SUMMARY OF U.S. NUCLEAR REGULATORY COMMISSION AND
U.S. DEPARTMENT OF ENERGY MEETING ON
THE EXPLORATORY STUDIES FACILITY

On December 8, 1993, representatives of the Nuclear Regulatory Commission, U.S. Department of Energy (DOE), State of Nevada Nuclear Waste Project Office and Nye County participated in a meeting on the exploratory studies facility (ESF). The purpose of the meeting was to discuss DOE activities related to the ESF design and design control process. Attendees also heard a summary of topics discussed at the October 4-5, 1993, DOE/NRC technical exchange on the ESF, including discussion of the proposed ESF enhanced design and future ESF concepts. The list of attendees is Attachment 1 to this summary. Copies of presenters handouts are included in Attachment 2.

Presenters representing DOE included staff from the DOE Yucca Mountain Project Office and the Civilian Radioactive Waste Management System Management and Operating Contractor (M&O). Presentations focused on current ESF design efforts and the design control process, the process for DOE acceptance of the ESF, and status of ESF construction. DOE representatives also discussed the process by which DOE will keep NRC informed of ESF progress and design changes, including the transmittal of design review packages two weeks prior to ESF 50% and 90% design reviews.

In the closing comments, NRC and State of Nevada representatives noted that they were pleased with the information provided prior to and at the meeting. The State of Nevada, Nye County and NRC representatives stated that DOE appears to be making progress in responding to concerns stated in the NRC letter of August 20, 1993. NRC staff noted that its review of DOE's response to that letter is in preparation. The staff also noted that the Site Characterization Program Baseline document, that contains the objectives and descriptions of the site characterization program, contains editorial inconsistencies and should be revised. NRC will review the preliminary design packages provided by DOE prior to all design reviews. Because of limited resources, the staff's review will not constitute an acceptance review. The NRC noted that DOE's corrective actions program appears good, but the staff will need to observe implementation of that program through participation as observers to DOE audits. A copy of the current Q-list from DOE was also requested by the staff.

The State of Nevada representative stated that the meeting assisted in a better understanding of the design and design control process, but he is still uncertain of many details of the process and posed some suggestions for agenda items for the regularly scheduled meeting in February or May. The State representative also asked for a future briefing on the decision process for the enhanced design, to include information on the rationale for, and documentation of, design decisions and who was involved in those decisions. Based on limited resources, the State representative commented, it will have only one individual in attendance at ESF meetings; therefore, comments made at these meetings will not necessarily constitute all of the State's concerns.

DOE representatives stated that an audit of the design improvement process is scheduled for April. Following that announcement, the meeting was adjourned with the next regularly scheduled meeting set for February 9, 1994.

Charlotte Abrams 1/4/94

Charlotte Abrams, Sr. Proj. Mgr.
Repository Licensing and Quality
Division of High-Level Waste
Management
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission

Christian E. Einberg 1/5/94

Christian Einberg
Regulatory Integration Branch
Office of Civilian Radioactive
Waste Management
U.S. Department of Energy

Attachment 1

December 8, 1993

DOE/NRC Technical Meeting
Exploratory Studies Facility Update

Sign In Log

PRINT NAME	SIGNATURE	ORGANIZATION	PHONE NO.
Steve LeRoy	Steven E. LeRoy	M&O/Duke	702-794-7836
Ron Ballard	Ronald L Ballard	NRC/HLWM	301-504-3462
Mark Senderling	M Senderling	DOE-NV-321	(202)586-2279
Daniel Dresser	D Dresser	Weston	202 646 6781
Keith McConnell	K. D. McConnell	NRC	301 504-2532
W.P. LAHN	W P Lahn	M&O/TRW	703-204-8812
Raymond Mele	Raymond Mele	M&O/WCFS	202 488 2321
BANAD JAHANNATH	Banad Jahannath	NRC	301-504 2593
John P Roberts	John P Roberts	DOE (RW-33)	202 589-9896
Rose MARTINEZ	R. Martinez	NWTRB	703 235 4473
Ray Wallace	Raymond Wallace	USGS/HQ	(202) 586-1244
Dan ZERGA	Dan Zerga	WESTON	(202) 646-6690.
Bakr Ibrahim	B.I.	NRC	(301) 504-2523
P.M. Neighbors	P.M. Neighbors	Nevada	(702) 482 6284
TED PETRIC	Edgar H Peterson	DOE-YMP	702 794-7961
JACK SPRAUL	J. Sprael	NRC-QA	305 504-2446
Thomas Dyerstedt	Thomas Dyerstedt	DOE/YMP	702-794-7590
Bill BELKE		NRC	301-504-2445
T. Arul MOZHI	T. Arul Mozhi	WESTON	(202) 646-6746 -
JIM YORK	Jim York	Weston	202-646-6650
JOHN TRAPP	John S. Trapp	NRC	301-504-2509
C.W. Reamer	C.W. Reamer	NRC	301-504-3391

