SUMMARY OF THE APRIL 19, 1994, U. S. NUCLEAR REGULATORY COMMISSION/U.S. DEPARTMENT OF ENERGY TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

Staff from the Nuclear Regulatory Commission met with representatives of the Department of Energy (DOE) to discuss items of mutual concern regarding design and the design control process at DOE's Exploratory Studies Facility (ESF) at Yucca Mountain. Representatives of the State of Nevada (NV) and Nye County, NV also attended the meeting. Other Affected Units of Local Government had been notified of the meeting, but did not attend. Also in attendance were representatives of the DOE Civilian Radioactive Waste Management System Management and Operating Contractor, the Center for Nuclear Waste Regulatory Analyses, the U.S. Geologic Survey, and the Nuclear Waste Technical Review Board. Attachment 1 is an attendance list. Copies of presenters handouts are included as Attachment 2.

A major focus of this meeting was on DOE's technical, management, and architectural document hierarchy for the ESF. The NRC staff noted that progress had been made in explaining the integration of the various documents in the hierarchy and how they relate to the program's regulatory requirements. Concerns were expressed with the interrelationship of the design requirements for the ESF, the Engineered Barrier System (EBS), and the Geologic Repository Operations Area (GROA). There was a general agreement that DOE's approach appeared to allow for all applicable EBS and GROA requirements for the ESF to be considered. However, the NRC staff believed that this could have been depicted more clearly in the graphics presented by DOE. Also discussed at this meeting were the status of the construction and drilling programs.

In the closing comments, the NRC staff and the NV and Nye County representatives reiterated the belief that a clearer demonstration of the relationship of the Site Characterization Program Baseline (SCPB) to other documents in the hierarchy was needed. All agreed that they would like to know more about DOE's proposal to allow non-DOE participants to receive DOE-controlled documents through a managed distribution, rather than through DOE's controlled document process.

The NRC staff noted its agreement with a DOE suggestion that it would be beneficial if more members of the NRC staff were able to visit Yucca Mountain more often. Such visits can enhance the staff's knowledge of the DOE program. The insights gained are often useful resolving staff technical concerns and in answering questions before they need to be asked in writing.

The NRC staff believes that DOE did an extremely effective job in presenting the complex ESF document hierarchy and that this meeting promoted a more effective dialogue between the NRC staff and DOE with regard to the ESF.

In its presentations during the meeting, DOE had proposed resolution of the several DOE action items related to the ESF. During the closing comments the NRC staff, and the NV representative made the following observations regarding the status of the action items for which DOE had proposed resolution (numbers are assigned by DOE--see Action Item List in Attachment 2):

ENCLOSURE

NRC Concern

1. Description of DOE's Document Hierarchy

   The NRC staff believes that substantial progress was made in resolving this action item, but believes that additional work is necessary before it can be closed out. As discussed at the meeting, the staff believes that DOE needs to better explain the relationship of the SCPB and the other documents described by DOE as comprising the technical baseline or document hierarchy. DOE has agreed to revise the affected documents to more clearly depict this relationship.

NV Concerns

5. Determination of Importance Evaluation (DIE)

   The NV representative had requested explanations of the DIE and how DIEs are integrated with the design. The NV representative indicated that he believes DOE's presentation resolved this action item.

10. Integration of Test Alcoves

    The NV representative requested that DOE explain how decisions related to test alcove locations and excavation are integrated with technical test requirements. The NV representative indicated that he believes DOE's presentation resolved the action item.

It was agreed that a discussion of the ESF Q-list should be included on the agenda for the next meeting. The next NRC/DOE Technical Meeting on the ESF will be scheduled at the May 17, 1994, Interactions Scheduling Meeting.

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High-Level Waste & Uranium Recovery
Projects Branch
Division of Waste Management
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission

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NRC/DOE TECHNICAL MEETING

EXPLORATORY STUDIES FACILITY

FILE FOLDER #102.8

DIVISION OF HIGH-LEVEL WASTE MANAGEMENT
NMSS, NRC

ATTENDANCE LIST

SUBJECT OF MEETING: DOE/NRC TECHNICAL EXCHANGE DATE: 4/19/94

LOCATION: WHITE FLINT

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Robert Lane Johnson	NRC/HLWR	301-504-2409

pg (2) of (3)

DIVISION OF HIGH-LEVEL WASTE MANAGEMENT
NMSS, NRC

ATTENDANCE LIST

SUBJECT OF MEETING: [illegible] DATE: 4 [illegible]

LOCATION: [illegible]

NAME:	ORGANIZATION:	TELEPHONE NO:
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RAY WALLACE	USGS/HQ	202-586-1244
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Steve Frishman	State of NV	702-687-3744
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DIVISION OF HIGH-LEVEL WASTE MANAGEMENT
NMSS, NRC

ATTENDANCE LIST

SUBJECT OF MEETING: ESF TECHNICAL MEETING DATE: 4/19/94

LOCATION:

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ATTACHMENT 2

DOE-NRC Technical Meeting

on

Exploratory Studies Facility

MGDS DESIGN CONTROL IMPROVEMENT PLAN

Alden M. Segrest
MGDS Development
April 19, 1994

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN (DCIP)

- **NEED FOR DCIP**
  - M&O developed this action plan in August, 1993, in response to CARs and self-examination
  - Transition of design to the M&O required new procedures for revising drawings, specifications, Basis for Design Documents, and Field Change Requests
  - M&O procedures were new and difficult to use (not user friendly)
  - Design Organization not taking verbatim approach to procedural compliance

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN (DCIP)

- M&O had good quality products, but trends were evident in design processes that could impair quality if not changed

• PURPOSE OF THE DCIP

- M&O made a commitment to develop a series of improvements to the design control process to preclude future problems

- Provides a review of design control related issues to coordinate their resolution

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN (DCIP)

- The Plan allows a thorough review of design control process in general, to identify weaknesses or shortcomings, and correct the process

- The Plan was put in place to increase confidence of external agencies and DOE in M&O's ability to properly control design procedures and processes

DCIP ACTION ITEMS

- **Grouped by time frame and scope of expected response**
  - **Near-Term Response Actions**
  - **Process Improvement Actions**
  - **Confirmation Actions**

NEAR-TERM RESPONSE ACTIONS

- Actions necessary to provide prompt assurance that any conditions immediately adverse to quality are identified and corrected
- Primarily in response to procedural errors and identification of additional control over some specific elements of design control

PROCESS IMPROVEMENT ACTIONS

- Longer-term approach to improving overall MGDS design control process
- Issues include:
  - Resolution of conflicts between the systems engineering/configuration management control and design control processes
  - Enhanced understanding of and personnel training in design processes

CONFIRMATION ACTIONS

- Intended to explicitly document effectiveness of the plan and associated action items
- Systematic review of problems discussed in the plan
- Evaluation of the effectiveness of the completed actions in correcting these problems and preventing recurrence
- Confirmation is provided by two methods
  - DOE/M&O evaluation (3/23/94)
  - OQA Surveillances (10/93 and 4/11-15/94)

ACTION ITEM TOTALS

- **Open Action Items (FY/94 - 2; FY/95 - 2)** **4**
- **Closed Action Items** **52**
- **Total Action Items** **56**

OPEN ACTIONS ITEMS

- All Series-3 procedures re-written to be more user friendly. (Status: 4 out of 13 complete and approved)
- Implementation and classroom training on all revised Series-3 procedures completed. (Status: 1 procedure complete)
- Incorporate relevant RSN BFD sections for Package 1A into M&O BFD; prepare base line change for combined BFD. (FY95)
- Revise RSN drawings, specifications, calculations for new traceability; adopt fully as M&O products. (FY95)

Exploratory Studies Facility

Technical Baseline

April 19, 1994

R. M. Sandifer

Pre-Decisional Draft

LV-MD-94-023

Purpose

- Describe the elements of the DOE Document Hierarchy that are relevant to the Exploratory Studies Facitity (ESF) development

- Describe documents other than hierarchy documents that are relevant to ESF development

- Provide an overview of the ESF engineering process and where relevant documents are used

Purpose (Continued)

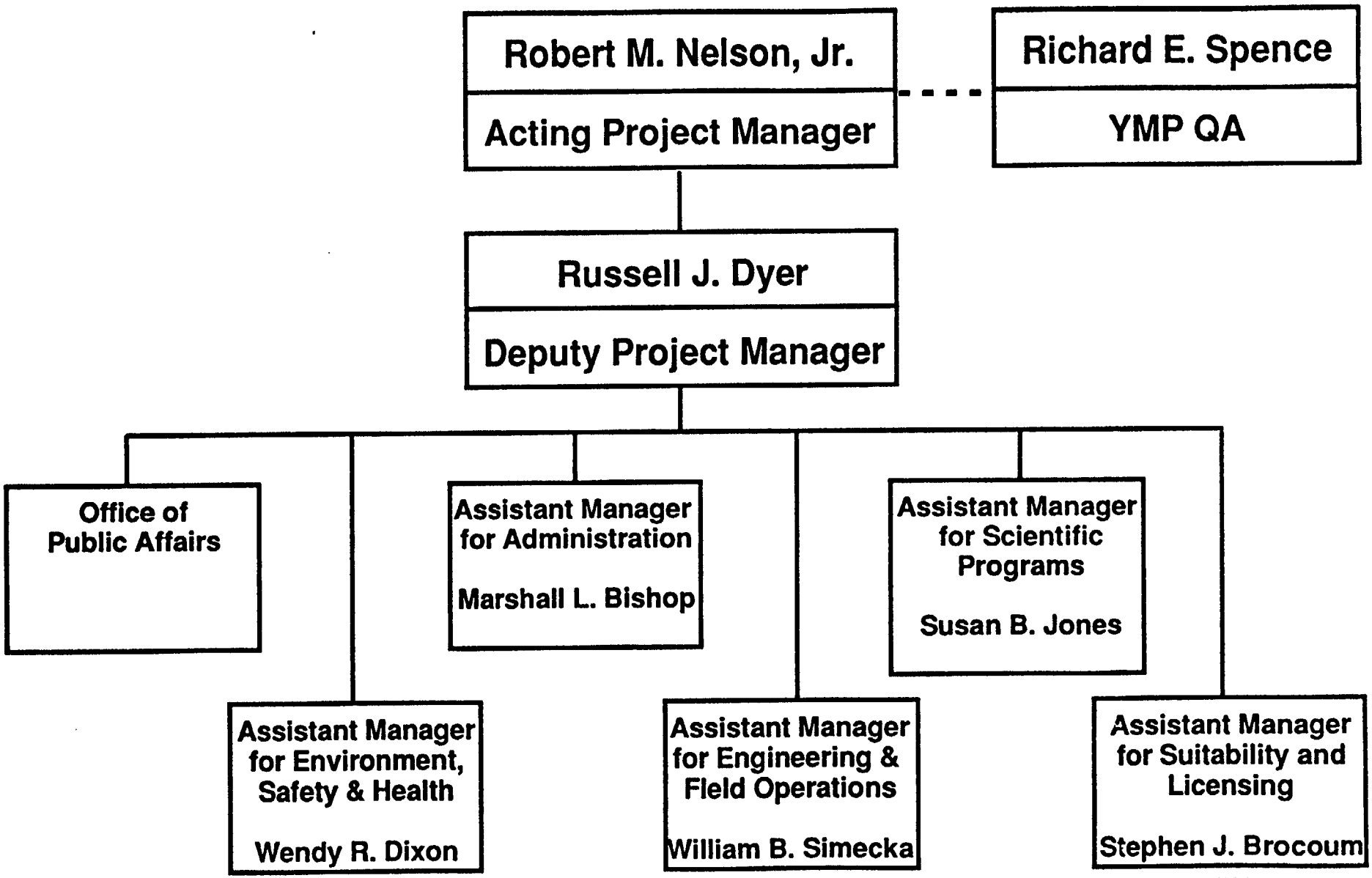
- **Provide answers to the following questions:**
  1. **What documents control or influence the ESF design?**
  2. **Where is the ESF design basis documented?**
  3. **What documents control the physical interface of the ESF and Surface Based Testing Facilities (SBTF) with the potential Geologic Repository Operations Area (GROA)?**
  4. **What is the role of the Site Characterization Program Baseline (SCPB) for ESF design and how is it related to the hierarchy?**
  5. **Why are Determination of Importance Evaluations (DIEs) performed and how do they fit into the ESF design process?**

Presentation Outline

- Purpose
- ESF Background
- ESF Governing Documents
  - Plans
  - QA Program
  - Technical Requirements
  - Architecture/Configuration
- Determination of Importance Evaluations
- Requirement Traceability Example
- Current Activities

YMP Management and Organization

Yucca Mountain Site Characterization Office



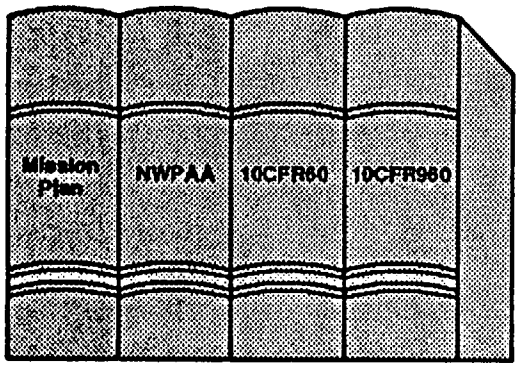
ESF Background

Background

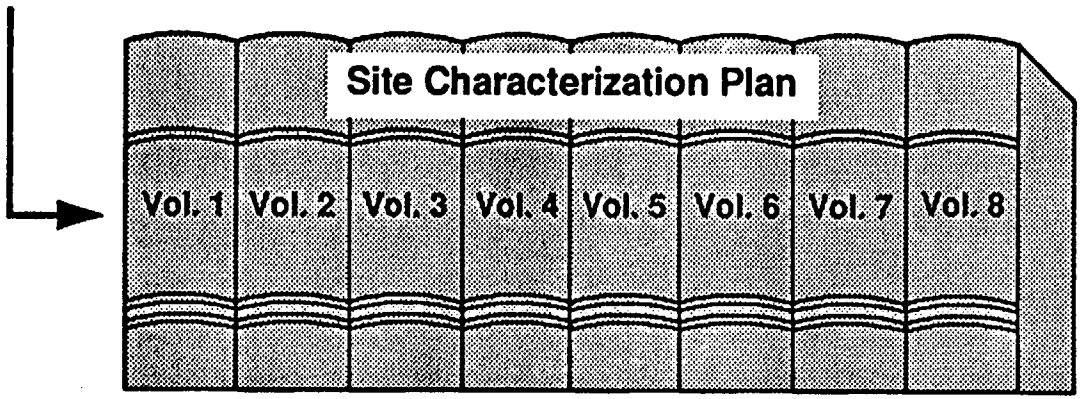
- Nuclear Waste Policy Act as Amended (NWPAA) directed DOE to characterize the Yucca Mountain Site
- The NWPAA directed that the repository be subject to regulations promulgated by EPA, NRC and DOE
- The Site Characterization Plan (SCP) was developed to provide the information needed to show compliance with EPA, NRC, and DOE regulations
- The SCP identified the need for a structured hierarchy of requirements
- The SCP identified the need for Surface Based Testing and an Underground Facility (ESF) for Subsurface Testing

The Site Characterization Plan

Part A: Description of the Mined Geologic Dispoal System Introduction

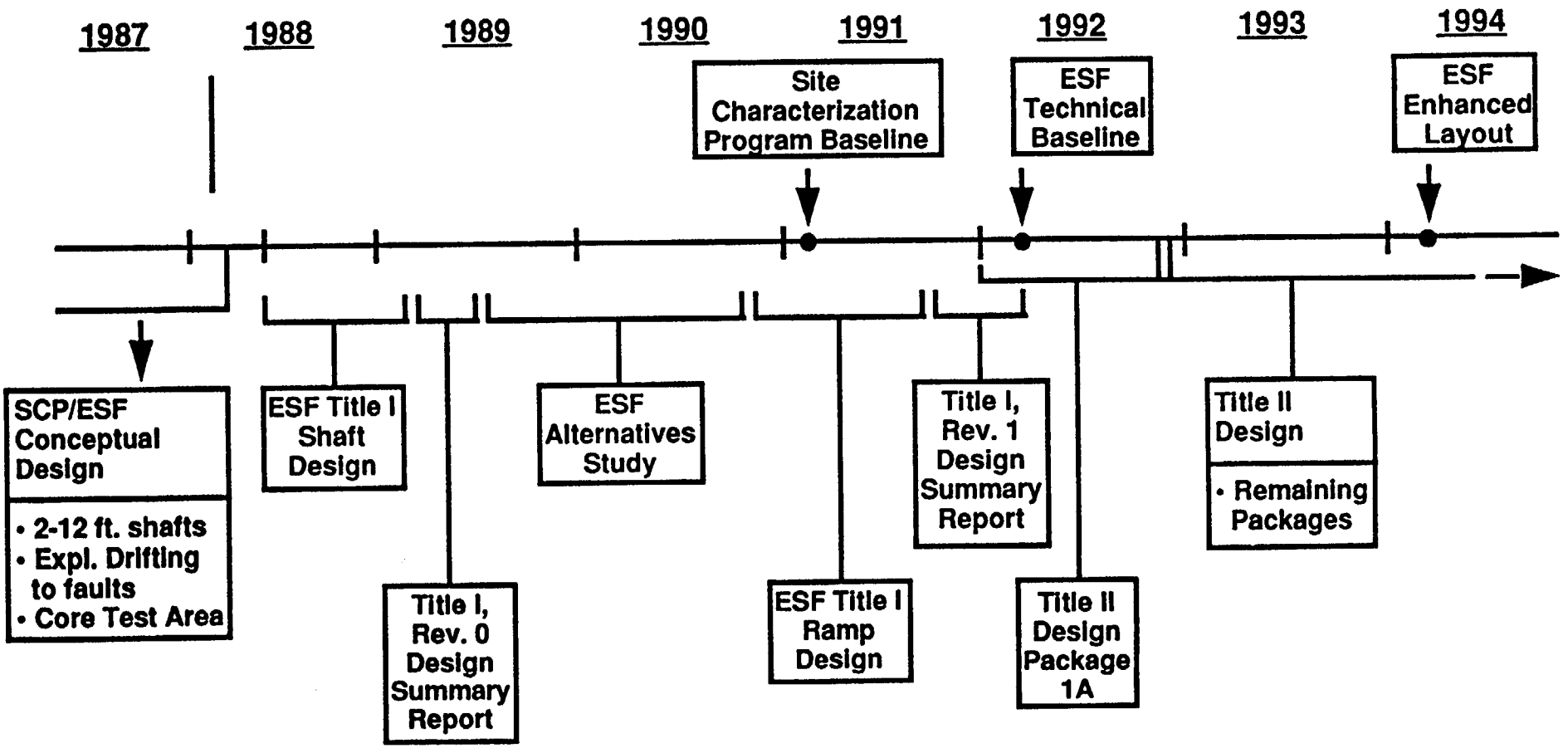


	Vol. 1	Chapter 1. Geology
		Chapter 2. Geoengineering
	Vol. 2.	Chapter 3. Hydrology
		Chapter 4. Geochemistry
		Chapter 5. Climatology and Meteorology
	Vol. 3	Chapter 6. Conceptual Design of a Repository
		Chapter 7. Waste Package
Part B:	Vol. 4-8	Chapter 8. Site Characterization Program



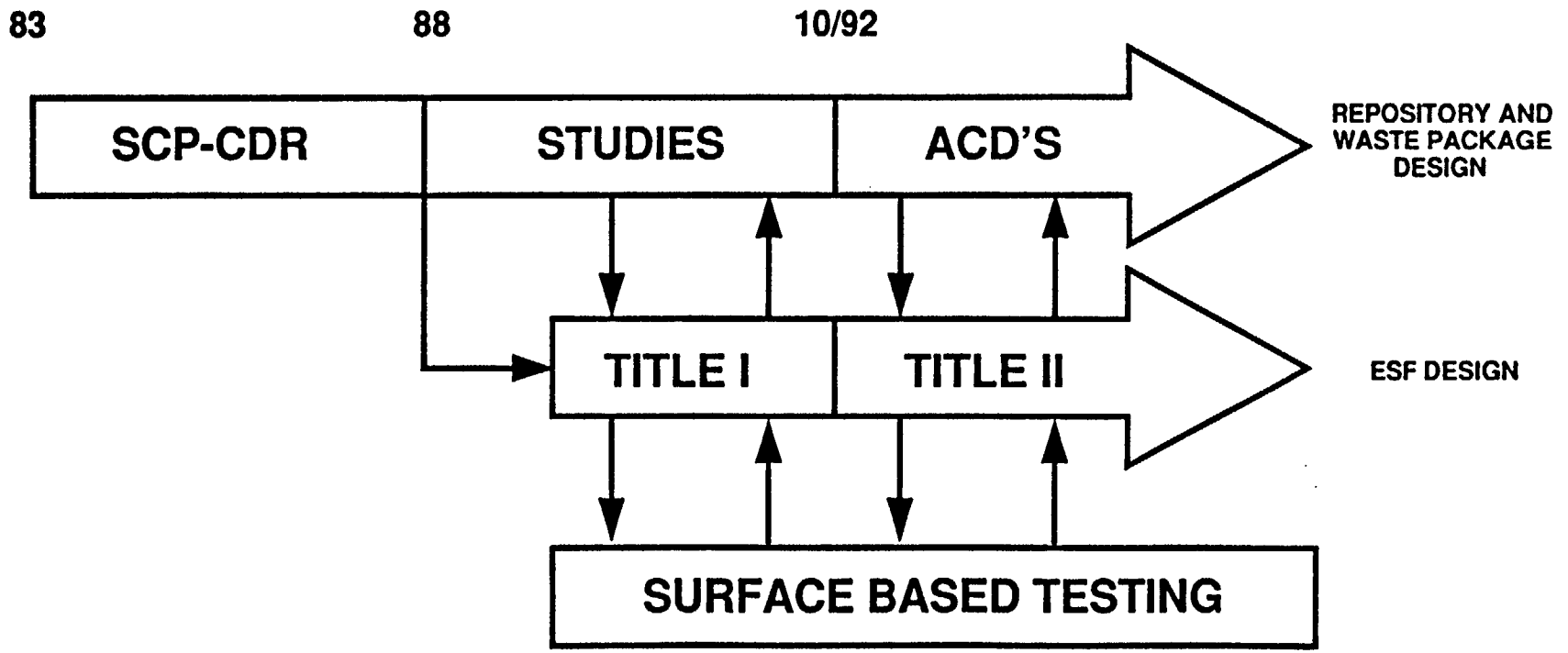
- Identified Site Characterization Program Approach
- Described the State of Knowledge of the Yucca Mountain Site
- Described Repository and Waste Package Conceptual Designs
- Translated 10 CFR 60 into Issues and Information Needs to Resolve These Issues
- Identified a Test and Analysis Program to Provide the needed Information

