represents the cross-section that is orthogonal to five parallel, uniformly-spaced, 300-W heaters. The 2-D, cross-sectional model assumes adiabatic boundaries on the sides of the block (i.e. perfect insulator). Because it is 2-D, the cross-sectional model effectively neglects heat flow in the third dimension. The condition of adiabatic lateral boundaries facilitates the applicability of the 2-D model. The 2-D, cross-sectional model is very useful in showing how long it takes for thermal interference between the heaters to occur. T. Buscheck is representing the block with an R-Z axisymmetric model which averages the heating from the individual heaters with a disk-shaped heat source. The 3 m x 3 m cross-sectional area of the block is represented by a circular cross section with a 3.385-m diameter (giving it the same cross-sectional area). The R-Z axisymmetric model does not assume adiabatic sides. Instead it represents the sides having insulation of a specified thickness and thermal conductivity, K_{th}. Because of its large heat capacity and K_{th}, the loading frame (that confines the block) is assumed to be at a constant temperature. If the K_{th} of the insulation is one-tenth that of the rock, a minimum insulation thickness of 2 ft is recommended. However, even for 2-ft-thick insulation, heat loss out of the sides of the block may be larger than preferred. Therefore, the use of guard strip heaters located inside the insulation may be needed to obtain the necessary adiabatic boundary.

D. Stahl (M&O) visited LLNL on May 26 to discuss the LBT. H. Kalia, N. Elkins (LANL) and L. Costin (SNL) visited LLNL on May 27 to discuss planning for the LBT.

1.2.2.2.5 Characterizatio f the Effects of Man-Made Ma ials on Chemical & Mineralogical Changes in the Post-Emplacement Environment

Revision of the Man-made Materials Study Plan 8.3.4.2.4.5 continues.

As a result of contacts made at recent meetings, activities continued with emphasis on procurement of information on introduced materials. Emphasis has been placed on colloids, tracer fluids, water and epoxy compounds. The sources and potential amounts of water under investigation are those that may result from human intrusion and construction of the repository.

The abstract entitled "Introduced Materials and Colloid Formation, A Report on the Current State of Knowledge" by A. Meike and C. Wittwer for submittal to the MRS Fall meeting in Boston, MA on November 29-December 3, has completed internal review and was submitted to YMPO for approval.

The abstract entitled "Chemical Implications for the Presence of Introduced Materials in the Post-Emplacement Environment" by A. Meike for submittal to the MRS Fall meeting in Boston, MA on November 29-December 3, has completed internal review and was submitted to YMPO for approval.

1.2.2.3 Waste Form and Materials Testing

1.2.2.3.1 Waste Form

1.2.2.3.1.1 Waste Form Testing - Spent Fuel

Spent Fuel Dissolution

The eight UO_2 dissolution experiments begun in April as a part of the LLNL test matrix were completed. These eight experiments are at temperatures of 50°C and 75°C, and at subatmospheric oxygen levels of 0.2% and 2%. This completes the initial test matrix of nineteen experiments at alkaline conditions. Additional experiments at related conditions were also run to yield 27 experiments finished since early last year. Detailed analysis of the final results of the full test matrix is required before formal conclusions can be made.

Flow-through dissolution tests at PNL on ATM-106 fuel (PWR fuel with a 50 MWd/kgM burnup and 18% fission gas release) in both oxidized (O/M ~2.4) and unoxidized forms are in progress. Preliminary results from the oxidized specimens do not indicate a high initial release of Tc such as was found earlier with oxidized ATM-105 fuel (BWR fuel with 31 MWd/kgM burnup and 0.6% fission gas release).

Another specimen of ATM-106 fuel was oxidized to U_3O_8 by heating in air overnight at 425°C causing the BET surface area to increase by a factor of about 40 compared with unoxidized particles about 1 mm in size. The large increase in surface area is the result of substantial intra-and inter- granular cracking during oxidation. Flow-through tests on the U_3O_8 material have been completed. Preliminary analytical results indicate that 15% of the total Cs inventory in the fuel

was dissolved in the first 29 hours compared with only 4% of the total uranium. Thereafter, the U and Cs dissolution rates were equal. A possible explanation for the 11% excess of Cs over U dissolution is that some of the Cs may be associated with gas bubbles in the UO_2 fuel matrix. Cracks caused by the oxidation probably intercepted many of these bubbles thereby exposing the associated Cs for immediate dissolution. It was anticipated that oxidizing the fuel to U_3O_8 might also give rise to an increase in the initial dissolution of Tc; this was not observed.

An addendum to the Test Plan for Flow-Through Dissolution Studies on Spent Fuel - Activity D-20-53b was submitted by PNL to LLNL for comment and approval.

W. Gray (PNL) attended the YMPO Colloid Workshop held in Santa Fe, NM on May 3-5. He presented a summary of information on colloid formation from spent fuel dissolution, which was taken from two reports by C. Wilson entitled "Results from NNWSI Series 2 Bare Fuel Dissolution Tests" (PNL-7169) published November 1990 and "Results from NNWSI Series 3 Bare Fuel Dissolution Tests" (PNL-7170) published June 1990.

Spent Fuel Oxidation

Dry Bath Testing

Preliminary testing with the new controlled mode indicated sufficient temperature stability at ~250°C to conduct a drybath test. The drybath was loaded with specimens of fuels at various O/M ratios as per the test plan addendum. The test was run at 255°C for 195 hours and stopped for the first interim examination. Those samples that were initially unoxidized had oxidized to a Δ(O/M) between 0.35 and 0.42 (i.e., essentially all the way to the plateau). Those samples that had been oxidized to Δ(O/M) ~0.4 at 175°C had very little change in O/M which would be expected for samples already on the plateau. A few samples are being removed for x-ray diffraction (XRD) and ceramography.

Calculations performed in support of the revised, elevated temperature (255°C) drybath tests indicated that U_3O_8 formed by oxidation of spent fuel may be unstable due to self-irradiation (α-decay) of the fuel. For 10- to 50-year-old spent fuel, the calculations indicate that U_3O_8 will become completely amorphous in as little as 90 days. In 1000-year-old fuel, U_3O_8 would be expected to lose its crystallinity in approximately 6 months. The amorphization of U_3O_8 due to α-decay may explain the apparent resistance of spent fuel to U_3O_8 formation in tests conducted up to 195°C. This possible transformation will be factored into the determination of the interim examination frequency for the 255°C where U_3O_8 is expected to form.

Due to pressure by the hot cell operators, many samples gathered during the interim examination of the 195°C test, earlier Thermogravimetric Apparatus (TGA) runs, and other drybath examinations are being discarded. Samples of possible future value to the program will be saved.

The abstract entitled "Effects of Air/Steam Oxidation on the Initial Dissolution of Soluble Radionuclides from Spent LWR Fuel" by W. Gray, L. Thomas and

R. Einziger (PNL) for s nittal to the MRS Fall meetir in Boston, MA on November 29-December 3 has completed internal LLNL review and was submitted to YMPO for approval.

Thermogravimetric Apparatus (TGA)

TGA #2 has been brought out of storage and is now fully operational. Oxidation tests of unirradiated depleted UO_2 are expected to start shortly after a dry run and refamiliarization with procedures are completed. The thermocouples in TGA #1 are being calibrated, and this TGA should also be operational shortly. This work is being carried out by OCRWM fellow, B. Hanson.

Materials Characterization Center (MCC) Hot Cell Activities

PNL has made a determination of the spent fuel requirements projected for this project from the current inventory of spent fuel. Inquiries are still being made for the needs of other projects which might have a justifiable need for MCC fuel samples. This information should be assembled in June.

The paper entitled "Rationale for Determining Spent Fuel MCC Acquisitions" by S. Marschman, R. Einziger (PNL) and R. Stout (LLNL) is completing PNL clearance. It will be sent to LLNL in June.

