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

October 29, 2002

MEMORANDUM TO: Janet R. Schlueter, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

FROM: Robert M. Latta, Sr. On-Site Licensing Representative /RA/
Repository Site Section
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SUBJECT U.S. NUCLEAR REGULATORY COMMISSION ON-SITE LICENSING REPRESENTATIVES' REPORT ON YUCCA MOUNTAIN PROJECT FOR JULY 1, 2002, THROUGH AUGUST 31, 2002

The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representatives' (ORs) report for the period of July 1, 2002, through August 31, 2002.

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 audits. The ORs also attended various meetings and accompanied NRC staff on visits to Yucca Mountain.

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

Enclosure: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives' Report, Number OR-02-04

Memorandum to Janet R. Schlueter, Chief, dated October 29, 2002

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The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representatives' (ORs) report for the period of July 1, 2002, through August 31, 2002.

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 audits. The ORs also attended various meetings and accompanied NRC staff on visits to Yucca Mountain.

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

Enclosure: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives' Report, Number OR-02-04

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U.S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVES' REPORT

NUMBER OR-02-04

FOR THE REPORTING PERIOD OF JULY 1, 2002 THROUGH AUGUST 31, 2002

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Enclosure

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Figure 1: ESF/ECRB PLAN VIEW ALCOVE, NICHE AND BOREHOLE TESTING LOCATIONS . . . . .

ACRONYMS AND ABBREVIATIONS

ACRO	TITLE
AMR	Analysis and Modeling Report
ATC	Alluvial Tracer Complex
BSC	Bechtel SAIC Company, LLCs.
CAR	Corrective Action Report
CAQ	Conditions Adverse to Quality
CIRS	Conditions/Issue Identification Reporting Resolution System
CNWRA	Center for Nuclear Waste Regulatory Analyses
DAR	Document Action Request
DDEF	Deficiency Document Encoding Forms
DOE	U.S. Department Of Energy
DR	Deficiency Report
DWM	Division of Waste Management
EBS	Engineered Barrier System
ECRB	Enhanced Characterization of the Repository Block
ESF	Exploratory Studies Facility
EWDP	Early Warning Drilling Program
FY	Fiscal Year
KTI	Key Technical Issue
LA	License Application
MII	Management Improvement Initiatives
No.	Number
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
OCRWM	Office of Civilian Radioactive Waste Management
OPDD	OCRWM Program Documents Database
OR	On-Site Representative
OQA	Office of Quality Assurance
QA	Quality Assurance

ACRONYMS AND ABBREVIATIONS - continued –

ACRO	TITLE
QARD	Quality Assurance Requirements Description
QO	Quality Observation
RPC	Records Processing Center
SA	Self-Assessment
SCM	Software Configuration Management
SDS	Structural Deformation and Seismicity
SSPA	Supplemental Science and Performance Analyses
TER	Technical Product Errors Report
TSPA	Total System Performance Assessment
YMP	Yucca Mountain Project
YMSCO	Yucca Mountain Site Characterization Office

1.0 EXECUTIVE SUMMARY

REVIEW OF U.S. DEPARTMENT OF ENERGY's MANAGEMENT IMPROVEMENT INITIATIVES

On July 19, 2002, the U.S. Department of Energy (DOE) released the Office of Civilian Radioactive Waste Management (OCRWM) Management Improvement Initiatives (MII). The purposes of the MII were to: (1) address deficiencies in the implementation of the OCRWM Quality Assurance (QA) program; (2) prevent recurrence of program problems due to inadequate implementation of previously identified corrective actions; and (3) establish a foundation for continuous program improvement. To evaluate the adequacy of the corrective actions associated with the MII the ORs participated in the initial review of the document, along with staff from the Division of Waste Management (DWM), Region IV, and the Center for Nuclear Waste Regulatory Analyses (CNWRA).

Subsequent to this OR reporting period, the results of the NRC review team's assessment of the MII were provided to DOE on October 3, 2002. Reference: Letter to Dr. Margaret Chu (DOE) from Martin J. Virgilio (NRC), dated October 3, 2002 (ADAMS Accession ML022730625).

DEFERRAL OF YUCCA MOUNTAIN SITE CHARACTERIZATION OFFICE QA AUDIT

The ORs reviewed the project justification for deferring the annual compliance audit of the Yucca Mountain Site Characterization Office (YMSCO) and the response provided by the Office of Quality Assurance (OQA), which granted an audit extension to December 2002, with provisions for evaluating the need for a further extension at a later date. The ORs also reviewed the program requirements associated with the performance of audits contained in Subsection 18.2.1 E, of the Quality Assurance Requirements Description (QARD), which state that "Internal audits of work to verify QA program compliance shall be performed annually or at least once during the life of the work, whichever is shorter."

Based on the results of these reviews, it was determined that the justification for delaying the scheduled audit of the YMSCO organization did not appear to establish an adequate basis for deferral of a required audit activity. Given that the required performance of annual audits represents a minimum periodicity to verify QA program compliance, and that the justification for delaying the scheduled audit of YMSCO for 3 months does not appear to be adequately supported, this example of an apparent deviation from the requirements of Subsection 18.2.1 E of the QARD is identified as **OR Open Item 02-08.**

OBSERVATION OF BECHTEL SAIC COMPANY, LLC's SURVEILLANCE OF TECHNICAL PRODUCT ERRORS REPORTING PROCESS

During the week of July 8-12, 2002, the ORs observed selected aspects of Bechtel SAIC Company, LLC's (BSC) QA surveillance (BSCQA-02-S-37) of the Technical Product Errors Reporting (TER) process. The purpose of this performance-based surveillance was to evaluate the effectiveness of the recently implemented TER process described in Administrative Procedure AP-15.3Q, "Control of Technical Product Errors." As a result of this surveillance, one condition adverse to quality was identified, concerning the failure to follow procedures during the processing of Deficiency Document Encoding Forms (DDEFs). The BSC surveillance team also identified a concern regarding the lack of timeliness in the TER validation and disposition process.

Based on the ORs observations, it was determined that this oversight activity was effectively performed and that the BSC surveillance team demonstrated a thorough knowledge and understanding of the technical and administrative requirements associated with the TER process. The ORs reviewed the surveillance team's findings and generally agreed with the results documented in BSC QA Surveillance Report BSCQA-02-S-37. No NRC open items were identified as a result of this surveillance observation.

OBSERVATION OF DOE'S AUDIT OF BSC's IMPLEMENTATION OF THE QA PROGRAM

During the week of July 29 through August 2, 2002 DWM staff, including the ORs, and representatives from the CNWRA, observed a limited-scope compliance-based audit of the BSC's implementation of the OCRWM's QA program. The objectives of the DOE OQA audit were to assess the adequacy and effectiveness of BSC's Repository Design Project's implementation of the QARD, and to verify BSC's compliance with the requirements within the areas reviewed.

