



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001**

December 20, 2001

MEMORANDUM TO: C. William Reamer, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

FROM: William L. Belke, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
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SUBJECT U.S. NUCLEAR REGULATORY COMMISSION ON-SITE
LICENSING REPRESENTATIVES' REPORT ON YUCCA
MOUNTAIN PROJECT FOR SEPTEMBER 1, 2001, THROUGH
OCTOBER 31, 2001

The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representatives' (OR's) report for the period of September 1, 2001, through October 31, 2001.

This report highlights a number of Yucca Mountain Project activities of potential interest to NRC staff. The OR's continue to respond to requests from NRC Headquarters staff to provide various documentation and feedback related to Key Technical Issues (KTI's) and their resolution. During this reporting period, the OR's continued to observe activities associated with Yucca Mountain Site Characterization, KTI's, and auditing. The OR's also attended a number of meetings and accompanied NRC staff on visits to Yucca Mountain.

If you have any questions on this report or its enclosures, please call William L. Belke on (702) 794-5047, or Robert M. Latta on (702) 794-5048.

Enclosures: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives' Report
ESF/ECRB Plan View Alcove, Niche and Borehole Test Locations
Nye County Early Warning Drilling Program Drillhole Locations
ATC Site Layout/ATC Cross-hole Configuration

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U.S. NUCLEAR REGULATORY COMMISSION
ON-SITE LICENSING REPRESENTATIVES' REPORT
NUMBER OR-05-01

FOR THE REPORTING PERIOD OF SEPTEMBER 1, 2001 THROUGH OCTOBER 31, 2001

/s/

William L. Belke
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Enclosures

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1.0 EXECUTIVE SUMMARY

DEFICIENCIES DATABASE

In the March/April 2001 On-Site Representative's (OR) report, the OR review of the database used for tracking deficiencies adverse to quality revealed that there may be areas where there are recurrences of deficiencies that were previously identified and closed. One area of a suspected trend was the recurrence of scientific notebook (S/N) deficiencies. These increased deficiencies prompted the DOE Office of Quality Assurance (OQA) to initiate a review of the recent documentation information pertaining to S/Ns. This review was completed and the evaluation provided several recommendations aimed at minimizing S/N deficiencies.

DOE QA AUDIT OF YUCCA MOUNTAIN SITE CHARACTERIZATION OFFICE

During the August 6-10, 2001, DOE Quality Assurance (QA) audit of the Yucca Mountain Site Characterization Office six Deficiency Reports (DR's) and an NRC OR Open Item 01-01 that is related to the absence of a position description were identified. During the audit, the OR requested three Position Descriptions (PD) to determine whether these individuals had the necessary education and experience to demonstrate compliance with the requirements in the PD. Two of the individuals occupying these positions were sufficiently qualified and met the PD requirements. The remaining PD evaluation completion is pending the OR's receipt and review of the necessary training records to determine whether sufficient information exists to demonstrate compliance with the PD requirements.

SUPPLIER AUDIT/SURVEY REPORTS

Recent surveillance and audits of DOE and the DOE contractor have surfaced several inconsistencies and deficiencies in the area of maintaining accurate documentation for indoctrination and training. The OR considered these deficient conditions to possibly indicate a trend in training activities. These deficiencies for two of the audits are being addressed through the DR's that were issued. The concern is that deficiencies in training are being handled project wide through a Corrective Action Report (CAR) that is in draft and being processed in the review cycle. The OR considers that OQA's overview continues to remain effective.

OUTREACH ACTIVITIES

GOVERNMENT-TO-GOVERNMENT MEETING BETWEEN NUCLEAR REGULATORY COMMISSION AND NATIVE AMERICAN GOVERNMENT REPRESENTATIVES

On September 26 and 27, 2001, members of the NRC staff including the OR's participated in a Government-to-Government meeting with representatives of Native American Tribes potentially impacted by the possible siting of a high-level waste geological repository at Yucca Mountain, Nevada. Following opening remarks by Commissioner Jeffrey Merrifield, staff members provided an overview of NRC's high-level waste regulatory program.

NEVADA COMMISSION ON NUCLEAR PROJECTS MEETING

On October 30, 2001, the OR's attended a scheduled meeting of the Nevada Commission on Nuclear Projects in Las Vegas, Nevada. This meeting focused on the current status of the Nevada protection fund, the State of Nevada oversight program, transportation studies and initiatives related to local governments. Commission officials expressed concern about the premature release of the draft NRC Licensing Review Plan for the Licensing Application (LA) for the Yucca Mountain repository. At the conclusion of the meeting, local officials, public interest groups, and members of the public stressed the need for improved communications between the State and Federal agencies.

EXPLORATORY STUDIES FACILITY (ESF) & NRC KEY TECHNICAL ISSUES (KTIs)

Seepage Testing

DOE is conducting water release and seepage testing at several locations in the Topopah Springs Tuff. Passive hydrologic testing continues where sealed bulkheads isolate sections of the Enhanced Characterization of the Repository Block (ECRB) from the effects of ventilation to allow drifts to return to ambient conditions in an effort to observe natural seepage. DOE has also developed a detailed test plan for the passive hydrologic test along with a procedure to enhance the documentation and transparency for future scientific and engineering testing.

On October 2, 2001, NRC Division of Waste Management (DWM) personnel, including the OR, participated in an entry into the ECRB in order to assess the conditions behind the bulkheads. During this entry moisture accumulation was identified in various locations from Stations 17+63 to 26+00. Project personnel are currently evaluating the presence of moisture behind the bulkheads in an attempt to determine if it is attributable to condensation or if it is the result of natural seepage. Additionally, enhanced monitoring and collection equipment, including remote cameras and moisture collection devices, are scheduled for installation in accordance with the revised test plan.

CI-36 Validation Study

Testing to determine the presence of bomb pulse Chlorine-36 (CI-36) in the vicinity of the Sundance and Drill Hole Wash Faults is continuing. Preliminary Tritium and CI-36 analysis completed by DOE have not confirmed the presence of bomb pulse CI-36; however, additional analysis is in progress.