1.2.2.3.1.2 Waste Form Testing - Glass

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

The N2 tests (SRL actinide-doped glass) continue with no sampling period occurring this month. These tests have been in progress for 372 weeks. The N3 tests (ATM-10, a West Valley actinide-doped glass) continue and have been in progress for 290 weeks.

1.2.2.3.2 Metal Barriers

Following discussions with USGS Principal Investigators, D. McCright visited the REECo Sub-dock in Area 25 on May 11 to examine a carbon steel tubing string that had been removed from Well WH-5 on the north side of Yucca Mountain. The string had been used as a conduit for an instrument package placed in the well and had been exposed in the well for more than 10 years. The string was about 1100 meters in length and traversed both the unsaturated and saturated zones. The water level was 705 meters from the surface, the well was cased to a depth of around 750 meters. It was very evident which part of the string was immersed in water and which part was exposed to the atmosphere. There was little corrosion of the part which was exposed to the atmosphere. In fact, most of the original stenciling on the tubing was still intact. The part immersed in the water showed abundant corrosion products, apparently ferric oxide. Arrangements are being made with USGS and REECo to obtain samples from the tubing steel for characterization to determine the corrosion penetration of the steel, the pattern of attack (generalized or localized), and the nature of the corrosion products. This information will be incorporated in

the evaluation of steel as an overpack material in different waste package designs being considered by the project.

J. Mitchell and R. Van Konynenburg are preparing an experimental plan for studying the degradation (oxidation and corrosion) of materials in humid environments. The emphasis of this work will be on carbon steel and other iron-base materials and will focus on the effect of humidity and temperature in the transition from oxidation under "dry" conditions to corrosion under "wet" conditions. A system was designed for generating different humidity levels. This system will be used in conjunction with the thermal gravimetric analysis unit that was recently ordered as part of the YMP capital acquisition.

The mechanical components of the crack growth measurement system have been completed for the laboratory that is being refurbished for this work. Some electrical work is yet to be completed. A project work plan was prepared for the crack growth testing and other experimental work.

Work continues on compiling information on carbon steels, cast irons, and low to intermediate alloy steels. This will be used for the degradation mode survey on this family of materials.

R. Van Konynenburg supplied information on the calculation of radiation dose from radon gas to W. Lin, Task Leader for the Engineered Barrier System Field Tests. He also supplied data to E. Kansa, Principal Investigator in Waste Form Characterization, to help in the modeling of carbon-14 release from Yucca Mountain.

The abstract entitled "Limitations on the Development of a Scientific Basis for Nuclear Waste Management" by R. Van Konynenburg for submittal to the MRS Fall meeting in Boston, MA on November 29-December 3, has completed internal review and was submitted to YMPO for approval.

1.2.2.3.3 Other Materials

This WBS element has not been funded in FY93.

1.2.2.3.4 Integrated Testing

1.2.2.3.4.1 Integrated Radionuclide Release: Tests and Models

Determination of Elemental Profiles in Rocks, Minerals, and Glasses using the Ion Microscope

Samples of single crystals of clinoptilolite previously equilibrated with #1N Na, K, and Ca chloride salts at 85°C were removed from the reaction flasks and embedded in epoxy in preparation for analysis by Scanning Electron Microscopy (SEM) and electron and ion probes. The single crystals were oriented so that (010), (100), and (001) crystal planes would be exposed for subsequent diffusion experiments.

Additional single crystals re added to #1N Na, K, and Ca c ride salts at 85°C for future analysis.

Interactions of Actinide-bearing Solutions with Rock Core Samples

Flow testing continued in an effort to determine the source of the oscillations in differential pressure and flow rates. A sample injection loop was added to the flow-through apparatus and will be used for testing the behavior of a conservative tracer (Br^-).

1.2.2.3.4.2 Thermodynamic Data Determination

The abstract entitled "Collinear Photothermal Deflection Spectroscopy of Liquid Samples at Varying Temperature" by J. Spear, R. Silva, G. Klunder and R. Russo for submittal to "Applied Spectroscopy" has completed internal review and was submitted to YMPO for approval.

1.2.2.3.5 Nonmetallic Barrier Concepts

This WBS element has not been funded in FY93.

1.2.2.4 Design, Fabrication, and Prototype Testing

1.2.2.4.3 Container/Waste Package Interface Analysis

This WBS element has not been funded in FY93.

1.2.3 SITE INVESTIGATIONS

1.2.3.1 Site Investigations Coordination and Planning

This WBS element has not been funded in FY93. LLNL has submitted a C/SCR to the CCB to be added to the WBS Dictionary for this element.

1.2.3.2 Geology

1.2.3.2.1.2.1 Natural Analogue of Hydrothermal Systems in Tuff

This WBS element has not been funded in FY93.

1.2.3.4 Geochemistry

1.2.3.4.2 Geochemical Modeling

Testing and final preparation of the Version 7.2 package continued. A few code bugs, mostly in the new input file reformatters, were caught in late-stage testing and have been resolved. In connection with this testing, the database group was requested to change the names of a few organic aqueous species. Changes were also requested to correct the thermodynamic data of two magnesium hydroxysulfate

minerals which figure prominently in two members of the test case library. The release of Version 7.2 has been delayed until June.

Work is underway on Version 8.0. Following the Software Design Description (SDD), this version is a major re-write incorporating elements of Version 7.1 and the aborted 3270 development line. Recent developments from Version 7.2 are also being incorporated. The input file reformatters created for Version 7.2 are being extended to Version 8.0 to allow conversion of the existing test case library. The design goals for Version 8.0 are described in the Software Requirements Specification (SRS). The new capability of most immediate interest is the modification of EQ6 to make reaction-path calculations allowing various degrees of redox disequilibrium (e.g., metastable presence of sulfate and nitrate under reducing conditions, metastable presence of aqueous organics under oxidizing conditions).

1.2.3.5 Drilling

1.2.3.5.2.2 Engineering, Design, and Drilling Support

LLNL was added to the WBS Dictionary in WBS 1.2.3.5.2.1. The .2 WBS is a better fit for the diagnostic support activities of the LLNL/LANL NTS Geotechnical Engineering Group (GEG), and a C/SCR was submitted to shift the support to that WBS element. LANL was requested to be added to that element to permit funding of development of a new diagnostic instrument at the Los Alamos site.

J. Blink provided a YMP overview and indoctrination to seven people from the GEG at NTS on May 18: these people are now included in the LLNL-YMP personnel list.

1.2.3.10 Altered Zone Characterization

No significant activities.

1.2.5 REGULATORY

1.2.5.1 Regulatory Coordination and Planning

This WBS element has not been funded in FY93. This WBS element has not been funded in FY93. LLNL has submitted C/SCR to the CCB to be added to the WBS Dictionary for this element.

1.2.5.2 Licensing

1.2.5.2.2 Site Characterization Program

The Nuclear Waste Technical Review Board (NWTRB) requested the Metal Barrier Task to make a presentation at the July 13-14 meeting in Denver, CO. The topic to be addressed is thermal effects on corrosion. A planning meeting for all the presenters is scheduled for early June.

D. Chesnut completed is review of Rev. 2 to Stu · Plan 8.3.1.2.2.4, "Characterization of the YM Unsaturated Zone in the ESF".

1.2.5.3 Technical Data Management

1.2.5.3.4 Geologic and Engineering Materials Bibliography of Chemical Species (GEMBOCHS)

GEMBOCHS Change Requests 2, 4 and 5 which were submitted using the CNGBOCHS system were resolved. These requests and their resolution history are filed in CNGREQ. Their summary fields are as follows:

1) CR-2, request to modify data for 2 MHSH minerals (82jan)
2) CR-4, request for thermodynamic data for xylenes
3) CR-5, JEWEL bug; error in solcrt.qf.

JEWEL was used to generate a revised suite of thermodynamic datafiles (DATA0 suite R20) that support the EQ3/6 geochemical software package. These new datafiles incorporate database and software updates that resulted from the resolution of CR-[2,4,5]. The new files were piped through EQPT to generate the corresponding DATA1 suite, which was then transferred to s60:/dberror/data0, where it can be accessed by local users of EQ3/6.

