U.S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVE REPORT

NUMBER OR-96-10

FOR THE REPORTING PERIOD OF October 1-31, 1996

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REPORT DETAILS

1.0 INTRODUCTION

The principal purpose of the On-Site Licensing Representative (OR) reports is to alert NRC staff, managers and contractors to information on the U.S. Department of Energy (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 Exploratory Studies Facility (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 and ESF development. In addition to communication of this information, any potential licensing concerns, or opinions raised in this report represent the views of the ORs and not that of NRC headquarters' staff. The reporting period for this report covers October 1-31, 1996.

2.0 OBJECTIVES

The function of 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 the DOE scientists, engineers, or 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 issue resolution. A principle 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.

3.0 SUMMARY AND CONCLUSIONS

Over this reporting period the TBM advanced to station 68+07 meters (22,334 feet). ESF activities continue to focus on the excavation of the Connect Drift for the Heated Drift Test in Alcove 5, and the excavation of the Northern and Southern Ghost Dance Fault Alcoves (Alcoves 6 and 7). Recent ESF testing activities include: in-situ stress testing of potential repository rock in Alcove 5;

penetration of the Ghost Dance Fault with a radial borehole drilled from Alcove 6; ongoing monitoring of temperature and humidity in Alcoves 3, 4, and the ESF main drift; and geologic mapping and sampling. Recent surface-based activities include the injection and initial breakthrough of tracers used for the fourth tracer test at the C-Hole Complex. This report also notes that pneumatic monitoring has been discontinued at borehole NRG-6, and may be discontinued at other boreholes in FY 97 if the test objectives of the pneumatic testing program are met.

4.0 QUALITY ASSURANCE, ENGINEERING, AND NRC KEY TECHNICAL ISSUES

From October 21-23, 1996, the OR attended the American Society of Mechanical Engineers (ASME) meeting on Nuclear Quality Assurance. In 1975, the American Standards Institute assigned ASME responsibility for development and maintenance of nuclear power QA standards. Included in this array of standards is ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications." DOE has adopted NQA-1 for the Civilian Radioactive Waste Program and has patterned its top tier QA document (Quality Assurance Requirements and Description) after NQA-1. The OR has been a member of the ASME NQA-1 Working Group on Document Control and Records Management (WG DC&RM) since 1981.

During the past year, the NQA-1 Committee underwent a total reorganization (See Enclosure 1). The purpose of this reorganization was to develop a structure that closely paralleled the NQA-1 Standard, and the work required to support the current NQA-1 version and continue to develop the standard to be commensurate with the industry's needs. The reorganization is also focused on minimizing the redundancy and replication that existed in the prior pyramid of committees.

The WG DC&RM has been changed and is now known as the Subcommittee on Management Processes (SC MP). The newly formed SC MP has been assigned more functions (as indicated underneath the "Mgmt. Processes" block in Enclosure 1) and has expanded its membership to accommodate the development of methodology for these new functions. One of the newly initiated tasks of the SC MP is to develop guidance to implement the NQA-1 requirements in a graded manner.

The NRC also has an effort underway to develop methodology to implement Appendix B to Title 10 of Part 50 of the Code of Federal Regulations requirements in a graded manner. A draft Regulatory Guide and Standard Review Plan are being developed to provide guidance on graded QA programs. Current plans are to make these documents available for public comment in 1997.

Presently, for the Civilian Radioactive Waste Management Program, there is no definitive NRC guidance for the application of the graded approach for any of the structures, systems, and components important to safety and to the engineered barriers important to waste isolation. However, certain of the methodology being developed by the NRC staff and the ASME SC MP may be applicable to the Civilian Radioactive Waste Management Program. This applicability may be beneficial to assist in resolving the NRC concerns expressed in their Key Technical Issues as well as future issues that may surface. Depending on the timing of the published methodology by the NRC, the ASME SC MP conceivably could accept the NRC methodology and voluntarily incorporate it into the NQA-1 Standard. This could avoid the full blown effort of NRC resources necessary to develop and publish a Regulatory Guide. The OR intends to follow this effort and keep appropriate NRC management informed on its progress.

In the OR Report for January 1996 (dated February 8, 1996), the ORs noted that the QA organization did not appear to be involved in the preparation, review, or approval of the Total System Performance Assessment-1995, Document No. B00000000-01717-2200-00136, Rev. 01 (TSPA-95). This report documented the quantitative predictions for the processes and parameters potentially affecting the long term behavior of the disposal system used to access the Yucca Mountain Site and its associated engineered designs to meet the NRC and U. S. Environmental Protection Agency regulatory objectives. The ORs commented in the OR Report that since the TSPA document contained significant information to potentially meet regulatory requirements, it would appear that the QA organization should have been involved in the review comment, and approval process for this document. Consequently, the ORs recommended that for future TSPA document development, that the QA organization be involved.

