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

April 25, 2001

MEMORANDUM: 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
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SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION ON-SITE LICENSING REPRESENTATIVES' REPORT ON YUCCA MOUNTAIN PROJECT FOR JANUARY 1, 2001, THROUGH FEBRUARY 28, 2001

The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representative's (ORs) report, for the period of January 1, 2001, through February 28, 2001.

This report highlights a number of Yucca Mountain Project activities of potential interest to NRC staff. The ORs continue to respond to requests from NRC Headquarters staff to provide various documentation and feedback related to Key Technical Issues (KTIs) and their resolution. During this reporting period, the ORs continued to observe activities associated with Yucca Mountain Site Characterization, KTIs, and auditing. The ORs 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, Chad J. Glenn on (702) 794-5046 or Robert Latta on (702) 794-5048.

Enclosures: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives Report
ESF/ECRB Plan View, Alcove, Niche & Boreholes Testing Locations
University of Nevada, Las Vegas (UNLV) Press Release
Process for Arranging Escorted & Unescorted Access
Early Warning Drilling Program - Nye County, Nevada

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U. S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVES REPORT

NUMBER OR-01-01

FOR THE REPORTING PERIOD OF JANUARY 1, 2001 THROUGH FEBRUARY 28, 2001

/s/
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Enclosures

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NUMBER OR-01-01

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1.0 EXECUTIVE SUMMARY

TOTAL SYSTEM PERFORMANCE ASSESSMENT - SITE RECOMMENDATION (TSPA), PROCESS MODEL REPORTS (PMRS), AND ANALYSIS/MODEL REPORTS (AMRS) AUDITS

During October 1999 through August 2000, the U. S. Department of Energy (DOE) Office of Quality Assurance (OQA) performed audits of the draft TSPA, PMRs and AMRs. Since these documents were in the early draft stage, 175 recommendations were documented in lieu of noting these findings as potential deficiencies. These 175 recommendations have been entered into the DOE Condition/Issues Identification and Reporting System (CIRs) and will be tracked until the appropriate resolution occurs and then closed. The On-Site Representatives (ORs) agree with this methodology and have requested to be placed on distribution for this separate database when it is finalized for tracking purposes.

NONCONFORMANCE REPORT (NCR) OPEN ITEMS DATABASE

The OR overview of the NCR, and Corrective Action Report (CAR) and Deficiency Report (DR) open items databases indicated there were examples of deficiencies being overdue past their estimated completion dates. The OR Report recently closed two open items pertaining to this subject matter. This matter was brought to the attention of DOE management. DOE management was fully aware of this situation and indicated that this was partially due to the recent transition to a new Civilian Radioactive Waste Management System Management and Operating Contractor (M&O). It was decided to continue maintaining the Corrective Action Board (CAB) until the trend for timely closure of deficiencies improves. The ORs will track and monitor progress to this activity in subsequent OR Reports.

SCIENTIFIC NOTEBOOK DEFICIENCIES

Recently, there were four deficiencies issued pertaining to scientific notebooks (S/Ns). The OR report carried repetitive S/N deficiencies as an NRC Open Item and recently closed it in the December 1999 OR Report. This matter was discussed with OQA representatives who indicated that the trending program had recognized this as a potential problem and that a Suspected Trend Investigation Report was being prepared. The ORs will track and report on the results of this investigation.

AUDIT/OBSERVATIONS

During the week of January 16-19, 2001, the ORs observed DOE's audit of the Operating Contractor's (M&O) procurement program. Within the areas examined, the audit team generally concluded that the QA controls for procurement activities were being satisfactorily implemented. One potential deficiency was identified involving incomplete records; however, this example appeared to be isolated in nature and of minor safety significance. The ORs reviewed the audit teams findings and agreed with the results as presented at the post audit conference.

From February 5-9, 2001, the ORs participated in the observation of DOE's audit of the Unsaturated Zone Flow and Transport Model Process Model Report (UZ PMR). Although the audit team identified some minor deficiencies, and four Audit Observer Inquires were generated, the NRC observers determined that the AMRs and PMRs

reviewed during the audit were technically sound and that these products indicated an improving trend over several AMRs and PMRs evaluated during the past year.

From February 20-23, 2001, the ORs participated in the observation of DOE's audit of the Engineered Barrier System (EBS) Process Model Report (PMR). The NRC observers reviewed the preliminary findings and agreed with the results as presented at the post audit briefing. However, the NRC observers expressed a concern regarding the repetitive nature of these discrepancies involving model development, software and model validation, data traceability and technical checker accuracy that were identified in previous audits. The recurrence of these issues is being evaluated by DOE's Office of Quality Assurance.

TECHNICAL EXCHANGE MEETING WITH DOE

On January 31, 2000, the ORs, along with members of the Division of Waste Management, participated in a technical exchange with DOE in Rockville, Maryland, to discuss the data verification and software qualification process. The technical exchange focused on the processes used by DOE to resolve issues concerning data and software traceability and reproducibility used in PMRs and AMRs. The materials presented by DOE and their M&O were beneficial to the staff and the meeting resulted in an effective exchange of information. No open items were identified as a result of this technical exchange meeting.

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 Spring Tuff. Passive hydrologic testing also continued 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. These bulkheads were opened for several days over this period to service test instrumentation and equipment. DOE has not yet developed a detailed test plan for the passive hydrologic test, but DOE scientists indicate that the development of a test plan is in progress.