The Sample Management Facility has completed crushing of all but eight of the validation samples and USGS has completed leaching the sample splits. Splits of the leached samples have been sent to the labs and these samples have been prepared for isotopic analysis. The samples were analyzed using the Atomic Mass Spectrometer on October 26, 2001. The results of this analysis will be documented in a future OR Report.

Thermal Testing

DOE continues to maintain drift wall-rock temperatures at 200° Centigrade (392° Fahrenheit) in the Alcove 5 thermal test. The heated phase of this test is nearing completion and power to the heaters is scheduled to be terminated on January 14, 2002 to allow for a natural cooling phase.

Analysis of water samples condensed from the hottest (>140° Centigrade) hydrological holes in the Drift Scale Test indicate relatively high fluoride concentrations (20-66 ppm)

and low pH (3.1-3.3) values. Tests are underway to determine if the source of fluoride is from the degradation of materials originally installed to facilitate measurements. The most likely fluoride contributors are the Viton packers used to isolate test zones or teflon tubing used to draw water and steam from the test zones.

On October 19, 2001 drilling activities were initiated on the Drift Scale Test Chemistry Hole that runs from the access/observation drift along a line that penetrates the dry-out zone located above the heated drift crown. This operation will provide core from the margins outside the dry-out zone that will be processed to accurately measure saturation levels.

Fluid Inclusion Study

University of Nevada Las Vegas (UNLV) scientists have completed a study to determine the origin and age of fluid inclusions found in calcite at Yucca Mountain. A draft version of this report is expected to be released in November of 2001.

Surface-Based Testing

DOE completed the field work supporting the geotechnical investigation at the Yucca Mountain North Portal area to collect data for the design of a waste handling building for a potential repository. DOE continued the work of integrating geotechnical information collected from drilling and geophysical logging activities. Final reports on these activities are expected to be submitted to DOE by the middle of FY 2002.

Nye County Early Warning Drilling Program

The Alluvial Tracer Complex (ATC) is a joint Nye County and DOE cooperative program to investigate flow and transport properties of the saturated alluvium. During this reporting period, reaming of the EWDP-IM1 and IM2 boreholes for installation of casing and well screen was completed. Nye County personnel also completed a successful 48-hour pump test in each of these well boreholes.

Busted Butte Unsaturated Zone Transport Test Facility

The hydrologic and tracer testing at Busted Butte was designed to provide data to help model flow and transport of radionuclides in the unsaturated zone under the proposed repository. Atomic Energy of Canada, LTD., continues to perform radionuclide transport testing on blocks of rock extracted from the Busted Butte Test Facility. However, the generators at the site have been turned off and the site has been closed. Accordingly, the routine status reporting for this test facility will be discontinued.

Engineered Barrier System (EBS) Testing

DOE continues EBS testing at their Pilot Scale Test Facility located in North Las Vegas. Phase II EBS ventilation testing, which started in April 2001, was completed during this reporting period. This test activity simulated the ability of the inlet air, at different temperatures, to maintain sub-boiling temperatures at the emplacement drift wall in a potential repository. DOE developed a test plan for Phase III testing which will add moisture to the porous media in the simulated invert to determine the effect on ventilation efficiency.

DOE is also performing a Post-closure Ventilation Test to study the convective heat transfer in the post-closure time period. This test is currently under construction at the EBS test facility.

REPORT DETAILS

2.0 INTRODUCTION

The principal purpose of the OR report is to inform NRC staff, managers, and contractors of information on the DOE programs for site characterization, repository design, performance assessment, and environmental studies that may be of use in fulfilling NRC's role during pre-licensing consultation. The principal focus of this and future OR reports will be on DOE's programs for the ESF, surface-based testing, performance assessment, data management systems, and environmental studies. Relevant information includes new technical data, DOE's plans and schedules, and the status of activities to pursue site suitability. The OR's also participate in activities associated with resolving NRC KTI's. In addition to communication of this information, this report may raise potential licensing concerns, or express opinions; these items represent the views of the OR's. The reporting period for this report covers September 1, 2001, through October 31, 2001.

3.0 OBJECTIVES

The OR mission is to principally serve as a point of prompt informational exchange and consultation and to preliminarily identify concerns about site investigations relating to potential licensing issues. The OR's accomplish this function by communicating, consulting and identifying concerns. Communication is accomplished by exchanging information on data, plans, schedules, documents, activities and pending actions, and resolution of issues. The OR's consult with DOE scientists, engineers, and managers with input from NRC Headquarters management on NRC policy, philosophy, and regulations. The OR's focus on such issues as QA, design controls, data management systems, performance assessment, and KTI's resolution. A principal OR role is to identify areas in site characterization and related studies, activities, or procedures that may be of interest or concern to the NRC staff.

4.0 QUALITY ASSURANCE, ENGINEERING, AND NRC KEY TECHNICAL ISSUES

Deficiencies Data Base

Background

In the previous OR Report, the OR had reviewed the DOE data base used for tracking and trending the deficiencies adverse to quality that have surfaced during the various audits, surveillances, self assessments, or observations. These deficiencies have been documented in CAR's or in DR's which indicate where there may be repetitive recurrences of deficiencies that were previously identified and closed. One area where there appeared to be a trend pertained to deficiencies in developing and maintaining S/N's.

There were several recurrences of various S/N deficiencies. Increased S/N deficiencies were noted as NRC OR Open Item 98-2 in the January-February 1998 NRC OR Report

dated March 17, 1998. DOE initiated a custom training program for each participating organization in the use and control of S/N's. Also, reviews of 656 ongoing or open S/N's were conducted. Based on these results, the problems with S/N's were corrected and NRC Open Item 98-2 was closed in the October-December 1999 OR Report. Until recently, these efforts appeared to be effective. However, several recurrences of S/N deficiencies again surfaced. A Suspected Trend Investigation Report was initiated by DOE on March 6, 2001, to determine whether sufficient actions are being taken by the affected organizations to correct recent conditions adverse to quality relative to implementation and use of S/N's. This resulted in DOE Surveillance Report BSC-SR-01-014 (April 10, 2001) concluding "... BSC's management is proactive in the control of S/N's and that no adverse quality trend exists nor did the review indicate a significant condition adverse to quality."