In October 1996, the OR Office received a copy of Total Performance Assessment-Viability Assessment (TSPA-VA) Plan, Document No. B00000000-01717-2200-00179, dated September 1996. The TSPA-VA describes the plan to conduct a Total System Performance Assessment for the DOE Viability Assessment and includes plans which address NRC Key Technical Issues. Once again, the review and approval sheet in the TSPA-VA, as with TSPA-95, does not have any indication that the QA organization was involved in the preparation, comment, or approval process. Since the TSPA-VA document contains information that could potentially be used in licensing or affect the quality of a product, the ORs question why the QA organization was not involved in reviewing this document. The DOE QA Director indicated that although the TSPA-VA document did not receive a QA review,

there will be QA oversight on the products developed from this document. This matter was also briefly discussed with the newly appointed DOE Project Control Manager and it was indicated that as part of this function, all project documents under development will be listed according to their QA status. This status designation will conceivably provide better control for determining and initiating actions for those documents requiring QA involvement.

5.0 EXPLORATORY STUDIES FACILITY (ESF) AND KEY TECHNICAL ISSUES

Exploratory Studies Facility (ESF) Testing:

As of October 31, 1996, the Tunnel Boring Machine (TBM) advanced to station 68+07 meters. Instrument installation and data collection for construction monitoring continues. Geologic mapping and photogrammetry progressed approximately to station 67+00 meters. Over this reporting period, alcove construction and testing activities were focused in Alcoves 5, 6, and 7. However, investigators continue to collect temperature and humidity data in Alcoves 3 and 4 and at several other locations in the ESF main drift. There was no testing activity in Alcoves 1 and 2 over this period. The location of alcoves and preliminary tunnel stratigraphy is summarized in Enclosure 2.

Alcove 5 (Thermal Testing Facility Access/Observation Drift and Connecting Drift)
Excavation of the connecting drift for the Heated Drift Test continued over this reporting period using the drill and blast method. On October 31, 1996, this excavation advanced approximately 35 meters of its planned 45 meter length. The Heated Drift Test will heat approximately 15,000 cubic meters of rock in the repository horizon to 100 degrees centigrade or greater to investigate coupled processes under thermal loading. Excavation of the Heated Drift is expected to start in late November/early December 1996 using the Alpine Miner.

Over this reporting period, "Hydrofrac" testing was conducted in the vicinity of Alcove 5 to measure in-situ rock stress in the potential repository horizon. Investigators drilled a vertical borehole extending approximately 30 meters below the floor of the drift from the end of the Access/Observation drift (station 1+28 meters). The full length of this borehole was confined to the Topopah Spring Tuff middle nonlithophysal unit. In this test, a small volume of

water (5-10 gallons) was injected into isolated intervals of the borehole at steadily increasing pressure until the rock failed/fractured. A total of 6 separate intervals were tested over the length of this borehole.

Alcove 5 (Thermomechanical Alcove)
The Single Heater Test started on August 26, 1996. Instruments for this test are reported to be working properly and the collection of test data continues. This test is designed to heat approximately 25 cubic meters of rock to 100 degrees centigrade or greater to investigate thermomechanical properties of rock in the potential repository horizon.

Alcoves 6 and 7 (Northern and Southern Ghost Dance Fault Alcoves)
Testing in Alcoves 6 and 7 is designed to investigate the hydrochemical and pneumatic properties of the Ghost Dance Fault. Over this reporting period, Alcove 6 was extended an additional 15 meters (station 1+05 meters from the centerline of the ESF main drift). Investigators then drilled a 60 meter horizontal radial borehole from the end of Alcove 6 in an effort to penetrate the Ghost Dance Fault. After an examination of core and video log from this borehole, investigators determined that the Ghost Dance Fault was penetrated between 38-50 meters in this borehole (stations 1+43 to 1+55 from the centerline of ESF main drift). Planned testing in this borehole will provide information on the geothermal, hydrologic, and pneumatic properties of the Ghost Dance Fault. The excavation of Alcove 7 (ESF station 50+64 meters) started in late October 1996 using the Alpine Miner and advanced a total of 7 meters.

SURFACE-BASED TESTING

Borehole Testing:

The location of boreholes referenced in this section is provided in Enclosure 3.