Cl-36 Validation Study

Testing to verify the presence of bomb pulse Chlorine-36 in the vicinity of the Sundance and Drill Hole Wash Faults continues. DOE reports that preliminary Tritium and Chlorine-36 analyses completed, to date, have not confirmed the presence of bomb pulse Chlorine-36; however, additional analyses await completion. DOE is proceeding with steps to determine if differences in sample preparation techniques might explain differences in analytical results from two laboratories. Over this period, these laboratories completed separate leaching experiments of reference samples to determine what effect different leaching procedures may have on Chlorine-36 analyses. The laboratories plan to complete Chlorine-36 analyses on these samples, compare results, and develop a standard protocol for analyzing the remaining samples for this study.

Thermal Testing
DOE continues to maintain drift wall-rock temperatures below 200_ Centigrade in the Alcove 5 thermal test. Over this period, DOE started drilling boreholes in the Topopah Spring lower lithophysal unit to collect in-situ thermal conductivity data of this rock unit.

Fluid Inclusion Study
University of Nevada Las Vegas (UNLV) scientists are proceeding with a study to determine the origin and age of fluid inclusions in calcite at Yucca Mountain. On February 8, 2001, UNLV scientists met in Las Vegas to present their final results on this study. This meeting was followed by a UNLV press release.(See Enclosure 3)

Surface-Based Testing
Waste Handling Building Geotechnical Investigation - DOE completed the field work supporting a geotechnical investigation at the Yucca Mountain North Portal area to collect rock property and geophysical data for input to the design of a waste handling building for a potential repository at Yucca Mountain. A final report is expected to be submitted to DOE by the end of FY 2001. The ORs will continue to track the progress of this work.

Nye County Early Warning Drilling Program
Over this period, DOE initiated their third and final single well alluvial tracer test at Nye County well NC-EWDP-19D/D1.

Busted Butte Unsaturated Zone Transport Test Facility
Phase II post-test characterization continued over this period. Atomic Energy of Canada, LTD., continues radionuclide tracer testing on blocks of tuff extracted from the Busted Butte Test Facility.

Engineered Barrier System (EBS) Testing
DOE continues EBS testing at their Pilot Scale Test Facility located in North Las Vegas. The DOE Phase II pre-closure ventilation test, is expected to start in March 2001. This phase of testing simulates the ability of ventilation inlet air, at different temperatures, to maintain sub-boiling temperature at the emplacement drift wall in a potential repository.

REPORT DETAILS

2.0 INTRODUCTION

The principal purpose of the OR report is to inform NRC staff, managers, and contractors to 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 ORs also participate in activities associated with resolving NRC KTIs. In addition to communication of this information, this report may raise potential licensing concerns, or express opinions; these items represent the views of the ORs. The reporting period for this report covers November 1, 2000, through December 31, 2000.

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 ORs 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 ORs consult with DOE scientists, engineers, and managers with input from NRC Headquarters management on NRC policy, philosophy, and regulations. The ORs focus on such issues as Quality Assurance (QA), design controls, data management systems, performance assessment, and Key Technical Issues (KTIs) 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

TSPA, PMR, AND AMR AUDIT RECOMMENDATIONS

Background:

During October 1999 through the August 2000, time frame, the draft TSPA, nine PMRs and approximately 40 AMRs were audited by the auditors representing the DOE OQA. Portions of these PMRs/AMRs and TSPA were still in the process of being developed and revised to accommodate changes and comments. The PMRs/AMRs and TSPA also had not gone through the full DOE review and approval process. The purpose of these audits was to gain insight early enough in the developmental process, to assure effective controls were established and followed in order to produce a quality product. The NRC staff was briefed on this process and observed several of these audits. Consequently, for those concerns deemed to be needing further improvement, it was agreed to note these conditions as recommendations as opposed to a condition adverse to quality. Normally, "recommendations" do not require a response. However, due to the nature of these PMRs/AMRs, OQA Management initiated actions to require responses to these recommendations, and then track the responses to the 175 recommendations noted during these audits.

Current Status:
Originally, tracking was to be accomplished through the newly developed CIRS. Upon further consideration, OQA Management decided that it would be more effective and timely to enter and track the responses and closure of the 175 recommendations through a separate database developed and managed by OQA. Future audit recommendations will be entered and tracked in CIRS. The OR agrees with this methodology and has requested to be put on distribution for the separate database once it becomes finalized in order to track and monitor timely closure of these recommendations.

NCR OPEN ITEMS DATABASE
Background:
A review of the NCR Open Items database indicated several NCRs were overdue relative to their estimated completion date. The database contained no explanations for this slippage or rationale to possibly extend the estimated completion date. Likewise, a review of the database for CARs and DRs revealed that deficiencies were not being acted on as aggressively as was done previously to pursue timely closure of open items. The NRC OR recently closed its two open items pertaining to timely closure of NCRs, CARs, and DRs based on the system DOE initiated and put in place for timely corrective action and timely closure of open items.

Current Status:
Recent review of the database indicated that closure of open items was not progressing as scheduled. This matter was brought to the attention of the DOE CAB member who was fully aware of this situation. The CAB member had earlier elevated this matter to upper DOE management for further actions. It appears that this situation occurred mainly during the period of the transition of the new M&O and the establishment of new position responsibilities. In addition, in the previous six months, the CAB had shifted from active involvement in resolution of the deficiencies to a status role. This was done in an attempt to determine whether or not the CAB could be disbanded. DOE upper management has directed the M&O to continue maintaining the CAB until a reversal in the current upward trend of open deficiencies and the corrective action process is noted. The OR will track and monitor and report on the progress of this activity.