Development continued of a WINDOWS/4GL (mouse-driven) version of JEWEL. This program facilitates interactive point-and-click generation of thermodynamic datafiles for EQ3/6, GT, and other geochemical modeling packages. Effort has been focused on both code development and researching the optimal implementation of Ingres/Net that will facilitate access to the mouse-driven JEWEL by remote users.

The paper by S. Daveler, S. Lundeen and J. Johnson entitled "CNGBOCHS: An Integrated Ingres-Email-Interleaf System for Processing Change Requests Associated with the GEMBOCHS Database and EQ3/6" was approved by YMPO and will be published in June.

S. Lundeen attended the "Ingres World '93" conference held in Santa Clara, CA on May 10-13.

1.2.5.3.5 Technical Data Base Input

The response to the Request for Completion of Site and Engineering Properties Database (SEPDB) Backlog submittal package was submitted to YMPO on May 25. All items were completed and closed.

1.2.5.4 Performance Assessment

1.2.5.4.2 Waste Package Performance Assessment

Work continued on development of the Engineered Barrier System/Near Field Environment (EBS/NFE) Source Term for TSPA-2.

Staff from INTERA visited LLNL on May 18 to discuss temperature dependent process models to be developed by LLNL for use in the INTERA TSPA-2.

Staff from LLNL went to SNL to install a version of Livermore's YMIM code in the SNL-TSPA computer model.

1.2.9 PROJECT MANAGEMENT

1.2.9.1 Management and Coordination

1.2.9.1.2 Technical Project Office Management

W. Clarke and J. Blink attended the TPO meeting in Las Vegas on May 7. W. Clarke and D. Wilder attended the TAG meeting in Los Alamos on May 14. T. Statton and R. St. Clair (M&O) visited LLNL on May 20 to discuss the Annual Plan for Site Characterization (APSC) with the LLNL staff. A follow-up TAG meeting, held in Las Vegas on May 21, was attended by W. Clarke and J. Blink. LLNL submitted requested additional APSC information to the M&O.

J. Blink attended the May 6 Infrastructure Reduction Assessment Team (IRAT) meeting in Las Vegas. He was also interviewed by the DOE IG team on May 14; they seemed very interested in the PA Transition Plan. He attended a number of budget meetings with the M&O and participated in the WBS 1.2.5 mid-year review. Finally, he obtained tracer/fluid/materials information from LANL and provided it to the LLNL PI in WBS 1.2.2.2.5 (Man-Made Materials Effects on Geochemistry). He also met with K. Stetzenbach (UNLV) to discuss the adequacy of projected tracers and the potential for increasing the number of tracers.

D. Wilder provided input on the Yucca Mountain Project to the Environmental Protection Department (LLNL) who hosted a group of gifted school children from Nuevo School in Hillsborough, CA at LLNL on May 13. These children had been chartered with the task of developing a solution to the nuclear waste problem for the United States. LLNL's presentation gave them an overview on ways that Livermore is working on this issue.

J. Blink spent four days at schools throughout Nye County, NV on May 10-13. He presented hands-on science classes to 580 students and 32 teachers in Beatty, Gabbs, Round Mountain, and Duckwater. He also addressed the Nye County School Board, briefed him on his classroom activities and on the LESSON Science Workshop to be held at NTS for Nye County teachers in June. Finally, he held a Boy Scout Atomic Energy Merit Badge Workshop in Tonopah on May 11; three Scouts earned the Merit Badge.

On May 20, J. Blink provided training to new LESSON instructors. On May 24, J. Blink presented hands-on science classes to 75 students at Burkholder Middle School in Henderson, NV.

J. Blink (LLNL), T. Kaisch (M&O), and E. Harle (SAIC), M. Pfister (KLAS-TV 8 weatherman), City Pride Foods, and Pepsi Cola Bottling developed and hosted an

egg drop contest on M 28. Over 250 students from C k and Nye Counties participated. Students used the OCWRM curriculum guide to build protective devices (with limited materials) for raw eggs to be dropped from 2 m. They followed up with the contest in which there were no material limits and drop heights ranged to six stories. Channel 8 covered the egg drop "live" on the noon weather show, gave tours of the station, and produced a news promo from the egg drop video. The promo, which stresses their slogan "People you can count on", has run several times a day for the last few weeks.

1.2.9.2 Project Control

1.2.9.2.2 Participant Project Control

The April Cost/FTE report was submitted to YMPO. The April actual schedule progress and costs were submitted via the PACS workstation. The Cost Plan was updated to include April actuals. LLNL has been successful in reducing variances; the February total of twelve was reduced of four in March. Variance analysis explanations for those four P&S accounts were submitted to the M&O.

A revised Change Control Request was submitted to modify the budget and workscope for Metal Barriers, WBS 1.2.2.3.2 and Man-Made Materials, WBS 1.2.2.2.5. Changes accounted for an additional $100,000 to fund crack growth studies at ANL under Metal Barriers and a revised workscope in Man-Made Materials to include analysis of introduced hydrocarbons in the EBS. Preparations were completed with ANL for additional SANLs (interlaboratory agreements) to perform crack growth studies.

An analysis of the FY93 Estimate at Completion was initiated. The analysis will be conducted at the P&S Account level and will be completed in June.

The Compliance Evaluation Plan for the DOE-IRM activity is being reviewed. The review is scheduled to be completed in June. To implement this plan, LLNL must be added to WBS Dictionary element 1.2.12.3.

J. Podobnik, D. Wilder, W. Halsey and R. Stout met with P. Gottlieb and H. Benton (M&O) on May 6 to discuss performance measurement issues and the progress of LLNL activity as described under PACS. The meeting was useful in describing to the M&O the plans LLNL has for executing the workscope within the FY93 budget limitations.

Work continues to screen potential candidates for two position openings: Project Control Coordinator to assist in the development and maintenance of the PACS database; and an Engineering/Scientific Coordinator to provide planning, programmatic and technical support for Technical Area Leaders. The candidate for the Engineering/Scientific Coordinator position declined to accept the job, and at this point, an alternative candidate has not been selected. The Project Control Coordinator position is still unfilled, and a suitable candidate has not been found. Supplemental labor will be used to fill this position until a permanent replacement can be found.

1.2.11 QUALITY ASSURANCE

1.2.11.1 Quality Assurance Coordination and Planning

R. Monks began work at LLNL on May 17 as the new Quality Assurance Manager.

1.2.11.2 Quality Assurance Program Development

Work continued on the activities to implement the new QARD and completion of implementing documents.

The following documents were completed and issued:

1) 033-YMP-QP 1.0, Rev. 4, Organization,
2) 033-QP 2.3, Rev. 1, Management Assessments,
3) 033-YMP-QP 2.5, Rev. 1, Acceptance of Data Not Generated Under the Control of the QARD,
4) 033-YMP-QP 5.0, Rev. 3, Technical Implementing Procedures,
5) 033-YMP-QP 13.0, Rev. 1, Handling, Storage, and Shipping,
6) 033-YMP-QP 16.0, Rev. 5, Corrective Action,
6) 033-YMP-QP 16.2, Rev. 4, Trend Analysis,
8) 033-YMP-QP 17.0, Rev. 5, Quality Assurance Records,
9) 033-YMP-QP 18.0, Rev. 5, Audits,
10) 033-YMP-QP 18.1, Rev. 5, Surveillances, and
11) 033-YMP-QP 18.2, Rev. 3, Qualification of Quality Assurance Audit Personnel.

Grading Report LLNL-QAG-L067 for Activity D-20-43, Unsaturated Dissolution Tests on Spent Fuel and UO_2 (LLNL support only, testing performed at ANL and graded at ANL), was completed and distributed.

1.2.11.3 Quality Assurance Verification

1.2.11.3.1 Quality Assurance Verification - Audits

E. Weeks and K. McFall, representing YMPO, met with LLNL staff on May 20 for pre-audit discussions concerning the July 19th audit.