C-Hole Complex
Tracer testing at the C-Hole Complex is conducted in the Bullfrog interval of the Crater Flat Tuff for the purpose of determining hydrologic properties in the saturated zone. On October 10, 1996, investigators initiated the fourth tracer test at the C-Hole complex. The tracers injected into C#2 were lithium bromide, microspheres, and polyflourobenzoic acid (PFBA). Tracers were injected in C#2 while pumping C#3 at a

rate of 150 gallons per minute with partial recirculation of water from C#3 to C#2. The distance between C#2 and C#3 is approximately 30 meters. Breakthrough of tracers occurred 14 hours after completion of injection. Initial peak concentration of all tracers occurred on October 11, 1996. Secondary increase in concentration began about October 16, 1996, and peaked on about October 25, 1996. Investigators believe these observations are consistent with a bimodal model where initial fracture flow response is followed by a lesser response representing fracture-matrix flow. Pumping and sampling for this tracer test continue.

G-2 Testing

Automatic recording of water-level recovery data from the pump test conducted in April 1996 continues. Over this reporting period, the water level in this borehole appears to be approximately one-third of a meter below the pre-test water level. Water level recovery data from the pump test will provide information on the high hydraulic gradient in the vicinity of G-2.

Pneumatic Testing in Boreholes

Pneumatic data recording and gas sampling continues at boreholes UZ-4, UZ-5, UZ-7a, SD-7, SD-12, UZ-6s and NRG-7a. DOE terminated pneumatic monitoring at NRG-6 in September 1996 and may discontinue monitoring at NRG-7a in the near future. Monitoring was terminated at NRG-6 because the test objectives for this borehole had been met. DOE is also evaluating the need for continued pneumatic monitoring of the remaining instrumented boreholes in FY 97. Nye County continues to record pneumatic data in NRG-4 and ONC-1 as well as collecting temperature, pressure, and humidity data from instrumentation installed on the TBM.

OTHER ACTIVITIES

A number of technical reports have been reviewed and accepted by DOE over this reporting period. A summary of several of these reports is provided here.

Summary and Synthesis on Mineralogy and Petrology Studies for Yucca Mountain Site Characterization Project, Volumes I, II, III

Volume I of this report summarizes the occurrence, distribution, composition, and origin of important minerals at Yucca Mountain. Over 1,300 samples have been analyzed for quantitative mineralogic abundance and have been interpreted in the context of stratigraphic position. Data obtained from these samples allow an assessment of the

mineralogy of Yucca Mountain in terms of its geologic and hydrologic assessment, and in terms of the potential of minerals to act as natural barriers to radioactive waste migration. Quantitative data on mineral abundances are presented and summarized in terms of the three major mineral-stratigraphic units (vitric, devitrified, and zeolitic layers) used in constructing a 3D mineralogical model of Yucca Mountain. Particular attention is given to the Calico Hills Formation. Volume I describes the application of this information to the understanding of transport pathways at Yucca Mountain.

Volume II discusses the results of the alteration history study which supports the site suitability program. This study characterizes past and present natural alteration processes that have affected the potential geologic repository and predicts future effects of natural and repository-induced alteration.

Volume III describes the basis for evaluating anticipated repository-induced geochemical alteration based primarily on experimental results, theoretical mineral stability, and computer models of repository behavior. The focus of Volume III is on the stability and reaction kinetics of zeolites. The effect of temperature and fluid composition in controlling the stability relations of minerals at Yucca Mountain is emphasized. A theoretical model is developed that allows the calculation of thermodynamic properties as a function of composition. The model is used in the evaluation of mineral stability at Yucca Mountain, particularly with respect to anticipated effects of elevated temperature. A computer model of the stability relations among zeolites is made based on experimentally constrained thermodynamic data.

Volume II Near-Field and Altered-Zone Environmental Report
This report provides the status and summary of the near-field environment through FY 1996. It is intended to be a stand-alone document providing the necessary information to understand the near-field and altered-zone environments. This is an important study since the design and performance of the waste package and the Engineer Barrier System will be dependent on the geochemical, hydrologic, and geochemical conditions over time in the rock forming the near-field environment.

Interpretation of Pneumatic and Chemical Data From the Unsaturated Zone Near Yucca Mountain, Nevada
This report summarizes pneumatic pressure data collected from instrumented boreholes at Yucca Mountain as well as flow, temperature, and chemistry data collected for open boreholes at the crest of Yucca Mountain. It groups

lithostratigraphic units at Yucca Mountain into 4 distinct pneumatic systems. These pneumatic systems are the (1) Tiva Canyon welded tuffs; (2) the Paintbrush nonwelded units; (3) the Topopah Springs Tuff; and (4) the pre-Topopah Spring bedded tuff, nonwelded tuff of the Calico Hills Formation, and pre-Calico Hills Formation bedded tuffs.