The OR noticed through a review of the DRs, that there were four deficiencies recently issued pertaining to S/N. The OR previously carried this subject matter as an NRC Open Item for an extended period of time and ultimately closed it in December 1999. The recent S/N deficiencies that have surfaced were discussed with DOE QA Verification Manager and the Trend Coordinator. It was agreed that although the deficiencies were generally minor in nature, they should receive attention to prevent the problem from escalating as previously was the case. The Trend Coordinator noted that the trending program had recognized this as a potential problem and a draft Suspected Trend Investigation Report (STIR) was being prepared. The purpose of a STIR is to investigate suspected trends by reviewing the deficiencies identified, the similarity of other deficiencies and/or other STIRS and if necessary, perform surveillances or reviews.

AUDIT/OBSERVATION OF M&O PROCUREMENT PROGRAM
Background:
During the week of January 16-19, 2001, a team of auditors representing the DOE OQA performed a compliance-based audit (M&O-ARC-01-03) of the M&O procurement

activities. The purpose of this audit was to evaluate the implementation of the OCRWM's QA program related to procurement document control, control of purchased items and services and QA records as described in the Quality Assurance Requirements and Description (QARD) document and associated procedures. The audit team also reviewed the status of past M&O procurement deficiency documents, identified in previous QA audits and surveillances, to determine the effectiveness of completed corrective actions.

The ORs participated as observers on audit M&O-ARC-01-03, in order to evaluate the M&O's implementation of the OCRWM QA procurement program and the associated procedures. The OQA audit of the M&O was conducted in accordance with OCRWM Quality Assurance Procedure (QAP) 18.2, "Internal Audit Program," and QAP 16.2Q," Management of Conditions Adverse to Quality." The NRC staff observation of this audit utilized the guidance provided in NRC Manual Chapter 2410, "Conduct of Observation Audits," dated July 12, 2000.

Current Status:
The audit team conducted a limited scope evaluation of the M&O's procurement program to assess the implementation of activities affecting procurement document control, control of purchased items and services, and QA records management. Specifically, the audit team conducted interviews with cognizant personnel and examined a representative sample of implementing documents and records involving quality related procurement actions to ensure that these activities were performed in accordance with the applicable provisions of the QARD. The detailed audit checklist, used by the audit team, included provisions for the confirmation of: 1) procurement document acceptance methods, 2) source verification documentation, 3) acceptance reports for analytical, technical, and calibration services, 4) collection and transmittal of documents to the Records Processing Center, 5) technical organization and procurement engineering involvement, 6) verification of Q-deliverable acceptance criteria, and 7) the review of supplier evaluation records.

The audit team determined that with the exception of one minor deficiency, the M&O was satisfactorily implementing the elements of the QARD related to procurement document control, control of purchased items and services, and QA records management. The deficiency, DR LVMO-01-D-035, concerned the failure of the M&O to comply with the requirements of Procedure AP-7.5Q, "Submittal, Review, and Acceptance of Deliverables" for documents provided to the DOE. Examples of this deficiency included: 1) the failure to properly complete the associated Deliverable Acceptance Review forms for several documents and; 2) an incomplete transmittal letter related to a Features, Events and Processes (FEPs) database deliverable, that failed to identify if there were any open deficiency reports against the document.

Additionally, the audit team identified one recommendation concerning the consolidation of the requirements contained in Procedure YLP-7.1Q, "Acceptance of Purchased Products/Materials" and the criteria specified in Procedure QAP 7-5, "Acceptance of Items and Services." This recommendation was made to ensure that the supplier documentation and inspection records, establishing the acceptability of instrumentation, were processed prior to release of items to the field.

The audit team also evaluated the effectiveness of corrective actions for deficiency documents involving M&O suppliers. This evaluation identified one DR (LVMO-V-00-D-

085) involving the failure of a supplier to include the appropriate technical and quality requirements in procurement documents for measuring and testing equipment. The action to prevent recurrence, for this DR, included restriction of the supplier on the Qualified Vendors List, and establishing a requirement that the M&O procure for the supplier, all items and services related to the Yucca Mountain Site Characterization Project. The audit team determined that appropriate administrative controls had been initiated to address the identified deficiency. However, the supplier had not procured any additional items or services related to the project and the stipulated commitment had not yet been implemented.

Based on the ORs observation of the audit team, it was determined that this oversight activity was performed effectively and the audit team demonstrated a thorough knowledge and understanding of the procurement program elements and the governing procedures. The ORs reviewed the audit teams findings and agreed with the results as presented at the post audit conference. No NRC audit observation inquiry forms were initiated and the ORs concluded that, within the areas evaluated, the M&O procurement program was being satisfactorily implemented.

Technical Exchange Meeting with the Department of Energy

Current Status:

On January 31, 2001, the ORs and the staff from the Division of Waste Management participated in a technical exchange with representatives from the DOE. The technical exchange meeting held at NRC's headquarters in Rockville, Maryland, included telephone-conference communications with DOE's Yucca Mountain Project Office in Las Vegas, Nevada and the Center for Nuclear Waste Regulatory Analysis in San Antonio, Texas. The purpose of this technical exchange that was open to members of the public was to discuss DOE's data verification and software qualification processes. As indicated by DOE the Yucca Mountain Project established a process to assure that previously-qualified data, classified as to-be-verified (TBV) and to-be-determined (TBD), met all of the project requirements for traceability, technical quality and documentation accuracy. This process was based on a series of CARs generated by the YMP in 1998. Although the root cause evaluations, remedial actions and actions to preclude recurrence, including resolution of CAR LVMO-98-C-002, have been completed, DOE stated that the data verification and software qualification process is a continuing project initiative.