A request for an extension of CAR YM-91-056 was submitted to YMPO to extend the due date to June 30. Corrective action for this CAR has been open awaiting the issuance of the QARD.

1.2.11.3.2 Quality Assurance Verification - Surveillance

Extensions were requested and approved for CARs-LLNL-020, -021, and -022. The extension date is June 30.

1.2.11.4 Field Quality Assurance/Quality Control

This WBS element has not been funded in FY93.

1.2.11.5 Quality Assurance - Quality Engineering

No significant activities.

1.2.12 INFORMATION MANAGEMENT

1.2.12.2 Records Management

1.2.12.2.2 Local Records Center Operation (LRC)

Eleven new revisions were issued by Document Control. There were no change notices issued.

1.2.12.2.3 Participant Records Management

A total of 301 items were logged into the LLNL-YMP tracking system. This includes 108 records/records packages that were processed through to the CRF. Nine action items were closed.

The records staff reviewed and commented on AP-1.18Q and AP-1.5Q.

1.2.12.2.5 Document Control

LLNL received no funding under this WBS. Work performed to complete LLNL's obligation in this WBS is funded under WBS 1.2.12.2.2.

1.2.13 ENVIRONMENT, SAFETY AND HEALTH

1.2.13.1 Environment, Safety and Health Coordination and Planning

LLNL did not receive ifs requested FY93 funding in this WBS element. Funding will again be requested for FY94.

T. Roy, an LLNL ES&H engineer at NTS, was brought into the LLNL-YMP to provide part-time support for the Large Block Test (LBT). His FY93 efforts in this area will be charged to the LBT-WBS (1.2.2.2.4) or to the TPO management WBS (1.2.9.1.2) based on verbal guidance from the project manager to meet ES&H requirements even if direct funding is not provided.

1.2.15 SUPPORT SERVICES

1.2.15.2 Administrative Support

On May 11, LLNL received the first draft of PR 8, Site Characterization Progress Report: Yucca Mountain, Nevada. LLNL reviewed the report and accepted it as written. A written response was sent to YMPO on May 12.

1.2.15.3 Yucca Mountain Site Characterization Project (YMP) Support for the Training Mission

Thirty eight different self-study assignments were issued, and LLNL-YMP staff were trained to these assignments. Currently, there are 86 participants on the project who are to be trained and/or tracked.

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

WBS 1.2.9.2
QA: N/A

JUN 1 4 1993

Lake H. Barrett, Acting Director, Civilian Radioactive Waste Management,
HQ (RW-1) FORS
THRU: Linda M. Smith, Acting Associate Director, OGD

OFFICE OF GEOLOGIC DISPOSAL WEEKLY HIGHLIGHTS FOR THE WEEK ENDING JUNE 11, 1993 (SCP: N/A)

I. FORECAST SIGNIFICANT EVENTS

A. Site Characterization Activities

Effective June 7, 1993, Linda M. Smith began her detail as Acting Associate Director, Office of Geologic Disposal.

Design activities will continue in preparation for 90 percent design reviews in July and August 1993.

Construction will continue in the Starter Tunnel, including placement of shotcrete, installation of cement grouted pattern bolts, and excavation of the north and south slashes.

Exploratory drilling operations will continue at the NRG-2, NRG-5, and UZ-14 boreholes. Backfilling at the Exploratory Studies Facility (ESF) test pits south of "H" Road will begin.

B. Public Outreach and Institutional Activities

Kathleen Grassmeier, Yucca Mountain Site Characterization Project Office (YMPO), will give a presentation on transportation to approximately 200 members of the Transportation Coordination Group in Washington, D.C., on June 9, 1993.

II. CRITICAL ITEM STATUS - YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT (YMP)

A. Site Characterization Activities

ESF

Construction

The contract for the first Tunnel Boring Machine (TBM) was awarded on May 27, 1993. This is an important step forward in the development of the ESF.

Excavation continues on the TBM Starter Tunnel at the North Portal. The pilot drift is in approximately 30 meters and the north and south slashes are in approximately 18 meters each, as of June 4, 1993.

Construction is continuing on surfacing (base course aggregate application) of the North Portal access road and on the stormwater diversion channel around the North Portal area.

The following milestones represent the near-term plan for ESF activities:

Award Subcontract for Underground Construction	June 1993
Begin 90 percent design review, Package 1B	July 19, 1993
Begin 90 percent design review, Package 2	August 11, 1993
Complete 60 meters of TBM Starter Tunnel	September 15, 1993

Design

The 50 percent management and independent technical reviews of Design Package 1B (Surface Facilities, North Portal) and Design Package 2 (North Ramp - Surface to Topopah Spring Level) are nearing completion. The final comment resolution process is in progress. Design continues on both packages for 90 percent reviews scheduled for July and August 1993.

Surface-Based Testing Activities

Exploratory drilling operations progress is summarized as follows:

Borehole	Starting Core Depth June 1, 1993	Ending Core Depth June 4, 1993
2	215.15 feet	260.59 feet
5	971.38 feet	1107.7 feet
14	669.97 feet	682.04 feet

On June 2, 1993, the core barrel on the UZ-14 borehole was broken off downhole at a depth of about 680 feet. Fishing operations to recover the lost drilling equipment were successful on June 4, 1993, and drilling operations resumed. The NRG-4 pad construction was begun on June 4, 1993. Midway Valley Trench T-5A was backfilled the same day.

A total of 2,400 feet of core from UE-25 NRG-3, UE-25 NRG-2, USW UZ-14, UE-25 UZ-16, and UE-25 B#1h were laid out for examinations conducted by the U.S. Geological Survey (USGS), Los Alamos National Laboratory (Los Alamos), and Sandia National Laboratories (SNL).

A total of 429 specimens were removed from core per the Principal Investigator's request and Sample Overview Committee (SOC) approval.

An SOC meeting was held on June 2, 1993.

The following is a listing of site characterization field activities that are currently active.

SCP ACTIVITY	TITLE	COMMENTS
8.3.1.3.2.1	Mineralogy, Petrology & Rock Chemistry of Transport Pathways	Outcrop sampling
8.3.1.3.2.2	Mineralogic & Geochemical Alteration	Outcrop sampling
8.3.1.4.2.2	Structural Features within Site Area	Surface mapping, ESF mapping
8.3.1.8.5.1	Characterization of Volcanic Features	Test pits, trenching
8.3.1.14.2	Soil & Rock Properties of Potential Location of Surface Facilities	Test pits, trenching, ramp exploration holes
8.3.1.17.4.2	Location & Recency of Faulting Near Prospective Surface Facilities	Trench mapping
8.3.1.17.4.3	Quaternary Faulting within 100 km of Yucca Mountain	Surface mapping
8.3.1.17.4.4	Quaternary Faulting in NE-Trending Fault Zones	Surface mapping
8.3.1.17.4.10	Geodetic Leveling	Traversing
8.3.1.17.4.6	Quaternary Faulting within Site Area	Trench mapping
8.3.1.2.1.1	Precipitation & Meteorological Monitoring for Regional Hydrology	Ongoing measurements
8.3.1.2.1.2	Runoff & Streamflow	Ongoing measurements
8.3.1.2.2.1	Unsaturated Zone Infiltration	Drilling/logging of neutron-access holes; ponding tests
8.3.1.2.2.2	Water Movement Tracer Tests	Cl-36 measurements
8.3.1.2.2.3	Percolation in Unsaturated Zone	UZ drilling/testing
8.3.1.2.2.4	Characterization of YM Percolation in UZ-ESF Investigation	Perched water
8.3.1.2.2.6	Gaseous Phase Movement in Unsaturated Zone	UZ drilling/testing
8.3.1.2.2.7	Unsaturated Zone Hydrochemistry	UZ drilling/testing
8.3.1.2.3.1	Site Saturated Zone Groundwater Flow System	Ongoing monitoring
8.3.1.2.3.2	Saturated Zone Hydrochemistry	Ongoing sampling
8.3.1.15.1.8	In Situ Design Verification	Construction monitoring/testing

Regulatory Interactions

Mined Geologic Disposal System (MGDS) Annotated Outline (AO)

A preliminary schedule for production of the MGDS AO, Revision 3, has been prepared and is under informal review. Planning has begun for a meeting between the AO authors and the U.S. Department of Energy (DOE) managers to discuss Revision 3.