ESF Timeline Background

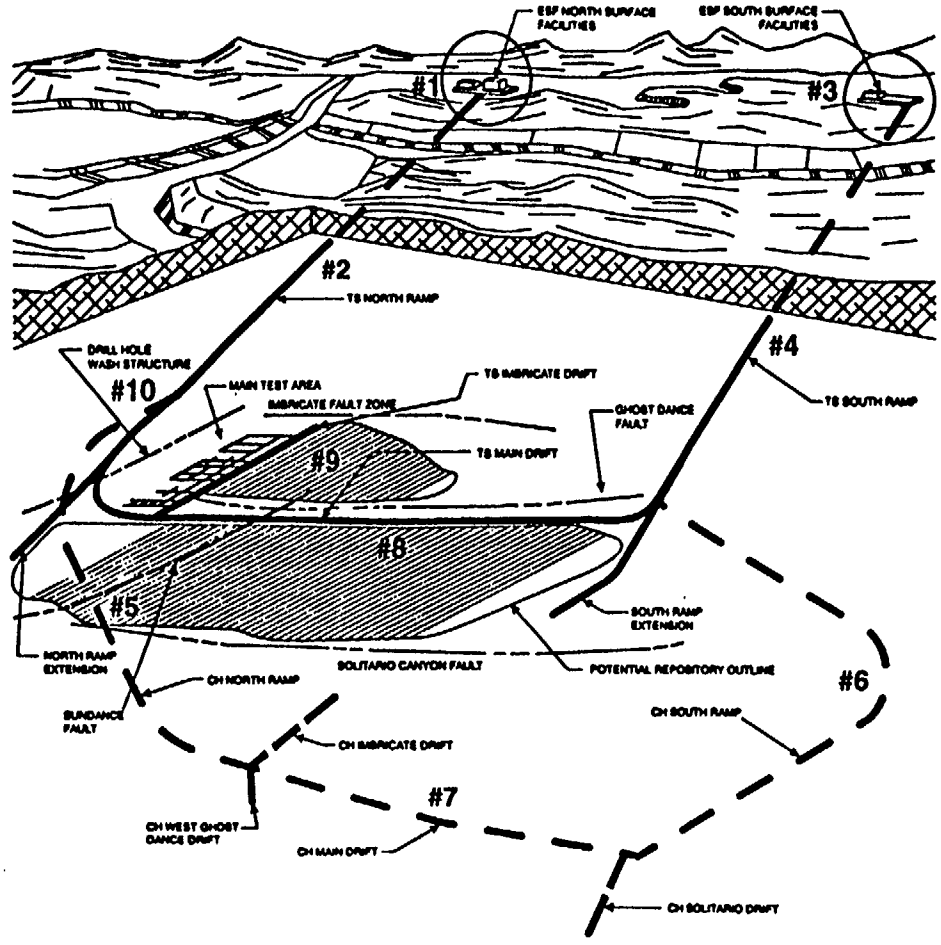


ESF design process is integrated with:

- Repository and Waste Package Advanced Conceptual Design (ACD)
- Surface Based Testing (SBT)



Proposed ESF/Repository Design



ESF Sub-Packages

ESF design packages have been divided into the following sub-packages:

1A	North Portal Pad, Starter Tunnel, etc.
1B	Power Distribution, Explosive Storage, etc.
1C	Stand-By Generators, Muck Storage, etc.
1D	Site Lighting, Covered Storage, etc.
1E	Warehouse and Operations Building
2A	Procurement Specifications for Conveyor System and Electrical Support for TBM
2B	Conveyor System, various studies,
2C	North Ramp to Topopah Spring, Utility Systems, etc.
8A	Main Test Drift, Balance of Systems, etc.
8B	North Ramp Extension, Balance of Systems, etc.
9	Topapah Springs Level Test Drifts

ESF Governing Documents

- There are essentially three categories of documents which are directly relevant to the ESF design
  1. Project Plans
  2. Technical Requirements Documents
  3. Architecture Documents
- Top level documents for categories 1 and 2 are pictured in the DOE Document Hierarchy.

Roles of the Documents

Plans

The purpose of the plans is to essentially provide a contract between DOE management and the engineering contractor with respect to "how" the design will be performed

Requirements

The requirements documents establish the design basis for the system to direct the engineer on "what" the system must do

Architecture

The architecture documents capture the physical aspect of what the configuration items (Structures, Systems, and Components (SSCs) "look like"

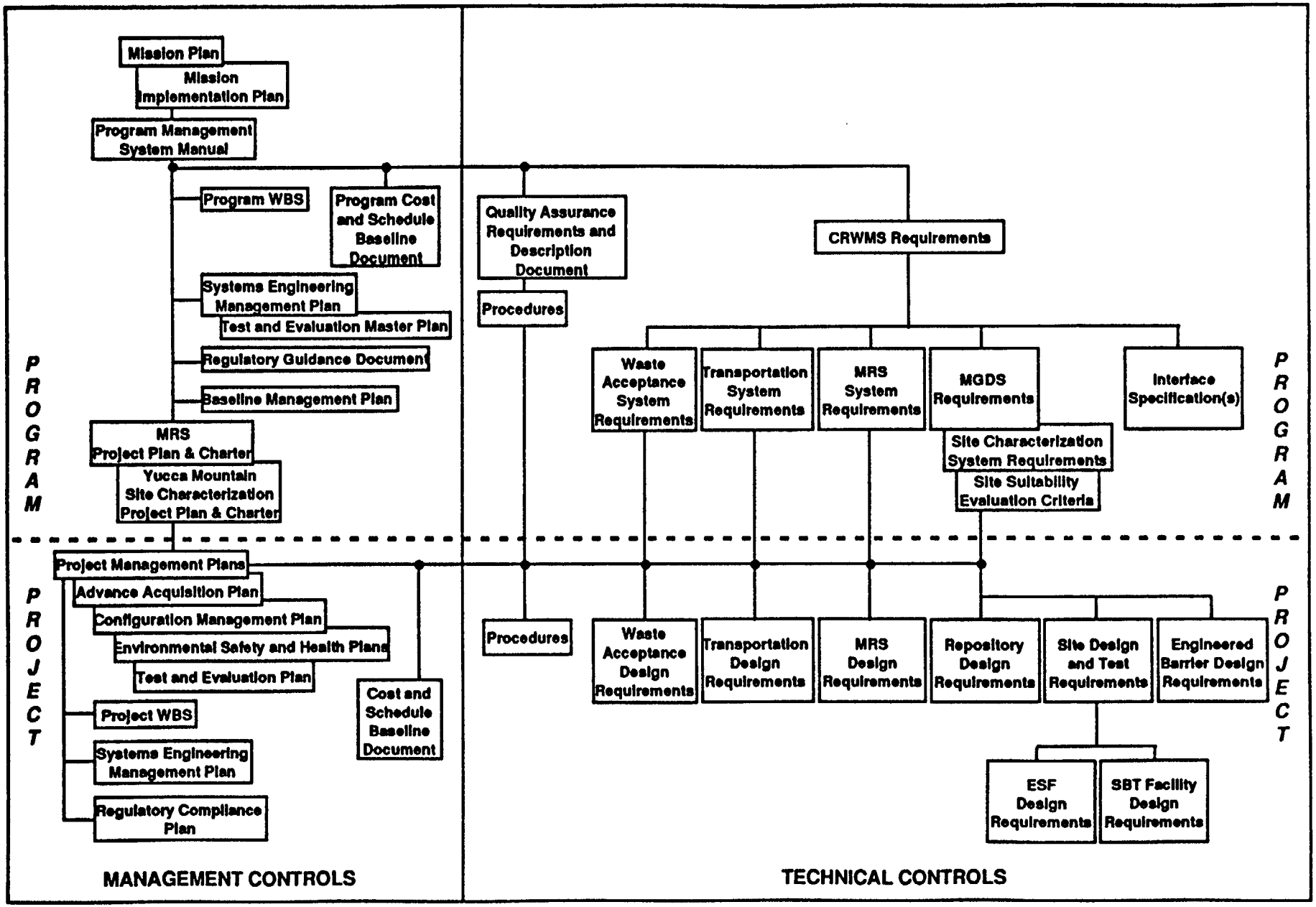
What are "Hierarchy" Documents?

The DOE Document Hierarchy is comprised of a series of documents which cover the entire OCRWM Waste Management Program.

The Hierarchy is structured so that responsibilities and requirements imposed on the Storage and Transportation Project and Site Characterization Project are identifiable.

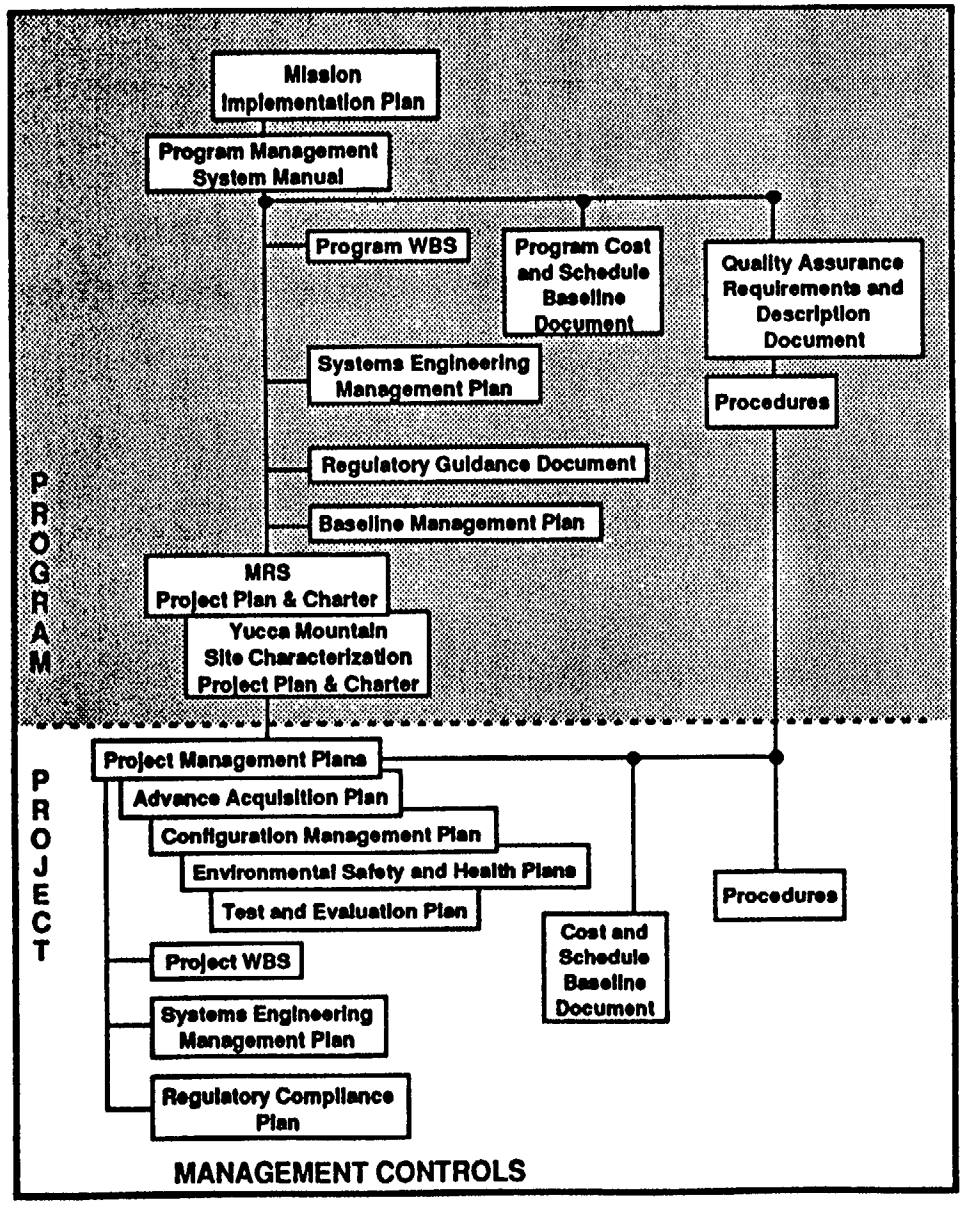
Traceability of technical requirements which affect the design is maintained.

OCRWM DOCUMENT HIERARCHY



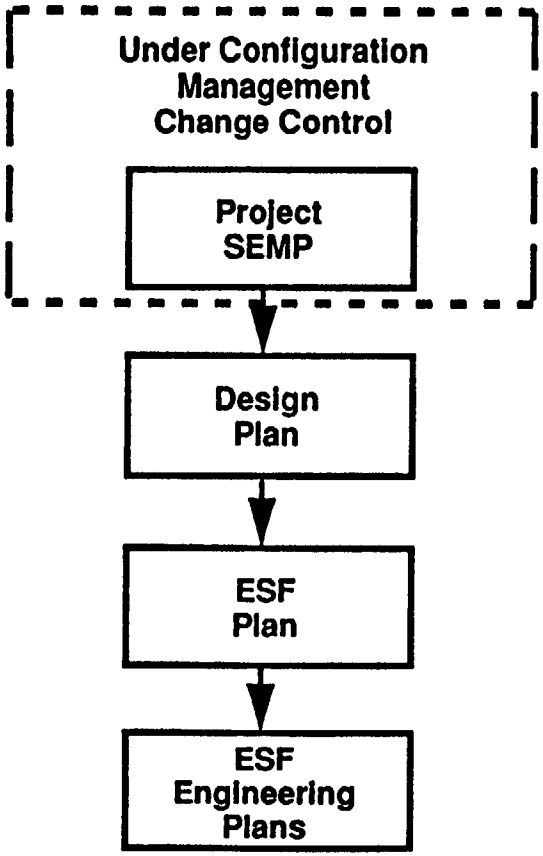
Project Plans

Portions of the Document Hierarchy



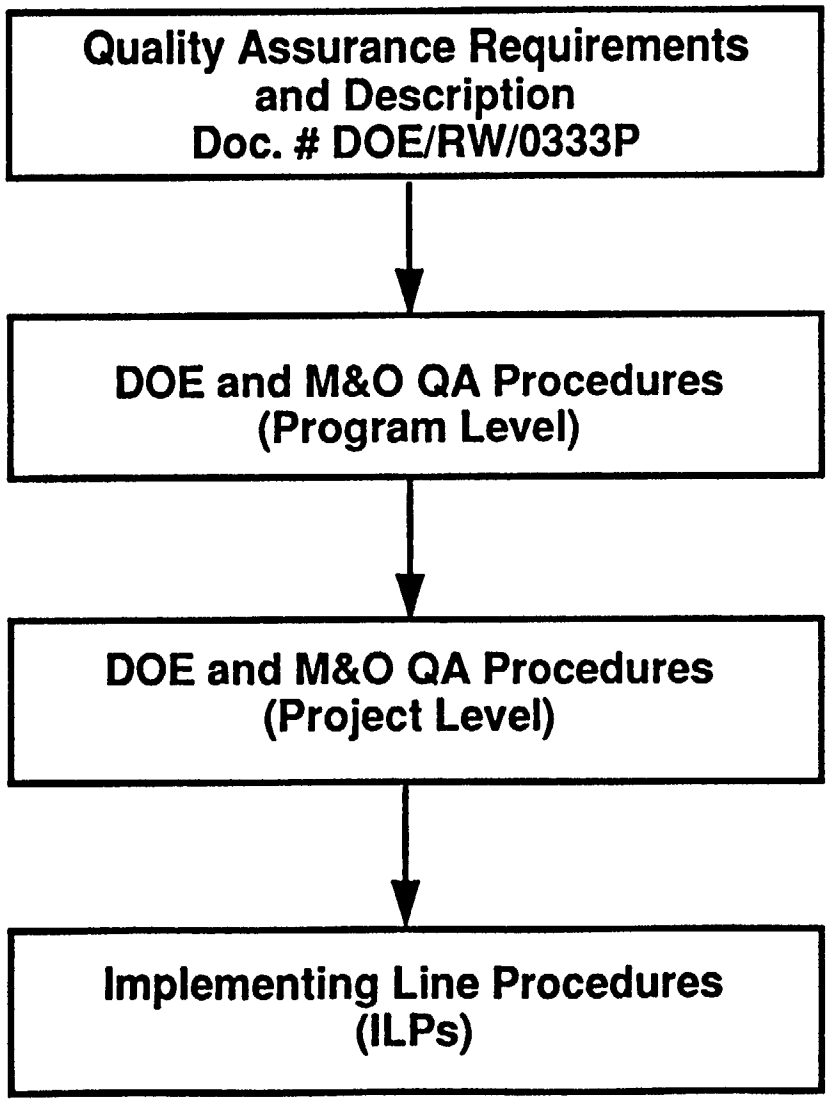
- These are in effect the contract that dictates to participants how to conduct their activities
- These plans are identified/described in the Program Management System Manual
- Design Plans, Engineering Plans (ESF, REP, WP and SBT) are lower tier to the project management plans identified in the OCRWM Document Hierarchy

ESF Management Plans



Systems Engineering Management Plan	Defines manner in which the system engineering process is implemented and controlled on the Project. Document Number YMP/CC-0007.
Design Plan	Outlines management requirements for all Project design activities, Document Number YMP/CC-0009.
ESF Plan	Describes ESF design tasks, including organizational responsibilities, management controls and the design and development process. Document Number YMP/93-07.
ESF Engineering	Defines the scope for work, deliverables and schedules for the ESF design group for a given fiscal year. Document ID B00000000-01717-4600-00023.

Quality Assurance Portion of the Document Hierarchy

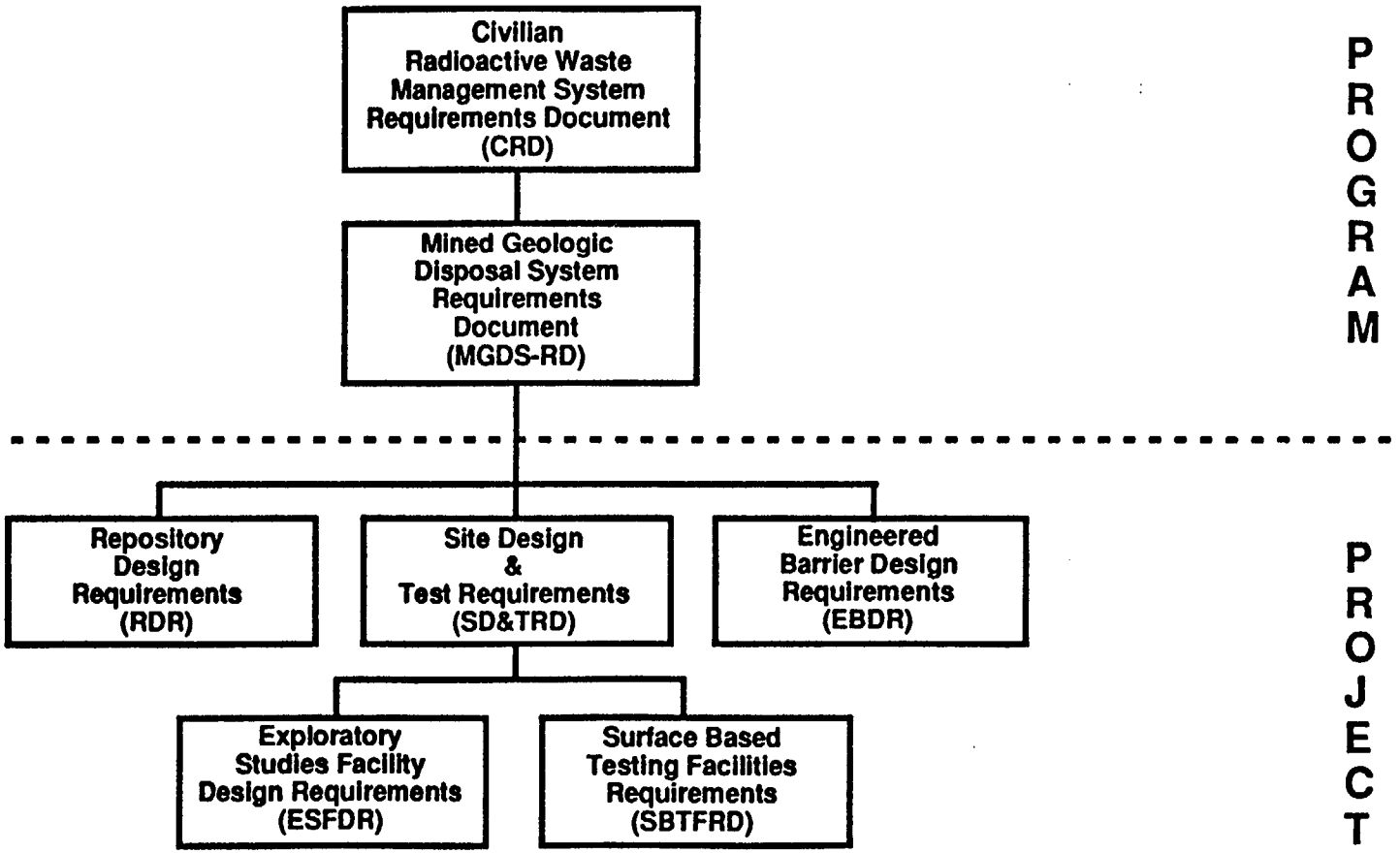


The QARD Provides top-level requirements to be implemented in participant procedures

QAPs implement specific controls across the entire organization

ILPs provide detailed instructions specific to a group or location - may interface with M&O or DOE procedure

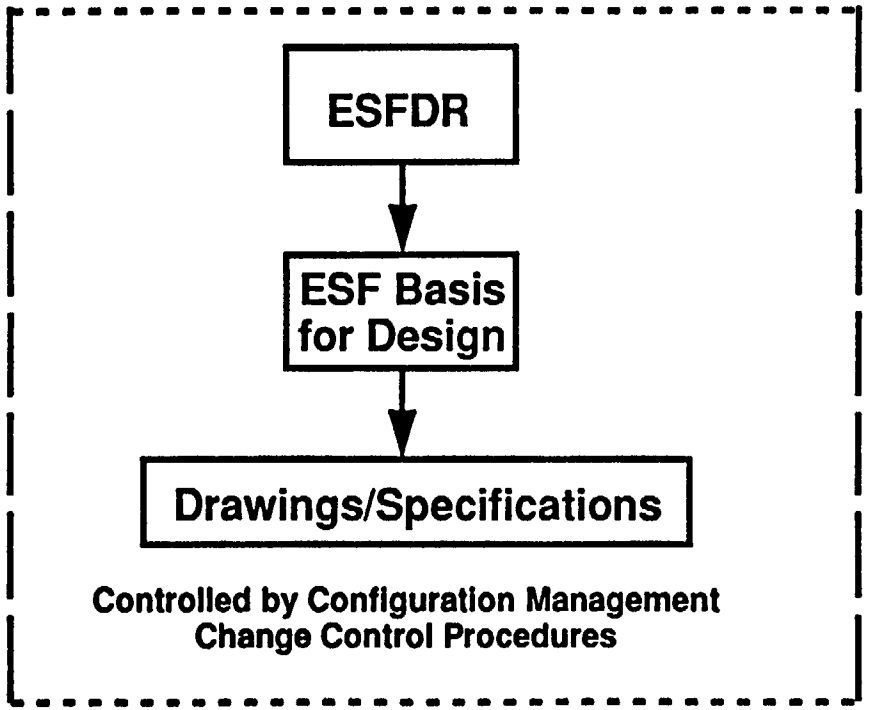
ESF Technical Requirements Portion of the Document Hierarchy



What Document "Tells" the ESF Designer What His Design Must Do?