The results of this study indicate that there is little attenuation of the barometric pressure signal in the Tiva Canyon tuff indicating large bulk permeabilities and abundant interconnection of fractures. In the Paintbrush nonwelded tuff, the barometric pressure signal is substantially attenuated due to lower permeability sub-units within this system. In the Topopah Spring tuff, the attenuation of barometric pressure is generally negligible indicating that fractures are permeable and interconnected. Bulk permeabilities for these four pneumatic systems are provided in this report.

ESF excavation effects were detected in pneumatic pressure records for all boreholes with the exception of borehole UZ-7a, which is drilled through the Ghost Dance Fault. Effects of ESF excavation at UZ-7a may be masked by the effects of this fault. Faulting also appears to affect pneumatic pressure data in other instrumented boreholes. This study emphasizes the importance of including detailed pneumatic characteristics of faults and major fractures (potential high permeability zone) in models to adequately represent effects of important pneumatic pathways in the vicinity of the proposed repository.

Bedrock Geologic Map of the Central Block Area, Yucca Mountain, Nye County, Nevada

The Yucca Mountain Project has completed a new detailed surface geologic map (1:6,000-scale) and cross sections of the central block at Yucca Mountain. This work defines the character and extent of the dominant structural features in the vicinity of potential repository. A report accompanying this map describes the central block as being made-up of Tertiary volcanic rocks and bounded on the west by the Solitario Canyon fault, on the east by the Bow Ridge fault, on the north by the Drill Hole Wash fault, and the south by Abandoned Wash. This report discusses the methodology used in this mapping study, the regional setting, the structural setting of the Central Block area, and the tectonic implications of this work.

Topical Report-Preclosure Seismic Design Methodology for a Geologic Repository at Yucca Mountain

This Topical Report describes DOE's method and acceptance criteria for the preclosure seismic design of systems, structures and components important to safety. All systems,

structures, and components important to safety must be built to a single seismic design that meets all requirements, including those for postclosure performance. This Topical Report is being submitted for NRC staff review and comment in an effort to reach agreement on an acceptable preclosure seismic design approach before DOE implements the license application design.

6.0 GENERAL

1. Meetings/Interactions

- Attended the regularly scheduled meeting with W. Barnes Yucca Mountain Site Characterization Office (YMSCO) Project Manager, Deputy Project Manager, YMSCO Assistant Managers, and the YMSCO QA Manager. See Enclosure 4 for the subject matter discussed at this meeting.

- Attended the October 23, 1996, NRC/DOE Management Videoconference Meeting in Las Vegas, Nevada and Washington, D.C. The purpose of this meeting was to update the status of the program and discuss regulatory and licensing issues. See Enclosure 5 for the subject matter discussed at this meeting.

- On October 31, 1996, the ORs attended and participated in a one day workshop on performance-based auditing. This workshop was presented by the Office of Civilian Radioactive Waste Management to assure consistency in the DOE performance-based auditing process. NRC's NUREG/CR-5151, "Performance-Based Inspections" was reviewed and several of the concepts in this NUREG were incorporated into this workshop. This workshop was also initiated partially in response to NRC comments noted in the November 2, 1995, NRC Audit Observation Report (OA-95-11) for the DOE September 6-14, 1995, performance-based audit (YM-ARP-95-20) of the U.S. Geological Survey. At this audit, NRC recommended that performance-based technical audits should focus on all points in the process at which technical judgements are made. The NRC recommendation resulted from its observation during this audit whereby technical examination of supporting documentation, particularly scientific notebooks and technical reviews, was limited.

  The workshop opened with about a one hour lecture followed by a series of workshops to implement and practice on the material presented at the lecture. The lecture defined:

- o Performance-based auditing
- o Benefits
- o Timing of when to conduct a performance-based audit
- o What product to select for evaluation
- o Scoping process
- o Flowchart techniques
- o Objectives and measurement criteria
- o Checklist development
- o Audit performance

This workshop will be offered to all of the DOE auditors involved in site characterization activities for the ESF.

The ORs believe that this workshop was beneficial and well prepared as evidenced with the material presented. If the presentation material is properly implemented, it should promote consistency in the DOE performance-based auditing process.

The ORs offered a suggestion which could promote continuity in performance-based auditing when deficiencies are presented. It may be beneficial to have the auditor or Lead Auditor when explaining a deficiency to the auditee, to explain the overall effect or importance of the deficiency on the program. This explanation could assist in neutralizing the defensive posture sometimes exhibited by auditees.