Site Characterization Plan/Study Plan (SP) Status

No new SPs were approved by YMPO this week. The format of this report is being changed to clarify the contents. In the future, we will distinguish between the initial version of an SP, Revision 0 or "initial plan," and subsequent major revisions. Minor revisions of SPs are not tracked in this report, but the submission to YMPO and approval by YMPO is noted.

STUDY PLAN BREAKDOWN

	Initial Plans	Major Revisions
Not Submitted to YMPO	40	0
In Screening Review	0	0
In YMPO Review	2	1
Awaiting Comment Resolution	2	3
In Verification Audit	7	4
Awaiting YMPO Approval	1	0
Awaiting Submission to U.S. Nuclear Regulatory Commission (NRC)	0	0
Awaiting NRC Phase 1 Review	11	0
Accepted by NRC	41	5
Totals	104	13
Total Submitted to NRC	52	5

State of Nevada Comments Status:

Received Comments from the State of Nevada.....18
Responses Transmitted to the State of Nevada 18

NRC Comments Status:

Received Comments from NRC 21
Responses transmitted from DOE to NRC 19

B. Project Planning and Control

Analysis of participant capital equipment planning for fiscal year 1993 was conducted and necessary corrective actions were reviewed with the participants.

The staff completed analysis of Planning and Control System actuals versus Financial Information System accounting data.

A response to the Citizen's Utility Board Freedom of Information request was submitted.

C. Quality Assurance (QA) Implementation

The USGS Audit YMP-93-10 is scheduled for June 14-18, 1993.

Reynolds Electrical & Engineering Co., Inc. (REECo), Audit YMP-93-12 is scheduled for June 21-25, 1993.

Surveillance 93-025 of REECo Training and Qualification of Personnel is in progress June 2-9, 1993.

Surveillance 93-027 of USGS Measurements of Sub-Surface Moisture Content at the Nevada Test Site is scheduled for June 6-11, 1993.

Surveillance 93-026 of USGS Calibration of Measuring and Test Equipment is scheduled for June 29-30, 1993.

Determination of Importance and Grading Enhancement

Quality (Q)-List and Q-List Procedure Development

A draft description of the processes to be used for development and maintenance of the Q- and Management Control (MC)- Lists following cancellation of Administrative Procedure 6.17Q is under review.

Q-List Implementation

A revision to the Q-List was completed and is in Quality Assurance Procedure 6.2 review. The MC-List is in process in the Plans and Procedures Department (PPD).

D. Public Outreach and Institutional Activities

James Blink, Lawrence Livermore National Laboratory (LLNL), Todd Kaish, Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O), and Mark Physter, KLAS-TV, Channel 8, sponsored an "Egg Drop" contest on May 28, 1993, in Las Vegas, Nevada. A total of 260 students from Amargosa Valley, Gordon McCaw, Faye Herron, and James Gibson elementary schools, and Griffith Day School, used scientific methods to construct a device to protect an egg when dropped from different heights. The schools had elimination contests at their individual schools and, from these contests, 60 devices were entered in the final competition. Students proved their engineering skills by designing 40 devices which protected an egg from a five-story drop. The devices are on display at the Las Vegas Yucca Mountain Information Office.

Carl Gertz, Project Manager, gave a general YMP overview to 35 members of the Nevada Association of Fleet Managers on June 3, 1993, in Las Vegas.

The Institutional and External Affairs (IEA) staff attended the Joint City/County Impact Alleviation Committee Meeting in Caliente, Nevada, on June 2, 1993, and the Nye County Interactions Meeting in Las Vegas on June 3, 1993.

The IEA staff delivered a YMP exhibit to White Pine County's oversight office in Ely, Nevada, on June 4, 1993. The exhibit will be on display for one month.

III. ANALYSIS & VERIFICATION DIVISION

The staff participated in the Geochemistry Integration Team meeting on June 2, 1993, in Las Vegas.

MGDS

The staff reviewed the following: Surface-Based Testing Facilities Requirements Document, Draft B; Engineered Barrier Design Requirements Document, Revision 0; and ESF Design Requirements Document, Draft B. All comments on these documents were provided to PPD. The staff is also reviewing the DOE Standard Reference Natural Phenomena Hazards. Regarding SP coordination, reviewer qualification documentation was completed for D. Fenster (Tectonic Synthesis and Models).

IV. GENERAL INFORMATION ITEMS

CRWMS M&O

The staff completed arrangements for and hosted the first CRWMS M&O Program System Safety meeting. Each of the program elements provided a summary of the types of safety hazards expected. The attendees were charged to compile a preliminary list of critical hazards for the next meeting tentatively scheduled for the last week in June 1993.

Regarding Waste Package Development, shielding calculations were completed consisting of five waste package designs with two first barrier thicknesses and three second barrier thicknesses. Finite element analysis models of the repository were developed. These models provide the thermal response of the repository. The output will be used as the boundary conditions of the waste package discrete thermal model. Systems study thermal evaluations are about half completed.

LLNL

Regarding Work Breakdown Structure 1.2.2.3.2 (Metal Barriers), recent authorization from YMPO will permit procurement of a high sensitivity thermogravimetric analysis unit. This unit will be used in an experimental study to discern at what point there is a transition between "dry" oxidation and "wet" corrosion. It is expected that the study will be conducted on a corrosion allowance material (such as carbon steel) with temperature, humidity, and surface condition as the principal variables. The transition between dry and wet conditions is very important with respect to performance of the container material and the design strategy for keeping the waste package in a "dry" condition for an extended period of time.

Environmental and management approvals were received on May 24, 1993, to clear the heated Large Block Test area. REECo completed the clearing and rock surface cleaning on June 2, 1993. A team from LLNL, assisted by Los Alamos, SNL, Raytheon Services Nevada, and REECo personnel, mapped fractures and selected a test area on June 1-2, 1993.

REECo

The REECo Information Management Department's Research and Study Center received and organized compact disc read-only memory subscription, and installed hardware and software. These systems offer an extensive collection of industry standards, environmental and safety library of U.S. Environmental Protection Agency and Occupational Safety and Health Administration regulations, American Society of Mechanical Engineers Boiler and Pressure Vessel Codes, and vendor catalogs.

Representatives from the Technical Information Section staffed the YMP Technical Information Display presented at the Geological Society of America's combined Rocky Mountain and Cordilleran sections conference in Reno, Nevada.

Specifications, transport, and other issues relating to the TBM were reviewed with the vendor, CTS, in Seattle, Washington.

SNL

The SNL staff completed a "supplier qualification evaluation" of the portion of the SNL Secondary Standards Laboratories that provides calibration services for electrical/electronic, temperature, pressure, load cell, and acceleration measuring and test equipment. The facilities and personnel were found to be capable of providing such services, so they are considered "qualified."

Analyses to support the design of the North Ramp are continuing. The first set of analyses is completed. SNL is currently developing core logs and rock quality indices to be used for the estimation of rock-mass properties, based on data from the NRG holes for the second set of analyses. The third set of analyses is to evaluate the loading on the North Ramp that would result from a seismic event (earthquake or underground nuclear explosion). The analysis will estimate the static and dynamic loading on various sections of the North Ramp based on an assumed 0.4g acceleration. The results of all three of these analyses will provide input to the 90 percent design package.

Proposed changes to Appendix I of the ESF Design Requirements were transmitted to YMPO. The proposed changes will include the results of recent analyses to evaluate the use of water in the ESF. Both water used for construction and testing were considered and recommended controls were proposed.