Current Status

The OR agrees that the S/N deficiencies that surfaced were mostly of a minor nature. However, the OR does not agree with the DOE conclusion that a trend does not now exist. This is of special concern in that DOE undertook a significant effort to correct the previous trend.

OQA initiated an effort to review the recent documented information pertaining to S/N deficiencies and concerns. This review was completed and the results were documented in a report on the increase in problems with S/Ns to the Director, OQA. The summary of this evaluation concluded that there were no negative impacts for the types of problems that surfaced and provided the following recommendations to assist in minimizing the deficiencies that surfaced:

- To correct management awareness, provide managers training to the procedure for S/Ns (AP SIII.1Q).
- To correct for lack of management oversight and accountability, the S/N Register Database will be enhanced to allow for improved notification, tracking, and reporting of reviews and record submittals.
- Principal investigators are recommended to have annual refresher training to keep them aware of changes.
- Revise AP-SIII.1Q to clarify what is an administrative function and not a condition adverse to quality.
- Revise AP-SIII.1Q to exclude inactive S/N's from the annual compliance reviews.

Progress in implementing the above recommendations will be observed by the OR and reported on in future OR Reports.

DOE QA Audit of Yucca Mountain Site Characterization Office

During the August 6-10, 2001, audit of the DOE Yucca Mountain Site Characterization Office in Las Vegas, NV, the OR participated as an observer in this DOE QA audit. The purpose of this audit was to evaluate the Office of Civilian Radioactive Waste Management implementation of the QA Program at the Yucca Mountain Site Characterization Office in Las Vegas, NV. The audit determined whether the requirements of the DOE/RW-0333P Quality Assurance Requirements and Description document and associated implementing procedures were being met. This activity was a

routine compliance-based audit to verify implementation adequacy and to determine the effectiveness of the QA program. Areas audited included: Organizational Interfaces, Training, Self Assessments, Q-List Classification, Procurement, Procedure Preparation and Approval, Document Review and Control, Managing Conditions Adverse to Quality, and Records Control.

The Audit Team was well prepared, independent, thorough, and objective. During the Audit, the OR requested to review the PDs for the Assistant and Deputy Assistant Managers of the Office of Project Execution, and the Compliance Management Specialist (CMS) from the Office of Project Execution. The "status cover sheets" for the Assistant and Deputy Assistant Managers PD's contained minor inconsistencies. These inconsistencies were brought to the attention of the Lead Auditor. The PD for the CMS could not be retrieved, and therefore was not reviewed. It was explained to the OR that this PD had been sent to Washington, DC, for review and revision. However, while the revision is needed, it has not been timely because the current CMS has held this position since 1999. This is being carried as NRC OR Open Item 01-01 in the OR Report.

In addition, the results of this audit identified six DR's and one deficiency corrected during the audit. The six DR's were in addition to four DR's issued as a result of an earlier DOE self assessment. At the audit exit, the OR's expressed their concern with the number of findings. It is recognized that the individual issues identified in these DR's are not significant. However, the OR emphasized that for rather straightforward and uncomplicated procedures, these were recurring implementation issues involving: (1) failure to follow procedures; (2) inattention to detail; and (3) management failure to properly convey expectations concerning quality-related activities. These recurring deficiencies are similar to previously identified deficiencies described in CAR's BSC-01-C-001 and BSC-01-C-002.

Current Status

In late October 2001, the OR received the CMS's PD. According to the PD requirements, the purpose of this position is to serve as an expert analyst in Compliance Management responsible for advising the Office of Project Execution Assistant Manager and other senior management in the conduct of analytical research to ensure identification and resolution of quality-affecting issues.

Based on the OR review, the OR could not confirm the incumbent met the qualifications required by the PD. This has been brought to the attention of DOE. The OR has requested to review training records or other information to substantiate compliance with the requirements delineated in the PD. This will remain as NRC OR open item 01-01 until the requested documentation is made available.

Surveillance and Audits of DOE and DOE Contractor

During the recent August 2001, audit of the DOE Yucca Mountain Site Characterization Office, the September 2001, audit of the OQA, and the October 2001, surveillance of Bechtel SAIC Company, LLC (BSC), several deficiencies and inconsistencies surfaced

in the area of documentation for indoctrination and training. The YMSCO and OQA issues are being addressed separately through the Deficiency Reports that were issued. The OR considered these deficient conditions to possibly indicate a trend in training activities. However, as a result of these activities, OQA has also recognized this condition as a project-wide concern and initiated a CAR to BSC. The OQA review of the training issues were prompted as a result of the BSC surveillance that identifies a lack of accountability and completion of training for personnel performing work on the project. The OR considers that OQA's overview continues to remain effective.

QA/Technical Requirements Not Incorporated

In the OR Report for August/September 1999, NRC OR Open Item 99-1 was initiated for suppliers not including QA/technical requirements into their sub-tier supplier's documents. Open Item 99-1 was ultimately closed in the September/October 2000, OR Report with DOE issuing a procurement notice to all suppliers alerting them of this deficiency of suppliers failing to pass on appropriate QA/technical requirements in their procurement documents to their sub-tier suppliers.

Four recent DOE audits of DOE suppliers listed on the Qualified Suppliers List, indicate that purchase orders failed to include appropriate QA/technical requirements. This condition is a repetitive occurrence and will be carried as a new NRC Open Item 01-01.

5.0 OUTREACH ACTIVITIES

Government-to-Government Meeting between Nuclear Regulatory Commission and Native American Government Representatives

On September 26 and 27, 2001, members of the NRC staff including the OR's participated in a Government-to-Government meeting with representatives of Native American Tribes potentially impacted by the possible siting of a high-level waste (HLW) geological repository at Yucca Mountain, Nevada. The meeting initiated a dialogue with the Tribes, as described in SECY-01-0064, "Interaction with Tribal Governments and Entities near Yucca Mountain on High-Level Waste Repository Issues." This dialogue facilitated ongoing communication between NRC and Tribal governments and entities on health and safety issues associated with a possible licensing decision on a HLW repository at Yucca Mountain, including potential environmental impacts related to cultural and property rights interests asserted by the Tribes. On the evening of September 26, Commissioner Jeffrey Merrifield welcomed the Native American representatives and gave them an overview of NRC's mission and responsibilities. Following these opening remarks, some Tribal representatives expressed concerns about the viability of the Yucca Mountain project, frustrations experienced in working with other Government organizations, and issues they wanted addressed at the next days' meeting.