- The ESFDR identifies the technical performance requirements and regulatory constraints that apply to the ESF
- The ESFDR includes those 10 CFR 60 requirements that are applicable to the ESF
- The designer translates the requirements into more detailed design criteria from which drawings and specifications can be prepared
- The design criteria which respond to ESFDR requirements are documented in the ESF Basis For Design

Technical Requirement Traceability for ESF Design



ESFDR identifies applicable technical requirements and regulatory constraints. Document Number YM/CM-0019

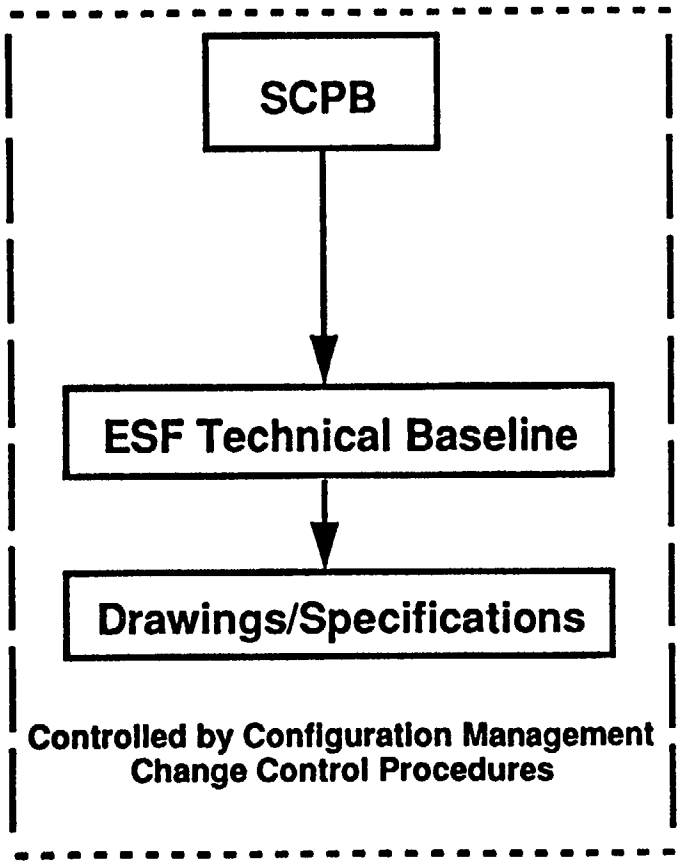
ESF BFD translates requirements into specific design criteria for each major configuration item (SSC). ID BAB000000-01717-6300-00002

Design Outputs

What Documents Describe What the ESF Design Must Look Like?

- The SCPB (among other things) identifies the general configuration of the proposed Repository, ESF, and Surface-Based Borehole Program
- The ESF designer is required to "fit" his design into the general configuration controlled in the SCPB
- The ESF Technical Baseline captures the ESF design in greater detail based on the results of the completed Title I (Preliminary) design and the already completed portions of Title II (Definitive/Detailed) design

ESF Architecture Document Hierarchy



SCPB identifies and updates SCP (Chapter 8) test objectives, performance allocation tables. Provides a description of site characerization activities and test controls. Identifies general configuration of proposed Repository, ESF and Surface Based Borehole Program, and controls the physical interfaces. Document NumberYMP/CM-0011, Rev. 10.

ESF Technical Baseline provides current drawings and specificacations for Project approved (ESF) design (Title I drawings until superseded by approved Title II drawings). Identifies and controls ESF/Repository interface. Document Number YMP/CM-0016.

Determination of Importance Evaluations

What are Determination of Importance Evaluations and Why Are They Performed for ESF Design?

- 10 CFR 60.15(c)(1) requires that Site Characterization investigations be conducted in a way that limits adverse effects on the geologic repository to the extent practical.
- 10 CFR 60.151 requires that the Quality Assurance Program be applied to all structures, systems, and components that are important to radiological safety. The QA Program must also be applied to the design of Engineered Barriers and the characterization of natural barriers that are important to waste isolation. The QA Program must also be applied to related activities.

What are Determination of Importance Evaluations and Why Are They Performed for ESF Design (Continued)

- NUREG-1318 provides guidance that the DOE should also implement a program to demonstrate compliance with other requirements (besides radiological safety and waste isolation) important to Licensing
- DIEs are prepared in accordance with QAP-3-9 (Engineering Analyses)

QA Classifications

- The DOE Quality Assurance Requirements Document (QARD) established the following QA categories for structures, systems, and components

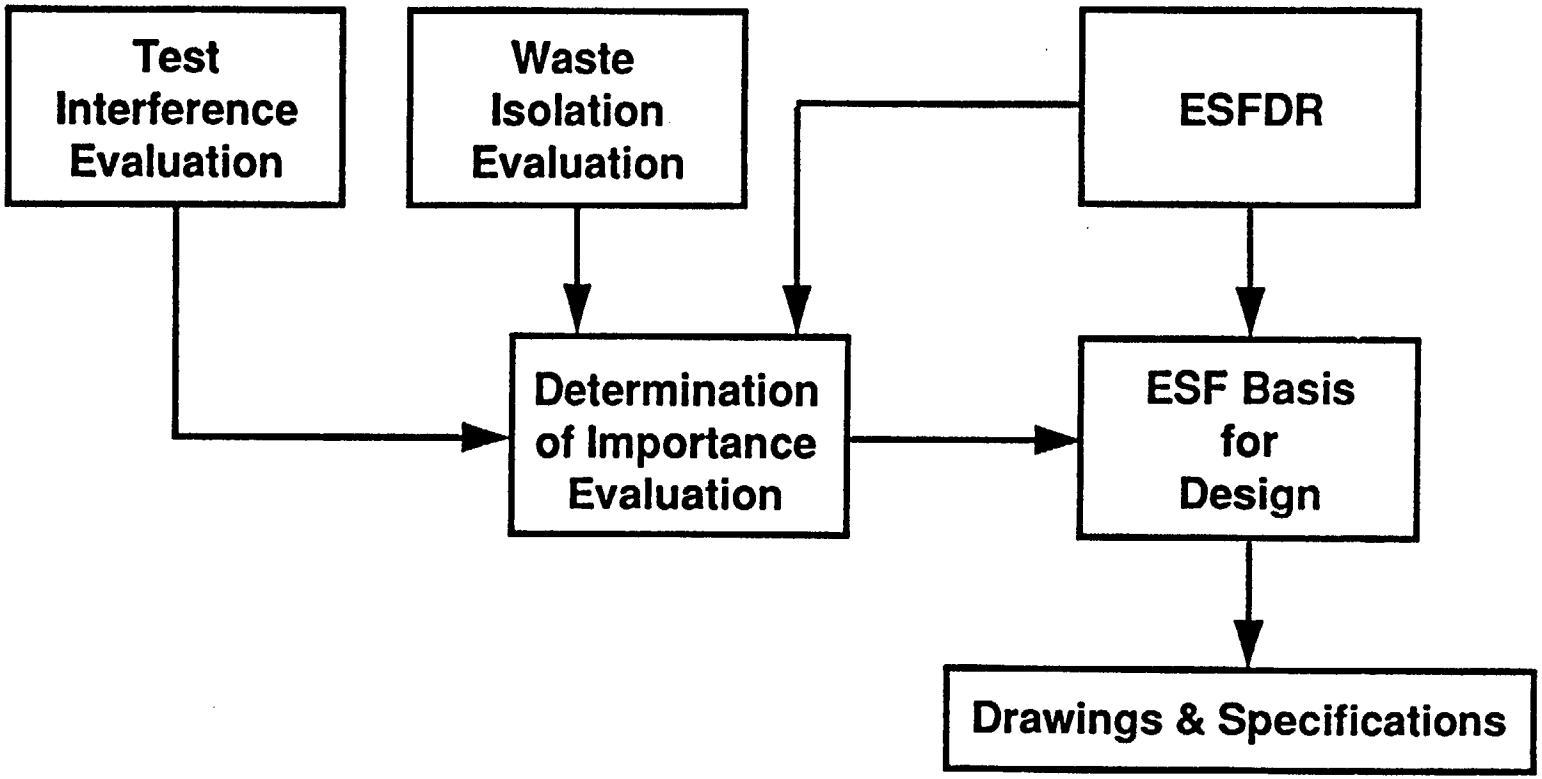
QA-1	Important to Radiological Safety (IRS)
QA-2	Important to Waste Isolation (ITWI)
QA-3	Important to Control of Radioactive Waste
QA-4	Important to Fire Protection (i.e., of QA-1 or -2 items)
QA-5	Important to Potential Interaction (continued function not required, but failure could impact QA-1 or -2 items)
QA-6	Important to Physical Protection (SNM, S&S, etc.)
QA-7	Important to Occupational Radiological Exposure (ALARA)

- Since the number of ESF items which could be incorporated into a repository are limited, QA-1 and QA-2 are the relevant classifications to consider during ESF design. The other categories will be used during GROA design.

Purpose of the DIEs

- The DIE establishes and documents the QA classification for each permanent configuration item (CI) in the ESF. This classification is then captured in the BFD for that CI.
- The DIE also integrates test interference and waste isolation results to identify controls that must be implemented in the design and specified in the appropriate drawings and specifications.
- Appropriate controls are identified for any ESF CI, whether or not it has a QA classification, to ensure waste isolation and test interference concerns are addressed.
- CIs which are determined to fit in any of the QA categories are documented on the DOE Q-List.

DIEs as Inputs in the ESF Design Process



Waste Isolation Evaluations (WIEs)

- Developed by the M&O Performance Assessment Group in accordance with NLP-3-17.
- Provide guidance to limit adverse effects on the site to the extent practical.
- Historically have focused on changes to ambient conditions. Result in limits that conservatively estimate no appreciable impact.
- Use best available information and conservative bounding assumptions to provide recommendations.

Test Interference Evaluations (TIEs)

- Performed by the M&O Site Characterization Group in accordance with NLP-3-16.
- Include consideration of construction-to-test and test-to-test interferences.
- Focus on limiting impacts which may result in invalidating a test or biasing test data.
- Use conservative bounding assumptions and best available information on proposed activity and site conditions.

Traceability Example

Requirements Traceability

Example

10 CFR 60.15(c)(1)

Conduct Site Characterization investigation in such a manner as to limit adverse effects on long-term performance of geologic repository to the extent practical.

CRD

Allocates 10 CFR 60 to the MGDS-RD and 10 CFR 60.15(c)(1) in CRD 3.7.4.2.K.5

MGDS-RD

Allocates 10 CFR 60.15(c)(1) to SD&TRD in Section 3.2.1.1.B for Site Characterization Facilities

SD&TRD

Allocates 10 CFR 60.15(c)(1) to ESFDR in Section 3.7.1.B (Table 3-8) and in Section 3.7.2.2.A

Requirements Traceability (Continued)

ESFDR

Allocates 10 CFR 60.15(c)(1) to all ESF Subsystems to be addressed in the ESF design ESFDR 3.2.1.M.

3.2.1.M Investigations to obtain the required information shall be conducted in such a manner as to limit adverse effects, to the extent practical, on the long-term performance of the geologic repository.

DIE for ESF temporary 69 kv Power Supply System, Site Grounding System, and Lighting Protection System.

Requirement 2: Record all tracers, fluids and materials consumed during construction and operation

Requirement 3: Minimize to the extent practical leakage of oil from electrical equipment into the North Portal Pad

Requirement 4: Minimize spills of hydrocarbons (hydraulic fluid, fuels, oils, etc.) in accordance with 10 CFR 15(c)(1). Report any unrecovered spill material in accordance with the TFM Management Plan

Requirements Traceability (Continued)

BFD (BAB000000-01717-6300-00002, Rev. 03, Draft)

7.2.4.1.V.B	Records shall be made and provided in accordance with the TFM Management Plan of all tracers, fluids and materials consumed during construction and operation for the 69kV Power Supply System,
7.2.4.1.IV.E1.f	All liquid filled transformers shall be provided with a lined concrete pad, with an oil containment basis having the capacity to hold all the transformer oil. The design requirements for the construction/operation to inspect the foundation and basis monthly for accumulation of water/debris shall be added to the pad-mounted transformer specifications.
7.2.4.1.V.C	The amount of hydrocarbons (i.e., hydraulic fluid, oils, etc.) spilled and lost in the construction and operation of the surface ESF shall be minimized in accordance with 10 CFR 60.15(c)(1). Any unrecovered spill material shall be recorded and reported in accordance with the TFM Management Plan.

Requirements Traceability (Continued)

Electrical Specifications

BAB000000-01717-6300-16460, Rev. 01 (Pad Mounted Transformer Specification)

3.03 Installation

C. The transformer concrete foundation and basin shall be inspected periodically by qualified and trained individuals responsible for removing accumulated water or debris and checking for fluid leaks. The cleanliness of the concrete basin shall be maintain throughout the construction and operation phases of this project. Any oil insulated leaks are to be repaired on discovery. (QA requirement)

BAB000000-0171706399-01600, Rev. 02 (Material and Equipment Specification)

3.03 Installation

3.03.1 Final completion of this product shall be based on the Contractor's submittal of a procedure that addresses the reporting of all tracers, fluids, and materials consumed during construction and operation for the system. This shall be submitted and the reporting procedures shall be in accordance with current TFM Management Plan.

3.03.2 The amount of hydrocarbons spilled and lost in the construction and operation of this system shall be minimized. Final completion of this product shall be based on the constructor's submittal of a procedure that addresses the reporting of any unrecovered spilled material during construction and operation of this system. This shall be submitted and the reporting procedures shall be in accordance with the current TFM Management Plan.

Requirements Traceability (Continued)

Electrical Drawing

BABBDA000-01717-2100-24060 shows the incorporation of an oil collection sump, as well as sump liner as part of the transformer concrete pad installation.

ESF Related Activities Currently Underway

- ESF Design
  - Packages 2B (Conveyer System & Studies), 1C (Generator & Muck Storage), 2C (North Ramp & Utility Systems)
- Advanced Conceptual Design (Repository and Waste Package)
  - Required to continue to increase confidence as ESF development continues
  - Will result in revisions to the RDR and EBDR as the conceptual design and performance requirements of important structures, systems, and components are defined
- SCPB Revision
  - Eliminate redundant information contained in the technical requirements hierarchy
  - Improve the top-level description of the various potential repository, engineered barrier, ESF, and surface-based test facilities, including their interfaces with each other
  - Correct various editorial errors

Summary

- Provided Answers to:

1. Documents that control/influence ESF design
   - Requirements: ESFDR, DIEs, and BFD
   - Architecture: SCPB, ESF Technical Baseline, drawings and specification
2. What constitutes ESF Design Basis documentation
   - Captured in the ESF Basis For Design document
3. What documents control interfaces between ESF, SBTF and GROA
   - SCPB controls general configuration
   - ESF Technical Baseline controls ESF/Repository detailed interface

Summary (Continued)

4. What is the SCPB role with respect to the hierarchy and ESF design
   - SCPB part of Architectural Hierarchy
   - Identifies/Controls ESF general configuration
5. Why are DIEs performed and what is their role in the ESF design process
   - Identify CIs that should be on the Q-List.
   - Performed to identify controls required to limit adverse effects to the extent practical
   - Role in ESF design is to establish QA classifications, integrate WIEs and TIEs and identify controls to ESF Design Drawings and Specifications

Summary (Continued)

- Described the elements of the DOE Document Hierarchy as they relate to ESF development
- Described other documents relevant to ESF development
- Provided our overview of the ESF Engineering Process and relationship to the above documents

DOE-NRC Technical Meeting

on

Exploratory Studies Facility

MGDS DESIGN CONTROL IMPROVEMENT PLAN

Alden M. Segrest
MGDS Development
April 11, 1994

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN (DCIP)

- M&O had good quality products, but trends were evident in design processes that could impair quality if not changed

• PURPOSE OF THE DCIP

- M&O made a commitment to develop a series of improvements to the design control process to preclude future problems

- Provides a review of design control related issues to coordinate their resolution

DCIP ACTION ITEMS

- **Grouped by time frame and scope of expected response**
  - **Near-Term Response Actions**
  - **Process Improvement Actions**
  - **Confirmation Actions**

PROCESS IMPROVEMENT ACTIONS

- Longer-term approach to improving overall MGDS design control process
- Issues include:
  - Resolution of conflicts between the systems engineering/configuration management control and design control processes
  - Enhanced understanding of and personnel training in design processes

ACTION ITEM TOTALS

- **Open Action Items (FY/94 - 2; FY/95 - 2)** **4**
- **Closed Action Items** **52**
- **Total Action Items** **56**

DOE-NRC Technical Meeting

on

Exploratory Studies Facility

MGDS DESIGN CONTROL IMPROVEMENT PLAN

Alden M. Segrest
MGDS Development
April 19, 1994

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN (DCIP)

- **NEED FOR DCIP**
  - M&O developed this action plan in August, 1993, in response to CARs and self-examination
  - Transition of design to the M&O required new procedures for revising drawings, specifications, Basis for Design Documents, and Field Change Requests
  - M&O procedures were new and difficult to use (not user friendly)
  - Design Organization not taking verbatim approach to procedural compliance

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN (DCIP)

- M&O had good quality products, but trends were evident in design processes that could impair quality if not changed

- **PURPOSE OF THE DCIP**

  - M&O made a commitment to develop a series of improvements to the design control process to preclude future problems

  - Provides a review of design control related issues to coordinate their resolution

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN (DCIP)

- The Plan allows a thorough review of design control process in general, to identify weaknesses or shortcomings, and correct the process

- The Plan was put in place to increase confidence of external agencies and DOE in M&O's ability to properly control design procedures and processes

DCIP ACTION ITEMS

- Grouped by time frame and scope of expected response
  - Near-Term Response Actions
  - Process Improvement Actions
  - Confirmation Actions

NEAR-TERM RESPONSE ACTIONS

- Actions necessary to provide prompt assurance that any conditions immediately adverse to quality are identified and corrected
- Primarily in response to procedural errors and identification of additional control over some specific elements of design control

PROCESS IMPROVEMENT ACTIONS

- Longer-term approach to improving overall MGDS design control process
- Issues include:
  - Resolution of conflicts between the systems engineering/configuration management control and design control processes
  - Enhanced understanding of and personnel training in design processes

CONFIRMATION ACTIONS

- Intended to explicitly document effectiveness of the plan and associated action items
- Systematic review of problems discussed in the plan
- Evaluation of the effectiveness of the completed actions in correcting these problems and preventing recurrence
- Confirmation is provided by two methods
  - DOE/M&O evaluation (3/23/94)
  - OQA Surveillances (10/93 and 4/11-15/94)

ACTION ITEM TOTALS

• Open Action Items (FY/94 - 2; FY/95 - 2)	4
• Closed Action Items	52
• Total Action Items	56

OPEN ACTIONS ITEMS

- All Series-3 procedures re-written to be more user friendly. (Status: 4 out of 13 complete and approved)
- Implementation and classroom training on all revised Series-3 procedures completed. (Status: 1 procedure complete)
- Incorporate relevant RSN BFD sections for Package 1A into M&O BFD; prepare base line change for combined BFD. (FY95)
- Revise RSN drawings, specifications, calculations for new traceability; adopt fully as M&O products. (FY95)

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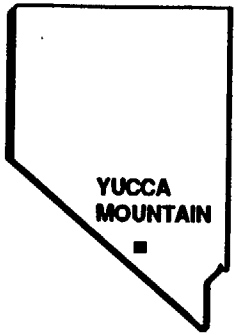


YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

DESIGN AND CONSTRUCTION PROGRESS

PRESENTED BY

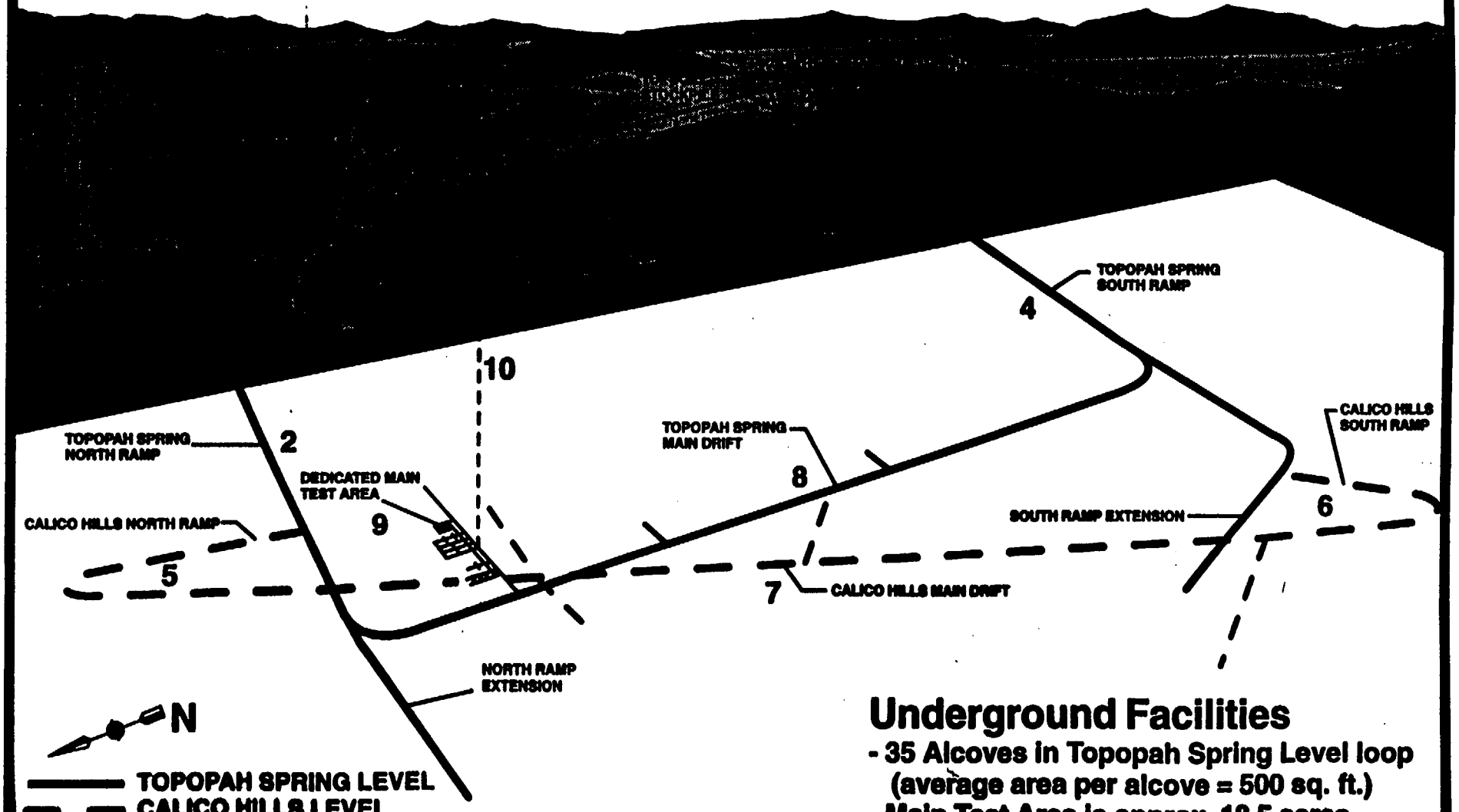
JAMES M. REPLOGLE

APRIL 19, 1994
ROCKVILLE, MD

PRESENTATION PARAMETERS

- ESF design and construction progress information is based on projected budgets of:
  - FY94 = $55M
  - FY95 = $101M
  - FY96 = $114M
  - FY97 = $119M
- ESF packages are described either by configuration items (where defined) or projected scope