As a result of the audit, three conditions adverse to quality were identified which resulted in the issuance of two DRs and one Quality Observation (QO). The DRs involved: (1) the failure to document the justification for not performing an impact review for several revised drawings; and (2) inadequate implementing procedures related to the control of electronic media. The QO concerned an isolated administrative error associated with the review of record summary forms. Based on the ORs observations, it was concluded that OQA Audit BSC-ARC-02-15 was effective in determining the level of compliance of BSC QA activities with the requirements of the QARD and with associated implementing procedures. The observers generally agreed with the audit team's conclusions, findings, and recommendations, as presented at the post- audit conference on August 2, 2002. No NRC open items nor audit observation inquiries were identified as a result of this audit observation.

REVIEW OF SELF-ASSESSMENT OF THE BSC SOFTWARE STAND-DOWN EXEMPTION PROCESS

During this reporting period, the ORs reviewed the results of Self-Assessment Report SA-SPP-2002-004, "Self-Assessment of the BSC Software Stand-Down Exemption Process 2001/2002," dated July 17, 2002. The purpose of this self-assessment was to determine if the criteria related to the stand-down exemption process and the Notice of Management-Directed Stand-Down had been appropriately addressed. The self-assessment also examined how the exemption process was implemented and tracked, as well as how the Yucca Mountain Site Characterization Project (YMP) complied with the requirements of Administrative Procedure APSI.1Q, "Software Management."

Based on the ORs' review of Self-Assessment Report SA-SPP-2002-004, it was generally determined that the BSC software stand-down exemption process was effective in providing increased managerial oversight of software development, in accordance with the requirements of Administrative Procedure AP-SI.1Q. However, the results of the self-assessment identified several areas for improvement, including the lack of a comprehensive process necessary to ensure project-wide compliance with the intent of the managerial direction and the need for an improved process for tracking and reporting criteria. The ORs will continue to monitor the implementation of the software management program and the results will be documented in a future report.

REVIEW OF ENGINEERING DESIGN PROCESS READINESS REVIEW REPORT

On August 9, 2002, DOE's YMSCO, Office of Project Execution, released its "Engineering Design Process Readiness Review Report." The purpose of this report was to ensure that, if the site were designated, the required processes would be in place to design a monitored geologic repository.

The ORs reviewed the scope of the Readiness Review which included the evaluation of: (1) procedure review, qualification of personnel and training; (2) software integration systems; (3) environmental safety and health; (4) project management organization and controls; (5) design control processes and plant design systems; (6) requirements and configuration control processes; and (7) procurement controls.

As a result of the above reviews, it was generally determined that DOE's Readiness Review methodology, which included the examination of existing procedures, interviews with BSC staff, analysis of training records and engineering documentation, and the evaluation of past deficiencies and oversight activities, adequately assessed existing project design controls. However, two OR open items were identified as a result of this review, related to the pending revision of engineering procedures to include appropriate design verification considerations (**OR Open Item 02-09**)--and the evaluation of the design control attributes associated with requirements of 10CFR § 63.44 and 10 CFR Part 21 (**OR Open Item 02-10**.)

EVALUATION OF CORRECTIVE ACTION REPORT NUMBER BSC (B)-02-C-129, "FAILURE TO PRESERVE QA RECORDS"

The ORs reviewed the initial conditions documented in Corrective Action Report (CAR) BSC No. (B)-02-C-129, dated July 19, 2002, which identified that, contrary to the requirements of QARD, Section 17.2.7 A, the Records Processing Center (RPC) failed to adequately preserve QA records in the form of raw data archived on magnetic tapes. As described in the CAR BSC No. (B)-02-C-129, the magnetic tapes have a finite life expectancy, and no process has been maintained to ensure preservation of the recorded data. Some tapes have deteriorated and the data were not migrated to currently acceptable media. It was also noted that no procedures have been instituted to ensure the appropriate migration of QA records, on electronic media, when the media become obsolete, or the media are no longer accepted per RPC administrative controls.

Subsequent to the identification of this condition, the project developed a report listing the accession numbers with the associated titles for affected QA records. Of the approximately 14,000 QA records originally identified, a population of approximately 4000 QA records were found to need migration and preservation. Although the impact of this condition has not been determined, it was established that elements of the data represent the baseline data for the project and that the loss of this information could impact the License Application (LA). Accordingly, this issue will be the subject of discussion at the Quarterly QA meeting scheduled for October 16, 2002. Additionally, the ORs will continue to monitor the resolution of CAR BSC No. (B)-02-C-129, and the results will be documented in a future report.

GENERAL SITE ISSUES

On August 13, 2002, a magnitude 2.1 earthquake occurred 66 kilometers (41 miles) east of the Yucca Mountain site. An earthquake of this magnitude and distance would not normally require any DOE response. However, because this earthquake was mentioned on a local radio station, it was reported to the ORs office.

The site continues to operate without access to well water, by relying on stored water for drinking and non-potable uses.

EXPLORATORY STUDIES FACILITY (ESF) TESTING

The drift-scale thermal test continues its cool-down phase. Transient liquid water was detected in one borehole in the thermal test area. DOE attributes the presence of this liquid water to condensation within the borehole from cooling of the rock. DOE is still investigating this.

ENHANCED CHARACTERIZATION OF THE REPOSITORY BLOCK TESTING

The bulkhead at one end of the sealed portion of the enhanced characterization of the repository block (ECRB) cross drift (Station 17+63) was opened on June 24, 2002, to allow access for geotechnical testing and sampling between Stations 17+63 and 22+01. The testing and sampling are on schedule for completion in early November 2002. After completion, the bulkhead will be sealed again to allow for monitoring of moisture in the cross drift between Stations 17+63 and 22+01.

SURFACE-BASED FIELD TESTING

The cross-hole tracer tests at the well 19 complex of the Nye County Early Warning Drilling Program (EWDP) have been put on hold indefinitely, because of the State's nonrenewal of an expired permit waiver. Sampling of the Phase III drillholes began in late August 2002.

DOE has also begun conducting a disruptive-events (igneous-activity) field investigation in the area around Yucca Mountain.

LABORATORY STUDIES

The natural convection test and the breached drip-shield test at the Atlas facility have been formally concluded. There are currently no on-going tests at the facility.

UPCOMING NEW TESTS AND STUDIES

Upcoming new geotechnical sampling and tests are planned for a previously sealed portion of the ECRB cross drift, and at the Pena Blanca, Mexico site (natural analog program). A test to monitor repository integrity will begin setup in September 2002. Also planned for Fiscal Year (FY2003) are deep-water well drilling in Inyo County, California, and construction of Alcove 10 in the ECRB.