After this workshop, a discussion was held with the DOE QA Director concerning the auditing process. From the OR perspective, the DOE auditing process consists of Surveillances, Compliance and Performance-based audits. Compliance-based auditing is mainly a programmatic process which focuses on procedural implementation and compliance. Performance-based auditing evaluates the results of processes or activities and draws a conclusion of their effectiveness about the adequacy of the product produced. During the conduct of Performance-based auditing, it inherently envelops much of the Compliance-based concepts. Surveillances can and many times do include the combination of compliance and performance-based auditing but on a much more limited scope. Based on the ORs extensive observation of the DOE auditing process, it is obvious that performance-based auditing is a much more effective meaningful process in improving quality. Recognizing DOE is committed to performing internal audits to evaluate all aspects of their QA program implementation on an annual basis, the ORs believe this can be accomplished more effectively with performance-based audits supplemented with a series of surveillances. The ORs suggested to DOE that this subject be discussed at the forthcoming December 5, 1996, NRC/DOE QA meeting.

- The ORs have had several discussions with DOE management and technical personnel regarding the OR attendance at select DOE internal meetings and workshops. This matter was also discussed briefly at the October 23, 1996, NRC/DOE Management meeting. Discussions continue between the ORs and DOE on this matter.

7.0 REPORTS

Over this reporting period the following reports were received in the NRC Las Vegas office:

LAWRENCE LIVERMORE

UCRL-ID-125176 THE EFFECTS OF DIESEL EXHAUST ON THE MICROBIOTA WITHIN A TUFFACEOUS TUNNEL SYSTEM, 8/96, D. Haldeman, T. Lagadinos, L. Hersman, A. Meike, P. Amy

UCRL-ID-125343 THERMODYNAMIC DATA BASE NEEDS FOR MODELING STUDIES OF THE YUCCA MOUNTAIN PROJECT, 7/96, C. Palmer, R. Silva, J. Bucher

LOS ALAMOS

LA-12961-MS BATCH SORPTION RESULTS FOR NEPTUNIUM TRANSPORT THROUGH YUCCA MOUNTAIN TUFFS (Milestone 3349), I. Triay, C. Cotter, M. Huddleston, D. Leonard, Sidney Weaver, Steve Chipera, David Bish, Arend Meijer, J. Canepa

LA-13160-MS PREDICTIONS OF TRACER TRANSPORT IN INTERWELL TRACER TESTS AT THE C-HOLE COMPLEX (Milestone 4077), 9/96, Paul Reimus

DOE

DOE/EM-0290 THE 1996 BASELINE ENVIRONMENTAL MANAGEMENT REPORT, 6/66, EXECUTIVE SUMMARY

SANDIA NATIONAL LABORATORIES

SAND95-1606 NEAR-SURFACE VELOCITY MODELING AT YUCCA MOUNTAIN USING BOREHOLE AND SURFACE RECORDS FROM UNDERGROUND NUCLEAR EXPLOSIONS, 9/96, B. Durrani, M. Walck

SAND95-1938 SUMMARY OF GROUND MOTION PREDICTION RESULTS FOR NEVADA TEST SITE UNDERGROUND NUCLEAR EXPLOSIONS RELATED TO THE YUCCA MOUNTAIN PROJECT, 10/96, M. Walck
NUREG