The technical exchange presentations focused on the processes used to resolve issues concerning data and software traceability and reproducibility to ensure that defensible, regulatory-compliant documents are produced. Specifically, the staff was provided with a description of the process controls and procedures that are used to screen and track designated data sets used in calculations, analysis and models. This information included an overview of: 1) the Plan for Resolution of TBV/TBD Issues for Data Used as Direct Input to AMRs and PMRs, 2) checklists for compiling TBV/TBD Removal Records Packages, 3) Data Qualification Documentation Checklists, and 4) Records Road Maps.

During the technical exchange, participants were provided with opportunities to question various aspects of DOE's data verification and software qualification processes as well as issues related to data traceability. These questions were responded to by DOE and the M&O representatives and at the conclusion of the technical exchange, the staff expressed their appreciation to DOE and the M&O for the thoroughness of the presentation. No open items were identified as a result of this technical exchange

meeting and the follow-up action to provide definitions of software related terminology has been completed by DOE.

On-Site Representatives Attend Clark County Yucca Mountain Nuclear Waste Advisory Committee Meeting

Current Status:

On January 24, 2001, the ORs attended a public meeting of the Clark County Yucca Mountain Nuclear Waste Advisory Committee, at the Clark County Government Center in Las Vegas, Nevada. Among the items discussed during the meeting were the results of a recent public opinion poll concerning the proposed high-level nuclear waste repository at Yucca Mountain, transportation issues and a status update from Clark County's Nuclear Waste Division. The meeting was attended by representatives from the affected units of local government, citizen groups, and Tribal constituents, as well as staff members from the offices of U.S. Senators Harry Reid and John Ensign. The meeting provided an opportunity for the effective exchange of information and views. The ORs participation in this meeting was regarded as beneficial and the continued involvement of NRC representatives in community activities, such as this, are an important extension of the agency's public outreach program.

Observation of the DOEs Audit of the Unsaturated Zone Flow and Transport Model, Process Model Report

Current Status:

From February 5-9, 2001, the ORs along with staff from the Division of Waste Management and a contractor from the Center for Nuclear Waste Regulatory Analyses observed DOE's audit of the scientific analyses and models associated with the development of the Unsaturated Zone Flow and Transport Model Process Model Report (UZ PMR). The purpose of this audit was to evaluate the implementation of the applicable provisions of the QARD manual based on the review of the technical content of the UZ PMR and the four supporting AMRs. The audit also examined the corrective actions taken as a result of the findings and recommendations from the previous DOE audit of the UZ PMR performed in January 2000.

Based on the results of the NRC observers independent review of the applicable analysis reports, supporting data, models and software applications it was determined that the audit was effective in identifying potential deficiencies and recommending improvements for the PMR and AMRs reviewed. Although the audit team identified some minor deficiencies, and four Audit Observer Inquires requesting clarification and information were generated, the NRC observers believe that the AMRs and PMR reviewed during the audit were technically sound and that these products indicated an improving trend over several AMRs and PMRs audited during the past year.

Observation Audit of the Department of Energy's Activities that Constitutes Scientific Analyses and Models Pertaining to the Engineered Barrier System Process Model Report

Current Status:

From February 20-23, 2001, the ORs and staff from the Division of Waste Management observed the DOEs, OQA audit of the Engineered Barrier System (EBS) PMR. The DOE audit team evaluated the quality of the analyses, models, data, software, and the effectiveness of the approach for demonstrating compliance with the overall performance of the two AMRs supporting the EBS PMR. As a result of the audit, two deficiencies were identified, 13 recommendations were documented and two Audit

Observation Inquiries were provided by the NRC observers requesting OQA responses. The NRC observers reviewed the preliminary findings of the audit team and agreed with the results as presented at the post audit briefing. However, the NRC observers expressed a concern regarding the repetitive discrepancies identified during this audit and in previous audits involving model development, software and model validation, data traceability and technical checker accuracy, despite the implementation of corrective measures. This recurrence of issues is being evaluated by OQA and the ORs will monitor the response to these concerns.

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

ENHANCED CHARACTERIZATION of the REPOSITORY BLOCK (ECRB)

DOE continues ECRB construction and testing activities to maximize the amount of data available to support DOE TSPA - Site Recommendation Rev.1. Enclosure 2 provides ESF and ECRB test locations. ECRB construction and testing activities are summarized below.

Background:
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.

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 state that moisture conditions in this section of the ECRB have not fully re-equilibrated. DOE plans to continue this test through FY2001.

Current Status:
On January 22, 2001, DOE opened all tree bulkheads to service test instruments and equipment. After this entry, DOE scientists reported the following observations: no apparent evidence of seepage; condensation in test area likely due to high relative humidity and small temperature fluctuations; and presence of organic material declining in abundance.

On January 25, 2001, DOE completed servicing scientific instruments and equipment and resealed the bulkheads at Stations 25+03 and 26+00. The bulkhead at Station 17+63 was temporarily shut on January 25th and reopened on January 29th to continue work on a refuge chamber immediately behind this bulkhead. This work was completed and the bulkhead was resealed on February 1st.

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. In the OR view, such a plan would provide greater confidence that test results will address data needs for DOE-NRC issue resolution activities. To date, this test plan has not been developed. DOE scientists indicate that the development of a test plan is in progress. The OR will continue to monitor the development of this test plan.

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. Test results will feed the unsaturated zone flow and transport process model report.

Current Status:

DOE scientists completed test preparations and started Seepage Threshold Testing in late February 2001. This testing is expected to continue through FY2001.

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:

DOE continues to drill and conduct SHC testing in boreholes. DOE plans to continue this testing through FY2001.

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 paired 8.5 meter deep boreholes in this rock unit. Each pair of boreholes will contain a heater hole and an observation hole containing temperature sensors. The pair of horizontal boreholes will be drilled at a 45° angle to the drift wall such that they cross at a 90° angle of each other without intersecting. The observation borehole will be drilled so that it crosses 13-25 centimeters above the midpoint of the heater borehole.