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 prelicensing consultation. The primary 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 LA. The ORs also take part in activities associated with resolving NRC Key Technical Issues (KTI's). This report covers the period of July 1, 2002, through August 31, 2002.

3.0 OBJECTIVES

The OR mission is to serve principally as a point of prompt informational exchange and to identify preliminary concerns about site investigations about potential licensing issues. The ORs carry out this role by gathering and evaluating information, communicating, identifying concerns, and raising more significant issues to Management's attention. Communication is reached by exchanging information on data, plans, schedules, documents, activities and pending actions, and resolution of issues. The ORs interact with DOE scientists, engineers, and managers, with input from NRC Headquarters management, regarding NRC policy, programs, and regulations. The ORs also focus on such issues as QA, design controls, data management systems, performance assessment, and KTIs resolution. A primary 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 QA AND ENGINEERING

Review of DOE's MII

During this reporting period the ORs participated in the review of DOE's MII, which was released on July 19, 2002. The purposes of the MII were to: (1) address deficiencies in the implementation of the OCRWM QA program; (2) prevent recurrence of inadequate corrective actions; and (3) establish a foundation for continuous improvement. The objective of the NRC's review team was to determine the adequacy of DOE's corrective action program related to CARs BSC-01-C-001, "Model Validation," and BSC-01-C-002, "Software." These items were technical errors identified in the Total System Performance Assessment-Site Recommendation (TSPA-SR), and other project documents. The NRC team reviewed the MII with special emphasis on the commitments made by DOE during the September 6, 2001, and December 5, 2001, Quarterly QA meetings and the statements contained in DOE's letter from Dr. Margaret Chu, to Mr. Martin Virgilio, dated April 4, 2002, to determine if effective implementation of the MII could lead to improvements in the implementation of the QA program. The NRC review team also evaluated the scope and content of the MII as well as the proposed performance measures, to ascertain the overall effectiveness of DOE's proposed corrective action program.

Subsequent to this OR reporting period, the results of the NRC review team's assessment of the MII was provided to DOE on October 3, 2002. Reference: Letter to Dr. Margaret Chu (DOE) from Martin J. Virgilio (NRC), dated October 3, 2002 (ADAMS Accession ML022730625). In general, the NRC commented that DOE is responsible for managing its own program, and needs the discretion and flexibility to focus on program areas of concern. However, from the NRC's perspective, there appears to be an inherent assumption by DOE of problems in two program areas. These areas involve QA programs and processes, and program procedures that do not appear to be supported by DOE's root cause analysis, corrective action identification process, or self-assessment results. Therefore, as DOE takes a broad approach to improving the management of its program, it should also maintain an appropriate focus on how each of the initiatives will help achieve the stated purpose of addressing identified weaknesses and the effective implementation of the QA program to ensure that technical work products and quality affecting activities consistently satisfy program requirements. As a result of this review and the NRC's interest in seeing substantive improvements in DOE's QA program, NRC staff will be looking for opportunities to monitor DOE's success in meeting its goals for program improvements. Such opportunities may include discussions at quarterly meetings and periodic assessment site visits by NRC staff to monitor DOE activities. Also, DOE is expected to identify clear goals and associated time lines, further refine its effectiveness indicators, and update NRC on its progress in meeting these metrics and goals at the appropriate opportunities.

Deferral of Yucca Mountain Site Characterization Office Quality Assurance Audit

As previously documented in Report No. OR-04-01, dated September 28, 2001, the ORs observed DOE's OQA audit of the YMSCO conducted in Las Vegas, Nevada, from August 6 through 14, 2001. The purpose of this compliance-based audit was to determine if OCRWM's QA program requirements described in DOE/RW-0333P, "Quality Assurance Requirements and Description" (QARD) document and the associated procedures were being effectively implemented at the YMSCO office. The areas audited included: "Organizational Interfaces": "Training"; "Self-Assessments"; "Q-List Classification"; "Procurement, Procedure Preparation and Approval"; "Document Review/Control"; "Managing Conditions Adverse to Quality (CAQ)"; and "Records Review." As a result of this audit, six conditions adverse to quality were identified and resulted in four DRs, one Deficiency Identification and Referral (DIR), and one CAQ corrected during the audit. The overall conclusion of this audit was that YMSCO's organization was not satisfactorily implementing the required actions associated with the examined portions of the QARD.

As a follow-up to the unsatisfactory results of the previous OQA audit of YMSCO, the ORs requested a copy of the Audit Plan and the associated QA Checklist for the annual evaluation of the YMSCO organization scheduled for September 9 through 13, 2002. Subsequent to the receipt of these documents the ORs were advised that the Project Manager had requested a 6-month extension for the annual compliance audit of YMSCO. The ORs reviewed the Memorandum from R. Dyer, to R. Murthy, dated August 26, 2002, requesting the rescheduling of the annual compliance audit and the documented response provided by OQA, dated August 29, 2002. The response granted an extension to December 2002, with provisions for evaluating the need for a further extension at a later date. The ORs also reviewed the program requirements associated with the performance of audits contained in Subsection 18.2.1 E, of the QARD, which state that: "Internal audits of work to verify QA program compliance shall be performed annually or at least once during the life of the work, whichever is shorter." These same requirements, related to the performance of annual audits for quality-affecting activities, are reflected in the governing procedure AP-18.3Q, "Internal Audit Program." Based on the

results of the above reviews, it was determined that the justification for delaying the scheduled audit of the YMSCO organization, provided in the August 26, 2002, project management memorandum, did not appear to establish an adequate basis for deferral of a required audit activity. Specifically, the "programmatic modifications" referred to in the memorandum have not been implemented and would not be included in the audit scope. Similarly, the "....redefining of roles and responsibilities, reconstructing procedure hierarchies and reassessing the capabilities of the corrective action program," are planed activities that would not be subject to the audit.

Given that the required performance of annual audits represents a minimum periodicity to verify QA program compliance, and that the justification for delaying the scheduled audit of YMSCO for 3 months with provision for an additional extension does not appear to be adequately supported. Therefore, this example of an apparent deviation from the requirements of Subsection 18.2.1 E of the QARD is identified as OR Open Item 02-08.

Observation of Bechtel SAIC Company, LLC Surveillance of Technical Product Errors Reporting Process

During the week of July 8-12, 2002, the ORs observed selected aspects of BSC's QA surveillance (BSCQA-02-S-37) of the TER process. The purpose of this performance-based surveillance was to evaluate the effectiveness of the recently implemented TER process described in Administrative Procedure AP-15.3Q, "Control of Technical Product Errors."