EXPLORATORY STUDIES FACILITY DESIGN



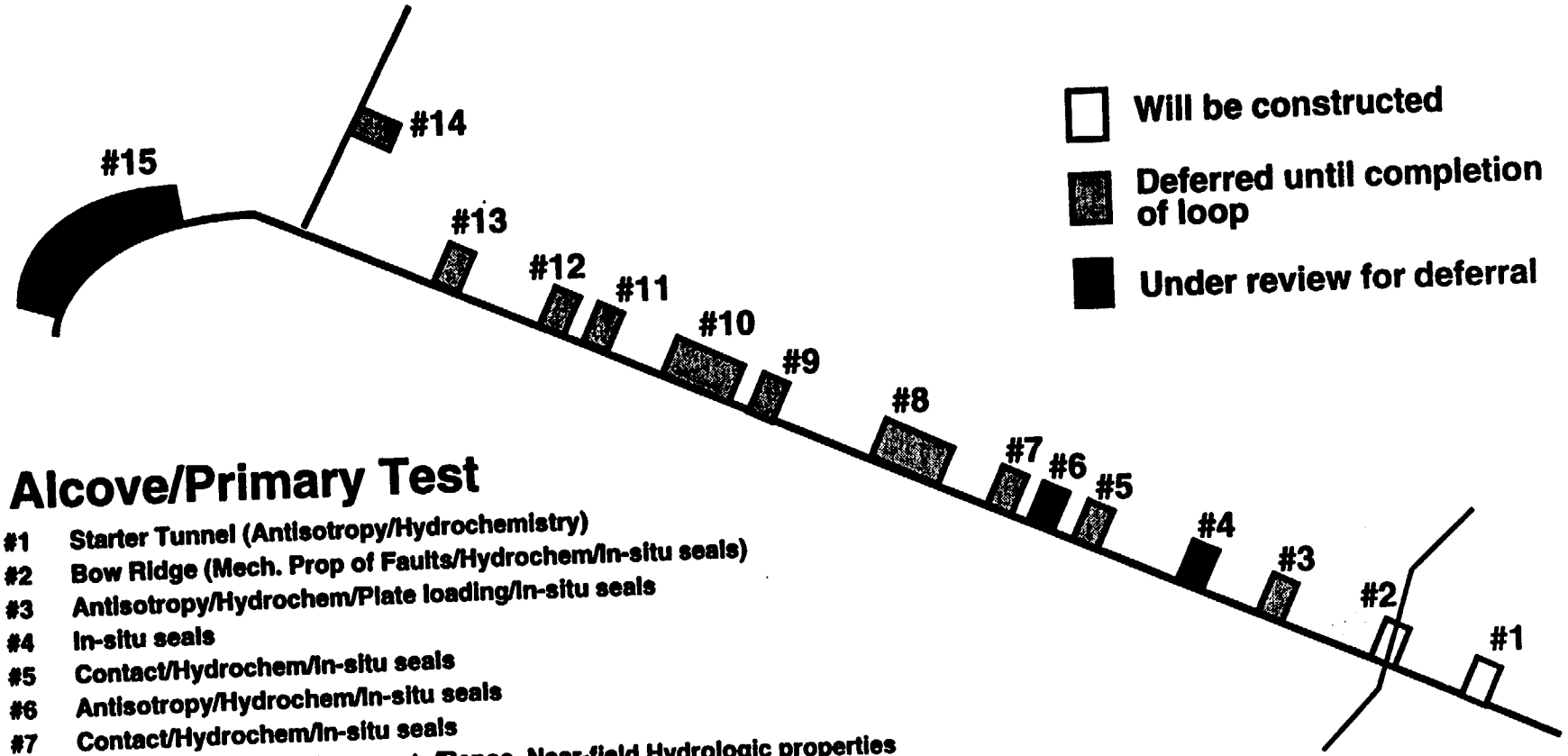
Underground Facilities

- 35 Alcoves in Topopah Spring Level loop (average area per alcove = 500 sq. ft.)
- Main Test Area is approx. 18.5 acres

(CALICO HILLS IS APPROX. 170 METERS BELOW TOPOPAH SPRING)

ESFPRP3C.CDR/2-21-94

NORTH RAMP ALCOVE CONFIGURATION



Alcove/Primary Test

- #1 Starter Tunnel (Antisotropy/Hydrochemistry)
- #2 Bow Ridge (Mech. Prop of Faults/Hydrochem/In-situ seals)
- #3 Antisotropy/Hydrochem/Plate loading/In-situ seals
- #4 In-situ seals
- #5 Contact/Hydrochem/In-situ seals
- #6 Antisotropy/Hydrochem/In-situ seals
- #7 Contact/Hydrochem/In-situ seals
- #8 Geochem of WP environments/Repos. Near-field Hydrologic properties
- #9 In-situ seals
- #10 Overcore stress/Heater in TSW1/Plate loading
- #11 Antisotropy/Hydrochemistry
- #12 In-situ seals
- #13 Hydrochem/In-situ seals
- #14 Excavation effects
- #15 Hydro Prop of Major Faults/Hydrochemistry

PACKAGE 1A:
NORTH PORTAL SITE PREPARATION

Configuration items:

- Tunnel Boring Machine (TBM), TBM starter tunnel, pad and access road, pad water system; switchgear building, rock and topsoil storage area, Test Alcove 1

Design Status

- All items complete and accepted for construction

PACKAGE 1A:
NORTH PORTAL SITE PREPARATION
(CONTINUED)

Construction status:

- Complete
  - TBM starter tunnel
  - Pad and access road
  - Rock and topsoil storage area
  - Test Alcove #1

- In process
  - TBM
  - Switchgear building
  - Pad water system
  - TBM launch chamber

Acceptance status: Pending

PACKAGE 1B: NORTH PORTAL SURFACE FACILITIES AND UTILITIES

Configuration items:

- Change House building, shop building, pad sewer system, pad electrical system, pad waste water system, pad drainage, explosive storage area, pad and access road, water system, surface rail

Design Status

- All items complete and accepted for construction

PACKAGE 1B: NORTH PORTAL SURFACE FACILITIES AND UTILITIES

(CONTINUED)

Construction status:

- **In process**
  - Pad sewer system
  - Pad electrical system
  - Pad waste water system
  - Pad drainage
  - Pad water system
- **Complete FY95**
  - Change House building
  - Shop building
  - Pad and access road
  - Explosive storage area

Acceptance status: TBD

PACKAGE 1C:
NORTH PORTAL SURFACE FACILITIES AND UTILITIES

Configuration items:

- Compressed air systems, standby power

Design Status

- In process, complete mid-FY94

Construction Status: Complete FY95

- Compressed air systems
- Standby power

Acceptance Status: TBD

PACKAGE 1D:
NORTH PORTAL SURFACE FACILITIES AND UTILITIES

Design Scope:

- Muck storage area, conveyor access road & oily water containment
- Integrated data/control system (IDCS) system description & procurement specifications
- Fuel storage system
- Covered storage building
- Remaining site lighting
- Stand by power shed (if necessary)
- Fence grounding
- Remaining pad electrical distribution
- Air compressor and stand-by generator foundations

Design Status

- In process, complete early FY95

Construction Status: Start FY95 - Complete FY96

Acceptance Status: Pending

PACKAGE 2A:

Configuration Items: None. Components only

Design Status: Complete

Construction Status: Procurement only, complete FY95

Acceptance Status: Pending

PACKAGE 2B:

Configuration items:

- Mapping Gantry, locomotives, rolling stock, precast concrete inverts, ventilation system

Design Status

- 90% Design Review complete

Construction Status: Procurement only FY94

Acceptance Status: Pending

PACKAGE 2C: NORTH RAMP TO TOPOPAH SPRING LEVEL (TSL)

Configuration items:

- North Ramp Excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor systems

Design Status

- In process - Complete late FY94

Construction Status: Start FY94 - Complete FY95

Acceptance Status: Pending

PACKAGE 3A: SOUTH PORTAL SITE PREPARATION

Design Scope:

- Pad and access roads, pad water and sewer systems, pad drainage

Design Status

- Start FY95 - Complete FY96

Construction Status: Start FY95 - Complete FY96

Acceptance Status: Pending

PACKAGE 3B: SOUTH PORTAL FACILITIES AND UTILITIES

Design Scope:

- Fan/Airlock structure, portal control building, shop building, warehouse building, pad utilities

Design Status

- Start FY95 - Complete FY96

Construction Status: Start FY95 - Complete FY96

Acceptance Status: Pending

PACKAGE 4: SOUTH RAMP TO TOPOPAH SPRING LEVEL (TSL)

Design Scope:

- South Ramp Excavation/breakthrough, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY95 - Complete FY96

Construction Status: Start FY96 - Complete FY96

Acceptance Status: Pending

PACKAGE 5: NORTH RAMP TO CALICO HILLS LEVEL (CH)

Design Scope:

- North Ramp To Calico Hills Excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY96 - Complete FY97

Construction Status: Start FY98 - Complete FY00

Acceptance Status: Pending

PACKAGE 6: SOUTH RAMP TO CALICO HILL LEVEL (CH)

Design Scope:

- South Ramp To Calico Hills Excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY96 - Complete FY97

Construction Status: Start FY97 - Complete FY99

Acceptance Status: Pending

PACKAGE 7: CALICO HILL (CH) DRIFTING

Design Scope:

- Calico Hills Excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY96 - Complete FY97

Construction Status: Start FY99 - Complete FY01

Acceptance Status: Pending

PACKAGE 8A: TOPOPAH SPRING LEVEL (TSL) MAIN DRIFT

Design Scope:

- TSL main drift excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY94 - Complete FY95

Construction Status: Start FY95 - Complete FY96

Acceptance Status: Pending

PACKAGE 8B: TOPOPAH SPRING LEVEL (TSL) NORTH RAMP EXTENSION

Design Scope:

- North Ramp Extension Excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY95 - Complete FY96

Construction Status: Start FY97 - Complete FY98

Acceptance Status: Pending

PACKAGE 8C: TOPOPAH SPRING LEVEL (TSL) SOUTH RAMP EXTENSION

Design Scope:

- South Ramp Extension Excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY95 - Complete FY96

Construction Status: Start FY97 - Complete FY98

Acceptance Status: Pending

PACKAGE 9: TOPOPAH SPRING LEVEL (TSL) MAIN TEST AREA

Design Scope:

- TSL Main Test Area Excavation, linings and ground support, subsurface electrical systems, subsurface mechanical systems, subsurface fire protection, subsurface monitoring and warning systems, subsurface conveyor system

Design Status

- Start FY95 - Complete FY96

Construction Status: Start FY96 - Complete FY98

Acceptance Status: Pending

PACKAGE 10: OPTIONAL SHAFT

Design Scope:

- Optional shaft excavation, linings and ground support, support utilities, site and pad preparation

Design Status

- Start FY97 - Complete FY98

Construction Status: Start FY98 - Complete FY00

Acceptance Status: Pending

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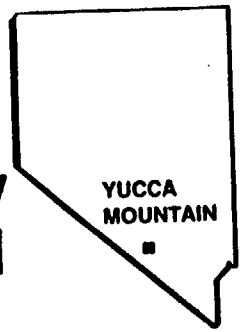


YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

ADMINISTRATIVE PROCEDURE (AP-6.14): REPORTABLE GEOLOGIC CONDITIONS REVISION 0, 2/1/91

PRESENTED BY

WILLIAM J. BOYLE

APRIL 19, 1994

INTENT OF PROCEDURE AP-6.14

Procedure AP-6.14, Reportable Geologic Conditions, was developed in 1991 with two main objectives:

- **To provide guidance to field personnel conducting site characterization activities in the determination of potentially significant and reportable geologic conditions**

- **To document subsequent investigative actions and notifications to other agencies**

NOTIFICATIONS

- The Yucca Mountain Site Characterization Office (YMSCO) has a project-specific agreement with the NRC establishing on-site representatives - and a protocol with Nye County establishing an on-site representative.

- YMSCO routinely provides information regarding site characterization activities, planned meetings, etc. informally to the NRC On-site Representatives (ORs) and to the Nye County OR.

- AP-6.14 was completed to extend and define the notification process under these agreements.

QUANTITATIVE THRESHOLDS

The use of quantitative thresholds for reportability was considered. However, the intent of AP-6.14 is to provide general guidelines to field personnel to identify potentially significant and reportable geologic conditions.

EXAMPLES OF POTENTIALLY SIGNIFICANT AND REPORTABLE CONDITIONS

- During site characterization activities, when field personnel encounter geologic conditions which are recognizable as unexpected conditions or as conditions not addressed in Study Plans, AP-6.14 will be initiated.

- Some examples of potentially reportable geologic conditions are:

  - Basaltic intrusion

  - Valuable natural resources

  - A condition which would make ESF or repository construction economically unfeasible

PURPOSE:

Documentation and reporting of significant unexpected geologic conditions

SCOPE:

Provides guidelines for:

- **Identifying whether a geologic condition is reportable**
- **Documenting subsequent actions**
- **Notifying the U.S. Nuclear Regulatory Commission (NRC) On-site Representatives and the Nye County Representative(s)**

APPLICABILITY:

Applies during the pre-license application phase to all YMSCO staff and Project Participants engaged in site characterization activities in which unexpected geologic conditions of interest may be encountered

Activities include:

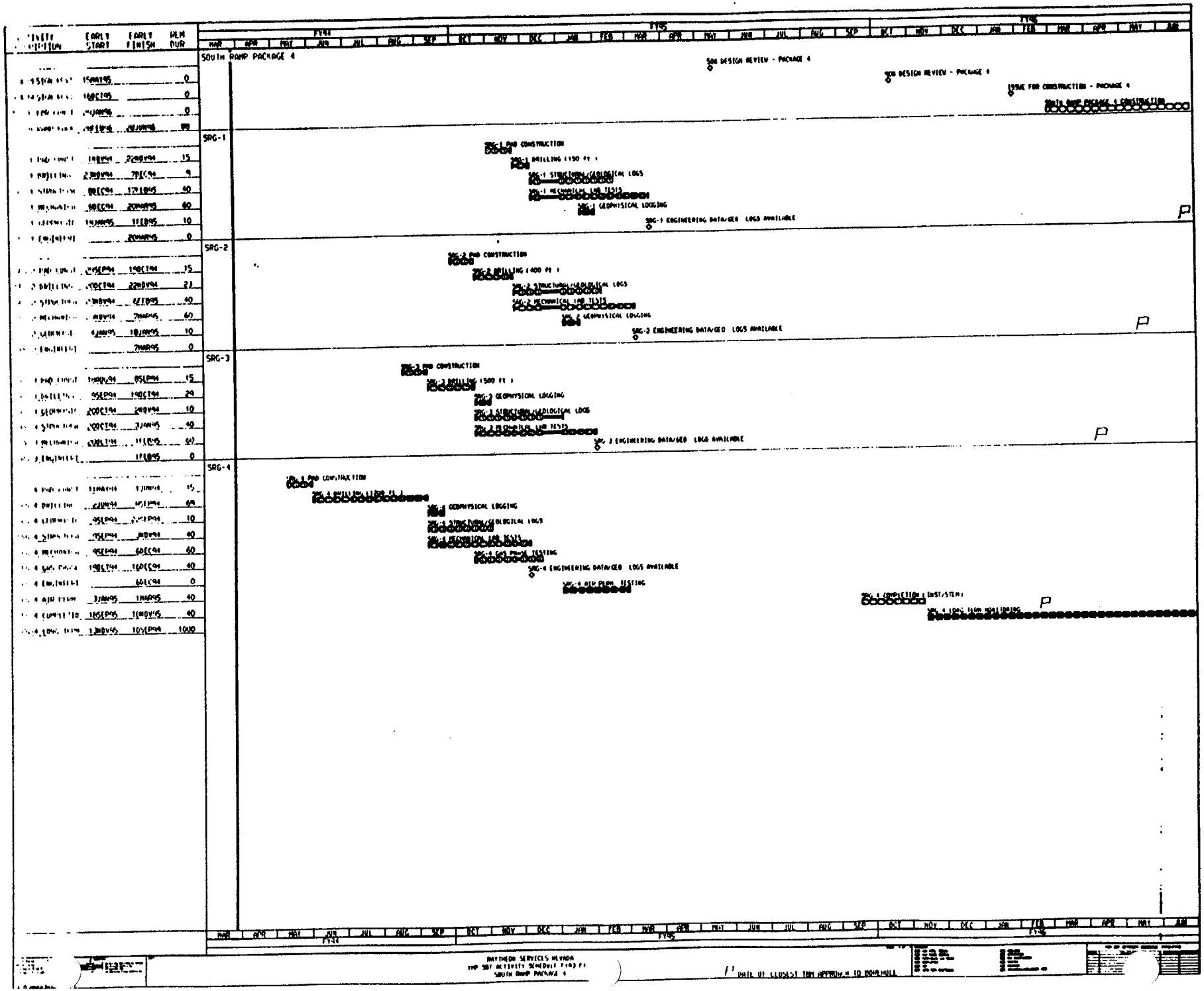
- **Construction of the Exploratory Studies Facility (ESF), ESF accesses, and drifts**
- **Surface-based drilling and testing**
- **Other test and evaluation activities related to site characterization on the surface or underground**

APPLICABILITY:

(CONTINUED)

- Procedure does NOT apply to reporting of Unusual Occurrences which is dealt with in Yucca Mountain Administrative Procedure YAP-30.1, Occurrence Reporting and Processing of Operations Information

- "Unusual Occurrence" relates to non-emergency conditions that have significant impact or potential for impact on safety, environment, health, security, or operations (i.e., environmental spill, degradation of personnel safety, etc.), as defined in DOE Order 5000.3B



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INFORMATION ONLY

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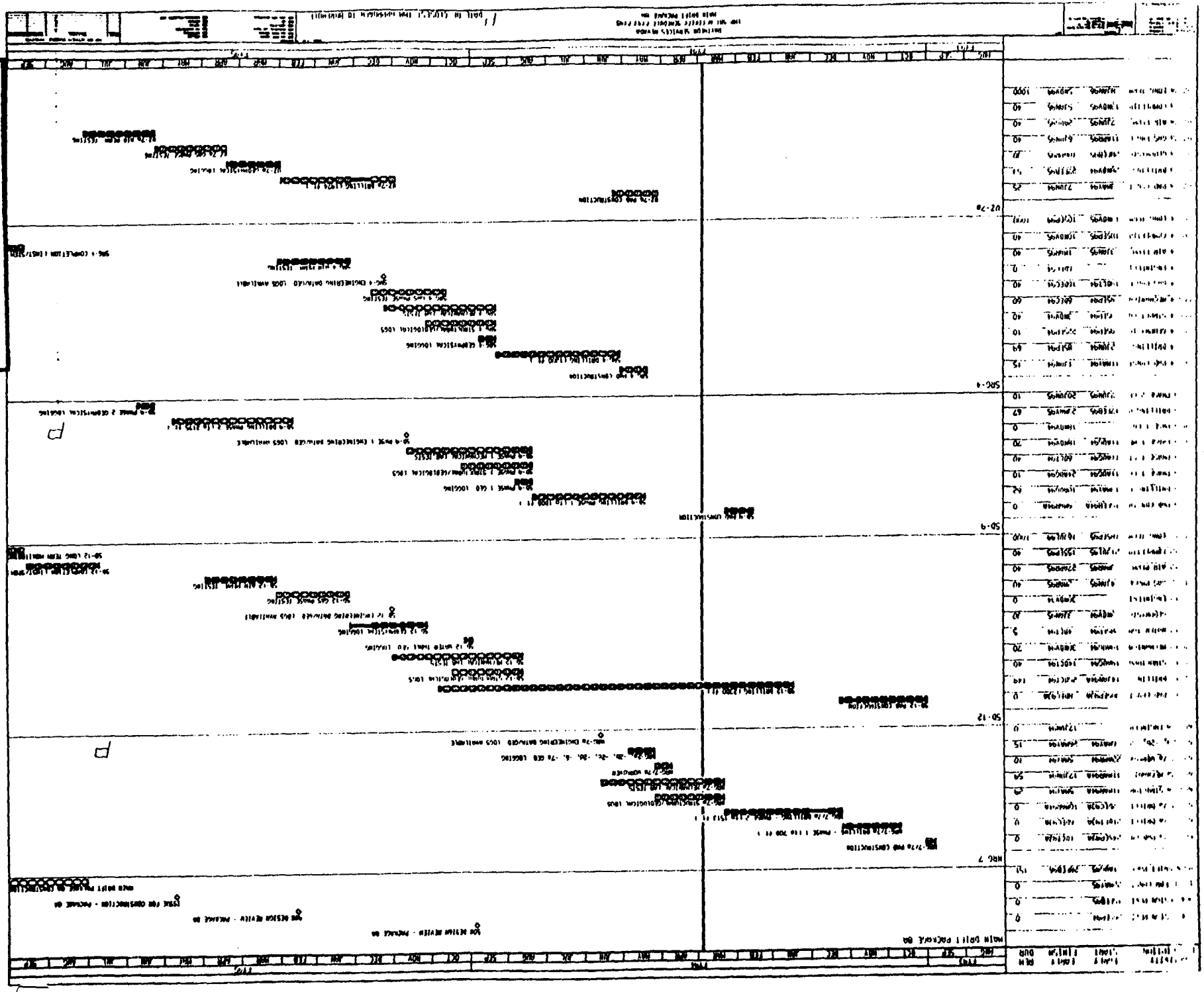