Status:

Over this period, DOE drilled the first pair of these boreholes at Stations 15+62 and 15+70. DOE plans to instrument these boreholes and start collecting thermal data from these boreholes over the next several months.

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 directly below this alcove (approximately 20 meters) 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).

Current Status:

To enhance the infiltration and seepage processes along this fault, DOE scientists have enlarged the infiltration plot. A trench (roughly 15 centimeters deep, 40 centimeters wide, and 4 meters long) was constructed along this fault. This trench will allow water to pond over the entire length of the fault exposed in the floor of Alcove 8. In March 2001, DOE plans to restart infiltration on this fault. DOE plans to start infiltration on the 3 X 4 meter plot in 4-6 months. This testing is expected to continue through FY2001.

EXPLORATORY STUDIES FACILITY (ESF) 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.

CHLORINE-36 VALIDATION STUDY

Background:

DOE scientists are proceeding with a study to validate the presence of bomb-pulse chlorine-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 chlorine-36 were detected in a previous study. These samples are being analyzed for chlorine-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 chlorine-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 is thought to have used a more aggressive crushing technique which may

release more rock chloride thus reducing the ratio of chlorine-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. A final report is expected to be completed by the end of CY2001.

Current Status:
Over this period, 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 Chlorine-36 analyses. The laboratories plan to complete Chlorine-36 analyses on these samples, compare their results, and develop a standard protocol for analyzing the remaining Chlorine-36 samples for this study.

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 heatup 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.

Current Status:
DOE scientists continue to maintain drift wall-rock temperatures below 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 February 22, 2001, sensors in the heated drift recorded the following preliminary temperatures: canister temperature of 196.1° Centigrade (385° Fahrenheit), rock-mass surface temperature of 194.4° Centigrade (382° Fahrenheit), and air temperature of 200.0° Centigrade (392° Fahrenheit). DOE scientists continued moisture monitoring via geophysical logging of selected boreholes.

Fluid Inclusion Study
Background:
University of Nevada Las Vegas (UNLV) scientists are proceeding with a study to determine the origin and age of fluid inclusions found in secondary minerals (calcite and silica) at Yucca Mountain.

Current Status:
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. On February 8, 2001, UNLV scientists sponsored a meeting in Las Vegas to

present their final results on this study. This meeting was followed by a UNLV press release on the study (Enclosure 3). A final report, documenting the results of this study, is expected to be completed in the Spring 2001 time frame.

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:

DOE continues with the construction of strainmeter niche monuments. The LSM is presently expected to be instrumented in the next several weeks and begin operation by the Summer 2001 time frame.

Underground Access Process

DOE/YMP has established a new underground access control procedure (AP-OM-005). This procedure establishes the responsibilities and process required for access to underground facilities which applies to all groups requiring access to these facilities. Under this process, YMP staff and others who visit or work underground on a periodic or infrequent basis require escorted access. The process for arranging escorted and unescorted access is outlined in Enclosure 4. NRC and Center staff should continue to contact the NRC OR office to arrange escorted access to YMP underground facilities.

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 is being conducted at well NC-EWDP-19D/D1 (Enclosure 5) and includes both hydrologic and tracer testing. Cross-well hydrologic and tracer testing will also be performed at NCEWDP-19D/D1 following the completion of single-well activities. 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 affects of ATC hydrologic testing on surrounding wells.

Current Status:

Over this period, the second single-well tracer test was completed in NC-EWDP-19D/D1. This test was conducted in the uppermost screened alluvial interval (412-431 feet) in this well. On January 4, 2001, the tracers 2,4-difluorobenzoic acid and sodium chloride were injected followed by 22,000 gallons of chase water. The pump-back phase started immediately after injection and was completed on January 12, 2001. On January 27, 2001, DOE started the third and final single-well tracer test in the same

screened interval as noted above. The tracers pentafluorobenzoic acid and sodium bromide were injected followed by 22,000 gallons of chase water. On February 27, 2001, DOE started the planned 60 day pump-back phase for this test.

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 involves drilling a series of boreholes and excavating trenches/test pits to characterize this area.

Current Status:

Over this period, DOE continued the work of integrating geotechnical information collected from drilling and geophysical logging of 15 shallow boreholes. A final report is expected to be submitted to DOE by the end of FY 2001.

Busted Butte Unsaturated Zone Transport Test

Background:

The planned hydrologic and tracer testing at Busted Butte is 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.

Current Status:

Over this period, DOE started post-test characterization of Phase II tracer testing. This work includes: overcoring selected injection boreholes, partial mine-back of the test block, and rock sampling and analyses to better characterize the distribution of reactive and nonreactive tracers. DOE completed overcoring four injection boreholes. On February 27, 2001, DOE started the partial mine-back of the Phase II block. This work is expected to be completed during the third quarter of FY2001. Atomic Energy of Canada, LTD., continues radionuclide transport testing on blocks of rock extracted from the Busted Butte Test Facility.

ENGINEERED BARRIER SYSTEM (EBS) TESTING

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 feed 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 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. This testing is expected to be completed by the end of FY2001.

Current Status:
Phase I of the EBS ventilation test was completed in December 2000. Phase I testing simulated the ability of ambient ventilation air to maintain sub-boiling temperature at the emplacement drift wall. Phase II testing is expected to start in March 2001. Phase II testing is expected to simulate the ability of the inlet air, at different temperatures, to maintain sub-boiling temperatures at the emplacement drift wall in a potential repository.