The BSC surveillance team reviewed the total population of 94 TERs that had been generated since the inception of the AP-15.3Q process in February of 2002. This review included the evaluation of TERs for compliance with the requirements of AP–15.3Q, as well as the overall effectiveness of this process to address the documentation, evaluation, and disposition of technical errors in approved scientific or performance assessment products. Based on the result of this surveillance, one condition adverse to quality was identified, concerning the failure to follow procedures during the processing of DDEFs. The BSC surveillance team also identified a concern with respect to the lack of timeliness in the TER validation and disposition process. Specifically, the surveillance team determined that at least 11 TERs had not been validated until 5 months after initiation, and 35 TERs had not been dispositioned until 4 to 5 months after initiation. The surveillance team noted that the validation and disposition of many of the TERs had been delayed until a decision could be made regarding which Analysis and Modeling Reports (AMRs) would not be carried forward for potential LA. Accordingly, the surveillance team initiated a Conditions/Issue Identification Reporting Resolution System (CIRS) Item 2975, identifying the need to revise Administrative Procedure AP-15.3Q, to incorporate a 30-day time frame to validate and disposition TERs. This CIRS item further recommended that if a disposition could not be provided until other issues were addressed, an appropriate justification should be provided in the TER, along with a projected disposition date.

The surveillance team also determined that Administrative Procedure AP-15.3Q, does not contain or refer to an action tracking system to ensure that issues associated with the TERs are appropriately identified and tracked, and that no trend reports have been submitted since March of 2002. As a result of this issue, another CIRS Item was initiated to revise Administrative Procedure AP-15.3Q, to include tracking of TER action items in the CIRS database. The surveillance team also reviewed several TERs that were dispositioned "Use-As-Is", which clearly indicated that errors were present in approved documents. However, Administrative Procedure AP-15.3Q does not require the TERs dispositioned "Use-As-Is" be accompanied by an Errata Sheet posted to approved documents identifying the specific errors in the TER.

Although the TER technical justification for a disposition of "Use-As-Is" establishes that the errors do not affect the results achieved by the respective document, users of these documents have no direct indication that these documents contain errors. As a result of this issue, a CIRS item was initiated to revise Administrative Procedure AP-15.3Q, to require that an Errata Sheet be attached to technical documents that have a "Use-As-Is" disposition.

Based on the ORs observations, it was determined that this oversight activity was effectively performed and that the BSC surveillance team demonstrated a thorough knowledge and understanding of the technical and administrative requirements associated with the TER process. The ORs reviewed the surveillance team's findings and generally agreed with the results documented in BSC QA Surveillance Report BSCQA-02-S-37. No NRC open items were identified as a result of this surveillance observation.

Observation of DOE's Audit of BSC's Implementation of the QA Program

During the week of July 29 through August 2, 2002, DWM staff, including the ORs, and representatives from the CNWRA observed the limited-scope compliance-based audit of BSC's implementation of the OCRWM QA program. The objectives of the DOE OQA audit were to assess the adequacy and effectiveness of BSC's Repository Design Project's implementation of the QARD, and to verify BSC's compliance with the requirements within the areas reviewed. Specifically, the OQA audit team evaluated the effectiveness of applicable DOE QA program elements as they pertain to YMSCO activities, for: (1) "Organization"; (2) "QA Program"; (3) "Design Control"; (4) "Implementing Documents"; (5) "Software"; and (6) "Control of Electronic Management of Data." Additionally, the OQA audit team examined the actions completed to correct the deficiencies identified during the previous QA audits and surveillances.

The audit identified three conditions adverse to quality, which resulted in two DR's and one QO being issued. The DR's involved; (1) the failure to document the justification for not performing an impact review for several revised drawings; and (2) inadequate implementing procedures related to the control of electronic media. The QO concerned an isolated administrative error associated with the review of record summary forms.

Based on the ORs observations, it was concluded that OQA Audit BSC-ARC-02-15 was effective in determining the level of compliance of BSC QA activities with the requirements of the QARD and with associated implementing procedures. The observers generally agreed with the audit team conclusions, findings, and recommendations presented at the post-audit conference on August 2, 2002. No NRC open items nor audit observation inquiries were identified.

Review of Self-Assessment of the BSC Software Stand-Down Exemption Process

During this reporting period, the ORs reviewed the results of Self-Assessment (SA) Report SASPP-2002-004, "Self-Assessment of the BSC Software Stand-Down Exemption Process 2001/2002," dated July 17, 2002. The purposes of this self-assessment are to determine if the criteria related to the stand-down exemption process and the Notice of Management Directed Stand-Down had been appropriately addressed. The self-assessment also examined how the exemption process was implemented and tracked, as well as how the YMP complied with the requirements of Administrative Procedure AP-SI.1Q, "Software Management." The scope of the self-assessment included: (1) interviews with Software Configuration Management (SCM) personnel; (2) review of activity reports from SCM; (3) evaluation of exemption letters: (4)

surveys of responsible managers and software developers; (5) assessment of AP-SI.1Q; (6) documentation; (7) evaluation of compliance with stand-down criteria; and (8) interviews with Quality Engineering product-support personnel.

As a result of this self-assessment, several good work practices were identified including: (1) adherence to stipulations pertaining to data collection software; (2) effective communication regarding the intent of the stand-down; and (3) the established provisions for training personnel on the requirements of Administrative Procedure AP-SI.1Q. These good work practices, along with increased management attention, resulted in the overall self-assessment conclusion that software that experienced development under the stand-down exemption process was compliant with the requirements of Administrative Procedure AP-SI.1Q. However, the self-assessment also identified adverse work practices that resulted from the absence of a comprehensive project plan which would ensure the entire project was complying with the intent of the managerial direction. In particular, numerous software items were processed in SCM/Software Quality Control under a blanket exemption for Site Recommendation/ Supplemental Science and Performance Analysis (SSPA) codes. These exemptions were apparently provided through verbal communications and there was no requirement to document or track which codes received this type of exemption. Additionally, it was determined that compliance check-points for LA affiliated software within SCM were incorporated into the process, based on SCM management's interpretation of the stand-down. Furthermore, the self-assessment team established that the criteria for lifting the stand-down were not explicitly defined and there was no objective tracking method to determine when the stand-down should be lifted.

In response to these issues, four CIRS items were issued related to training verification, documentation controls, clarification of exemption status codes, and enhancement of the SCM database, to incorporate the appropriate software stand-down exemption status and intended end-use software (eg., LA, SSPA, etc.).