Three papers on Yucca Mountain model validation studies were presented at the American Geophysical Union meeting. The first paper described a series of experiments examining infiltration flow instabilities (fingering) in unsaturated fractures. The second paper discussed numerical simulations of the fingering process based on modified percolation theory. The third paper discusses preliminary experiments examining the effects of fracture saturation and wetted structure on fracture permeability.

Technical & Management Support Services (T&MSS)

T&MSS QA completed an internal audit of Criteria 15, Nonconformance, and Criteria 16, Corrective Action, without deficiencies being noted.

The Quality Trend Analysis report for the second quarter was issued. Positive quality trends were noted.

USGS

The draft outline describing methodology for assessing seismic hazard at Yucca Mountain, Nevada, for a DOE topical report was completed. The methodology will be used in site design.

A global positioning satellite survey was completed. This resurveying of the existing base-station network provides information on relative land movement in the vicinity of Yucca Mountain. Preliminary Geodolite data indicates no significant strain accumulation at Yucca Mountain since the last survey in 1983.

V. UPCOMING EVENTS CALENDAR

Please note that the usage of "(P)" in the calendar indicates that the event is open to the public. Educational presentations and State and Public Interactions are coordinated by the Speakers Bureau; contact Jacqueline Brandt at (702) 794-7896 or Theresa Hirsch at (702) 794-7759 for additional information. Exhibits and Public Update Meetings are coordinated by Joanna Magruder at (702) 794-7056, and Tours are coordinated by Carleen Hill at (702) 794-7375.

Date	Event	Location	YMPO Contact
A. DOE/HQ Meetings			
No significant meetings to report.			
B. CRWMS M&O/DOE Meetings			
Monday, June 28	Cost Performance Management Meeting	Las Vegas, NV	C. Gertz
Wednesday, June 30	CRWMS M&O Program Management Review	Televideo	L. Smith/ C. Gertz
C. Internal and DOE Nevada Operations Office Meetings			
Friday, June 11	Technical Project Officers Meeting	Las Vegas, NV	C. Gertz
Friday, June 11	Planning and Budget Meeting	Las Vegas, NV	C. Gertz
Wednesday, June 16	NV Monthly Program Review	Las Vegas, NV	C. Gertz
D. NRC Interactions			
Monday, June 7	NRC Management Meeting for Interactions Scheduling (P)	Las Vegas, NV	T. Bjerstedt
Tuesday, June 8	Technical Exchange - Geophysics Integration (P)	Las Vegas, NV	T. Bjerstedt
Wednesday, June 9	Technical Exchange - Volcanism (P)	Las Vegas, NV	T. Bjerstedt
Wednesday, July 28	Technical Exchange - ESF Title II Design (P)	TBD	T. Bjerstedt

	Date	Event	Location	YMPO Contact
E.	Nuclear Waste Technical Review Board (NWTRB) Interactions			
	Tuesday-Saturday, June 1-12	NWTRB International Trip	United Kingdom, France, Belgium	J. Cooper
	Tuesday-Wednesday, July 13-14	NWTRB Full Board Meeting (P)	Denver, CO	J. Cooper
	Tuesday-Thursday, September 28-30 (Tentative)	NWTRB Joint T&S/ Engineered Barrier Systems Panel Workshop (P)	TBD	J. Cooper
	Tuesday-Friday, October 19-22	NWTRB Full Board Meeting (P)	Las Vegas, NV	J. Cooper
	Monday-Wednesday, January 10-12, 1994	NWTRB Full Board Meeting (P) (Tentative)	Arlington, VA	J. Cooper
	Monday-Wednesday, April 11-13, 1994	NWTRB Full Board Meeting (P) (Tentative)	Reno, NV	J. Cooper
	Monday-Wednesday, July 11-13, 1994	NWTRB Full Board Meeting (P) (Tentative)	Denver, CO	J. Cooper
	Wednesday-Friday, October 12-14 1994	NWTRB Full Board Meeting (P) (Tentative)	Las Vegas, NV	J. Cooper
F.	Advisory Committee on Nuclear Waste (ACNW) Interactions			
	Wednesday-Thursday, July 21-22	ACNW 55th Meeting (P)	TBD	A. Gil
	Wednesday-Thursday, August 25-26	ACNW 56th Meeting (P)	TBD	A. Gil
	Wednesday-Thursday, September 29-30	ACNW 57th Meeting (P)	TBD	A. Gil
	Wednesday-Thursday, October 27-28	ACNW 58th Meeting (P)	Las Vegas, NV	A. Gil

	Date	Event	Location	YMPO Contact
F.	ACNW Interactions (Continued)			
	Monday-Tuesday, November 22-23	ACNW 59th Meeting (P)	TBD	A. Gil
	Wednesday-Thursday, December 15-16	ACNW 60th Meeting (P)	TBD	A. Gil
G.	National Academy of Sciences (NAS) Interactions			
	Thursday, June 24	NAS Board on Radioactive Waste Management	Las Vegas, NV	C. Gertz
	Date	Event	Location	Speaker
H.	State and Public Interactions			
	Monday, June 14	Rapid Excavation & Tunneling Conference	Boston, MA	C. Gertz
	Tuesday, June 15	Nate Mack Elementary School	Las Vegas, NV	T. Kaish P. Snyder
	Wednesday, June 16	Palo Verde Generating Station	Phoenix, AZ	G. Fasano E. Harle
	Saturday, June 19	American Nuclear Society (ANS) Teacher Workshop	San Diego, CA	J. Peck
	Sunday, June 20	Vanishing Desert Greater Opportunity Group	Las Vegas, NV	A. Gil
	Sunday, June 20	Yucca Mountain Lecture Series (P)	Pahrump, NV	W. Dickson
	Tuesday, June 22	Yucca Mountain Lecture Series (P)	Las Vegas, NV	W. Dickson
	Wednesday, June 23	Citibank Child Care	Las Vegas, NV	R. Arnold
	Wednesday, June 23	ANS	San Diego, CA	C. Gertz
	Thursday, June 24	NAS Board on Radioactive Waste Management	Las Vegas, NV	C. Gertz
	Friday, June 25	Diablo Canyon Nuclear Power Plant	Avila Beach, CA	G. Fasano

Date	Event	Location	Speaker
H. State and Public Interactions (Continued)			
Wednesday, July 7	University of California, Santa Barbara	Santa Barbara, CA	C. Gertz
Thursday, July 15	Spring Valley Library	Las Vegas, NV	T. Bjerstedt
Monday, July 19	Institute of Nuclear Materials Management	Phoenix, AZ	TBD
Wednesday, July 21	C. T. Sewell Elementary School	Las Vegas, NV	T. Kaish M. Griffin
Wednesday, July 28	ANS Teacher Workshop	Deerfield, MA	J. Peck
Monday, August 2	United States Energy Council on Energy Awareness Energy Information Centers	Chicago, IL	C. Gertz
Thursday, August 12	Second International New Avenues in Risk and Crisis Management Conference	Las Vegas, NV	TBD
Tuesday, August 17	1993 American Institute of Chemical Engineers Summer National Meeting	Seattle, WA	TBD
Wednesday, August 18	Second International Mixed Waste Symposium	Baltimore, MD	TBD
Wednesday-Thursday, September 1-2	C. P. Squires Elementary	N. Las Vegas, NV	R. Arnold
Monday-Tuesday, September 6-7	C. P. Squires Elementary	N. Las Vegas, NV	R. Arnold
Friday, September 10	Public Gas Service Gas Company	TBD	TBD
Sunday, September 26	Children's Discovery Museum	Las Vegas, NV	R. Arnold
Monday, November 15	ANS	San Francisco, CA	TBD
Sunday, February 27, 1994	Waste Management Symposia	Tucson, AZ	TBD