On September 27, 2001, NRC staff members provided an overview of NRC's high-level waste regulatory program including the hearing process, a general description of the NRC's regulatory structure for a possible HLW waste repository (i.e., 10CFR Part 63 to be published November 2001), and NRC's regulatory role in the transportation of spent nuclear fuel. Staff representatives responded to numerous questions from Tribal representatives on these issues and items related to the evaluation of environmental

impacts. In responding to these questions, the staff stressed NRC's statutorily defined role as an independent regulator, and our willingness to listen and understand Tribal concerns. The staff is developing a list of action items from the meeting for NRC follow-up.

Nevada Commission on Nuclear Projects Meeting

On October 30, 2001, the OR's attended a scheduled meeting of the Nevada Commission on Nuclear Projects in Las Vegas, Nevada. The Commission on Nuclear Projects provides recommendations to the governor and the legislature on policy matters on all State projects associated with the disposal of radioactive waste. The Commission on Nuclear projects addressed the current status of the Nevada protection fund, the State of Nevada oversight program, and initiatives related to local governments. Commission officials expressed concern of a premature release of the draft NRC Licensing Review Plan for the licensing application for the Yucca Mountain Repository. Transportation studies and the preliminary results of the State's Yucca Mountain impact report were also discussed. Several of the Commission on Nuclear Projects members commented on NRC's recent approval of the Department of Energy's site guidelines contained in 10CFR part 963. At the conclusion of the meeting, local officials, public interest groups, and members of the public stressed the need for improved communications between the State and Federal agencies.

6.0 EXPLORATORY STUDIES FACILITIES (ESF), AND NRC KEY TECHNICAL ISSUES

ENHANCED CHARACTERIZATION of the REPOSITORY BLOCK (ECRB)

The excavation of the ECRB, completed on October 13, 1998, allows the collection of scientific and engineering data in stratigraphic units that constitute the bulk of the potential repository horizon. DOE continues ECRB construction and testing activities to maximize the amount of data available to support DOE TSPA - Site Recommendation. Enclosure 2 provides a description of the ESF and ECRB test locations. ECRB construction and testing activities are summarized below.

Passive Hydrologic Test

Background:

Since June 1999, sections of the ECRB have been isolated from the rest of the underground facility by the construction of sealed bulkheads. These bulkheads are located at Stations 17+63, 25+03 and 26+00. No forced ventilation occurs beyond the bulkheads, except during brief entries to collect data and perform maintenance. This is a passive test designed to allow the isolated parts of the ECRB to return to ambient (pre-construction) moisture and temperature conditions to determine if dripping from the rock-mass can be observed. Hundreds of moisture monitoring probes are installed in tunnel walls at depths of up to 2 meters. While some test probes show evidence of rewetting, DOE scientists have indicated that moisture conditions in this section of the ECRB have not fully re-equilibrated. DOE plans to continue this test through FY2002.

Current Status:

The September/October 2000 OR Report, initially suggested that DOE consider developing a detailed plan describing the test purpose and objective, approach, pre-test predictions, schedule and use of data collected. Such a plan would provide greater

confidence that test results would address data needs for DOE-NRC issue resolution activities. DOE has issued a plan for this test that provides this information. DOE has also issued a procedure to enhance the documentation and transparency for future scientific and engineering testing. The procedure is intended to impose controls for documenting test requirements, pre-test predictions, and other relevant information in advance of future testing.

On October 1, 2001, a planned opening of the bulkheads was accomplished and a limited entry was performed by site mine safety personnel and the Principal Investigator. On October 2, 2001, DWM personnel, including the OR, participated in an entry into the ECRB in order to assess the conditions behind the bulkheads. During this entry moisture accumulation was identified in various locations from Station 17+63 to 26+00. In particular, water droplets were noted on the ventilation ducting, jacketed cable, rock bolts, wire mesh and on the conveyer belt.

Project personnel are currently evaluating the presence of moisture behind the bulkheads in order to determine if it is attributable to condensation or if it is the result of natural seepage. Additionally, enhanced monitoring and collection equipment, including remote cameras and moisture collection devices, are scheduled for installation in accordance with the revised test plan. Current schedules indicate that the drift will be open until December of 2001, so that an additional bulkhead can be installed at 22+00, and test enhancements can be implemented. The OR's will continue to monitor these test activities and document the results in future reports.

Niche #5

Background:

This niche is constructed at Station 16+20 to conduct seepage testing in the Topopah Spring lower lithophysal zone. Over two-thirds of the potential repository is planned to be located in this rock unit. Niche walls and boreholes have been instrumented with moisture monitoring equipment. DOE also completed the construction of a "batwing" on the left of Niche 5. This batwing is designed to enhance DOE's ability to monitor and collect any moisture moving around this niche. Test results will support the unsaturated zone flow and transport process model report.

Current Status:

Air-K testing and ground penetrating radar testing were completed and the results of the infiltration testing are being reviewed.

Systematic Hydrologic Characterization (SHC)

Background:

DOE scientists are conducting SHC testing to investigate the spatial variability of hydrologic properties affecting seepage processes. DOE plans to drill approximately 20 boreholes in the Topopah Spring lower lithophysal zone. These boreholes will be used for air permeability and liquid release/seepage measurements along with gas tracer measurements. Test results will feed the near-field and unsaturated zone flow and transport process model reports.

Current Status:

During this reporting period, DOE continued to conduct SHC testing in a series of 20 meter deep boreholes in the Topopah Spring lower lithophysal zone. Testing has been completed in the arrays at Station 16+95. DOE has completed testing activities at station 16+65 meters. Testing on existing arrays will be completed; however, no additional systematic borehole drilling is planned for FY02.

In-Situ Thermal Conductivity Measurements**Background:**

DOE's thermal properties data of the Topopah Spring lower lithophysal tuff unit is limited to a small number of laboratory measurements. Therefore, DOE plans to collect in-situ thermal conductivity measurements by drilling a series of 8.5 meter deep boreholes in this rock unit. Each set of boreholes will contain a heater hole along with one or more observation holes containing temperature sensors. The thermal pulse measured from the heater will allow the in-situ thermal conductivity of the rock to be calculated. DOE completed drilling a two hole array at Station 15+62 and a six hole array at Station 15+35. Thermal conductivity boreholes at Station 16+62 are instrumented and collecting data.