Based on the ORs review of Self-Assessment Report SA-SPP-2002-004, it was generally determined that the BSC software stand-down exemption process was effective in providing increased managerial oversight of software development, in accordance with the requirements of Administrative Procedure AP-SI.1Q. However, the results of the self-assessment identified several areas for improvement, including the lack of a comprehensive process necessary to ensure project-wide compliance with the intent of the managerial direction and the need for an improved process for tracking and reporting criteria. The ORs will continue to monitor the implementation of the software management program and the results will be documented in a future report.

Review of Engineering Design Process Readiness Review Report

On August 9, 2002, DOE's YMSCO, Office of Project Execution, released its Engineering Design Process Readiness Review Report. As stated in this report, the YMSCO Project Manager authorized performance of a Engineering Design Readiness Review of BSC's Design Control Process in October of 2001. The purpose of this report was to ensure that, if the site were designated, the required processes would be in place to design a monitored geologic repository.

The ORs reviewed the scope of the Readiness Review which included the evaluation of (1) procedure review, qualification of personnel and training, (2) software integration systems, (3)

environmental safety and health, (4) project management organization and controls, (5) design control processes and plant design systems, (6) requirements and configuration control processes, and (7) procurement controls. The Readiness Review also examines sub-areas related to: (1) execution plans; (2) process and integration activities; (3) change control and software configuration; (4) product development; (5) staffing and verification of experience and education; (6) open deficiencies; and (7) interfaces between science and design organizations. The results of the Readiness Review determined that BSC was "Conditionally Ready" for preliminary design development. Although no restrictions on the performance of preliminary design activities were identified, the state of readiness will not be changed to "Ready" until appropriate actions are taken to resolve the following two conditions. The first condition involved the determination that several of the processes and associated procedures were not fully implemented. Accordingly, BSC has agreed to schedule a series of self-assessments and surveillances of design control processes to verify performance-based adequacy of the new procedures. The second condition concerned the readiness of BSC to implement discrete elements of the configuration management process. This condition included two open items; the first required upgrading of the OCRWM Program Documents Database (OPDD)/electronic data management system, to incorporate enhanced capabilities. When completed, the OPDD system will have the capability to provide traceability, transparency, retrieval, and disposition information. However, pending the implementation of the OPDD system, a second open item concerning the existing Configuration Management Information System which is not being maintained in accordance with current contract requirements, was identified.

The Readiness Review team also examined the design interface control and organizational responsibilities, in accordance with the requirements of 10 CFR § 63.142(d)(2)(i), concerning the performance of design reviews. During the readiness review evaluation process it was determined that BSC was not intending to perform a design verification on the LA design bases. However, since the QARD (paragraph 3.2.4) and Administrative Procedure AP-3.13Q, "Design Control," paragraph 5.4(e), requires a design verification of technical products subject to the QARD when used as a direct reference base for an LA, the readiness review team identified this issue as a weakness. Subsequent to the identification of this weakness, BSC indicated, in its response to Document Action Request (DAR)-D 4229, that the appropriate engineering procedures would be revised to include the necessary checking and verification activities that would satisfy the requirements of the QARD and Administrative Procedure AP-3.13Q. Because of the significance of the design verification process requirements specified in 10CFR § 63.142(d)(2)(i), this issue is identified as OR Open Item 02-09, pending the revision of the engineering procedures associated with DAR-D 4229. In addition to the above noted issues, the ORs determined that the provisions of 10CFR § 63.44, concerning Changes, Tests, and Experiments, which could affect DOE's Safety Analysis Report and the conforming requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance," were not specifically addressed in the Readiness Review Report. Therefore, pending the appropriate evaluation and documentation of the design control attributes associated with requirements of 10CFR § 63.44 and Part 21, this issue is identified as OR Open Item 02-10.

As a result of the above reviews, it was generally determined that DOE's Readiness Review methodology, which included the examination of existing procedures, interviews with BSC staff, analysis of training records and engineering documentation, as well as the evaluation of past deficiencies and oversight activities, adequately assessed existing project design controls. However, two OR open items were identified as a result of this review, related to the pending revision of engineering procedures, to include appropriate design verification considerations

(OR Open Item 02-09) and the evaluation of the design control attributes associated with requirements of 10CFR § 63.44 and Part 21 (OR Open Item 02-10.)

Evaluation of CAR No. BSC (B)-02-C-129, "Failure to Preserve QA Records"

The ORs reviewed the initial conditions documented in CAR BSC (B)-02-C-129, dated July 19, 2002, which identified that contrary to the requirements of QARD, Section 17.2.7 A, the RPC failed to adequately preserve QA records in the form of raw data archived on magnetic tapes. As described in the CAR, this condition represents approximately 1600 accession numbers dating back to 1987. The description of condition further states that the magnetic tapes have a finite life expectancy, and no process has been maintained to ensure preservation of the recorded data. Some tapes have deteriorated and the data were not migrated to currently acceptable media. It was also noted that no procedures have been instituted to ensure the appropriate migration of QA records on electronic media, when the media become obsolete, or the media are no longer accepted per RPC administrative controls.

Subsequent to the identification of this condition, the project developed a report listing the accession numbers with the associated titles for affected QA records. Of the approximately 14,000 QA records originally identified, a population of approximately 4000 QA records was found to need migration and preservation. Although the impact of this condition has not been determined, at the conclusion of this reporting period, it was established that elements of the data represent the baseline data for the project and that the loss of this information could impact the LA. Accordingly, this issue will be the subject of discussion at the next Quarterly QA meeting scheduled for October 16, 2002. Additionally, the ORs will continue to monitor the resolution of CAR BSC (B)-02-C-129, and the results will be documented in a future report.

5.0 OUTREACH ACTIVITIES

Staff Attends Clark County Yucca Mountain Nuclear Waste Advisory Committee Meeting

On July 25, 2002, the ORs attended a public meeting of the Clark County Yucca Mountain Nuclear Waste Advisory Committee. Items discussed at this meeting included updates on the status of Nevada's lawsuits against DOE, NRC, and the U.S. Environmental Protection Agency. The meeting also included a presentation by Dr. Anthony Hechanova, of the University of Nevada, Las Vegas, regarding transmutation technology and transport of radioactive waste. Specifically, Dr. Hechanova discussed the technical options associated with transmutation of high-level radioactive waste and presented the results of a recent transportation study commissioned by the Nuclear Waste Advisory Board of Pahrump. This study examined radioactive waste transportation issues and potential radiation doses to members of the public resulting from non-accident conditions. The Clark County Yucca Mountain Nuclear Waste Advisory Committee stated that the presentations were informative and helped it understand the risk associated with transportation of radioactive waste. Several of the Committee members also expressed their appreciation for NRC's presence at the meeting and indicated that NRC's safety oversight responsibilities for Yucca Mountain High-Level Waste Repository were important to the community.