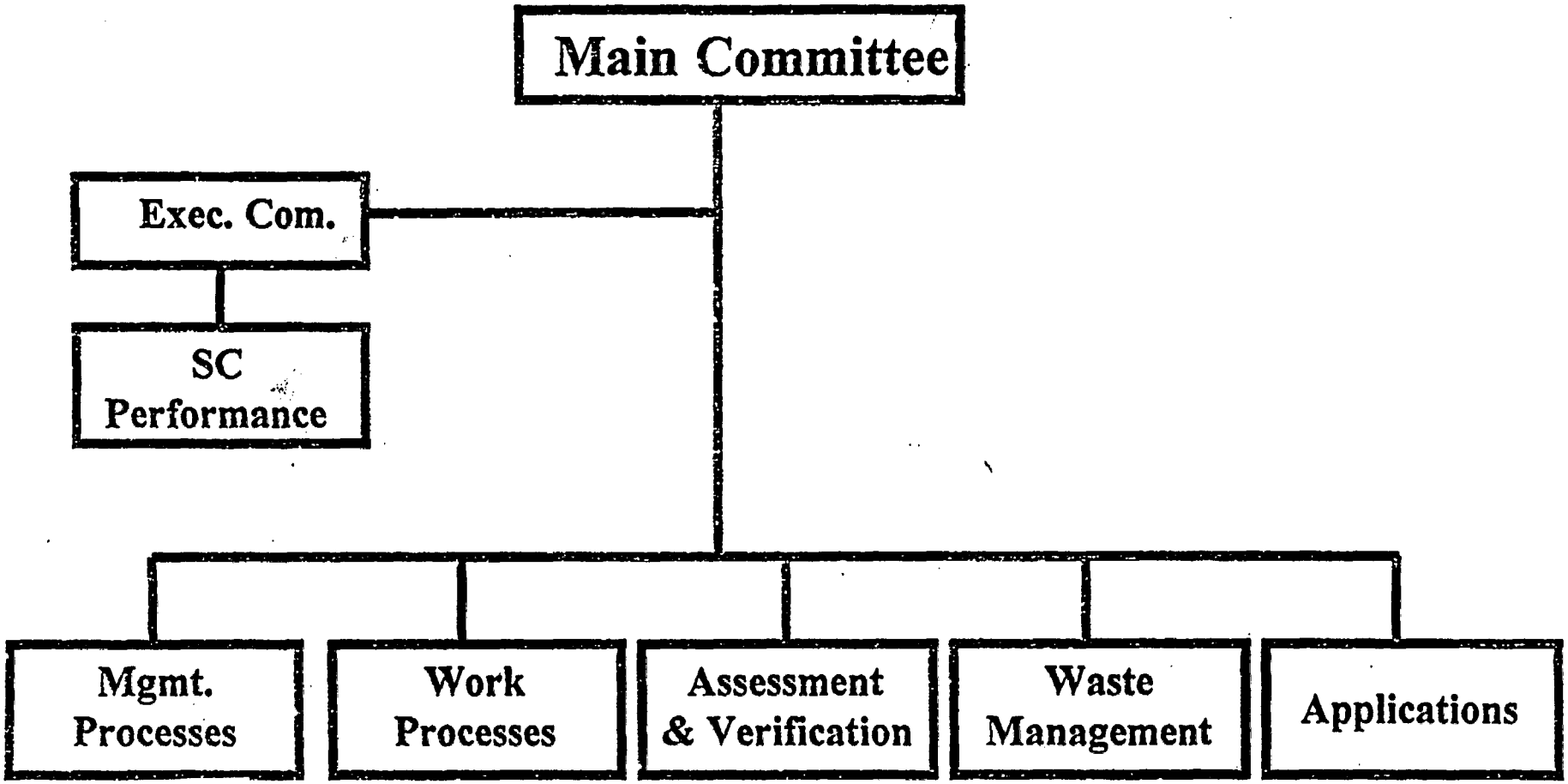
SAND95-2182 FRICTIONAL SLIDING IN LAYERED ROCK: LABORATORY-SCALE EXPERIMENTS, 9/96, B. Buescher, K. Perry, J. Epstein

SAND95-2338 SCALING OF MATERIAL PROPERTIES FOR YUCCA MOUNTAIN: LITERATURE REVIEW AND NUMERICAL EXPERIMENTS ON SATURATED HYDRAULIC CONDUCTIVITY, 8/96, S. McKenna, C. Rautman

The following progress reports were sent to NRC Headquarters:

YUCCA MOUNTAIN PROJECT BRANCH USGS PROGRESS REPORT, Sept., 1996

EXPLORATORY STUDIES FACILITY TESTING ACTIVITIES - Aug., 1996 PROGRESS REPORT (LOS ALAMOS)


Main Committee
Exec. Com.
SC Performance
Mgmt. Processes
Work Processes
Assessment & Verification
Waste Management
Applications
Organization
Program
Documents
Records Mgt.
Personnel & Training
Performance Improv.
Matrices
Grading
Fwd., Intro.
1,2,5,6,17,19
Definitions
Const. & Manuf.
Design
Procurement
Operations
Computer Software
Part2, 3,4,7,8,9
12,13,
Corrective Act.
Inspection & Test
Audit & Surv.
Assessment
10,11,14,15,16, 18
Waste Mgt.
D&D
Part 3
New/emergent programs
New/emergent processes
R&D
NMC&A
Stds. Interface

ENCLOSURE 1

ESF TUNNEL STRATIGRAPHY*

STATION	
0+00 to 0+99.5m	Tiva Canyon crystal poor upper lithophysal zone.
	Alcove #1 (centerline station intersection): 0+42.5
0+99.5 to 1+90m	Tiva Canyon crystal poor middle nonlithophysal zone
	Alcove #2 (centerline station intersection): 1+68.2
1+90 to 1+99.5m	Tiva Canyon crystal poor lower lithophysal zone.
1+99.5 to 2+02m	Bow Ridge fault zone (placing Pre-Ranier Mesa Tuff against Tiva Canyon Tuff)
2+02 to 2+20m	Pre-Ranier Mesa Tuff
2+20	Fault (4.3m offset)***
2+20 to 2+63.5m	Pre-Ranier Mesa Tuff
2+63.5 to 3+37m	Tuff "X"
3+37 to 3+49.5m	Pre-Tuff "X"
3+49.5 to 3+59.5m	Tiva Canyon vitric zone
3+59.5 to 4+30m	Tiva Canyon crystal rich nonlithopysal zone
4+30m	Fault (~10m offset)***
4+30 to 4+34	Tiva Canyon crystal rich nonlithopysal zone
4+34 to 4+39m	Tiva Canyon crystal rich lithopysal zone
4+39 to 5+50m	Tiva Canyon crystal poor upper lithophysal zone
5+50m	Fault (~5m offset)***
5+50 to 5+53	Tiva Canyon crystal poor upper lithophysal zone
5+53 to 5+87m	Tiva Canyon crystal poor middle nonlithophysal zone