Status:

Thermal conductivity on the two hole array was maintained and stabilized temperatures of approximately 347°F were recorded until approximately October 10, 2001, at which time the heaters were powered down. Subsequent to the planned power down on the two hole array, cool down temperatures were monitored. Collection of baseline data for the six hole array at Station 15+35 is complete and arrangements for providing power to the heaters have been accomplished.

Alcove 8:**Background:**

This alcove is constructed at Station 8+00 to conduct seepage testing from the Topopah Spring upper lithophysal zone to the underlying Topopah Spring middle nonlithophysal zone. DOE completed drilling a series of boreholes downward from this alcove for moisture monitoring. Niche #3, previously constructed in the Topopah Spring middle nonlithophysal zone, is situated 20 meters directly below this alcove and will be used in this test. Infiltration systems constructed on the floor of Alcove 8 will apply traced water at a measured rate. Boreholes in Alcove 8 and Niche #3 will be used to monitor changes in moisture content and other properties of the rock-mass. DOE scientists plan on monitoring these boreholes using ground penetrating radar, neutron logging, and acoustic tomography. Test results will feed near field and unsaturated zone flow and transport process model reports.

Two infiltration plots have been constructed on the floor of this alcove. One plot measured approximately 1 X 1 meter, and the second plot approximately 3 X 4 meters. The 1 X 1 meter plot was constructed on a segment of a small fault exposed both on the floor of Alcove 8 and the roof of Niche 3. From August to December 2000, DOE scientists ponded water on this fault and monitored moisture conditions in Niche 3 to determine the breakthrough time of traced water, but no breakthrough occurred. According to DOE scientists, this fault is filled with gouge (clay like material) which may be inhibiting flow. DOE scientists report that subsequent analyses of this gouge

material indicate the presence of smectite (clay that swells with water). To enhance infiltration and seepage processes along this fault, DOE scientists enlarged the infiltration plot. A trench (roughly 15 centimeters deep, 40 centimeters wide, and 4 meters long) was constructed along this fault. This trench allows water to pond over the entire length of the fault exposed in the floor of Alcove 8. On March 6, 2001, DOE started infiltration on this trench, and on April 6, 2001, DOE scientists detected initial breakthrough of traced water in Niche #3.

Current Status:

As reported by DOE, the current infiltration rate on the trench in Alcove 8 remains approximately 9.0 liters per hour, and the seepage rate in Niche #3 is roughly 5 percent of the infiltration rate. DOE has deferred the start of infiltration on the 3 X 4 meter plot until testing on this fault is completed. Seepage testing on this fault continued through this reporting period and is expected to continue through FY2002.

EXPLORATORY STUDIES FACILITY (ESF) TESTING

Seepage Testing

DOE has completed moisture monitoring and testing in Alcoves 1, 2, 6, and Niches 1, 2. Limited moisture monitoring and seepage testing continues at Alcoves 3, 4, 7 and Niches 3 and 4. Ongoing ESF testing activities are summarized below.

CL-36 Validation Study

Background:

DOE scientists are proceeding with a study to validate the presence of bomb-pulse CL-36 at two locations in the ESF. Approximately 60 samples have been collected in the vicinity of the Drill Hole Wash Fault and the Sundance Fault where elevated concentrations of CL-36 were detected in a previous study. These samples are being analyzed for CL-36, tritium, technetium-99, and supplemented by analyses of uranium, thorium, iodide-129 and radium isotopes.

To date, this validation study has detected no elevated CL-36 values; however, additional samples await analyses. According to DOE scientists, one possible explanation for the apparent disagreement between results of this study and an earlier study may lie in sample preparation and processing techniques. One of the two laboratories involved is thought to have used a more aggressive crushing technique and longer leach times which may release more rock chloride thus reducing the ratio of CL-36 to chlorine. To determine the effect of two different sample preparation and processing techniques, a bulk sample has been collected from the ECRB, crushed to a uniform size, and sample splits shipped to the two laboratories for analyses. According to DOE, the results of these analyses will be compared and the two laboratories will then agree to a standard sample processing method for subsequent chlorine-36 analyses. The two laboratories will synthesize their results and prepare a report documenting their findings including implications for conceptual models of unsaturated zone flow and transport. An interim report is expected to be completed by the end of CY2001. The two laboratories completed separate leaching experiments of reference sample splits to determine what effect different leaching procedures have on the release of rock chloride and CL-36 analyses. According to DOE, preliminary results indicate that CL-36 analyses are sensitive to the sample leaching time. These results suggest that minimal sample treatment (e.g., passive leaching and reduced leaching time) yields higher ratios

of CL-36 to chlorine. Accordingly, the DOE laboratories have agreed on a standard protocol for analyzing the remaining CL-36 validation samples which will use a 24-hour or shorter passive leach technique, and require that the Sample Management Facility crush all samples to a uniform size for leaching.

Current Status:

The sample management facility has completed crushing of all but eight of the validation samples and USGS has completed leaching the sample splits. Splits of the leached samples have been sent to the labs and these samples have been prepared for isotopic analysis. The samples were analyzed using the Atomic Mass Spectrometer on October 26, 2001. The results of his analysis will be documented in a future OR Report.

Alcove 5 (Thermal Testing Facility Access/Observation Drift, Connecting Drift, and Heated Drift)

Background:

DOE initiated the heating phase of this test on December 3, 1997. The four-year heat-up phase will be followed by a four-year cool-down phase. Heat generated by nine electrical floor heaters and 50 electrical wing heaters simulate heat from emplaced waste. This test is designed to heat approximately 15,000 cubic meters of rock in the proposed repository horizon to 100° Centigrade (212° Fahrenheit) or greater to investigate coupled thermal-hydrologic-mechanical-chemical processes. These processes are monitored by approximately four thousand sensors positioned in 147 boreholes around the heated drift. A data collection system records measurements from these sensors.