6.0 FIELD AND LABORATORY TESTING

GENERAL ISSUES

Seismic Event

On August 13, 2002, a magnitude 2.1 earthquake occurred 66 kilometers (41 miles) east of the Yucca Mountain site. An earthquake of this magnitude and distance would not normally require any DOE response. However, because this earthquake was mentioned on a local radio station it was reported to the ORs office. This earthquake does not appear to be related to the June 14, 2002, earthquake at Little Skull Mountain, which was approximately 20 kilometers (12.4 miles) southeast of the potential repository and had a magnitude of 4.4.

Site Access to Water Supply

In early April 2002, the State of Nevada terminated DOE's permits to access to Nevada Test Site (NTS) water wells for water supply to the project. Prior to this, DOE installed a 3,785,000 liters (1 million- gallon) water reservoir in NTS Area 25, just east of Fortymile Wash, along the road to Yucca Mountain. Access to certain surface areas at the project has been restricted to reduce the need to spray water for dust suppression. The quality of the water, in the 3,785,000 liters (1 million-gallon) reservoir, for use as site drinking water, and for use in underground tests, is questionable at this time.

ESF TESTING

The excavation of the ESF main drift, completed in 1997, allows the collection of scientific and engineering data at Yucca Mountain. DOE continues testing in the ESF main drift to supply data to support DOE's TSPA. Figure 1 shows the ESF test locations. Ongoing ESF testing activities are summarized below.

Alcove 5 (Drift-Scale Test)

In accordance with the established DOE test plan, power to the heated drift was turned off in mid-January 2002, and the 4-year cool-down of the facility is being monitored. DOE is performing periodic visual and video inspection, water sampling, gas sampling, neutron logging, and electrical-resistance tomography. The data being collected are primarily being used as input to the Thermal Testing AMR.

Borehole 75, in the drift-scale heater test, has produced unusual water during the cool-down period sampling. DOE characterized the water as discolored (brownish yellow), high in trace metals, chloride (but not fluoride), and sulfur. Conductivity has been measured at 10 to 100 times stronger than other drift-scale test waters. An investigation is underway to determine if this unusual water is the product of the exposure of packer materials (neoprene and stainless steel) to hydrothermal environments, and a complete chemical analysis is being conducted of the water.

ECRB TESTING

The excavation of the ECRB cross drift, completed in October 1998, allows the collection of scientific and engineering data in stratigraphic units that constitute the bulk of the potential repository horizon. DOE continues ECRB testing to supply data to support the DOE TSPA. Figure 1 describes the ECRB test locations. ECRB testing activities are summarized below.

Sealed Portion of the ECRB Cross-drift

In an ongoing effort to monitor moisture conditions in the sealed portions of the ERCB, the ECRB bulkheads from Station 22+01 and beyond were closed on November 14, 2001. The bulkhead at Station 17+63 was closed on December 20, 2001. Before the closure of those bulkheads, project personnel installed enhanced monitoring and collection equipment, including remote cameras and moisture-collection devices, in accordance with the revised test plan. Plastic sheets and drip cloths infused with a pH-sensitive chemical were installed near the crown of the tunnel, and numerous sample bottles were placed to collect possible drips from rock bolts.

DOE re-opened the bulkhead at Station 17+63, on June 24, 2002. The main purpose for this entry, which will last about 4 months, is to collect geotechnical samples and data between Stations 17+63 and 22+01. The bulkhead at 17+63 will be resealed after that time.

On June 25, 2002, NRC ORs entered to examine the cross-drift test. As detailed in the previous OR report, virtually no moisture was seen anywhere in the cross drift up to Station 22+01.

However, the ORs observed that the bulkhead at Station 22+01 was not properly sealed. The rubberized tape had come loose along the right margin of the large access door. The loose tape made it possible to look through the gap between the bulkhead door and the wall rock into the chamber beyond. The ORs brought this situation to DOE's attention and advised that a proper seal be restored as soon as possible to minimize any drying effects for the tunnel segments beyond Station 22+01. The ORs also observed that the air intake for open tunnel ventilation was located less than 2 meters (6.5 feet) from the bulkhead at 22+01, and could readily draw air and moisture from beyond a compromised bulkhead at 22+01. DOE informed the ORs that the incomplete seal would be repaired and that it had already planned to move the air intake away from the bulkhead.

Observations of the bulkhead at 22+01 during this reporting period indicate that the ventilation intake has been moved away from the bulkhead. The ORs' visual inspection of the bulkhead could not be completed, because of the high levels of radon in the end of the ECRB, near the bulkhead. However, DOE has provided the ORs with pictures of the repairs made to the bulkhead.

The ORs will monitor the geotechnical work to be performed in this section of the ECRB cross drift over the next 2 months, and the integrity of the repairs to the bulkhead at 22+01, until the re-establishment of the bulkhead at 17+63.

SURFACE-BASED FIELD TESTING

Nye County EWDP

The EWDP was initiated as part of the Nye County Nuclear Waste Repository Project Office Yucca Mountain Oversight program. The purpose of the EWDP is to establish a ground-water monitoring system to protect the residents of Nye County in Amargosa and Pahrump Valleys against potential radionuclide contamination.

The program is also intended to provide geologic and hydrologic information to DOE's Yucca Mountain program. The targeted area is located in the hydrogeologic system south of Yucca Mountain. The questions planned to be investigated are: 1) the origin of the spring deposits; 2) the geology and hydraulic properties of the valley-floor sediments; 3) the recharge; and 4) groundwater-flow patterns. By understanding this critical information, the monitoring system can be better designed to protect the water resources of Nye County.

Alluvial Tracer Complex (ATC)

The ATC is a joint Nye County and DOE Cooperative Testing Program to investigate flow and transport properties of the saturated alluvium. Part of the testing program was to include crosshole tracer tests at well NC-EWDP-19D/D1, in which tracers would have been introduced via observation wells. Well 19D1, which is located in the deepest zone in the saturated alluvium, was scheduled to be pumped, during those tests, to recover the tracers, through lateral flow from the observation wells. However, these tracer tests are currently on hold as the State Engineer has not renewed permit waivers for the cross-hole test tracers. Because non-renewal of these permits will impact efforts to validate the saturated zone flow and transport models, other alternatives to this testing are being investigated.

EWDP Phase III Status

All Nye County EWDP Phase III field work was completed as of March 31, 2002. Nye County water sampling at the EWDP Phase III piezometer wells was accomplished during the week of August 26, 2002. In addition to Nye County, samples were taken for DOE by Los Alamos National Lab, the U.S. Geological Survey, and the University of Nevada-Las Vegas. Samples were taken for NRC by the CNWRA. Samples were also taken by a State of Nevada contractor. The multiple-screen monitoring wells were scheduled to be sampled the second week of September 2002.