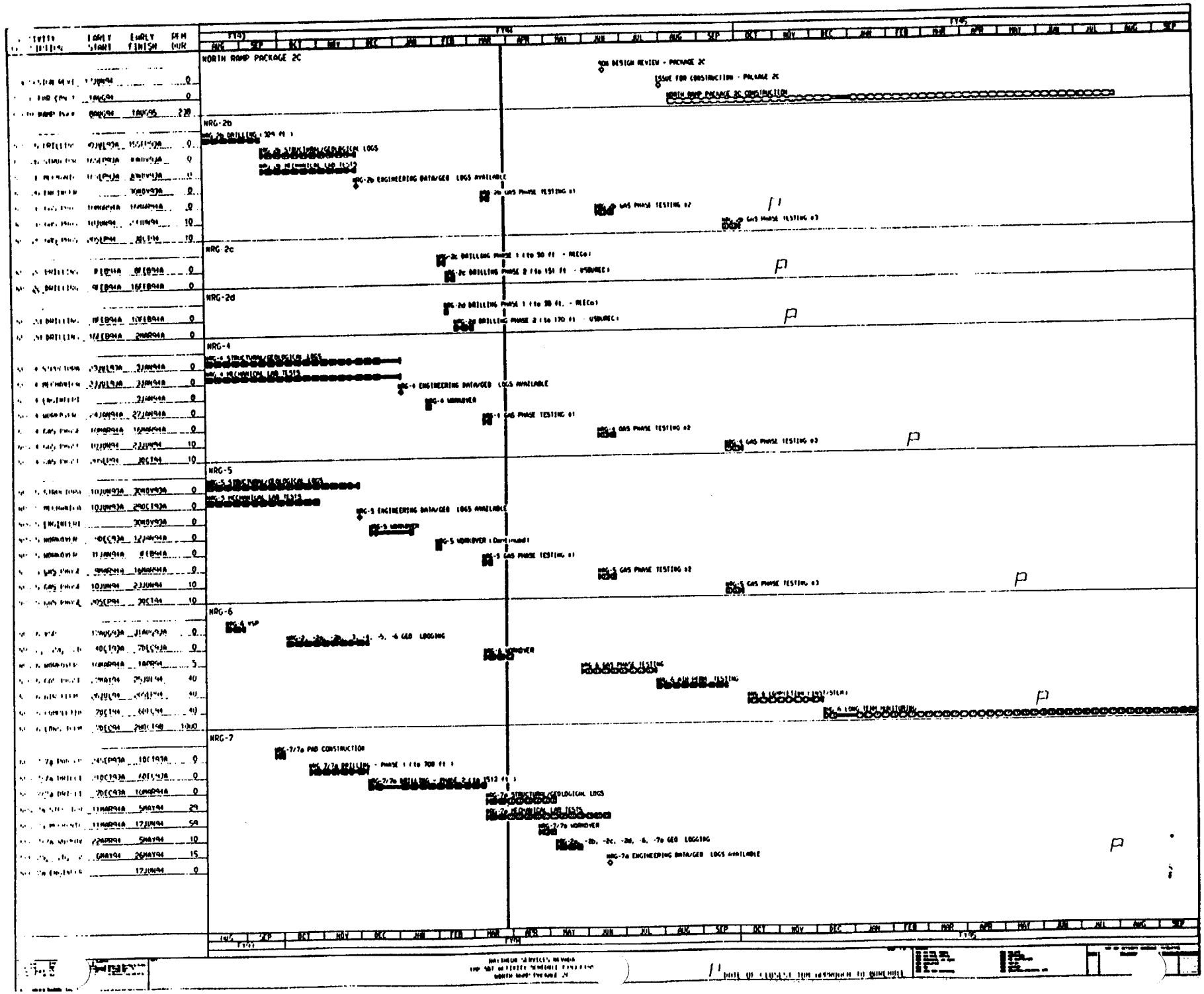

PRELIMINARY DRAFT
INFORMATION ONLY

Yucca Mountain Drilling Program Plan
April - June 1994

- **Gas Phase Testing**
  - NRG-2b, NRG-4, NRG-5, NRG-6, UZ-7
- **Geophysics**
  - NRG-2a, NRG-2b, NRG-2c, NRG-2d, NRG7/7a, SD-9, SD-12
- **SD-12 - Drilling**
- **SD-9 - Pad construction and drilling**
- **SD-7 - Pad construction and drilling**
- **ESF - Alcove 1 tests**

PRELIMINARY DRAFT
INFORMATION ONLY

EXILE HILL INVESTIGATION

Large interval of zero core recovery in NRG-2

NRG-2B drilled to investigate lost core interval

- **Results indicated zone of nonlithified material**
- **Nonlithified material also inferred from NRG-2A**

Additional characterization activities planned

- **Seismic survey**
- **Trench NRT-1**
- **Mechanical properties tests in trench**
- **Auger holes NRG-2C and NRG-2D**

Yucca Mountain Drilling Program
February-March 1994 (continued)

ESF:	**Cored 3 holes in the first alcove. Started sampling.**
NRT-1:	**Conducted stand-up time tests. Filled backhoe trench.**
C-Well Complex:	**Laying water line.**
Large Block Test:	**Finish sawing slots. Removing surrounding rock. Clearing test/instrumentation holes.**

Yucca Mountain Drilling Program
February-March 1994

NRG-2C:	**Augered and Standard Penetration Tests to ~ 150'**
NRG-2D:	**Augered and Standard Penetration Tests to ~170'**
NRG-6:	**Pulled casing**
NRG-7/7A:	**Cored from 1243' to 1513'. Water at 1510'**
SD-9:	**Drill pad prepared**
SD-12:	**Cored from 39' to 301'**
UZ-14:	**Cored through cement. Cored rock from 1442' to 1596'. Some water inflow. Not at water table.**

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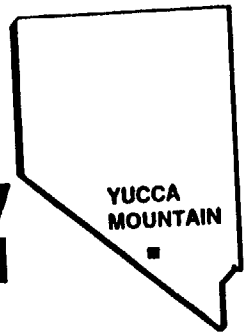


YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

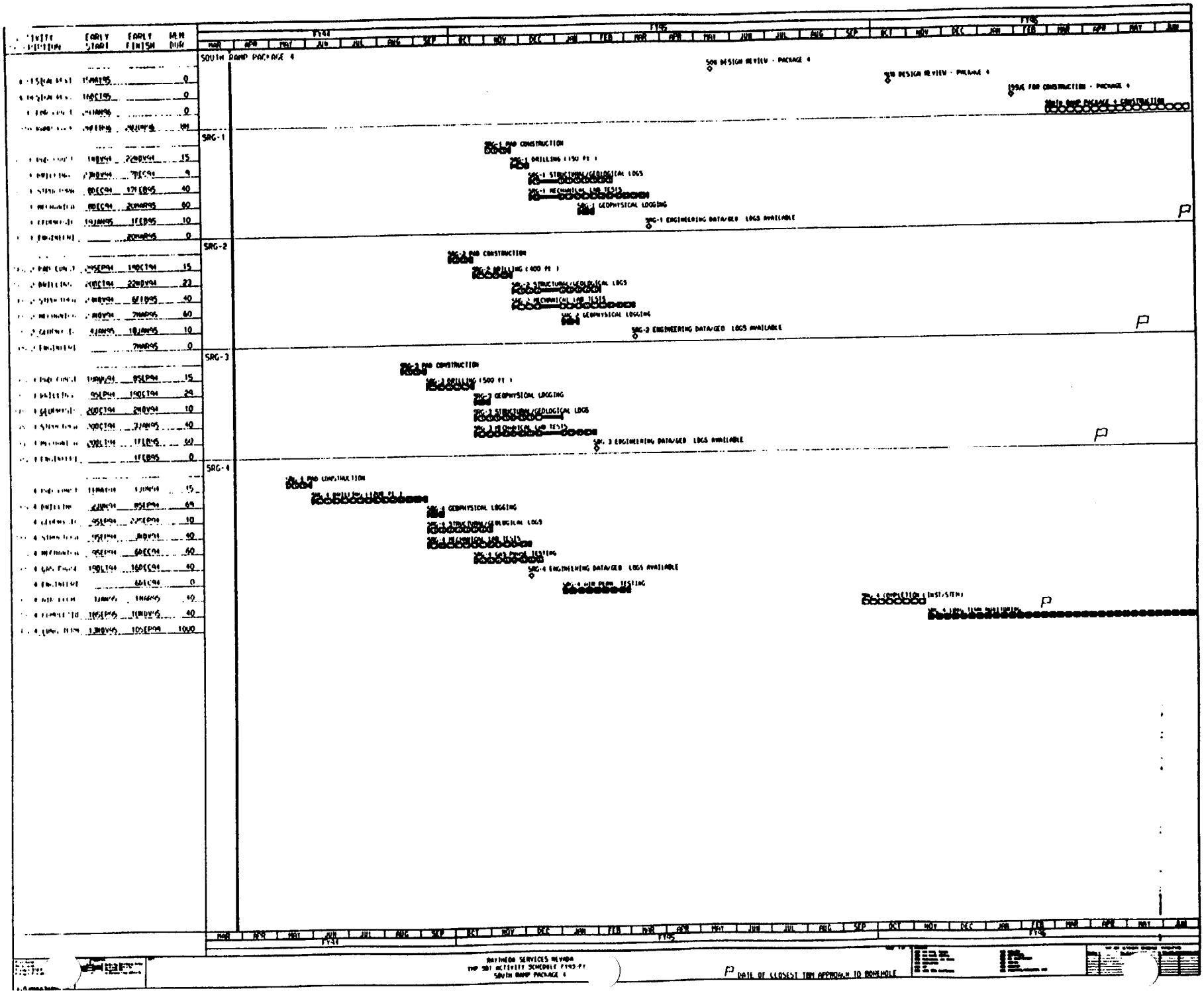
DRILLING PROGRAM UPDATE

PRESENTED BY

WILLIAM J. BOYLE

PRELIMINARY DRAFT
INFORMATION ONLY

APRIL 19, 1994
ROCKVILLE, MD



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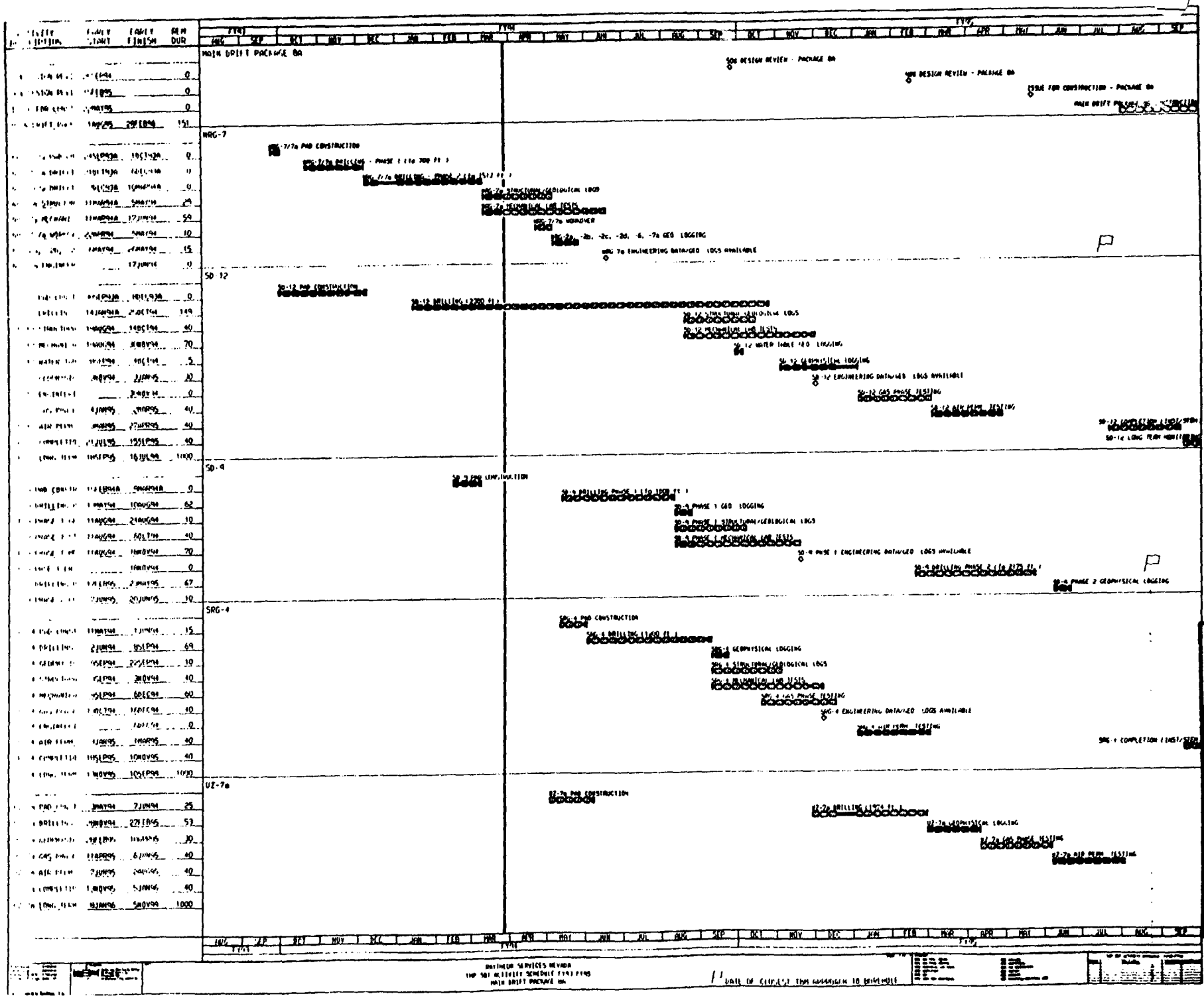
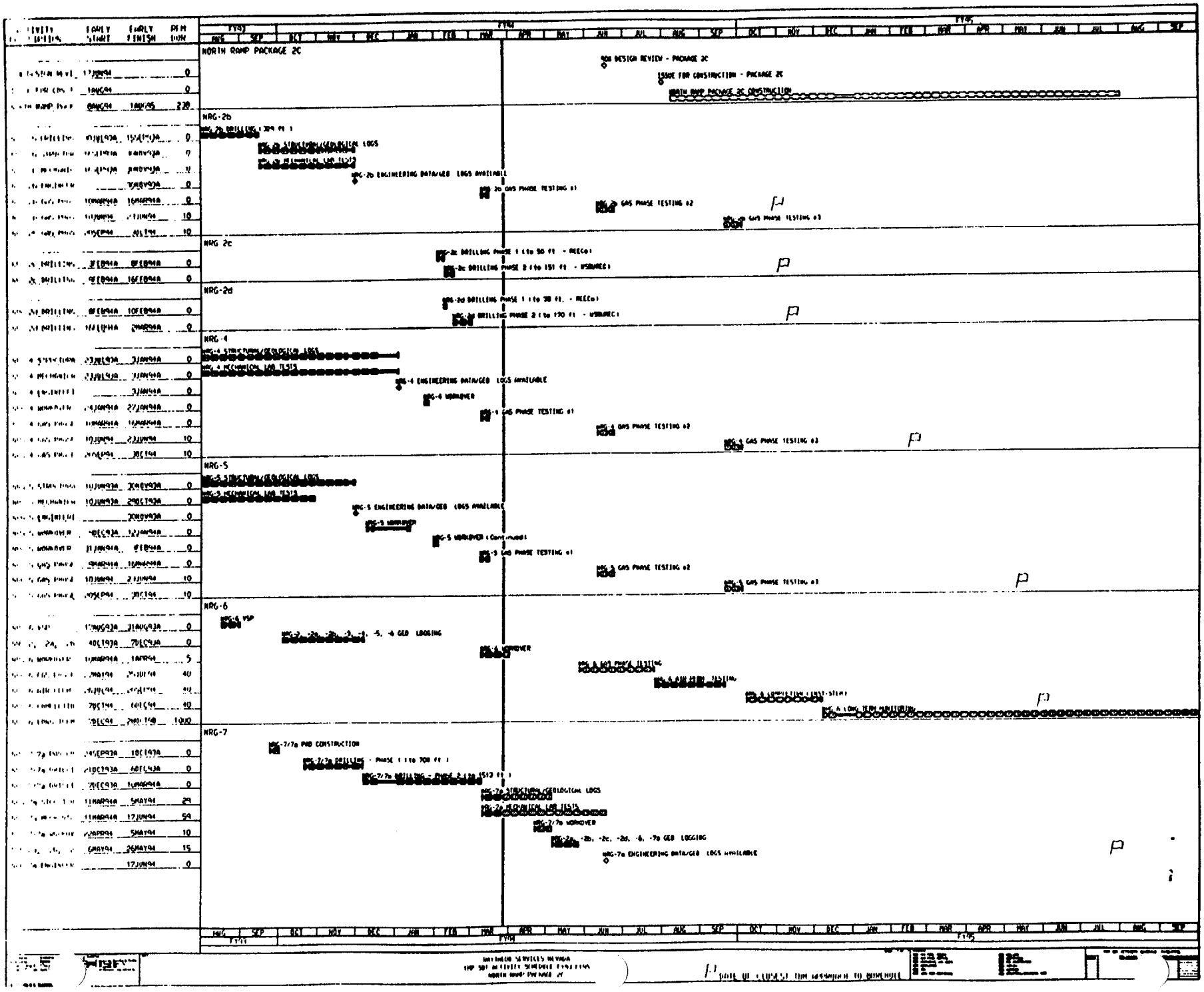

MAIN DRIFT PACKAGE 8A
SRG-7
SD-12
SD-9
SRG-4
UZ-7a
PRELIMINARY DRAFT
INFORMATION ONLY



Yucca Mountain Drilling Program Plan
April - June 1994

- **Gas Phase Testing**
  - NRG-2b, NRG-4, NRG-5, NRG-6, UZ-7
- **Geophysics**
  - NRG-2a, NRG-2b, NRG-2c, NRG-2d, NRG7/7a, SD-9, SD-12
- **SD-12 - Drilling**
- **SD-9 - Pad construction and drilling**
- **SD-7 - Pad construction and drilling**
- **ESF - Alcove 1 tests**

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INFORMATION ONLY

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Yucca Mountain Drilling Program
February-March 1994 (continued)

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Yucca Mountain Drilling Program
February-March 1994

NRG-2C:	**Augered and Standard Penetration Tests to ~ 150'**
NRG-2D:	**Augered and Standard Penetration Tests to ~170'**
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U.S. DEPARTMENT OF ENERGY

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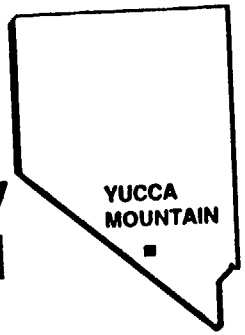


YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

DRILLING PROGRAM UPDATE

PRESENTED BY

WILLIAM J. BOYLE

PRELIMINARY DRAFT
INFORMATION ONLY

APRIL 19, 1994
ROCKVILLE, MD

CONTINGENCY PLANS

(1) Localized ground failures (pocket of lost ground):

- **Area behind lagging would be probed for voids, and if located, voids can be filled if required with pneumatically-placed pea gravel or sand materials.**

- **This type of failure has the highest possibility of occurring.**

CONTINGENCY PLANS

(2) Chimney type failures and extended ground failure:

- **These types of occurrences generally stabilize themselves once tunneling is halted.**

- **If the TBM can be advanced using horizontal grippers only, this process will be used.**

- **Void will be filled as required for localized situations similar to (1) above. If the void is extensive, it should be drilled from the surface and filled with lean concrete mix once the TBM passes the zone.**

- **Since no unconsolidated material has been located and stand-up time is good, the risk of this occurrence is low, if at all.**

CONTINGENCY PLANS

(3) Occurrence of running ground and TBM unable to advance:

- **This is a condition which would require the machine to be freed by hand excavating out around the shield, with continuing hand excavating up to solid ground, and then re-establishing a gripper wall. NATM method would be a likely support method.**

- **If test boring had found major areas of unconsolidated material, the entire area beyond the Bow Ridge would have to be chemically grouted from the surface prior to mining.**

- **Since no unconsolidated materials was found in the current test program, the risk of this occurrence is very low, if at all.**

OPERATIONAL PLANS

- **Bow Ridge Fault and area immediately beyond the fault are to be excavated with the TBM with the installation of steel ribs and full channel lagging.**

- **TBM operation at Bow Ridge, once started, will proceed on a continuous operation until the TBM head is back into rock material.**

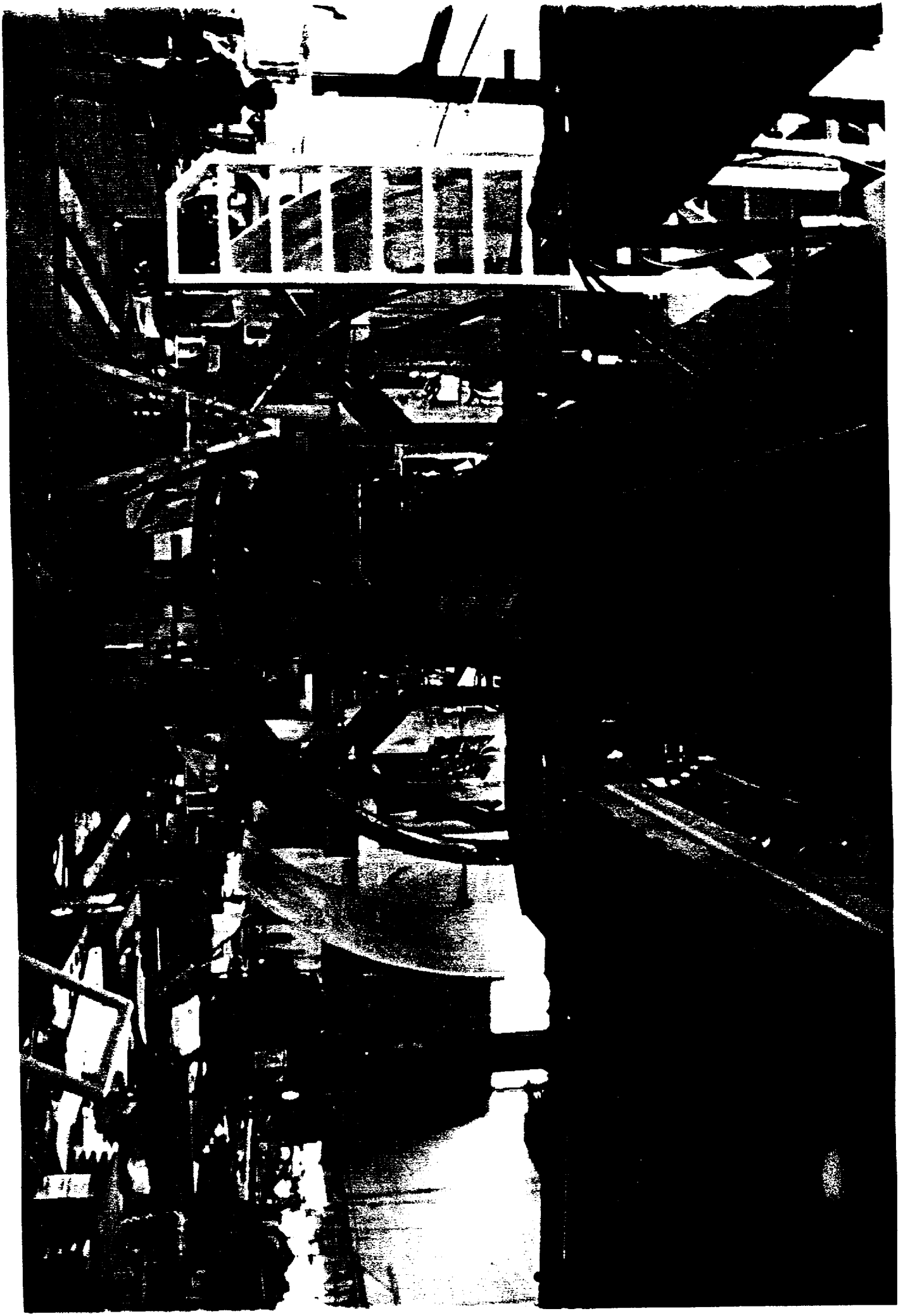
- **Crews will be fully trained in support installation methods prior to tunneling the Bow Ridge area. Sets and lagging supports will be used from the Starter Tunnel through the Rainer Mesa materials beyond Bow Ridge Fault. The work crews will have the maximum amount of experience possible with the steel set and lagging supports.**