DOE scientists continue to monitor moisture and rock mass changes around the Heated Drift via geophysical logging of selected boreholes as well as monitoring rock mass changes inside the Heated Drift. Furthermore, as indicated in a recent scoping study, DOE scientists have examined and are working to quantify heat and mass loss through the bulkhead.

Current Status:

DOE continued to maintain drift wall-rock temperatures at 200° Centigrade (392° Fahrenheit). DOE plans to hold these wall-rock temperatures through CY2001 to evaluate the effect of sustained heating on the hydrologic, chemical and mechanical behavior of the rock. On October 24, 2001, sensors in the heated drift recorded the following preliminary temperatures: canister temperature of 200° Centigrade (392° Fahrenheit), rock-mass surface temperature of 197.2° Centigrade (387° Fahrenheit), and air temperature of 202.2° Centigrade (396° Fahrenheit) to allow for a natural cooling phase.

As reported by DOE, the heated phase of this test is nearing completion and power to the heaters is scheduled to be terminated on January 14, 2002.

Analysis of water samples condensed from the hottest (>140° Centigrade) hydrological holes in the Drift Scale Test indicate relatively high fluoride concentrations (20-66 ppm) and low pH (3.1 - 3.3) values. Tests are underway to determine if the source of fluoride emanates from the degradation of materials originally installed to facilitate

measurements. The most likely fluoride contributors are the Viton packers used to isolate test zones or teflon tubing used to draw water and steam from the test zones.

On October 31, 2001, the Drift Scale Test Chemistry Hole had been drilled to a depth of approximately 89 feet (approximately 27 meters). The 39 meter hole is being drilled from the access/observation drift along a line that penetrates the dry-out zone located above the heated drift crown. This operation provides core from the margins outside the dry-out zone that will be processed in an ultracentrifuge to extract water and accurately measure saturation levels. The recovered water will be analyzed for major ions and isotopes.

Fluid Inclusion Study

Background:

UNLV scientists have completed a study to determine the origin and age of fluid inclusions found in secondary minerals (calcite and silica) at Yucca Mountain. Over 150 samples from the ESF and ECRB have been collected and characterized to better understand the development of secondary minerals and spatial distribution of fluid inclusions.

Current Status:

The publication of UNLV's report has been delayed; however, a draft version of this report is expected to be released in November of 2001.

Laser Strainmeter Test

Background:

Under a cooperative agreement with the Yucca Mountain Site Characterization Office, the University of California, San Diego will install and monitor a long-baseline strainmeter (LSM) in the ESF. The LSM experiment will supplement Global Positioning System surveys conducted at five sites in the Yucca Mountain area from 1991 to 1997, which indicated higher crustal elongation rates (strain rates) than those indicated by the volcanic and tectonic history of the region. The general test description consists of the installation and operation of the LSM along the South Ramp of the ESF. A laser will measure the distance between two end monuments.

Current Status:

Construction of strainmeter niche monuments is complete and installation of the remaining instrument enclosure, electrical terminations is continuing. The LSM is presently expected to be operational by the end of CY2001, or in early CY2002.

SURFACE-BASED TESTING

Alluvial Tracer Complex (ATC)

Background:

The ATC is a joint Nye County and DOE Cooperative Program to investigate flow and transport properties of the saturated alluvium. Single-well ATC testing at well NC-EWDP-19D/D1 (Enclosure 3) and includes both hydrologic and tracer testing is complete. Cross-well hydrologic and tracer testing will also be performed at NC-EWDP-

19D/D1. Nye County drilled 19D/D1 to a depth of 1438 feet and encountered water at 366 feet and volcanic rocks at 810 feet. This well was completed to isolate six water bearing zones (4 in alluvium and 2 in volcanic rocks). Nye County instrumented wells NC-EWDP-4PA, 4PB, 19P, 15P and Washburn to determine the affects of ATC hydrologic testing on surrounding wells. Drilling of injection/monitoring well boreholes EWDP-IM1 and IM2 was completed and cutting samples have been collected for analysis.

Current Status:

During this reporting period, reaming of the EWDP-IM1 and IM2 boreholes for installation of casing and well screen was completed. Nye County personnel also completed a successful 48-hour pump test in each of these well boreholes. Enclosure 4 provides the well configuration for cross-hole testing.

Waste Handling Building Geotechnical Investigation

Background:

DOE is conducting a geotechnical investigation at the Yucca Mountain North Portal area to collect data for the design of a waste handling building for a potential repository. This activity involved drilling a series of boreholes and excavating trenches/test pits to characterize this area. The field work is completed.

Current Status:

DOE continued the work of integrating geotechnical information collected from drilling and geophysical logging of 15 shallow boreholes and four test pits. Final reports on these activities are expected to be submitted to DOE by the middle of FY 2002.

Characterization of Near Surface Velocity Structure

Background:

DOE is collecting near surface velocity data at Yucca Mountain for use in the design of surface and subsurface facilities for a potential repository at Yucca Mountain. Within this area, DOE has completed the Spectral Analysis of Surface Waves surveys to assess shear wave profiles of shallow rock units at Yucca Mountain. Testing has also been completed to extend the near surface velocity structure characterization to the potential repository horizon.

Current Status:

Analysis modeling and documentation for this activity is expected to be completed in FY2002.

Busted Butte Unsaturated Zone Transport Test

Background:

The hydrologic and tracer testing at Busted Butte was designed to provide data to help model flow and transport of radionuclides in the unsaturated zone under the proposed repository. The Busted Butte underground facility includes a 72.5 meter main drift and a 19 meter test alcove. The test is fielded in the base of the Topopah Spring non-to-partly-welded vitric sub-zones and the top of the Calico Hills Formation. Phase I tracer testing was completed in 1998. Phase II tracer testing was conducted in a separate 10 X 10 X 6 meter block of rock and this testing was completed in December 2000. DOE completed post-test characterization of Phase II tracer testing and the site was closed.

The completed work activities (e.g., overcoring selected injection boreholes, partial min-back of the test block, and rock sampling and analyses), was done to better characterize the distribution of reactive and nonreactive tracers. Prior to site closure, DOE completed the partial mine-back and sampling of the Phase II block.