EWDP Phase IV drilling is to begin in early FY2003. A map of all EWDP well locations can be viewed at http://www.nyecounty.com/Figures/tsg02184.jpg.

Disruptive Events Field Investigation

DOE has also begun conducting a disruptive-events (igneous-activity) field investigation in the area around Yucca Mountain.

LABORATORY STUDIES

Engineered Barrier System (EBS) Testing (Atlas Facility)

All FY2002 EBS testing at the test facility located in North Las Vegas known as the Atlas facility has been completed. The test results will be used to support the EBS degradation and transport process model report.

UPCOMING NEW TESTS AND STUDIES

EWDP

Water sampling in the multiple-screen monitoring wells will be done in September 2002. EWDP Phase IV drilling is scheduled to start in early FY2003.

ECRB Cross-Drift Geotechnical Rock-Properties Studies

As of June 24, 2002, DOE has gained access to the portion of the ECRB cross drift between the bulkheads at Stations 17+63 and 22+01, to take geotechnical rock property samples and to do a slot test in the lower lithophysal zone. The geotechnical rock property coring was completed in August 2002. The slot test is being prepared. All this work is scheduled to be completed in November 2002, at which time the bulkhead at Station 17+63 will be resealed.

Pena Blanca (Natural Analog Program)

As of the end of August 2002, the drill rig was still at the U.S./Mexico border awaiting clearance to cross into Mexico.

Inyo County Well Drilling

In FY2003, Inyo County, California, plans to begin drilling five deep monitoring wells in the county, as part of their its Yucca Mountain oversight program. The county's rationale for drilling these new wells is to: 1) evaluate regional ground-water flow through the southern Funeral Mountains; 2) establish structural controls on flow-paths and discharge areas; and 3) evaluate potential zones of mixing between the deep regional ground-water and the local shallow ground-water systems to the northeast. The county is currently establishing the location of the new wells.

7.0 GENERAL ACTIVITIES

a. Meetings

Meeting with DOE on Yucca Mountain Criticality Issue

On July 9-10, 2002, staff from DWM, including the ORs, conducted an Appendix 7 meeting with DOE's OCRWM and their contractors, to discuss the changes to the Disposal Criticality Analysis Methodology Topical Report (Topical Report), Revision 01, which is currently under review by the staff. Subsequent to the issuance of Revision 01 and the staff's detailed technical review, DOE implemented additional changes to the overall methodology and the probability model.

During this meeting, DOE and its contractors presented their revised methodology and described their proposed approaches. The staff also met with DOE and its contractors at NRC's ORs' office, to review DOE's current efforts and draft documents, related to Yucca Mountain disposal criticality. As a result of these discussions, DOE plans to send a letter to the NRC, that lists the changes to the Topical Report, Revision 01, in the near future. Based on this letter, the staff will revise its schedule for the detailed technical review of the Topical Report. As stated during the meeting, DOE plans to submit the actual changes, to the Topical Report, within the next 2 to 3 months, that will form the basis for issuance of an amendment to NRC's Safety Evaluation Report issued in June 2000.

Technical Exchange and Management Meeting with the DOE to Discuss KTI Agreement Item Planning for FY 2003-2005

On July 23, 2002, staff members from the DWM, including the ORs, took part in a Technical Exchange and Management Meeting with the DOE, in Las Vegas, Nevada, to discuss DOE's KTI Agreement Item Planning Strategy and the KTI agreements DOE plans to address in FY 2003-2005. During the meeting, DOE discussed the process it used for binning agreements; how it developed the schedule for addressing agreements; and the method used to document the work scope needed to address the agreements. No new agreements were reached at this meeting. The staff plans to interact with DOE on each of the remaining open agreements, to understand the DOE approach for addressing the issue. As of July 31, 2002, 52 of the 293 agreements are listed as complete, 43 agreements under NRC review, and DOE plans to address another 15 agreements before the end of FY 2002.

NRC/DOE Quarterly QA and Management Meetings on the YMP

On July 30-31, 2002, staff from DWM, including the ORs, took part in the public NRC/DOE Quarterly QA and Management Meetings on the Yucca Mountain Project. These meetings took place at NRC Headquarters in Rockville, Maryland. On the first day, NRC and DOE focused on QA issues and DOE's revised MII, which DOE has developed to improve its QA program. Also, the staff heard from DOE's contractor, BSC, on its QA program organization and activities. The second day's meeting focused on management issues, including: (1) DOE Program and Project updates; (2) NRC Program update, including the Licensing Support Network, status of KTI agreement schedule, and milestones from now until LA. During this meeting, NRC management took the opportunity to share its expectations for both NRC and DOE during this pre-licensing transition phase. NRC and DOE will likely be holding the next Quarterly QA and Management Meetings in October 2002, in Las Vegas, Nevada.

Meeting with DOE on Geotechnical, Seismological, and Geophysical Data Supporting a Proposed Geologic Repository at Yucca Mountain

On August 6-8, 2002, staff from DWM, including the ORs and representatives from the CNWRA, participated in an Appendix 7 meeting with DOE. The purpose of the meeting was for DOE to present the geotechnical, seismological, and geophysical data it had collected and analyzed during the last 2 years. On August 6, 2002, personnel from DOE and its contractor, the staff, the CNWRA, and representatives from the State of Nevada and Nye County visited to the ESF. DOE contractors described the various rock-type formations and associated fractures, joints, faults, and rock-mechanics test and sampling locations within the ESF. On August 7-8, 2002, the staff discussed several issues related to structural deformation and seismicity, repository design and thermal-mechanical effects, and total system performance and integration

agreements. These discussions included explanations of how DOE plans to use the site characteristics to estimate potential seismic ground motions and the extent and magnitude of rockfall loads probabilistically. DOE also presented preliminary analyses that assess the response of the drip shield and waste package subjected to these potential seismic and rockfall loads. It identified the different reports to be issued, during 2003 and 2004, to support resolution of the applicable KTI agreements and their licensing applications. During the meeting, NRC and the CNWRA staff provided several observations.

b. Site Visits

On July 3, 2002, an OR visited DOE's Atlas facility, to observe the breached drip-shield/waste package-seepage flux test, using a simulated rough texture to approximate a corroded surface. The simulated rough surface was obtained by coating the surface of a full-size model of a drip shield with "deck paint."

On July 11, 2002, an OR was given a tour of surface and underground site operations at Yucca Mountain for orientation purposes. Also on that date, an OR gave a tour to an NRC staff member and two interns.