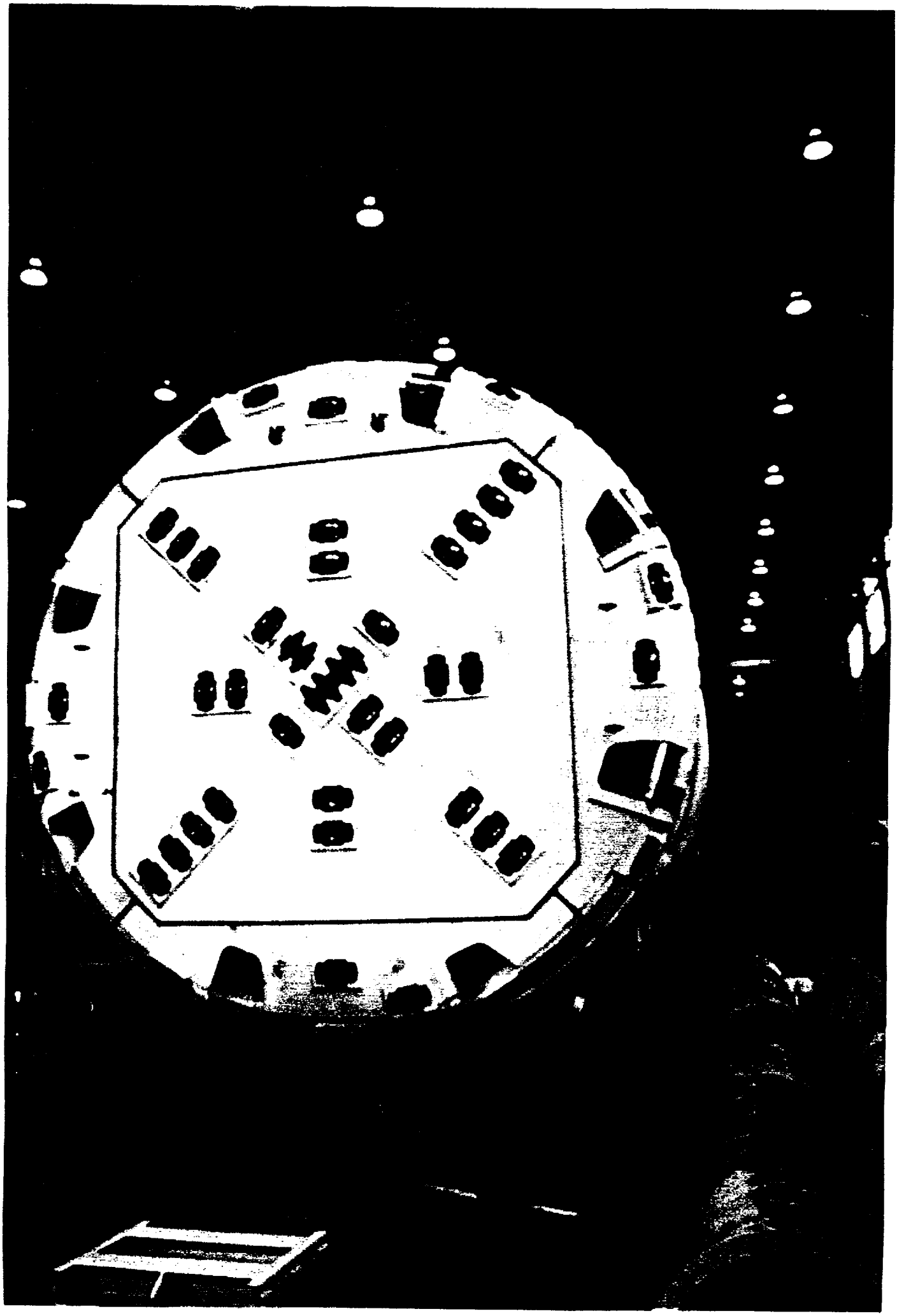
TBM RISKS IN SOFT GROUND CONDITIONS

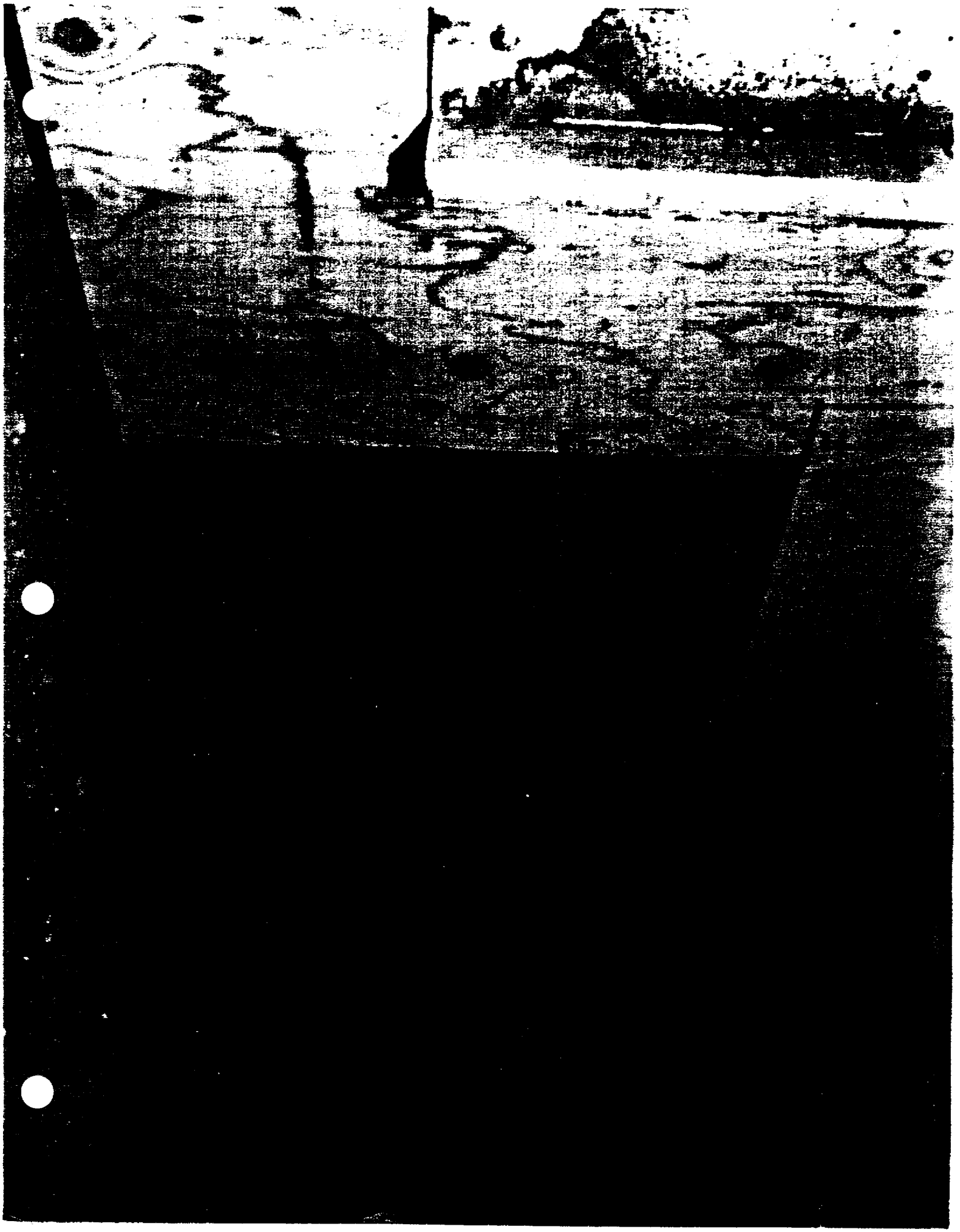
- **Localized failure of the material in the tunnel face and walls. Pockets of running ground.**

- **Extensive overexcavation and chimney type failure of the material in the tunnel arch and extended ground failure.**

- **The ground uncontrollably running into the cutterhead and tunnel, causing inability to advance the machine because of a plugged cutterhead.**







TBM FACTS

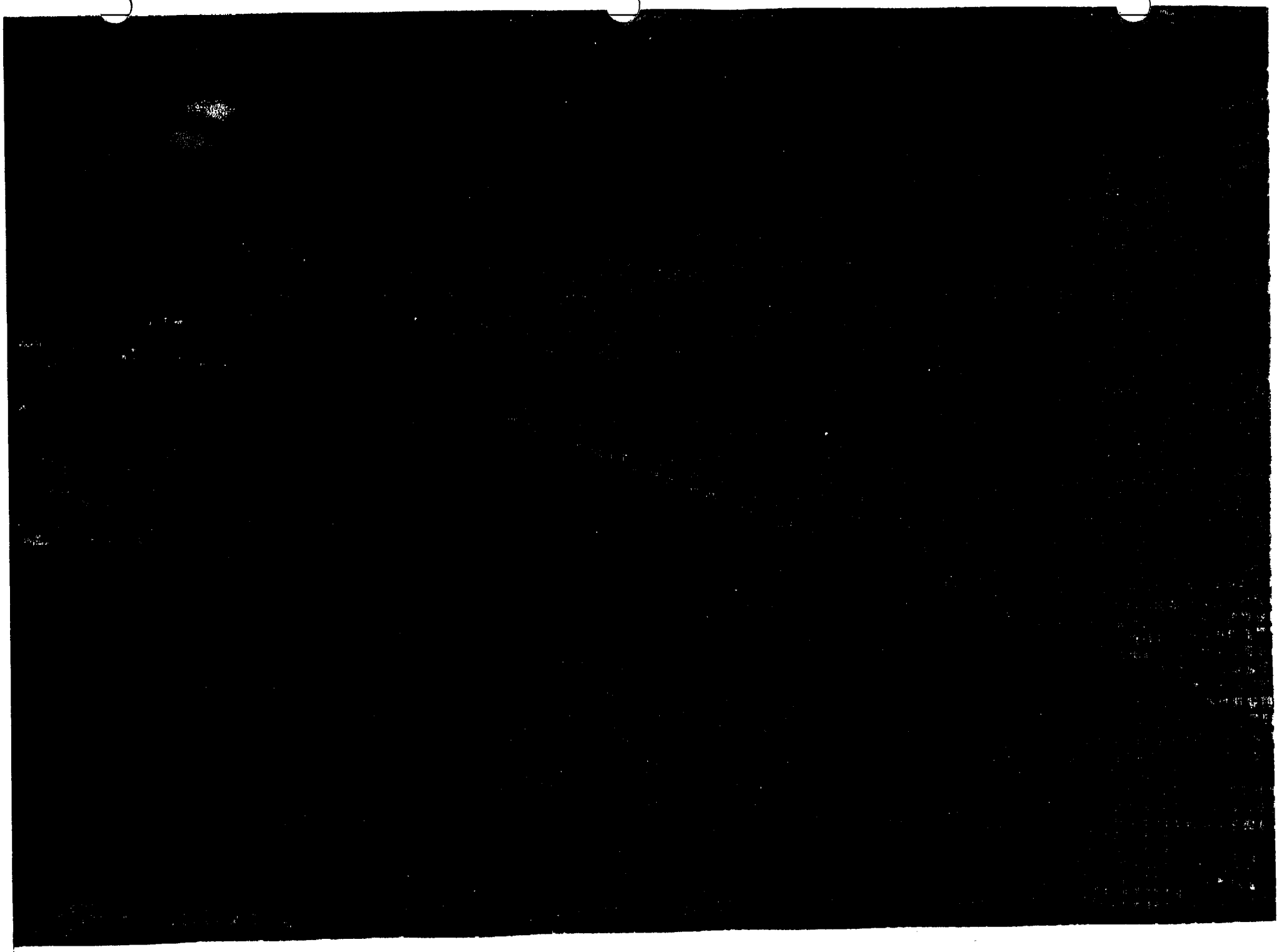
- **TBM purchased is a hard rock double shielded mining machine.**

- **Shield design provides ability to mine areas of cohesive materials and broken rock.**

- **Shield design provides for 360-degree gripping mode that will operate within tested bearing capacity of in situ materials.**

- **TBM cutterhead design is two (2) speed, with single rotation direction. Soft ground type machines that are intended for tunneling through mixed-face conditions, which best handle these types of materials, have variable speed drives (hydraulic drives, as opposed to electric 2-speed on this TBM). They also have closure doors and reversible head rotation.**

- **TBM will be equipped with a ring steel erector, rockbolt drills, and capability to install shotcrete.**



DOE-NRC TECHNICAL MEETING
ON
EXPLORATORY STUDIES FACILITY

TUNNELING PAST BOW RIDGE FAULT

Lance deStwolinski, Project Manager
KIEWIT/PB

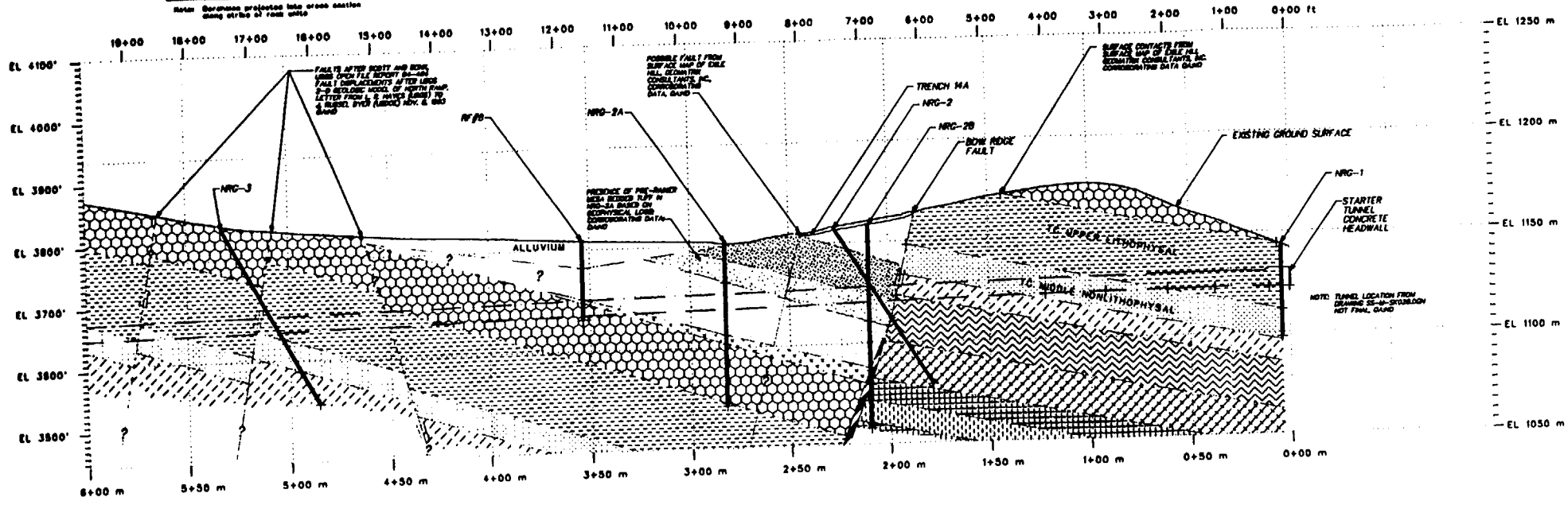
CROSS SECTION CONSTRUC...
ALONG RAMP ALIGNMENT – AZIMUTH 299°

0 20 40 60 80 100m

1 : 2000

Borehole	Projected to Section along Azimuth	Ground Elevation (m)	Distance to Section (m)
NRG-1	299°	1166	0.0
NRG-2	299°	1157	15.5 SW
NRG-2A	299°	1152	28.88 NE
NRG-2B	299°	1156	11.68 SW
NRG-3	299°	1166	36.2 SW
RF#8	299°	1166	86.48 NE

Note: Boreholes projected into cross section along strike of rock units



FORMATION	MEMBER	MAJOR ZONES	CORRELATIVE SUBZONES	FURTHER DESCRIPTION
TIMBER MOUNTAIN TUFF	RAINIER MESA			LITHIFIED, NONWELDED
				NONLITHIFIED, TUFF AND FALLOUT
	?			NONLITHIFIED, TUFF AND FALLOUT
		PRE-RAINIER MESA TUFF		PYROCLASTIC FLOW AND FALLOUT
		TUFF UNIT "X"		REWORKED PYROCLASTIC FLOW AND FALLOUT
		PRE-TUFF UNIT "X"		
PAINTBRUSH TUFF	TIVA CANYON	UPPER NONLITHOPHYSAL	CAPROCK UPPER CLIFF	NONWELDED TO DENSELY WELDED
		UPPER LITHOPHYSAL		DENSELY WELDED
		MIDDLE NONLITHOPHYSAL		DENSELY WELDED
		LOWER LITHOPHYSAL		DENSELY WELDED
		HACKLY		DENSELY WELDED
		COLUMNAR		DENSELY WELDED
	PAH CANYON	BEDDED TUFF		NONWELDED
				NONWELDED
		BEDDED TUFF		NONWELDED

STRATIGRAPHIC NOMENCLATURE IN DEVELOPMENT BY USGS

LEGEND

- LITHOLOGIC CONTACT, SOLID LINE WHERE APPROXIMATE, DASHED LINE WHERE INFERRED
- FAULT ZONE
- FAULT, ?-ATTITUDE UNCERTAIN
- PROPOSED TUNNEL OUTLINE

REV NO	DATE	BY	REVISION	SUPERCEDES
3				
2				
1	9-20-93 DRAFT	CCB	DRAFT	DRAFT

REVISIONS

QA:QA

ESF NORTH RAMP
YUCCA MOUNTAIN PROJECT
SITE CHARACTERIZATION
CROSS SECTION THROUGH EXILE HILL
NORTH RAMP 0+00 to 6+00m

Sandia National Laboratories

DRAWN: RJL/12-10-93
CHECKED: CCB
HOR. SCALE: AS SHOWN
VERT. SCALE: AS SHOWN

A. F. T. AGAPITO & ASSOC., INC. GRAND JUNCTION, COLORADO, USA

DRAWING NO: 88-60-08
VERSION: DRAFT
SHEET 1 OF 1

GEOLOGICAL FACTS AND FINDINGS

- **The Rainer Mesa formation material beyond Bow Ridge is not rock but essentially a wide range and mix of granular materials having some degree of bonding (i.e., interlock of individual grains that occurred during deposit of volcanic ash flow).**

- **The materials are present in a valley or graben created by fault movement.**

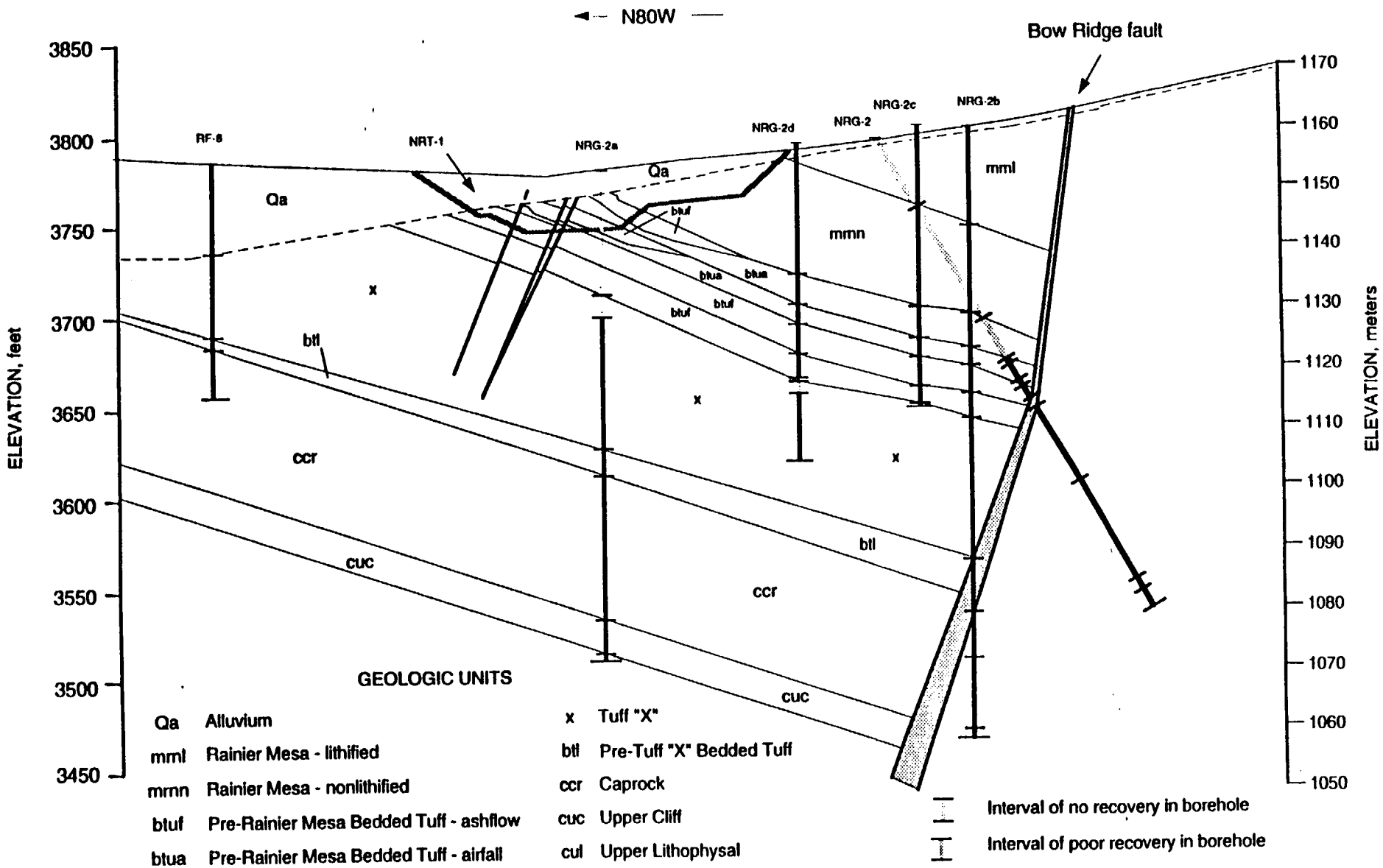
- **The original drill hole program, due to drilling methods, did not recover intact cores. The disturbed material initially raised the question of the existence of unconsolidated material. The existence of such material would represent a risk to the TBM excavation process.**

- **The current trenching program has shown both excellent stability as a vertical excavation and stand-up time when undercut.**

- **Exposed trench materials are geologically traceable to borehole materials at tunnel depths.**

- **Tests in trench indicate materials have a bearing capacity in and around 270 psi.**

LOCAL GEOLOGIC SECTION OF THE WEST SIDE OF EXILE HILL



CRITERIA:

REPORTABLE GEOLOGIC CONDITION

Geologic Condition:

Refers to geologic-related fields such as hydrology, geochemistry, tectonics, and rock mechanics

Reportable Geologic Condition:

A. **One determined to be significant and to require notification of the NRC ORs and other procedural agreement agencies**

B. **One that if not investigated in a timely manner could result in the loss of data relevant to characterization**

CRITERIA:

(CONTINUED)

SIGNIFICANT (or SIGNIFICANCE)

A specific condition so different from predicted or expected range of values or events that it may:

- **Impact the design and construction of the ESF, waste package, or geologic repository**
- **Have a potentially adverse impact on the ability to characterize the site or on the isolation capability of the site**
- **Be a potential deficiency in the site's characteristics that could, if not further examined and evaluated or corrected, be a potential safety hazard or an important deviation from established design criteria and basis**
- **Be sufficiently relevant such that acquisition of additional data would be required to document the condition**

CRITERIA:

(CONTINUED)

DELAY OF WORK

Temporary work stoppage during which a potentially reportable geologic condition may be investigated and evaluated for significance. Length of the work stoppage is dependent on the time required to determine the significance of the geologic condition and, if determined significant, the time to decide on an appropriate course of action.