Column Testing
Background:
In December 1999, DOE started column testing using crushed tuff. This testing is designed to replicate a previously reported test by Rimstidt (Rimstidt and Williamson 1991). The purpose of this testing is to determine the potential changes in permeability due to Thermal Hydrologic Coupled (THC) effects in backfill/invert materials.
To date, three column tests have been initiated, however equipment and contamination difficulties have delayed the completion of this testing. The final test started in September 2000, and was completed in December 2000. DOE conducted post-test characterization activities over this period.

Current Status:
The OR has requested that DOE provide post-test characterization results for NRC information.

6.0 GENERAL

1.0 Appendix 7 Interactions

On January 8 - 11, 2001, the OR's accompanied representatives of the NRC Division of Waste Management and Center for Nuclear Waste Regulatory Analyses on a visit to Yucca Mountain. This visit included training for underground access, sampling of calcite deposits, and viewing the Alluvial Tracer Complex at NC-EWDP-19D/D1.

On February 5, 2001, the OR accompanied a representative of NRC Fuel Cycle Safety and Safeguards Division on a visit of Yucca Mountain. The purpose of this visit was to view erosional and sedimentary features in the vicinity of Yucca Mountain.

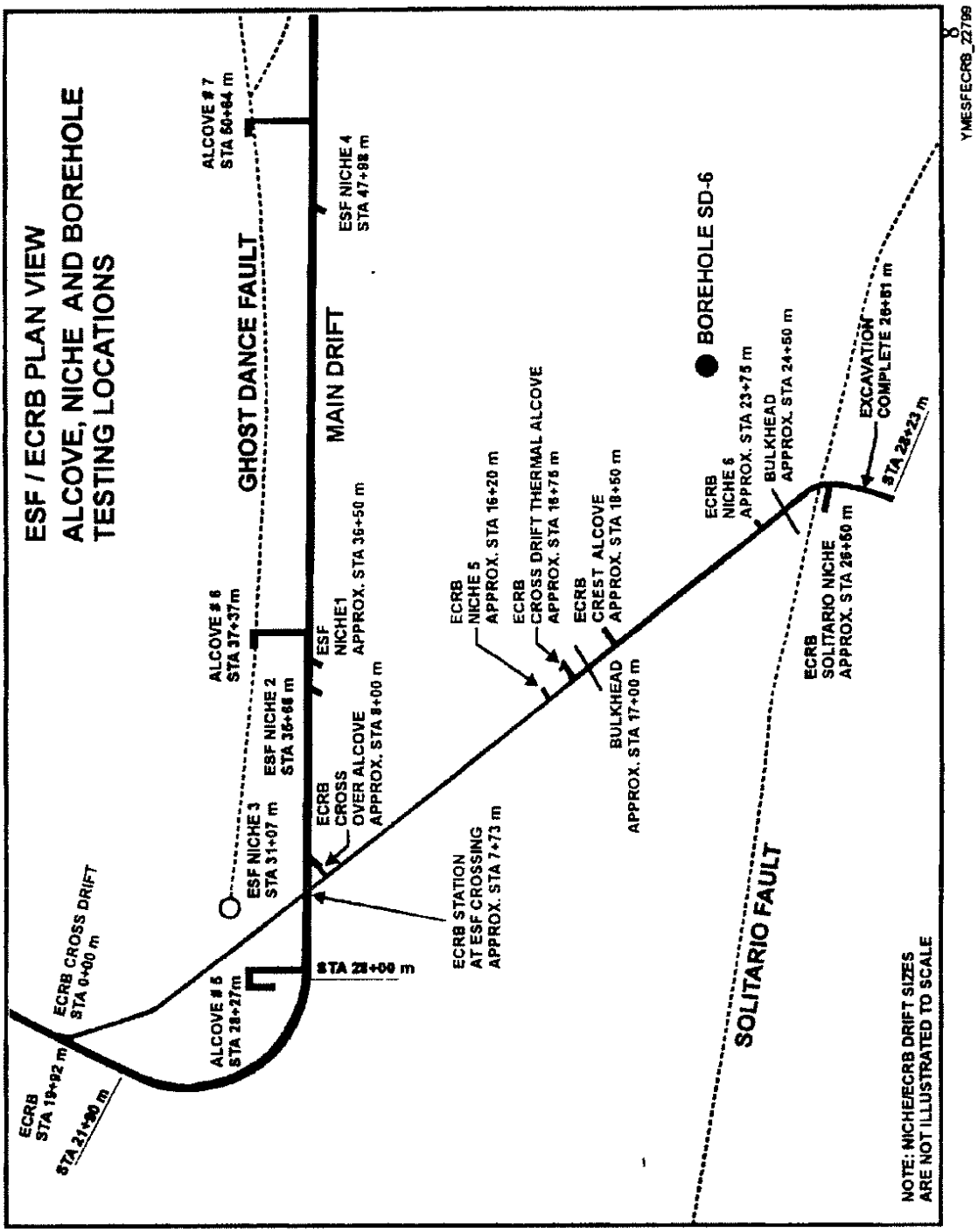
February 12, 2001, the ORs attended the Bechtel/SAIC all hands meeting to discuss the transition and organization of the new M&O contractor.

The purpose of the above activities is to obtain an overview of DOE's Yucca Mountain site characterization activities. There were no outstanding issues raised as a result of these visits.

2.0 Other

January 30 and January 31, 2001, the ORs attended the Nuclear Waste Technical Review Board meeting in Amargosa Valley, NV, to discuss DOE's efforts to characterize the site at Yucca Mountain, NV, as the possible location of a permanent repository for spent nuclear fuel and high-level radioactive waste.

February 6-8, 2001, the ORs attended (part time) the NRC/DOE technical exchange and management meeting held in Las Vegas, NV, to discuss repository design and thermal effects.