On July 15, 2002, an OR accompanied personnel from NRC's mapping and modeling contractor MANDEX on a site visit and underground tour. The purpose of this tour was to obtain an overview of the Yucca Mountain site, underground facilities, and DOE's site characterization activities.

On July 29, 2002, an OR accompanied NRC personnel involved in oversight of NRC's contract with the CNWRA on a site visit and underground tour. The purpose of this tour was to obtain an overview of the Yucca Mountain site, underground facilities, and DOE's site characterization activities.

On August 6, 2002, an OR accompanied a DOE site tour, for NRC and CNWRA personnel (and members of the public) associated with an Appendix 7 meeting in Las Vegas on "Structural Deformation and Seismicity (SDS)." The purpose of this tour was to obtain an overview of the Yucca Mountain site, underground facilities, and DOE's site characterization activities related to SDS.

On August 30, 2002, an OR visited the area south of Yucca Mountain to observe the sampling of water from Nye County EWDP Well 22, to compare sampling procedures to standard industry practice.

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

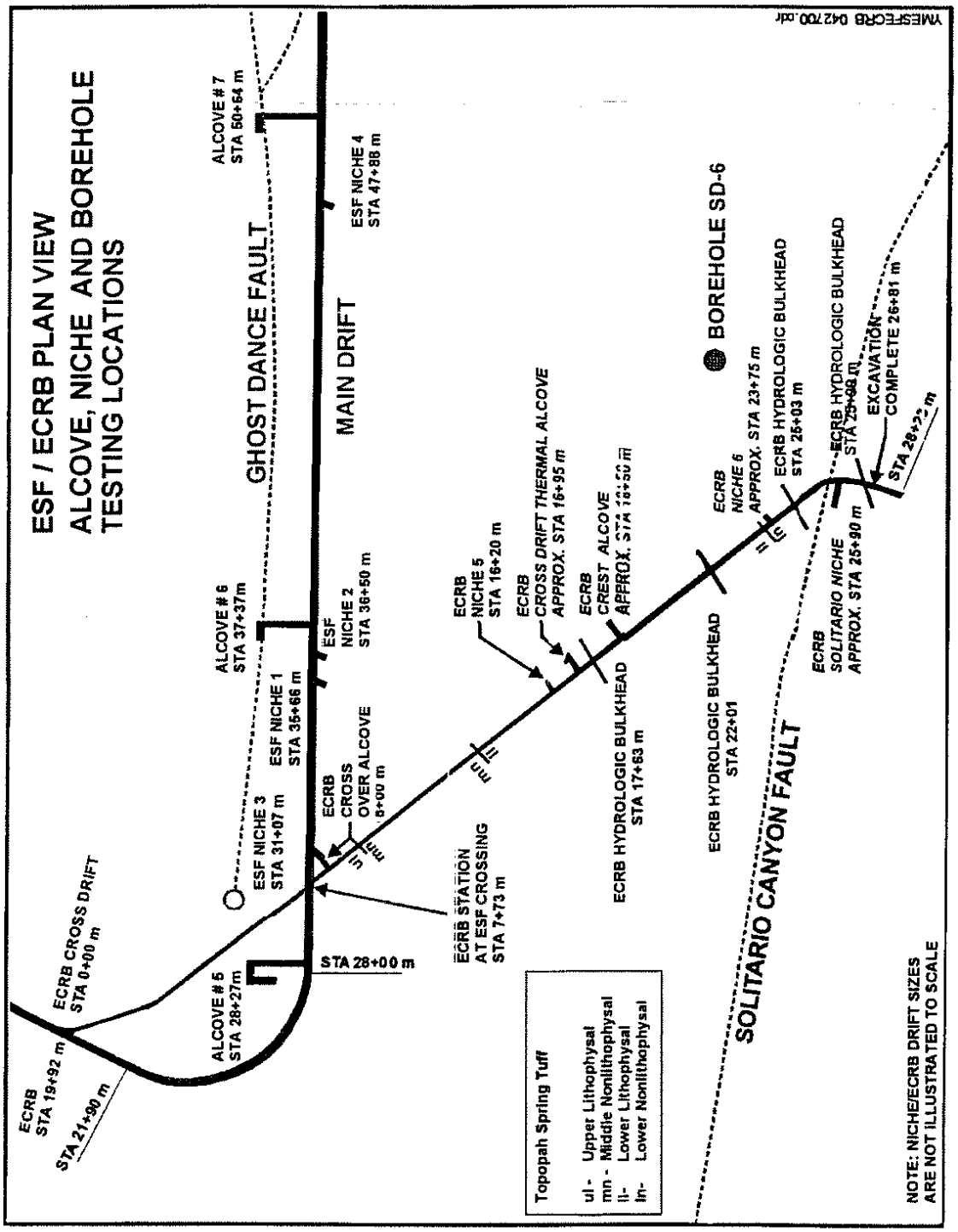
ESF / ECRB PLAN VIEW
ALCOVE, NICHE AND BOREHOLE
TESTING LOCATIONS
GHOST DANCE FAULT
MAIN DRIFT
ALCOVE # 6
STA 37+37m
ALCOVE # 7
STA 50+64 m
ESF NICHE 4
STA 47+88 m
ESF NICHE 3
STA 31+07 m
ESF NICHE 1
STA 35+66 m
ESF
NICHE 2
STA 36+50 m
ECRB
CROSS
OVER ALCOVE
8+00 m
ECRB CROSS DRIFT
STA 0+00 m
ALCOVE # 5
STA 28+27m
STA 28+00 m
ECRB STATION
AT ESF CROSSING
STA 7+73 m
ECRB
NICHE 5
STA 16+20 m
ECRB
CROSS DRIFT THERMAL ALCOVE
APPROX. STA 16+95 m
ECRB
CREST ALCOVE
APPROX. STA 18+50 m
ECRB HYDROLOGIC BULKHEAD
STA 17+63 m
ECRB HYDROLOGIC BULKHEAD
STA 22+01
BOREHOLE SD-6
ECRB
NICHE 6
APPROX. STA 23+75 m
ECRB HYDROLOGIC BULKHEAD
STA 25+03 m
ECRB HYDROLOGIC BULKHEAD
STA 25+08 m
ECRB
SOLITARIO NICHE
APPROX. STA 25+90 m
EXCAVATION
COMPLETE 26+81 m
STA 28+2[illegible] m
ECRB
STA 19+92 m
STA 21+90 m
SOLITARIO CANYON FAULT
Topopah Spring Tuff
ul - Upper Lithophysal
mn - Middle Nonlithophysal
ll- Lower Lithophysal
ln- Lower Nonlithophysal
NOTE: NICHE/ECRB DRIFT SIZES
ARE NOT ILLUSTRATED TO SCALE
YMESFECRB 042700.ddr

Figure 1