Date	Event	Location
I. Exhibits Scheduled		
Saturday, June 19	Public Open House (P)	Las Vegas, NV
Saturday, July 24	Public Open House (P)	Las Vegas, NV
Friday-Sunday, August 20-22	Home Show (P)	Las Vegas, NV
Saturday, August 21	Public Open House (P)	Las Vegas, NV
Tuesday-Monday, August 24-30	Nevada State Fair (P)	Reno, NV
Thursday-Tuesday, September 2-7	Elko County Fair (P)	Elko, NV
Saturday, September 25	Public Open House (P)	Las Vegas, NV
Tuesday-Saturday, September 28-October 2	Nevada Library Association	Elko, NV
Friday-Monday, October 1-11	Jaycee State Fair (P)	Las Vegas, NV
Saturday, November 6	Boy Scouts Expo	Las Vegas, NV
Date	Event	Escorts
J. Tours Scheduled		
Saturday, June 19	Public Open House (P)	Various Escorts
Monday, June 21	Girl Scouts Wider Opportunity Program	TBD
Date	Event	Escorts
Tuesday, June 22	NAS	TBD
Friday, June 25	NAS	TBD

Date	Event	Escorts
J. Tours Scheduled (Continued)		
Tuesday, July 6	University of Georgia	TBD
Friday, July 16	International Safeguards Group	TBD
Saturday, July 24	Public Open House (P)	Various Escorts
Friday, August 6	Military Order of Laos	P. Carmack
Saturday, August 21	Public Open House (P)	Various Escorts
Monday, September 13	Senior Tripsters	TBD
Thursday, September 23	Waste Package Development Workshop	R. Fish
Saturday, September 25	Public Open House (P)	Various Escorts
Thursday, September 30	League of Women Voters	TBD

for Carl P. Gertz
Project Manager

YMP:RVB-4567

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

WBS: 1.2.7.3
QA: N/A

JUN 14 1993

Carl P. Gertz, Project Manager, YMP, NV

YUCCA MOUNTAIN SITE OFFICE (YMSO) FIELD ACTIVITY REPORT

The following are the significant field activities for the weeks ending May 21, 1993 and June 4, 1993:

1. Field Operations Center, (YMSO)

A. Management and Administration

a. The Site Manager and FOC staff participated in and provided operational and logistical support to several tours conducted during this period. These were: Earth Magazine; DOE/HQ (VIP); Working Site Visit M&O PA Team; NRC; United States Council for Energy Awareness (USCEA); and Laughlin HS.

b. The Site Manager prepared the Job Package (JP) Authorization Letter for JP 93-02A, Drill Pad Construction, Drilling and Testing of Borehole UE-25 NRG-4.

c. The Site Manager prepared and distributed the Weekly YMSO Field Activity Report to the Project Manager for week ending May 14, 1993.

d. Provided operations, administrative, and security support to the Yucca Mountain Site Manager and his DOE staff.

e. Provided operational and administrative support for site characterization activities in the field.

f. Provided administrative support for issuing vehicles, first aid kits, fire extinguisher and other necessary equipment to personnel performing to HQ OCRWM.

g. Prepared and transmitted daily operations reports to NORSOC, and the biweekly reports to HQ OCRWM.

h. Prepared forty-five (45) badging requests for the site visitors and daily field work.

i. Provided duty officer support for ESF swing and graveyard shift operations.

j. Processed fourteen (14) Work Order Requests, providing for communications, equipment calibration and building maintenance activities.

k. Continued planning for office reorganization within the FOC building.

l. Continued providing round the clock photographic coverage for ESF North Portal operations.

m. Provided underground visitors training for visitors and workers requiring access.

n. Reformatted Extended Workday Schedule and distributed for preliminary review.

o. The Bullfrog Planning Commission continuing with development of data base for Facilities Management Program.

p. Continued planning for Helipad painting project.

q. Supplied listing of photographic and video products produced for YMP to RIB for forwarding to the NRC Representative.

r. Coordinated completion of Facility Use Permit for Bldg. 4117.

s. Began development of Welcome Package to assist newly assigned employees acclimation to working at the Ranch.

t. Attended Computer Security training.

u. I obtained Test Site Operations Permit for Neutron Access Borehole N-39. The environmental pre-activity surveys will begin the week of June 14, 1993.

B. Project Safety and Health, (DOE/SAIC)

a. Reviewed and commented on ESF Requirements Document.

b. Staff member attended American Conference of Governmental Industrial hygienists.

c. Conducted inspection of Bldg. 4117, Medical Facility.

d. Continued REECo Safety & Health functional appraisal.

e. Collected "Bulk" samples from ESF and sent off.

f. Developed draft Safety Bulletin on Hard Hat Safety.

g. Completed investigation of Public Tour Medical Incident of 4/14/93 and submitted findings and recommendations.

h. Completed Heat Stress study and forwarded report.

i. Assigned responsibility for Safety Awareness Day.

j. Completed 3 surveillance: UZ-16; NRG-2A; and North Portal entrance area. Completed 5 surveillance on ESF and Portal Area.

k. Monitored post-blast gasses at Starter Tunnel.

l. Began preliminary work on Safety Awareness Day.

m. Conducted ESF Starter Tunnel Visitor Training.

n. Coordinated Industrial Hygiene concerns or Mordenite and Erionite with LANL.

o. Supported on going tours.

p. Occurrence Reports - two waiting for FM signature.
   1. REECo - five outstanding: 2 awaiting FM Signature; 2 rejected (09/22/92 and 2 on 4/15/93); and 1 initial notification (05/27/93).
   2. SAIC - 2 outstanding: 2 rejected (both on 5/27/93).

2. <u>Raytheon Services Nevada, (RSN)</u>

A. <u>Field Support</u>

a. Geologic mapping is ongoing in the Starter Tunnel.

b. Survey continues to monitor movement of Box Cut.

c. Phase 3 of Ghost Dance Fault is ongoing.

d. NRG-5 as-built survey completed, calculations remain.

e. SRG-5 Topographic Survey complete calculations remain.

f. YMP Survey Control Net is completed and published.

g. Nine (9) Work Initiations issued.

h. Batch Plant survey is complete.

i. C Well Complex discharge piping survey started 05/20.

j. Geologic mapping Ghost Dance Fault, Phase III ongoing.

k. GSF test pits have been surveyed, calculations and plotting remain. Survey of booster pump stations test pits are complete. Survey calculations and MTL results of percolation test boreholes are complete.

l. Geologic mapping of North Portal Box Cut, Phase IV and V, are complete, calculations remain.

m. North Portal Movement 4th verification survey complete.

n. Survey of Starter Tunnel ongoing.

o. Survey Crew continuing work on A-25 Survey Control Net.

p. Environmental survey of C-Well Complex Road is complete, infiltromentor tests complete.

q. Re-Survey of Trench CF-1 and Trench 8, is complete, calculations remain.

r. As-built survey of NRG-5 drill pad and access road is complete, calculations remain.

s. As-build UZ-16 borehole is complete.

t. Field Engineering continues to check Trench 14 daily.

u. Environmental clearance of 138 KV line is ongoing.

B. Quality Control

a. Continued verification of activities on UZ-14 borehole, utilizing the LM-300 drill rig.

b. Continued verification activities on NRG-2A borehole, utilizing the CME 850 drill rig.

c. Started verification on access road for Borehole NRG-4.

d. Performed surveillance on trenches on Stagecoach Road (SCR T1, T2, T3) and in Crater Flats (SCF T-1, CF-2,) and Trench 8.

e. Continued verification activities on deepening NRG-5 borehole utilizing the Joy #1 drill rig.

f. Completed Field Verification Plan, FVP-93-030.a records package on NRG-3 drilling work program and sent package to RSN records coordinator.

3. Sample Management Facility, (SMF/SAIC)

a. Support drilling operations and continued processing core on NRG-5, NRG-2A and UZ-14.

b. Completed Drilling NRG-2a.

c. Removed 454 specimens from core and shipped 17 specimens to LANL.

d. Laid out 1,034 feet of core from UZ-16, NRG-2a and NRG-3 for three examinations by SNL, DOE, and USGS.

e. Supported deepening of boreholes NRG-5 and NRG-2.

f. Continued processing core and cuttings from UZ-14, NRG-2, and NRG-5.

g. Removed 429 specimens from core.

h. Laid out 2,400 feet of core from UZ-16, UZ-14, NRG-3, BH#1, and NRG-2 for examinations by SNL, LANL, and USGS.