RECORDS OF REPORTABLE GEOLOGIC CONDITIONS

All such reports shall be documented and included in the YMSCO records system in accordance with Records Management Plan (YMP/93-08)

Items to be submitted as part of a records package:

- Report forms and copies
- All records produced from additional data collection activities
- Copies of notifications to the NRC/OR and Nye County
- Completed record package must be submitted to the Local Records Center

FUNCTIONAL RESPONSIBILITIES UPON INITIATION OF AP-6.14 PROCESS*

Field Personnel	• Identify condition (Anyone) • Determine significance (Field Test Coordinator (FTC) of DOE) • Recommend data needs/work delay (FTC)
Assistant Manager for Scientific Programs (AMSP) or Deputy AMSP	• Agree/disagree with initial response • Communicate with DOE management all changes to earlier information, additional actions, and results • Concur with proposed actions

*(Proposed changes to reflect the YMSCO reorganization. These changes are not shown in Rev. 0)

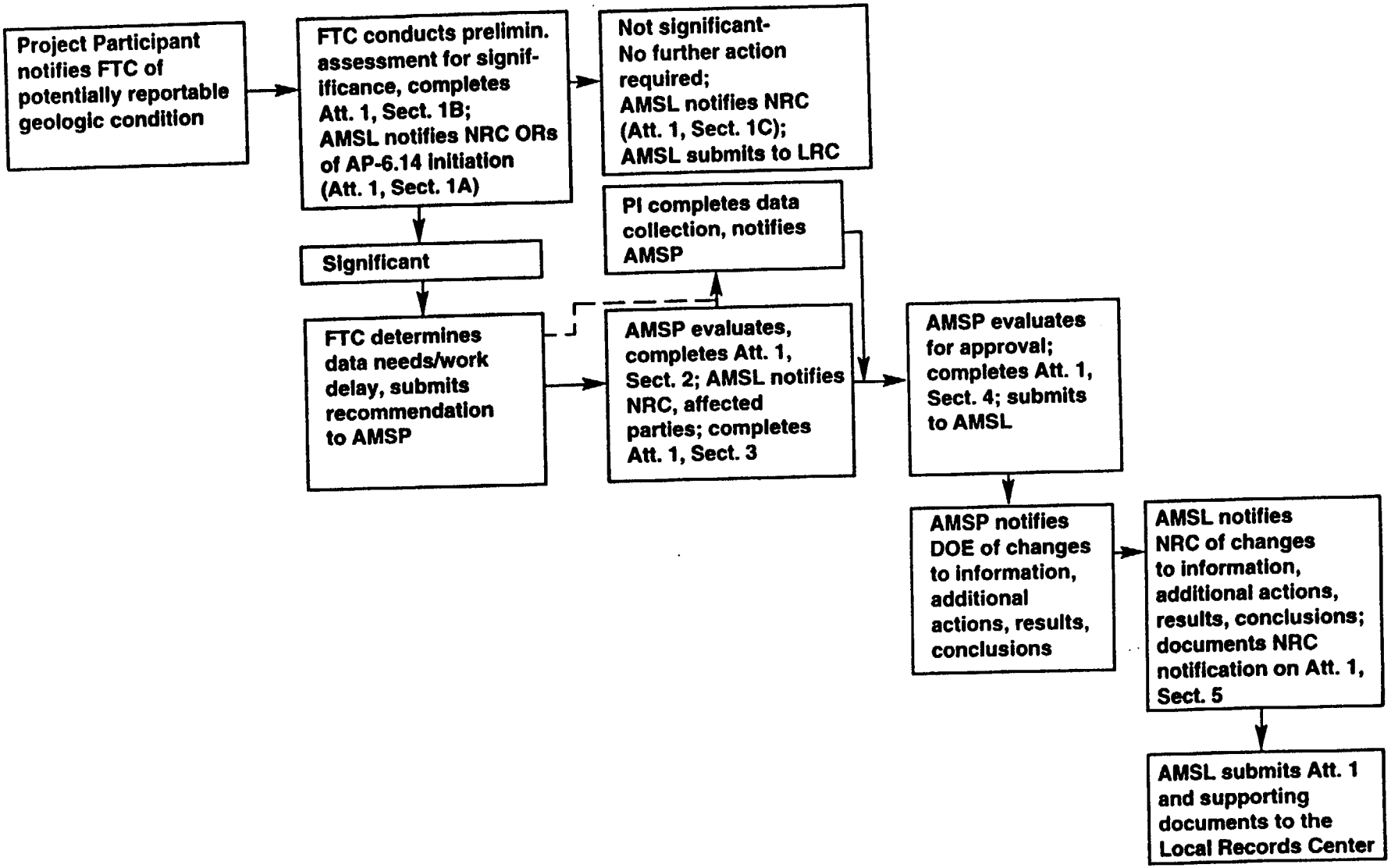
FUNCTIONAL RESPONSIBILITIES UPON INITIATION OF AP-6.14 PROCESS*

Assistant Manager for Suitability and Licensing (AMSL) or Deputy AMSL	Notify NRC ORs, and Nye County Communicate with NRC ORs and Nye County Representative all changes to earlier information, additional actions, and results Document actions and notifications
Principal Investigator (PI)	Complete data collection
M&O Regulatory & Licensing	Provide support to the FTC, AMSP, or AMSL or their designees as needed

*(Proposed changes to reflect the YMSCO reorganization. These changes are not shown in Rev. 0)

APRGCSJ14.PM4.DOE/3-31-94

AP-6.14 PROCESS AND FUNCTIONAL RESPONSIBILITIES*



*(Proposed changes to reflect the YMSCO reorganization. These changes are not shown in Rev. 0)

APRGCSJ15.PM4.DOE/3-31-94

LITTLE SKULL MOUNTAIN CASE STUDY

- Little Skull Mountain Earthquake occurred June 29, 1992 at 0314 PDT
- AP-6.14 process was begun to determine whether the earthquake should be categorized as a "Reportable Geologic Condition"
- Investigation under Study Plan 8.3.1.17.4.1, Historical and Current Seismicity, was recommended and initiated to study the aftershocks, to characterize seismic source parameters and attenuation in the Yucca Mountain vicinity, and to search for surface faults
- It was determined that the AP-6.14 criteria to declare the event a "Reportable Geologic Condition" were not met

LITTLE SKULL MOUNTAIN CASE STUDY

(CONTINUED)

Criterion 1:

Impact to the design and construction of the ESF, waste package, or geologic repository

- An earthquake of M=5.6 was not unexpected for the region
- Study Plan 8.3.1.17.4.1 was in place to study such an event
- Peak horizontal accelerations of 0.10 to 0.16 g were well below the design value of 0.3g (SAND88-1203)

Criterion 2:

Potentially adverse impact on the ability to characterize the site or on the isolation capability of the site

- No evidence was found to indicate adverse impact on site characterization activities or site isolation capability

LITTLE SKULL MOUNTAIN CASE STUDY
(CONTINUED)

Criterion 3:

Potential deficiency of the site's characteristics that could, if not further examined and evaluated or corrected, be a potential safety hazard or an important deviation from established design criteria and basis

- On-site recordings indicated groundwater level changes of ±0.8 foot, returning to normal within 30 minutes of the earthquake event
- Damage to the Field Operations Center was noted as a result of this earthquake, but delays to site characterization activities were minimally delayed
- Site drilling was not impacted
- No surface faulting was observed

Criterion 4:

Sufficient relevancy to site characterization such that acquisition of additional data would be required to document the condition

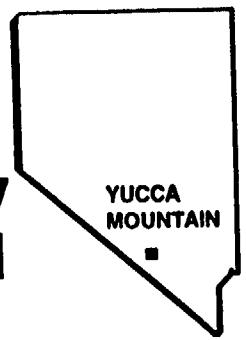
- Study Plan 8.3.1.17.4.1, in place prior to the earthquake, was implemented as planned to investigate the event

LESSONS LEARNED FROM LITTLE SKULL MOUNTAIN EARTHQUAKE

- Revision of AP-6.14 "Reportable Geologic Conditions" necessary:
  - DOE Field Test Coordinator to focus on performance of technical analysis
  - M&O support staff to document events in "real time"
- Revision to AP-6.14 should be completed prior to Tunnel Boring Machine start of operations

U.S. DEPARTMENT OF ENERGY

OCRWM



YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

ESF TEST ALCOVES

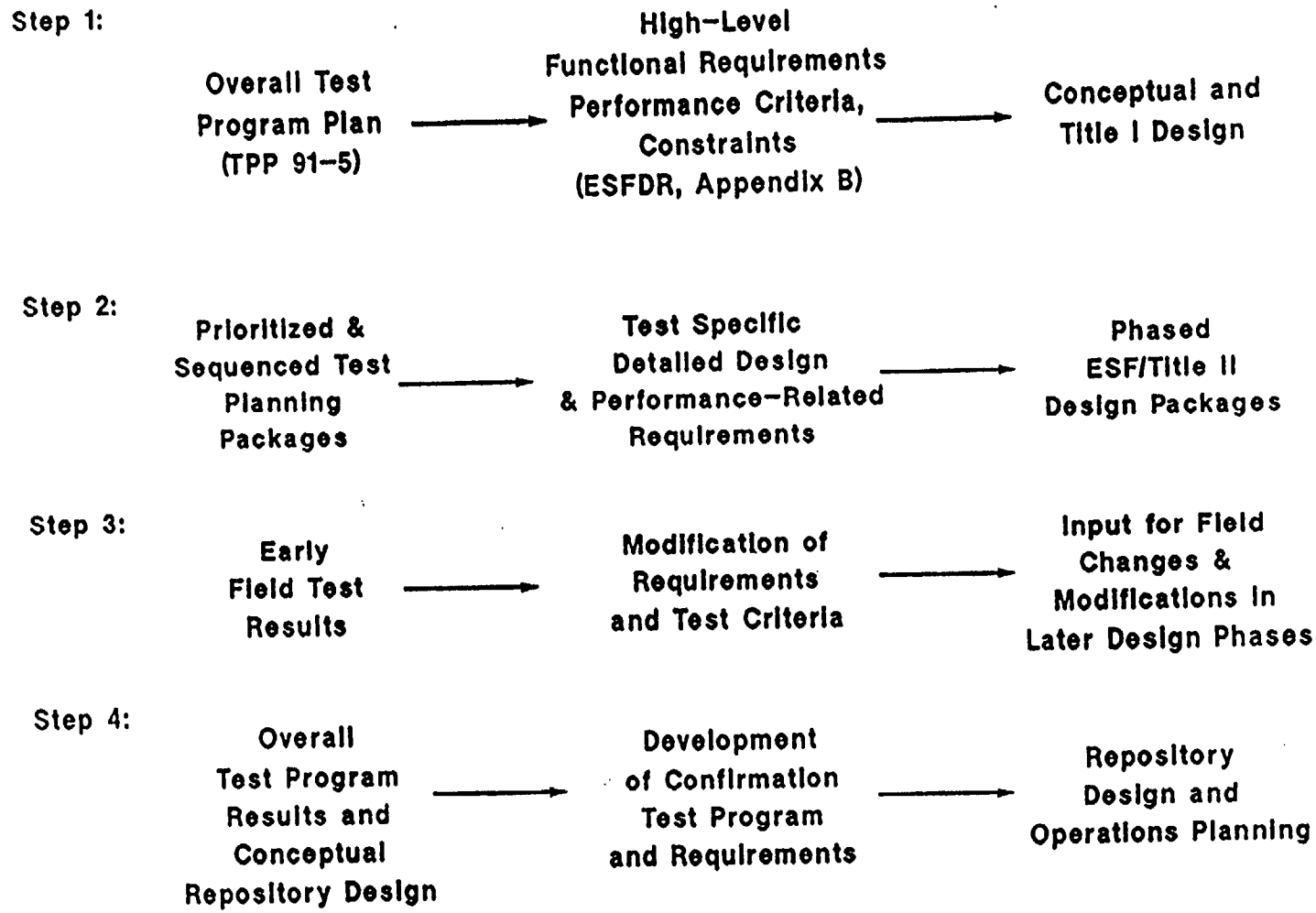
PRESENTED BY

WILLIAM J. BOYLE

PRELIMINARY DRAFT
INFORMATION ONLY

APRIL 19, 1994
ROCKVILLE, MD

STEPS IN CO-DEVELOPMENT OF ESF DESIGN AND TEST PROGRAM



PRELIMINARY DRAFT
INFORMATION ONLY

Exploratory Studies Facility

North Ramp Tests

Construction Phase

Test Event Name	Test Name (SCP Activity)	WBS Element	Study Plan	Study Plan Name	ESFDR A Appendix B Section	Test Location
Geologic Mapping ESF	Underground Geologic Mapping (8.3.1.4.2.2.4)	1.2.3.2.2.1.2	8.3.1.4.2.2	Characterization of structural Features in the Site Area	B.2.20	Throughout ESF
Perched Water Starter Tunnel (Contingency)	Perched Water Testing in the ESF (8.3.1.2.2.4.7)	1.2.3.3.1.2.4	8.3.1.2.2.4	Characterization of the Yucca Mountain Unsaturated-Zone in the ESF	B.2.9	As Encountered
Consolidated Sampling ESF	Matrix Hydrologic Properties Testing (8.3.1.2.2.3.1)	1.2.3.3.1.2.3	8.3.1.2.2.3	Characterization of the Yucca Mountain Unsaturated-Zone Percolation	B.2.2	Sampling Throughout ESF
Consolidated Sampling ESF	History of Mineralogic and Geochemical Alteration of YM (8.3.1.3.2.2.1)	1.2.3.2.1.1.2	8.3.1.3.2.2	Study Plan for History of Mineralogic Alteration of Yucca Mountain	B.2.17	Sampling Throughout ESF
Consolidated Sampling ESF	Petrologic Stratigraphy of the Topopah Spring Member (8.3.1.3.2.1.1	1.2.3.2.1.1.1	8.3.1.3.2.1	Study Plan for Mineralogy, Peterology, and Chemistry of Transport Pathways	B.2.14	Sampling Throughout Topopah Spring Member
Consolidated Sampling ESF	Mineral Distributions Between Host Rock and Accessible Environment (8.3.1.3.2.1.2)	1.2.3.2.1.1.1	8.3.1.3.2.1	Study Plan for Mineralogy, Peterology, and Chemistry of Transport Pathways	B.2.15	Sampling Throughout ESF
Consolidated Sampling ESF	Fracture Mineralogy (8.3.1.3.2.1.3)	1.2.3.2.1.1.1	8.3.1.3.2.1	Study Plan for Mineralogy, Peterology, and Chemistry of Transport Pathways	B.2.16	Sampling Throughout ESF
Consolidated Sampling ESF	Chloride and Chlorine-36 Measuements of Percolation at Yucca Mountain (8.3.1.2.2.2.1)	1.2.3.3.1.2.2	8.3.1.2.2.2	Water Movement Test, Rev. 0 Water Movement Test, Rev. 1	B.2.1	Sampling Throughout ESF

Exploratory Studies Facility

North Ramp Tests

Construction Phase

Test Event Name	Test Name (SCP Activity)	WBS Element	Study Plan	Study Plan Name	ESFDR A Appendix B Section	Test Location
Consolidated Sampling ESF	Biological Sorption and Transport (8.3.1.3.4.2)	1.2.3.4.1.2.2	8.3.1.3.4.2	Biological Sorption and	B.2.18	Sampling Throughout ESF
Consolidated Sampling ESF	Density & Porosity Characterization (8.3.1.15.1.1)	1.2.3.2.7.1.1	8.3.1.15.1.1	Laboratory Thermal Properties	B.2.22	Sampling Throughout ESF
Consolidated Sampling ESF	Volumetric Heat Capacity Characterization (8.3.1.15.1.2)	1.2.3.2.7.1.1	8.3.1.15.1.1	Laboratory Thermal Properties	B.2.22	Sampling Throughout ESF
Consolidated Sampling ESF	Thermal Conductivity Characterization (8.3.1.15.1.1.3)	1.2.3.2.7.1.1	8.3.1.15.1.1	Laboratory Thermal Properties	B.2.22	Sampling Throughout ESF
Consolidated Sampling ESF	Thermal Expnasion Characterization (8.3.1.15.1.2.1)	1.2.3.2.7.1.2	8.3.1.15.1.2	Laboratory Thermal Properties	B.2.22	Sampling Throughout ESF
Consolidated Sampling ESF	Compressive Mechanical Properties of Intact Rock at Baseline Experiment Conditions 98.3.1.15.1.3.1)	1.2.3.2.7.1.3	8.3.1.15.1.3	Laboratory Determination of the Mechanical Properties of Intact Rock	B.2.22	Sampling Throughout ESF
Consolidated Sampling ESF	Effects of Variable Environmental Conditions on Mechanical Properties (8.3.1.15.1.3.2)	1.2.3.2.7.1.3	8.3.1.15.1.3	Laboratory Determinations of the Mechanical Properties of Intact Rock	B.2.22	Sampling Throughout ESF
Consolidated Sampling ESF	Mechanical Properties of Fractures at Baseline Conditions (8.3.1.15.1.4.1)	1.2.3.2.7.1.4	8.3.1.15.1.4	Laboratory Determinations of the Mechanical Properties of Fractures	B.2.22	Sampling Throughout ESF

Exploratory Studies Facility

North Ramp Tests

Construction Phase

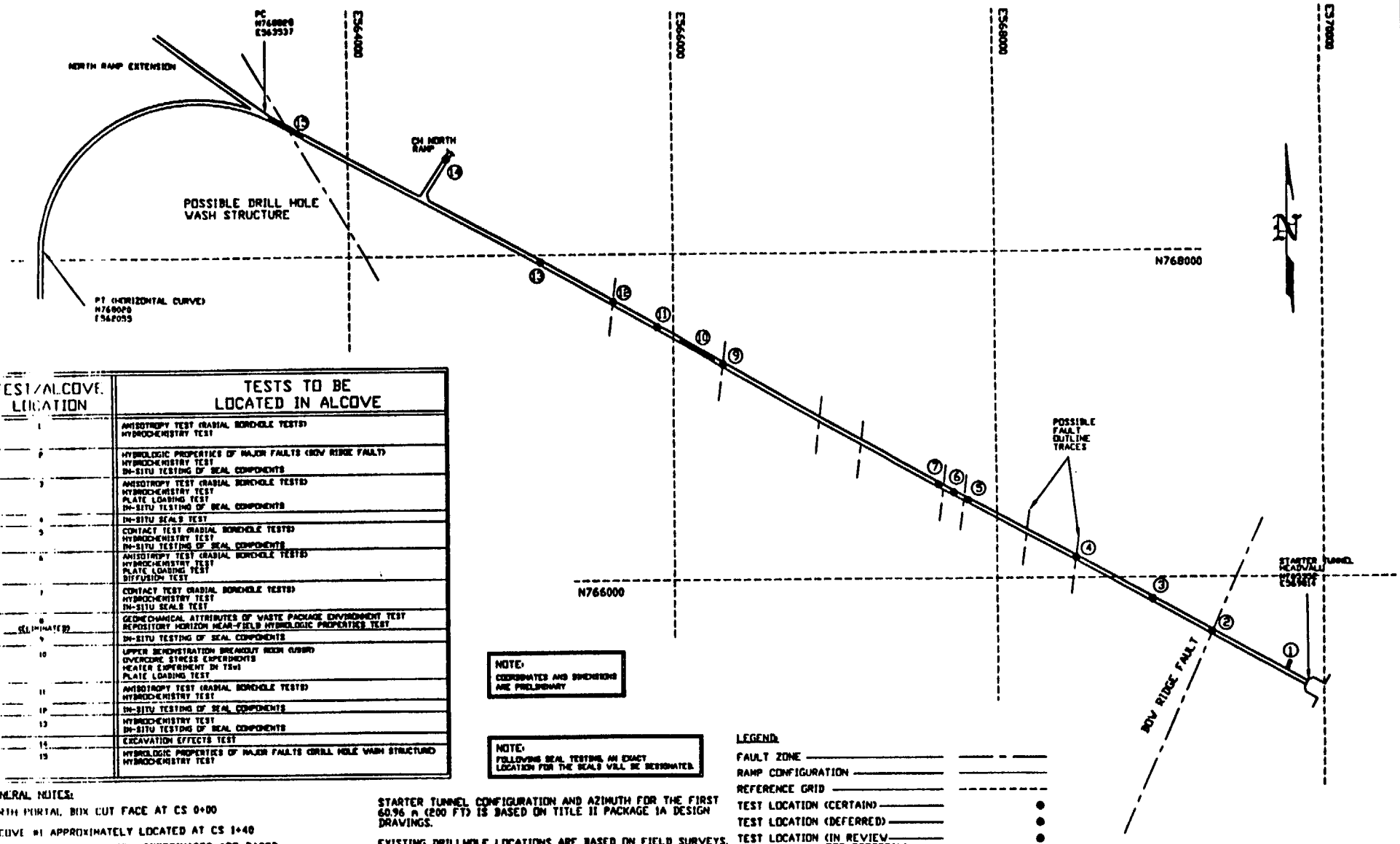
Test Event Name	Test Name (SCP Activity)	WBS Element	Study Plan	Study Plan Name	ESFDR A Appendix B Section	Test Location
Consolidated Sampling ESF	Effects of Variable Environmental Conditions on Mechanical Properties of Fractures (8.3.1.15.1.4.2)	1.2.3..2.7.1.4	8.3.1.15.4	Laboratory Determinations of the Mechanical Properties of Fractures	B.2.22	Sampling Throughout ESF
Consolidated Sampling ESF	Repository Horizon Rock-Water Interaction (8.3.4.2.4.4.2)	1.2.2.2.4	8.3.4.2.4.4	Engineered Barrier System Field Tests	B.2.42	Sampling Throughout Topopah Spring Member
Consolidated Sampling ESF	Geochemical Assessment of Yucca Mountain in Relation to the Potential for Mineralization (8.3.1.9.2.1.1)	1.2.3.7.2.1	8.3.1.9.2.1	Natural Resource Assessments of Yucca Mountain, Nye County, Nevada	N/A	Sampling Throughout ESF
Consolidated Sampling ESF	Studies of Calcite and Opaline Silica Vein Deposits (8.3.1.5.1.5)	1.2.3.6.2.2.1	8.3.1.5.2.1	Characterization of Yucca Mountain Quaternary Regional Hydrology	N/A	Sampling Throughout ESF
Radial Borehole Testing	Radial Borehole Tests in the ESF (8.3.1.2.2.4.4)	1.2.3.3.1.2.4	8.3.1.2.2.4	Characterization of Yucca Mountain Unsaturated-Zone in the ESF	B.2.6	Throughout ESF
Hydrochemistry Testing	Hydrochemistry Tests in the ESF (8.3.1.2.2.4.8)	1.2.3.3.1.2.4	8.3.1.2.2.4	Characterization of Yucca Mountain Unsaturated-Zone in the ESF	B.2.10	Alcoves and Drifts Throughout ESF
Hydrologic Properties of Major Faults	Hydrologic Properties of Major Faults Encountered in the ESF (8.3.1.2.2.4.10)	1.2.3.3.1.2.4	8.3.1.2.2.4	Characterization of Yucca Mountain Unsaturated-Zone in the ESF, Rev. 2	B.2.12	Alcoves at Identified Structures Throughout ESF