ESF / ECRB PLAN VIEW
ALCOVE, NICHE AND BOREHOLE
TESTING LOCATIONS
GHOST DANCE FAULT
MAIN DRIFT
SOLITARIO FAULT
BOREHOLE SD-6
ECRB CROSS DRIFT
STA 0+00 m
ECRB
STA 19+92 m
STA 21+90 m
ALCOVE # 5
STA 28+27m
STA 29+00 m
ESF NICHE 3
STA 31+07 m
ALCOVE # 6
STA 37+37m
ESF NICHE 2
STA 38+68 m
ECRB
CROSS
OVER ALCOVE
APPROX. STA 8+00 m
ESF
NICHE1
APPROX. STA 36+50 m
ECRB STATION
AT ESF CROSSING
APPROX. STA 7+73 m
ALCOVE # 7
STA 50+64 m
ESF NICHE 4
STA 47+98 m
ECRB
NICHE 5
APPROX. STA 16+20 m
ECRB
CROSS DRIFT THERMAL ALCOVE
APPROX. STA 18+76 m
ECRB
CREST ALCOVE
APPROX. STA 18+50 m
BULKHEAD
APPROX. STA 17+00 m
ECRB
NICHE 6
APPROX. STA 23+75 m
BULKHEAD
APPROX. STA 24+50 m
ECRB
SOLITARIO NICHE
APPROX. STA 26+50 m
EXCAVATION
COMPLETE 26+61 m
STA 26+23 m
NOTE: NICHE/ECRB DRIFT SIZES
ARE NOT ILLUSTRATED TO SCALE
YMESFECRB_22799

Enclosure 2

2/8/01

PRESS RELEASE

Yucca Mountain Fluid Inclusion Thermochronology Project

We are here to report the final results of a two-year investigation of the fluid history at Yucca Mountain. This project was designed to address the following questions. First, were fluids with elevated temperatures ever present within the Yucca Mountain site? If such fluids were recognized, three additional questions would be addressed: 1) what were the *temperatures* of these fluids, 2) what was their *spatial distribution* across the repository site, and 3) *when* did these fluids move through the site?

We have answered all of these questions and the data are not ambiguous. Fluids with temperatures typically ranging from about 45 to 60 degrees C were present throughout the site in the geological past. The data provide no evidence for the presence of these fluids with elevated temperatures at the Yucca Mountain site during the past 2 million years. Some samples constrain the presence of fluids with elevated temperatures to more than 4 or 5 million years. Data obtained by the USGS and limited geochemical data reported by State of Nevada funded researchers are consistent with our results. Our results do not allow us to determine if the fluids that precipitated the secondary minerals originated as surface water or upwelling fluids. However, our observations are not consistent with a hydrothermal origin for secondary minerals at Yucca Mountain.

This study addressed the issue of the presence and timing of fluids with elevated temperatures at Yucca Mountain. We did not address other safety issues regarding the site that remain to be resolved. These issues include, but are not limited to, questions relating to potential volcanic activity, the lifetime of the nuclear waste packages, and the transport of radionuclides to the accessible environment.

Jean S. Cline
Associate Professor
UNLV

Enclosure 3

EXPLORATORY STUDIES FACILITY ACCESS PROCESS

ESCORTED:

1. Contact Training at 702-295-5660, 5247, or 6072 to arrange to watch the Visitor Orientation Briefing, and obtain a visitor access card.[1]

2. Complete Underground Access form per AP-OM-005

3. Escorts should be pre-arranged with the "sponsor" organization or party, or contact Ranch Control at 702-295-5915 to arrange for an escort.[2] Based on discussions with your escort if your activities require you to go into a respirator controlled area,[3] you will need to:
   a. Contact Industrial Hygiene at 702-794-7506 to complete a medical questionnaire[4] to receive a medical clearance. (This will be forwarded to the Medical Officer for approval and should be submitted in advance) Upon receipt of your medical clearance, you will need to:
   a. Contact training at 702-295-5247 for respirator training. After you have completed respirator training you will need to:
   b. Contact Industrial Hygiene at 702-794-7506 to receive a fit-test. After you have been fit-tested you are cleared to enter into a respirator-controlled area.

4. Contact Site Operations at 702-295-4100 to get on the Plan of the Day.

5. Contact site Logistics at 702-295-5438 to obtain hard hats, and safety glasses, orange vest if entering the ECRB. (You must follow your own company specific process for safety shoes).

6. At the portal shack you will be issued hearing protection, a dosimeter, a belt, a light, and a self-rescuer.

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[1]The card is valid for a period of 1 year.

[2]Modifications are underway to remove any limitation on the number of times an individual can be escorted underground, however, individuals accessing the ESF frequently may consider seeking the credentials for unescorted access.

[3]Other controlled areas exist for Radon and Mold. Specific requirements to access these areas will need to be followed on a case- by-case basis in consultation with Industrial Hygiene and Safety.

[4]Medical Questionnaires will be reviewed and cleared by the project medical officer. Depending upon the information submitted on the questionnaire the medical officer might request a physical.

EXPLORATORY STUDIES FACILITY ACCESS PROCESS

UNESCORTED:

1. Contact Training at 702-295-5660, or 295-6072 to arrange to complete the following training:
   a. General Underground Training/Refresher (Required Annually)
   b. American Red Cross Standard First Aid/Adult CPR/Refresher/or equivalent (Required Annually)
   c. Respirator Training (Required Annually)
   d. Hearing Conservation Training (Required Annually)
   e. General Employee Training (GET)

2. Contact Industrial Hygiene at 702-794-7506 for instructions for obtaining a respirator physical. After you have completed your physical you will need to return to Industrial Hygiene for a Fit-Test.