4. YMP Hydrologic Research Facility, (USGS)

The following activities were accomplished by USGS Staff:

Geologic Studies Program:

a. Completed current phase of Ghost Dance Fault mapping.

b. Geologic mapping of ESF tunnel and drainage channel.

c. Logging core from UZ-16 at Sample Management Facility.

d. Conducted mapping of Stagecoach Road Trenches.

e. Performed field work in Rock Valley.

f. Look at spring deposits in Crater Flats, Amargosa Valley and Death Valley.

g. Examine and sample Quaternary Pluvial deposits.

h. Monitor excavation of Trench SMT-2 across the Bear Mountain Fault, west side of Crater Flats.

i. Examined soil pits and field check previous surficial geologic mapping in northern Midway Valley.

j. Collect data and Perform Calibration at seismic sites.

Saturated Zone:

a. Conduct water level measurements and calibrated USW H-1 tubes 3 and 4. Data Recovered at WT-11, H-6 and H-1.

b. Conduct water level measurements at UE-25 WT12, WT14, J-11, J-12, J-13, and UZ-16. USW H-5 was checked for response to seismic activity.

c. Collect water samples in split Wash and Pagany Wash.

d. Assess feasibility of water sample collection in Titus and Monarch Canyons, Death Valley National Monument.

Unsaturated Zone:

a. Monitor tracer gas injection at UZ-14, NRG-5 and NRG-2.

b. Worked on data acquisition program.

c. Log fractures in core recovered from UZ-14.

d. Review descriptions of core from UZ-14 and take field trip to WT-2 for overview of water shed modeling work.

e. Service weather stations on Yucca Mountain.

f. Run 6 month check on hand held neutron moisture meters and calibrations on logging van.

g. Measure surface soil water content and collect samples for textured analysis on transect across WT-2 Wash. Collected solar isolation data from 19 positions on transect related to aspect, slope and blocking ridge effects.

5. Reynolds Electrical and Engineering Co., Inc., (REECo)

A. Drilling

a. JP 92-17, UZ-14, LM-300 drill rig, cored to 521.89 feet, reamed to 501.59 feet. Deviation surveys: 350 feet - 30 minutes; 450 feet - 20 minutes.

b. JP 93-05, NRG-2a, CME 850 drill rig, cored to 242.90 feet, drove casing to 159.69 feet. No surveys.

c. JP 92-17, UZ-14, LM-300 drill rig, cored to 682.04 feet, reamed to 671.73 feet. Lost core bit and stabilizer in hole, attempting to recover same. Deviation survey: 650 feet -15 minutes.

d. JP 93-3a, NRG-5, cored to 955.94 feet, hammer drilled to 1087.67 feet.

e. JP 92-19, NRG-2, cored to 257.24 feet.

B. Logistics

a. Continued requisitioning supplies, materials, and services for YMP Field Operations Center.

b. Supported tours during the weeks.

c. Supported construction efforts in Area 25.

d. Continued relocation of personnel in FOC, Bldg. 4015.

C. Construction

a. JP 92-20, ESF North Portal Pad and Facilities...REECo continued rework of north ESF drainage channel; continued grading and compacting access road; drilled and blasted NS-004 and SS-004; NS-005, and SS-005; NS-006 and SS-006, NS-007 and SS-007; NS-008 and SS-007; NS-008 and SS-008; NS-009 and SS-009, NS-010 and SS-010; NS-011 and SS-011; NS-012 and SS-012; completed installing lattice girders; fibercrete rock behind the girders; two slash rounds, NS-015 and SS-015 were drilled, loaded, shot and mucked out.

b. JP 93-02a, NRG-4 Drill Pad...REECo continued construction of the access road and drill pad.

6. Los Alamso National Laboratory, (LANL)

a. Continued monitoring construction activities at the box cut.

b. Continued to blast in Starter Tunnel. Mapping, photography and surveying continue. Shotcretting of crown commenced right after mapping.

c. Continue to obtain list of individuals available for shift work for the Field Test Coordinator.

d. PI's placed their geophones and recorded data from blasts and peak particle velocity was determined. Agreed to location for rockbolt load cell.

e. Blasted rib section of each side of pilot drift to VS 0+78. Followed by installation of rock bolts and wire mesh.

f. Load cells installed on 3 High Wall locations and CS 0+90.

g. Tracer water used 05/24 to 05/28 was 14,260 gallons.

7. Documents and Records Center, (CRWMS M&O)

a. Received and Issued the following Controlled Documents:

Job Packages

YMP/JP93-02, Rev. 0, "Construction of Access Road for Borehole UE 25 NRG-4."
YMP/JP93-20c, Rev. 0, "Consolidated Sampling in the Starter Tunnel."

Test Planning Packages - N/A

Specifications

YMP-025-9-SP09, Rev. 0, "Access Road to NRG-4 Borehole."

Drawings

YMP-025-9-CIVL-PR107, Rev. 0,"NRG-4 Borehole Access Road Cross Sections."
YMP-025-9-CIVL-PL106, Rev. 0, "NRG-4 Borehole Access Road Road Plan."
YMP-025-9-CIVL-PR106, Rev. 0, "NRG-4 Borehole Access Road Profile."

Work Programs - N/A

FCRs

FCR 93/122, "Changes on USW H-5 Additional Work Activities Work Program."
FCR 93/323, "Revise General Grounding Note 7 - YMP-025-9-CIVL-PL104."
FCR 93/342, "NRG-4 Access Road Revision."
FCR 93/368, "Increase in Total Depth of Borehole UE-25 NRG-5."
FCR 93/347, "Field Change to Replace FCR#93-306."
FCR 93/306, Obsoletion.
FCR 93/376, "Chain Link Fence Fabric Salvage Specification Change."
FCR 93/375, "Revise Drawing to Include Survey Stationing."
FCR 93/376, Rev. 1 Reissue.

b. Reproduction: 18,158 pages copied.
394 drawings copied.

c. Documents Issued: 755 controlled documents.
469 FCR's
144 DWG's
0 WP's
94 JP's
48 SPEC's
231 information copies.

d. DTAR logoffs: 510.

8. Field Training, (SAIC)

a. Forty-five (45) people attended the ESF Visitor Training.

b. Radiological Control Technician Testing conducted for a total of 19 personnel.

c. GET 1.5 Refresher Training, six (6) people tested and all passed.

d. New Underground Worker Training, conducted for eleven (11) students with fourteen (14) students at the First Aid Portion.

e. Two (2) people attended the Experienced Underground Worker Training.

Winfred A. Wilson

Winfred A. Wilson
Site Manager

YMP:WAW-93/143

cc:
R. M. Cameron, CRWMS M&O/YMSO, Mercury, NV
M. D. Voegele, SAIC, Las Vegas, NV
R. R. Schneider, SAIC/YMSo, Mercury, NV
G. K. Beall, SAIC, Las Vegas, NV
C. L. Lugo, SAIC, Las Vegas, NV
E. M. Gardiner, SAIC, Las Vegas, NV
C. J. Cotten, SAIC, Las Vegas, NV
G. D. Milligan, SAIC/YMSO, Mercury, NV
M. B. Blanchard, YMP, NV
R. V. Barton, YMP, NV
J. R. Dyer, YMP, NV
S. B. Jones, YMP, NV
D. R. Williams, YMP, NV
J. T. Sullivan, YMP, NV
R. B. Baumeister, YMP/YMSO, Mercury, NV
W. R. Tunnell, YMP/YMSO, Mercury, NV
R. J. White, YMP/YMSO, Mercury, NV
Phil Justus, NRC, Las Vegas, NV

bcc:
A. C. Bonk, REECo, Las Vegas, NV