Exploratory Studies Facility

North Ramp Tests

Construction Phase

Test Event Name	Test Name (SCP Activity)	WBS Element	Study Plan	Study Plan Name	ESFDR A Appendix B Section	Test Locations
Construction Monitoring - ESF	Access Convergence Measurements (8.3.1.15.1.5.1)	1.2.4.2.1.1.1	8.3.1.15.1.5	Excavation Investigations	B.2.23	Throughout ESF
Construction Monitoring - ESF	Evaluation of Mining Methods (8.3.1.15.1.8.1)	1.2.4.2.1.1.4	8.3.1.15.1.8	In Situ Design Verifacation	B.2.33	Throughout ESF
Construction Monitoring - ESF	Monitoring of Ground Support Systems (8.3.1.15.1.8.2	1.2.4.2.1.1.4	8.3.1.15.1.8	In Situ Design Verifacation	B.2.34	Throughout ESF
Construction Monitoring - ESF	Monitoring Drift Stability (8.3.1.15.1.8.3)	1.2.4.2.1.1.4	8.3.1.15.1.8	In Situ Design Verifacation	B.2.35	Throughout ESF
Construction Monitoring - ESF	Air Quality and Ventilation Experiement (8.3.1.15.1.8.4)	1.2.4.2.1.1.4	8.3.1.15.1.8	In Situ Design Verifacation	B.2.36	Throughout ESF
Intact Fracture Test	Intact-Fracture Test in the ESF (8.3.1.2.2.4.1)	1.2.3.3.1.2.4	8.3.1.2.2.4	Characterization of Yucca Mountain Unsaturated-Zone in the ESF	B.2.3	(DEFERRED)
Percolation Tests	Percolation Tests in the ESF (8.3.1.2.2.4.2)	1.2.3.3.1.2.4	8.3.1.2.2.4	Characterization of Yucca Mountain Unsaturated-Zone in the ESF	B.2.4	(DEFERRED)
Excavation Test	Excavation Test in the ESF (8.3.1.2.2.4.5)	1.2.3.3.1.2.4	8.3.1.2.2.4	Characterization of Yucca Mountain Unsaturated-Zone in the ESF	B.2.7	Alcoves in Norht Ramp and MTL Intersection Between Main and E-W Drift
Diffusion Tests	Diffusion Tests in the ESF (8.3.1.2.2.5.1)	1.2.3.3.1.2.5	8.3.1.2.2.5	Study Plan for Diffusion Tests in the ESF	B.2.13	(DEFERRED)



TEST/ALCOVE LOCATION	TESTS TO BE LOCATED IN ALCOVE
1	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST
2	HYDROLOGIC PROPERTIES OF MAJOR FAULTS (BOV RIDGE FAULT) HYDROCHEMISTRY TEST IN-SITU TESTING OF SEAL COMPONENTS
3	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST PLATE LOADING TEST IN-SITU TESTING OF SEAL COMPONENTS
4	IN-SITU SEALS TEST
5	CONTACT TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST IN-SITU TESTING OF SEAL COMPONENTS
6	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST PLATE LOADING TEST DIFFUSION TEST
7	CONTACT TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST IN-SITU SEALS TEST
8 (ELIMINATED)	GEOMECHANICAL ATTRIBUTES OF WASTE PACKAGE ENVIRONMENT TEST REPOSITORY HORIZON NEAR-FIELD HYDROLOGIC PROPERTIES TEST
9	IN-SITU TESTING OF SEAL COMPONENTS
10	UPPER DEMONSTRATION BREAKOUT ROOM (UDBR) OVERCORE STRESS EXPERIMENTS HEATER EXPERIMENT IN TSw1 PLATE LOADING TEST
11	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST
12	IN-SITU TESTING OF SEAL COMPONENTS
13	HYDROCHEMISTRY TEST IN-SITU TESTING OF SEAL COMPONENTS
14	EXCAVATION EFFECTS TEST
15	HYDROLOGIC PROPERTIES OF MAJOR FAULTS (DRILL HOLE WASH STRUCTURE) HYDROCHEMISTRY TEST

NOTE:
COORDINATES AND DIMENSIONS ARE PRELIMINARY

NOTE:
FOLLOWING SEAL TESTING, AN EXACT LOCATION FOR THE SEALS WILL BE DESIGNATED.

LEGEND
- FAULT ZONE
- RAMP CONFIGURATION
- REFERENCE GRID
- TEST LOCATION (CERTAIN)
- TEST LOCATION (DEFERRED)
- TEST LOCATION (IN REVIEW FOR DEFERRAL)

GENERAL NOTES:

NORTH PORTAL BOX CUT FACE AT CS 0+00

ALCOVE #1 APPROXIMATELY LOCATED AT CS 1+40

[illegible] FOOT GRID. COORDINATES ARE BASED ON THE NEVADA STATE COORDINATE SYSTEM, CENTRAL ZONE.

DIMENSIONS AND ELEVATIONS ARE SHOWN IN METERS. METERS ARE ROUNDED TO ONE DECIMAL PLACE. WHERE DISCREPANCIES BETWEEN ELEVATIONS AND GRADIENTS OCCUR DUE TO ROUNDING, ELEVATIONS WILL GOVERN.

THE BASIS FOR THE TEST ALCOVE LOCATIONS IS THE ESF DR [illegible]/CC 0010 REV 5/31-91.

THE GEOLOGICAL STRUCTURAL FEATURES ARE BASED ON THE SAIC PRELIMINARY CROSS SECTION CC-CC, DATE 5/3-91.

ACTUAL TEST ALCOVES WILL BE LOCATED IN THE FIELD AS GEOLOGY IS REVEALED BY EXCAVATION. ALCOVE LOCATIONS SHOWN ARE APPROXIMATIONS.

AN AREA OF LENGTH TO BE DETERMINED BEHIND AN ADVANCING TBM WILL HAVE THE UTILITIES LOCATED IN A MANNER TO PERMIT [illegible] OF THE RAMP PERIMETER.

[illegible] CALCULATE [illegible] SA-001 FOR MAJOR COORDINATES AND VERTICAL [illegible] DATA.

STARTER TUNNEL CONFIGURATION AND AZIMUTH FOR THE FIRST 60.96 m (200 FT) IS BASED ON TITLE II PACKAGE 1A DESIGN DRAWINGS.

EXISTING DRILLHOLE LOCATIONS ARE BASED ON FIELD SURVEYS. PROPOSED DRILLHOLE LOCATIONS ARE BASED ON INFORMATION CONTAINED IN THE WORK PROGRAMS.

FAULT TRACE LOCATIONS, EXCEPT FOR THE BOV RIDGE FAULT, ARE APPROXIMATIONS BASED ON AT-DEPTH PROJECTIONS OF INFORMATION FROM USGS OPEN FILE REPORT 84-494, PRELIMINARY GEOLOGIC MAP AND SECTIONS, BY SCOTT AND BONK. THE BOV RIDGE FAULT TRACE IS AN AT-DEPTH PROJECTION BASED ON PRELIMINARY FIELD WORK FROM ON-GOING ROCK AND SOIL INVESTIGATIONS.

ALCOVE 88 HAS BEEN DELETED FROM THE ESF TESTING PROGRAM. ALCOVE 88 WAS TO BE "GEOMECHANICAL ATTRIBUTES OF WASTE PACKAGE ENVIRONMENT TEST AND A REPOSITORY HORIZON NEAR-FIELD HYDROLOGIC PROPERTIES TEST"

GRAPHIC SCALE
121.92 m (400) 0 121.92 m (400) 243.84 m (800 FT.)

PRELIMINARY DR. [illegible]
INFORMATION ONLY

FOR REFERENCE DRAWINGS INDEX SEE DRAWING [illegible]

LOS ALAMOS NATIONAL LABORATORY
TEST COORDINATION OFFICE - YUCCA MOUNTAIN PROJECT

PROJECT: NORTH RAMP AND EXISTING/PROPOSED TEST LOCATION ILLUSTRATION - NEW ALLIGNMENT

CAD FILE: NORTHRMP.DVG	AUTOCAD R12	SIZE: A	SCALE: NOTED	REVISION: A1
DRN. BY: D.J. WEAVER	APPROVED BY: ON FILE N.Z. ELKINS/R.D. OLIVER		DATE DRN: 1/3/94	
NOTES: ADMINISTRATIVE/ILLUSTRATIVE USE ONL			PLOT DATE: 3/29/94	

Exploratory Studies Facility

North Ramp Tests

Construction Phase

Page 5

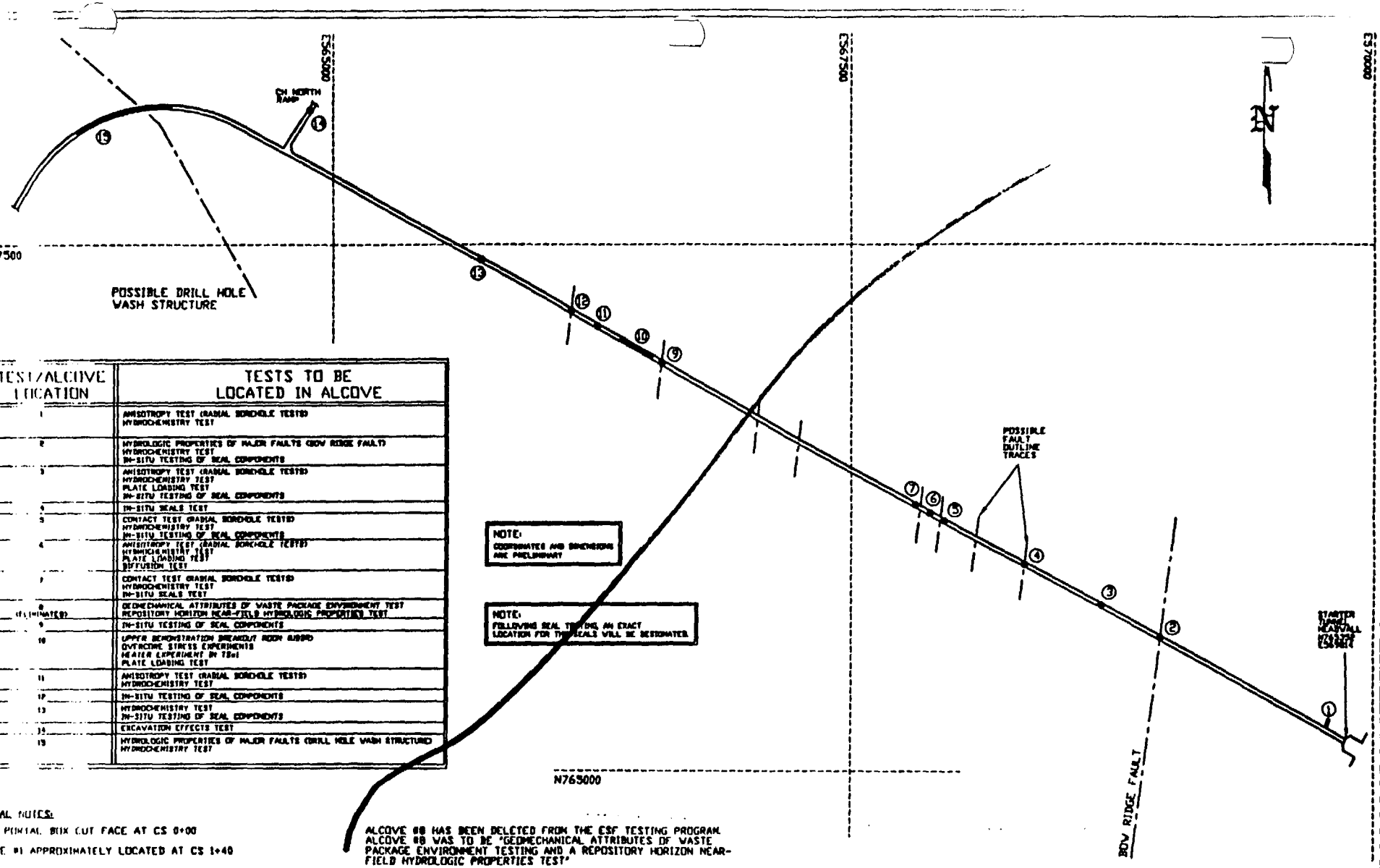
Test Event Name	Test Name (SCP Activity)	WBS Element	Study Plan	Study Plan Name	ESFDR A Appendix B Section	Test Locations
Seismic Tomography/ Vertical Seismic Profiling	Seismic Tomography/Vertical Seismic Profiling at the ESF (8.3.1.4.2.2.5)	1.2.3.2.2.1.2	8.3.1.4.2.2	Characterization of Structural Features in the Site Area	B.2.21	(DEFERRED)
Plata Loading Tests	Plate Loading Tests (8.3.1.15.1.7.1)	1.2.4.2.1.1.3	8.3.1.15.1.7	In Situ Mechanical Properties	B.2.31	(DEFERRED)
Overcore Stress Experiments	Overcore Stress Experiments in the ESF (8.3.1.15.2.1.2)	1.2.3.2.7.2.1	8.3.1.15.2.1	Characterization of the Ambient Stress Conditions	B.2.37	(DEFERRED)
Geochemical Attributes of the Waste Package Environment	Geochemical Attributes of the Waste Package Environment (8.3.1.19.3.7)	1.2.2.2.3	8.3.4.2.4.3 8.3.1.15.3.7	Geochemical Attributes of the Waste Package Environment	B.2.40	Alcoves in MTL Core Test Area or North Ramp Extension
Repository Horizon Near-Field Hydrologic Properties	Repository Horizon Near-Field Hydrologic Properties (8.3.1.19.4.1)	1.2.2.2.4	8.3.4.2.4.4 8.3.1.19.4.1	Engineered Barrier System Field Tests	B.2.41	Alcoves in MTL Core Test Area or North Ramp Extension

PRELIMINARY DRAFT
INFORMATION ONLY

ESF TEST FACILITY LOCATIONS

- ESFDR & DESIGN PROCESS CONTROLS GENERATE LOCATIONS AND COMMON FACILITY UTILITIES AND PHYSICAL CONFIGURATION OF AN ALCOVE

- FIELD EVALUATION AND OBSERVATION OF THE EXPOSED FORMATION AND STRUCTURE IS USED TO SELECT A FINAL ALCOVE LOCATION AND PHYSICAL TEST CONFIGURATION



TEST/ALCOVE LOCATION	TESTS TO BE LOCATED IN ALCOVE
1	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST
2	HYDROLOGIC PROPERTIES OF MAJOR FAULTS (BOV RIDGE FAULT) HYDROCHEMISTRY TEST IN-SITU TESTING OF SEAL COMPONENTS
3	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST PLATE LOADING TEST IN-SITU TESTING OF SEAL COMPONENTS
4	IN-SITU SEALS TEST
5	CONTACT TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST IN-SITU TESTING OF SEAL COMPONENTS
6	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST PLATE LOADING TEST DIFFUSION TEST
7	CONTACT TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST IN-SITU SEALS TEST
8 (ELIMINATED)	GEOMECHANICAL ATTRIBUTES OF WASTE PACKAGE ENVIRONMENT TEST REPOSITORY HORIZON NEAR-FIELD HYDROLOGIC PROPERTIES TEST
9	IN-SITU TESTING OF SEAL COMPONENTS
10	UPPER DEMONSTRATION BREAKOUT ROOM AREA OVERCORE STRESS EXPERIMENTS HEATER EXPERIMENT IN TSw1 PLATE LOADING TEST
11	ANISOTROPY TEST (RADIAL BOREHOLE TESTS) HYDROCHEMISTRY TEST
12	IN-SITU TESTING OF SEAL COMPONENTS
13	HYDROCHEMISTRY TEST IN-SITU TESTING OF SEAL COMPONENTS
14	EXCAVATION EFFECTS TEST
15	HYDROLOGIC PROPERTIES OF MAJOR FAULTS (DRILL HOLE WASH STRUCTURE) HYDROCHEMISTRY TEST

ALCOVE #8 HAS BEEN DELETED FROM THE ESF TESTING PROGRAM. ALCOVE #8 WAS TO BE 'GEOMECHANICAL ATTRIBUTES OF WASTE PACKAGE ENVIRONMENT TESTING AND A REPOSITORY HORIZON NEAR-FIELD HYDROLOGIC PROPERTIES TEST'

GENERAL NOTES:

NORTH PORTAL BOX CUT FACE AT CS 0+00

ALCOVE #1 APPROXIMATELY LOCATED AT CS 1+40

TWENTY FIVE HUNDRED FEET GRID. COORDINATES ARE BASED ON THE NEVADA STATE COORDINATE SYSTEM, CENTRAL ZONE.

DIMENSIONS AND ELEVATIONS ARE SHOWN IN METERS. METERS ARE ROUNDED TO ONE DECIMAL PLACE. WHERE DISCREPANCIES BETWEEN ELEVATIONS AND GRADIENTS OCCUR DUE TO ROUNDING, ELEVATIONS WILL GOVERN.

THE BASIS FOR THE TEST ALCOVE LOCATIONS IS THE ESF DR YMP/CC-0011 REV 5/31-91.

THE GEOLOGICAL STRUCTURAL FEATURES ARE BASED ON THE SAIC PRELIMINARY CROSS SECTION CC-CC, DATE 5/9-91.

ACTUAL TEST ALCOVES WILL BE LOCATED IN THE FIELD AS GEOLOGY IS REVEALED BY EXCAVATION. ALCOVE LOCATIONS SHOWN ARE APPROXIMATIONS.

AN AREA OF LENGTH TO BE DETERMINED BEHIND AN ADVANCING TBM WILL HAVE THE UTILITIES LOCATED IN A MANNER TO PERMIT OPTIMIZED MAPPING OF THE RAMP PERIMETER.

SEE CALCULATION ST-SA-001 FOR MAJOR COORDINATES AND VERTICAL CURVE DATA.

LEGEND

FAULT ZONE

RAMP CONFIGURATION

REFERENCE GRID

TEST LOCATION (CERTAIN) ●

TEST LOCATION (DEFERRED) ●

TEST LOCATION (IN REVIEW FOR DEFERRAL) ●

GRAPHIC SCALE

0 76.2 (250) 152.4 (500) 304.8 m (1000 FT)

PRELIMINARY DRAFT
INFORMATION ONLY

FOR REFERENCE DRAWINGS INDEX SEE DRAWING YMP-SDS-1-CIVL-GEOL

LOS ALAMOS NATIONAL LABORATORY
TEST COORDINATION OFFICE - YUCCA MOUNTAIN PROJECT

PROJECT: NORTH RAMP AND EXISTING/PROPOSED TEST LOCATION ILLUSTRATION

CAD FILE: NRMPOLD.DVG	AUTOCAD R12	SIZE: A	SCALE: NOTED	REVISION: A1
DRN. BY: D.J. WEAVER	APPROVED BY: ON FILE N.Z. ELKINS/R.D. OLIVER		DATE DRN: 12/30/93	
NOTES: ADMINISTRATIVE/ILLUSTRATIVE USE ONLY			PLOT DATE: 3/29/94	

ESF Coordinated Sampling

Types of Samples Collected

- **Samples Derived From Construction Activities**
  - Rock
  - Grout
  - Shotcrete
  - Construction Air
  - Water Used For Construction
  - Construction Fluids

  (Collected in Accordance with AP-6.26Q)

- **Non-Borehole Samples**
  - Tunnel Wall
  - Tunnel Invert
  - Muck
  - Hand & Bulk Geologic
  - Perched Water

  (Collected in Accordance with AP-6.26Q)

- **Borehole Samples**
  - Core
  - Cuttings
  - Rubble

  (Collected in Accordance with YLP-SII.2Q-SMF)

ESF North Ramp Starter Tunnel Alcove #1

Major Status Dates

Excavation of Starter Tunnel Begins	April 2, 1993
Excavation of Starter Tunnel is Completed (first 60 meters)	September 20, 1993
Construction of Alcove Begins	October 12, 1993
Construction of Alcove is Completed	January 24, 1994
Project Participant Occupies Alcove	January 26, 1994
Horizontal Drilling Begins for Project Participant	February 22, 1994
Project Participant Begins Borehole Testing in Alcove	March 2, 1994
Horizontal Drilling is Completed in Alcove (three, 30 meter boreholes)	March 22, 1994
Projected Duration of Borehole Testing in Alcove	Three to Five Years

Exploratory Studies Facility Plans and Records

ESF PLANS

- **Study Plans:**

  The objective of a study plan is to identify data parameters to be collected and provide a test strategy based on information available at the time of publication.

- **Test Planning Packages:**

  The objective of a test planning package is to capture high level detail test planning based on study plans and current information.

- **Work Plans:**

  The objective of a work plan is to integrate field operations and interactions required to conduct a test, consistent with requirements and controls established in design requirements documents and Test Planning Packages.

ESF Records

- **Records:**

  The objective of records is to assure that all field test activities are documented and those records are incorporated into the Yucca Mountain Project archives and data sets.