3. Contact the Site Construction Manager (Currently Unknown) for unescorted access authorization.[5]

4. Contact Site Operations at 702-295-4100 to get on the Plan of the day.

5. Contact Site Logistics at 702-295-5438 to obtain hard hats, safety glasses, and an orange vest if entering the ECRB (You must follow your own company specific process for safety shoes).

6. At the portal shack you will be issued hearing protection, a dosimeter, a light, and a self-rescuer.

7. Check in and out of the facility with the Portal Control Attendant.

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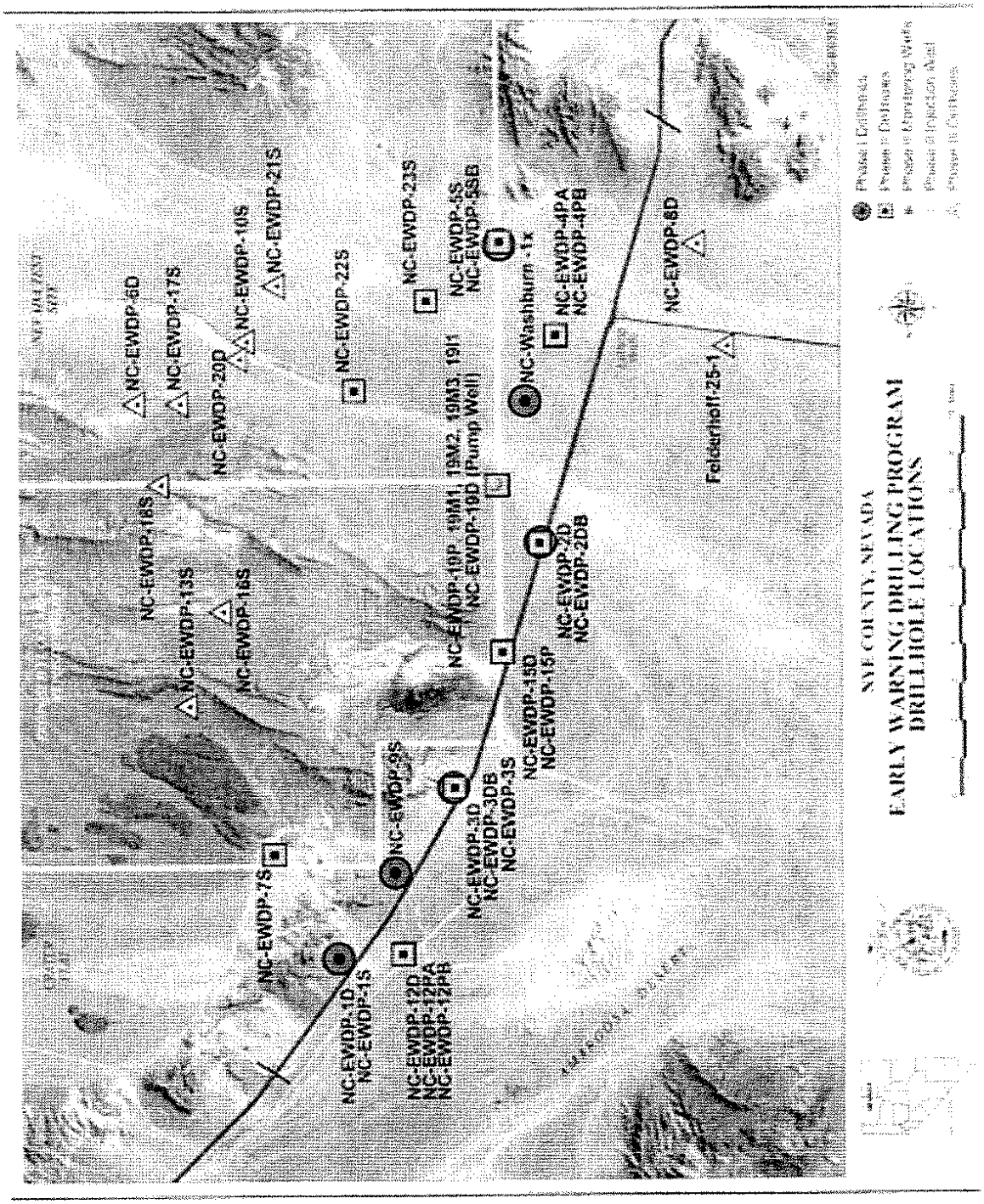
[5]Unescorted access will be granted to individuals who have achieved a sufficient level of site familiarity as determined by the Site Construction Manager.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NC-EWDP-17S
NC-EWDP-20D
NC-EWDP-10S
NC-EWDP-21S
NC-EWDP-18S
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NC-EWDP-16S
NC-EWDP-7S
NC-EWDP-22S
NC-EWDP-23S
NC-EWDP-5S
NC-EWDP-5SB
NC-EWDP-19P, 19M1, 19M2, 19M3, 19I1
NC-EWDP-19D (Pump Well)
NC-Washburn-1x
NC-EWDP-4PA
NC-EWDP-4PB
NC-EWDP-8D
Felderhoff-25-1
NC-EWDP-1D
NC-EWDP-1S
NC-EWDP-12D
NC-EWDP-12PA
NC-EWDP-12PB
NC-EWDP-9S
NC-EWDP-3D
NC-EWDP-3DB
NC-EWDP-3S
NC-EWDP-15D
NC-EWDP-15P
NC-EWDP-2D
NC-EWDP-2DB
NYE COUNTY, NEVADA
EARLY WARNING DRILLING PROGRAM
DRILLHOLE LOCATIONS

Enclosure 5