ESF TUNNEL STRATIGRAPHY CONTINUED*

5+87 to 6+19m	Tiva Canyon crystal poor lower lithophysal zone
6+19 to 7+00m	Tiva Canyon crystal poor lower nonlithophysal zone
7+00m	Fault (~20m? offset)***
7+00 to 7+77m	Tiva Canyon crystal poor lower nonlithophysal zone.
	Alcove #3 (centerline station intersection): 7+54.
7+77 to 8+69m	Tiva Canyon crystal poor vitric zone
8+69 to 9+12m	Bedded tuffs (including thin Yucca Mountain member)
9+12 to 10+20m	Pah Canyon Member.
10+20 to 10+51.5m	Pre-Pah Canyon tuffs
	Alcove #4 (centerline station intersection): 10+27.8
10+51.5 to 11+93m	Topopah Spring crystal rich vitric zone
11+93 to 17+17m	Topopah Spring crystal rich nonlithophysal zone
17+17 to 17+97m	Topopah Spring crystal rich lithophysal zone
17+97 to 27+20m	Topopah Spring crystal poor upper lithophysal zone
27+20 to 35+93m	Topopah Spring crystal poor middle nonlithophysal zone
	Alcove #5 (centerline station intersection): 28+27
35+93m	Sundance fault (most prominent fault plane, minor fracturing reported between Stations 35+85 and 36+40)
35+93 to 63+05m?	Topopah Spring crystal poor middle nonlithophysal zone

ESF TUNNEL STRATIGRAPHY CONTINUED*

Alcove #6 (centerline intersection): 37+37

57+30	Splay of the Ghost Dance Fault - Offset is approximately 2 meters
63+08 to 64+55**	Topopah Spring crystal poor upper lithophysal zone
63+25	Fault with the offset estimated as 3.8 meters
64+55 to 64+95**	Topopah Spring crystal rich lithophysal zone
64+95 to 66+32**	Topopah Spring crystal rich nonlithophysal zone
66+32 to 66+41.5**	Topopah Spring vitric zone
66+41.50 to face	Pre-Pah Canyon tuffs
66+38**	PTn contact
67+90**	Dune Wash fault (offset is greater than 10m)