Current Status:

Atomic Energy of Canada, LTD., continued to perform radionuclide transport testing on blocks of rock extracted from the Busted Butte Test Facility. However, the generators at the site have been turned off and the site has been closed. Future reporting will be exclusive to the Atomic Energy of Canada, LTD. work.

ENGINEERED BARRIER SYSTEM (EBS) TESTING

Background:

The Engineered Barrier System Operations (EBSO) Office of the Yucca Mountain Project continues to perform EBS testing. The EBS tests are performed in a Pilot Scale Test Facility located in North Las Vegas. Test results are used to support the EBS degradation and transport process model report.

PILOT SCALE TESTING

Pre-closure Ventilation Test

Background:

DOE's System Design Description for the emplacement drift system states that the subsurface ventilation will remove 70 percent of the heat generated by the waste packages during pre-closure. DOE is conducting a multi-phase pre-closure/post-closure ventilation test in the EBS test facility. The objectives of this test are to (1) develop data to support the design of the ventilation system for the potential repository to maintain sub-boiling emplacement drift temperatures; and (2) provide data to support computer models used for ventilation calculations.

Current Status:

Phase II EBS ventilation testing, which started in April 2001, was completed during this reporting period. This test activity simulated the ability of the inlet air, at different temperatures, to maintain sub-boiling temperatures at the emplacement drift wall in a potential repository. DOE developed a test plan for Phase III testing which will add moisture to the porous media in the simulated invert to determine the effect on ventilation efficiency.

DOE is also performing a Post-closure Ventilation Test to study the convective heat transfer in the post-closure time period. This test is currently under construction at the EBS test facility.

7.0 GENERAL

1.0 Appendix 7 Interactions

On October 22, 2001, staff from DWM including the OR's and a representative from the CNWRA participated in an Appendix 7 meeting with DOE. This Appendix 7 meeting concerned DOE's plan to discontinue monitoring in three unsaturated zone boreholes. Additionally, DOE provided an update on unsaturated zone testing in the ESF and cross drift. Discussions within this area addressed studies at Alcoves

1 and 7 and cross drift studies that included Alcove 8/Niche 3, Niche 5, systematic hydrologic characterization, bulkhead investigations, and monitoring of construction water and moisture. DOE also discussed an option to move the first bulkhead in the cross drift. Specifically, in September DOE proposed moving this bulkhead from its current location at station 17+63 to approximately station 22+01. This change was intended to make it easier to collect geomechanical samples in the formerly sealed-off portion of the tunnel. However, NRC staff expressed a concern that the change would have shortened the cross drift test by over 600m, making it very difficult for DOE to fulfill a number of NRC/DOE agreements.

Although DOE had postulated that the sealed drift would show evidence of condensation in the back of the drift with a drier environment toward the front (i.e., from approximately Station 23+00 to Station 17+63), the observed conditions revealed a pattern of wetted sections throughout the tunnel. As a result, DOE has revised their plans on moving the first bulkhead, and now anticipates installing an additional bulkhead near Station 22+01. DOE's planned activities also include collecting geomechanical data over the next several months, installing equipment to sample dripping water and measure rates of dripping, and sealing all of the bulkheads by late December, 2001.

2.0 Technical Exchanges

On September 5, 2001, staff from the Nuclear Regulatory Commission (NRC) conducted a technical exchange in Las Vegas, Nevada, with DOE staff, to discuss NRC concerns related to the consequences of future igneous activity subissues. These concerns can be separated into four topics: (1) Ash and Soil Redistribution; (2) Magma-Drift interactions; (3) Magma-Waste package Interactions; and (4) Magma-Waste Form Interactions. DOE and NRC staffs discussed in detail DOE plans to resolve NRC concerns. Four agreements were reached that fully cover the NRC "Consequence of Future Igneous Activity" subissue. As a result, the status of subissue 2, as well as the overall KTI, is "closed pending."

On September 18-19, 2001, staff from the Division of Waste Management conducted a technical exchange with the DOE on the range of potential operating temperatures. This public meeting was conducted by a three-way video conference among the NRC, (Rockville, MD); DOE, (Las Vegas, Nevada); and the CNWRA, (San Antonio, Texas). This was the second to two meetings on DOE's Supplemental Science and Performance Analyses Report (SSPA). This meeting focused on the NRC staff's questions pertaining to DOE's SSPA. The questions, arising from the staff's review of the SSPA, addressed many topics covered in previous KTI resolution meetings. Each of the staff's 129 questions was individually addressed and an adequate explanation was provided by DOE, or DOE agreed to provide the necessary information in future documents. Based on these discussions, two agreements pertaining to additional information DOE needed to provide were reached between NRC and DOE.

3.0 Other

NRC/DOE Quarterly Quality Assurance and Key Technical Issues Status Meeting

On September 6, 2001, DWM personnel including the OR's attended the NRC/DOE Quarterly Quality Assurance and Key Technical Issues (KTI) Status Meeting, in Las Vegas, Nevada. In preparation for this public meeting, DOE transmitted a letter to the NRC, dated August 31, 2001, that provided an evaluation of the significance

and impact of unqualified data and software on the results and conclusions of the Total System Performance Assessment for Site Recommendation (TSPA-SR.) The data and software, addressed in this letter, are used for the analysis model reports (AMRs) and process model reports (PMRs) which support the TSPA portion of a possible site recommendation. During the meeting, DOE discussed the population of data and software, supporting possible site recommendation, that is not fully qualified, as well as its significance and impact on the site recommendation process. Specifically, DOE reported that, as of September 5, 2001, it had qualified 94 percent of all data, and 98 percent of the software supporting the TSPA-SR. DOE also stated that the remaining population of unqualified data and software have no impact on the conclusions in the TSPA-SR. The NRC staff is presently reviewing the information contained in the August 31, 2001, letter, in order to confirm their understanding of the conclusions in the TSPA-SR.

As stated by DOE during the September 6, 2001, meeting they are in the process of summarizing their model validation review efforts and documenting the results. Furthermore, in their August 31, 2001, letter, DOE stated that "No model development issues have been identified that would impact the conclusions of the TSPA-SR," and that the results of the model validation review would be provided to the NRC in October 2001. In an interim status report to the NRC, dated October 19, DOE stated that their reviews were continuing and that the final results would be provided to the NRC by the end of November 2001.

Quality of Documents Supporting Site Recommendation

During the September 6, 2001, NRC/DOE Quarterly QA and KTI Status Meeting, DOE discussed the results of its reviews to verify the quality of the documents supporting site recommendation [i.e., TSPA-SR; the Science and Engineering Report (S&ER); and the Supplemental Science and Performance Analyses Report (SSPA)]. DOE indicated that they had performed vertical and horizontal reviews, as well as, technical evaluations of these documents using, in selected cases, personnel independent of the Yucca Mountain project. DOE also stated that they had used independent personnel to perform an analysis for determining the root causes of the errors found in these documents. As a result of these reviews and evaluations, DOE made several corrections to the documents supporting site recommendations.

DOE's August 31, 2001, letter, also discussed the status of unqualified data, software, and models used for the SSPA Report. The SSPA provides plans for additional low-temperature evaluations at the Yucca Mountain repository. DOE explained that the unqualified portion of the data, software, and models used in the development of the models and analyses described in the SSPA are not part of the baseline for TSPA-SR; therefore, they do not require impact assessments. DOE explained that the models, software, and data supporting the SSPA were not subjected to the same qualification controls as the data and software supporting the TSPA-SR because the information contained in the SSPA is not now a part of, and is not used to support, a potential License Application (LA). DOE added that if the information contained in the SSPA is used to support, or be a part of, an LA, should

DOE submit an application, the information would be fully qualified and subjected to the same qualification controls as used for the TSPA-SR.

DOE's Corrective Action Plan

During the September 6, 2001, NRC/DOE Quarterly QA and KTI Status Meeting, DOE and its contractor, BSC, presented the path forward regarding corrective actions to prevent recurrence of the previously identified quality problems. DOE stated that it will develop a comprehensive corrective action plan that will address the causes of problems and a process to improve the level of performance of its QA program implementation.

DOE's corrective action plan elements and proposed approach, as presented during the September 6, 2001, NRC/DOE Quarterly QA and KTI Status Meeting, were generally acknowledged by the staff. However, during this meeting, NRC noted that DOE has had difficulty implementing previous corrective action plans. Additionally, NRC indicated that it will observe DOE's implementation of its Plan.

The OR's will continue to provide oversight of the implementation of DOE's QA program and review and follow the implementation of DOE's latest action plan to correct QA problems.

Nuclear Waste Technical Review Board Meeting on Yucca Mountain

On September 10-12, 2001, staff from the Division of Waste Management including the OR's and representatives from the CNWRA attended a public meeting of the NWTRB in Las Vegas, Nevada. The purpose of these meeting's is for NWTRB to obtain insights from a variety of stakeholders on issues relevant to the DOE's potential site recommendation. DOE briefed NWTRB on its Preliminary Site Suitability Evaluation (PSSE), the SSPA, and DOE's plans to address the NRC KTI's and agreements. NWTRB members discussed DOE's characterization of uncertainty, as represented in these reports, and the efforts needed by DOE to complete work agreed to in the issue resolution agreements with NRC. NWTRB also heard three different scientific perspectives on the consequences of igneous activity from DOE, the State of Nevada, and the Center. The Environmental Protection Agency described its final Yucca Mountain standard (40CFR Part 197). DOE presented interim findings and results of different independent peer reviews of DOE work on waste package materials, biosphere, and total system performance assessment.

On October 23, 2001, the OR's accompanied a representative of the NRC Region IV, Division of Nuclear Materials Safety on a visit to the Yucca Mountain facility. The purpose of this visit was to obtain an overview of DOE's site characterization activities.

Department of Energy Conducts Public Hearings on Yucca Mountain Preliminary Site Suitability Evaluation

Subsequent to the release of the Yucca Mountain PSSE report on August 21, 2001, DOE's Office of Civilian Radioactive Waste Management conducted public hearings in Las Vegas, on September 5, 2001, and in Amargosa Valley, and Pahrump, on

October 10 and 12, 2001, respectively. These hearings along with others conducted in various locations in Nevada, provided a forum for public comments on the PSSE which presents an initial assessment of the site's performance against the final radiation safety standards set by the Environmental Protection Agency in June of 2001. The OR's attended the public hearings in Las Vegas, Armagosa Valley and Pahrump which provided additional information intended to facilitate public review and comment on the possible site recommendation by the Secretary of Energy to the president for development of a high-level nuclear waste geologic repository. These hearings which were well attended by DOE management personnel, state and local officials, public interest groups, tribal representatives and members of the public provided an effective mechanism for obtaining public comments.

There were no outstanding issues raised as a result of these visits.

ESF / ECRB PLAN VIEW
ALCOVE, NICHE AND BOREHOLE
TESTING LOCATIONS

ALCOVE # 7
 STA 50+84 m

ESF NICHE 4
 STA 47+98 m

MAIN DRIFT

GHOST DANCE FAULT

ALCOVE # 6
 STA 37+37 m

ESF NICHE 2
 STA 36+66 m

ESF NICHE 3
 STA 31+07 m

ECRB CROSS OVER ALCOVE
 APPROX. STA 8+00 m

ECRB CROSS DRIFT
 STA 0+00 m

ALCOVE # 5
 STA 28+27 m

STA 28+00 m

ECRB STATION AT ESF CROSSING
 APPROX. STA 7+73 m

ECRB NICHE 5
 APPROX. STA 16+20 m

ECRB CROSS DRIFT THERMAL ALCOVE
 APPROX. STA 16+75 m

ECRB CREST ALCOVE
 APPROX. STA 18+50 m

BULKHEAD
 APPROX. STA 17+00 m

BULKHEAD
 APPROX. STA 24+50 m

ECRB NICHE 6
 APPROX. STA 23+75 m

BOREHOLE SD-6

ECRB SOLITARIO NICHE
 APPROX. STA 26+50 m

EXCAVATION COMPLETE
 STA 28+81 m

SOLITARIO FAULT

NOTE: NICHE/ECRB DRIFT SIZES ARE NOT ILLUSTRATED TO SCALE

NOTE: NICHE/ECRB DRIFT SIZES ARE NOT ILLUSTRATED TO SCALE