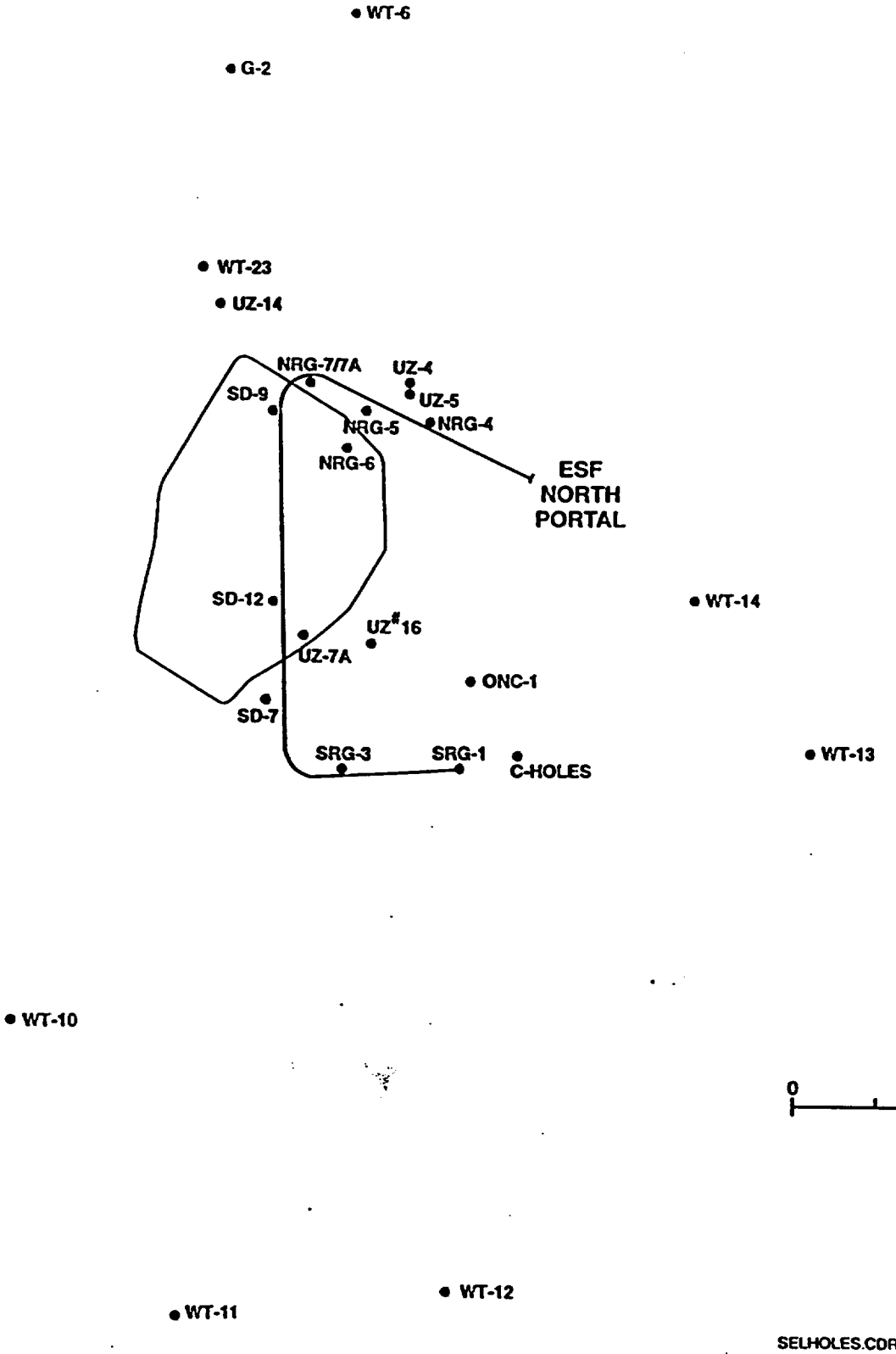
Note: Starting at station 57+02 and ending at 59+80, the crystal poor lower lithophysal zone is exposed in the lower portion of the tunnel (below springline).

* All stations given are referenced to the right springline unless otherwise noted. Station 0+00 is located at coordinates N765352.7, E569814.4.

** Indicates that contact is preliminary and has not been verified by USGS geologists.

*** Only significant faults are noted on the table.

Selected Borehole Locations



SELHOLES.CDR.123/9-7-95

ENCLOSURE 3

AGENDA FOR 10/15/96 W. BARNES MEETING

- o DOE/YMSCO reorganization update and what personnel will be assigned to specific functions (other than DOE management). DOE Organizational chart used for initial briefing of DOE personnel would be helpful for this topic discussion. OR's to provide current NRC/DWM staff listing.

- o NRC to discuss QA problems as perceived and discussed with D. Horton, R. Spence et. al. Will probably be an agenda item for the 10/23/96 NRC/DOE Management meeting (See QA handout page).

- o DOE QA update on proposed QA consolidation effort and whether this proposed consolidation will assist in resolving NRC QA concerns expressed in above bullet.

- o NRC requests DOE feedback (if any) on qualification of data exercise as noted in the August OR Report (specifically the comments included in the second full paragraph on page 5 of the report. Any DOE plans for qualifying other data and if so, what data. Also, request any comments/concerns with NRC August letter on this subject (See handouts provided for specifics).

- o NRC/DOE discussion on LSS & Regulatory Guide 3.69 (Copies provided).

- o NRC information on Strategic Assessment & Baselining Initiative for High-Level Waste (See Handouts).

- o NRC to provide information/update on NRC budget.

- o NRC feedback on recent NRC/ACNW visits

- o DOE status on: Proposals for drilling additional boreholes
  Management Assessment
  TRM Board of Consultant's Report
  Response to Nye County concerns on water usage in ESF

- o DOE/NRC feedback on any other pending issues

ENCLOSURE 4

NRC/DOE MANAGEMENT MEETING AGENDA

October 23, 1996
Video Conference

2:00 EST

- **OPENING REMARKS** — ALL

- **PROGRAM STATUS**
  - Budget/Legislative Update — DOE
  - Update on OWAST Activities — DOE
  - NRC Budget Reduction and Program Impacts — NRC

- **REGULATORY AND LICENSING**
  - Status Update on 10 CFR 960 — DOE
  - Update on Decision Documentation — DOE
  - Seismic Topical Report #3 — DOE
  - Status of QA Concerns — DOE/NRC
  - Status of LSS — DOE/NRC

- **CLOSING REMARKS** — ALL

5:00 EST Adjourn