December 8, 1993

DOE/NRC Technical Meeting
Exploratory Studies Facility Update

Sign In Log

PRINT NAME	SIGNATURE	ORGANIZATION	PHONE NO.
Shiann-Jang Chern	Shiann-Jang Chern	US NRC	301-504-2537
WILLIAM BOYLE	William Boyle	US NRC	301 504 2547
Chris Einberg	Chris E Eb	DOE/HQ	202/586-8869
TRIEU TRUONG	Trieu Truong	DOE/HQ	202/586-4957
Steve Smith	Steve Smith	Nye County, NV	703/516-2504
Charlotte Abrams	Charlotte Abrams	US NRC	(301) 504-3403
Sam HORTON	Sam Horton	QA T&S	(702)-794-7399
PAMB. MURTHY		DOE/HQ	202-586-1239
James R. Wells		M&O	703-204-8721
CARL JOHNSON		NWMO	702 687-3744
JIM [illegible]		DOE/YMP	702 794 7929
KEITH ROBERTS		M&O/TRW	702-794-1952
Robert M. Sandifer		M&O/TRW	702-794-1869

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

INTRODUCTORY REMARKS

PRESENTED BY

EDGAR H. PETRIE
DEPUTY DIRECTOR

DECEMBER 8,1993
WASHINGTON, D.C.

AGENDA
DOE-NRC TECHNICAL MEETING ON EXPLORATORY STUDIES FACILITY

December 8, 1993

8:00	Opening Remarks	DOE, NRC, State, Counties, Affected Parties
8:15	Introduction	DOE
8:25	Overview of topics from October 1993 DOE-NRC TE	
	- Baseline Control Process	DOE (Petrie-YMP)
	- Scientific Investigations Control	
9:15	- Design Construction Process	DOE (Sandifer-M&O)
	- M&O Improvement Plan	
10:00	BREAK	
10:15	Design Status/Update	
	- ESF Enhancement	DOE (Sandifer-M&O)
11:00	- ESF Design and Construction Progress	DOE (Roberts-M&O)
11:30	Keeping NRC Informed of ESF Design Changes	DOE (Petrie-YMP)
12:00	LUNCH	
1:15	Process for DOE Acceptance of ESF	DOE (Roberts-M&O)
1:45	Selected Items From NRC's October 1, 1993 Letter	DOE (Sandifer-M&O)
	- DIEs, Modeling, Design Conservatism, and Implementation of Design	
	- Appendix 7 Meeting on October 6, 1993	
2:30	State of Nevada Comments	State
3:00	BREAK	
3:10	Other Comments	Counties/Affected Parties
3:40	NRC Comments	NRC
4:20	Closing Remarks	DOE, NRC, State, Counties/Affected Parties
5:00	ADJOURN	

NOTE: Each topic on the agenda includes time allotted for discussion.

EXPECTED MEETING RESULTS

DOE will communicate

- Baseline management process
- Scientific investigations process and integration with design
- Present ESF design and construction status
- In process changes
- DOE construction acceptance
- Selected items from NRC's October 1, 1993 letter as discussed at the DOE-NRC Appendix 7 meeting on October 6, 1993

U.S. DEPARTMENT OF ENERGY

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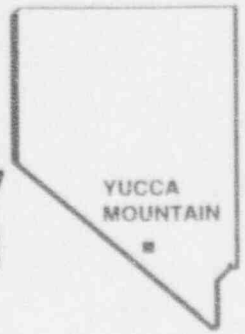


YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

MANAGEMENT OF THE PROJECT BASELINE

PRESENTED BY

EDGAR H. PETRIE
DEPUTY DIRECTOR

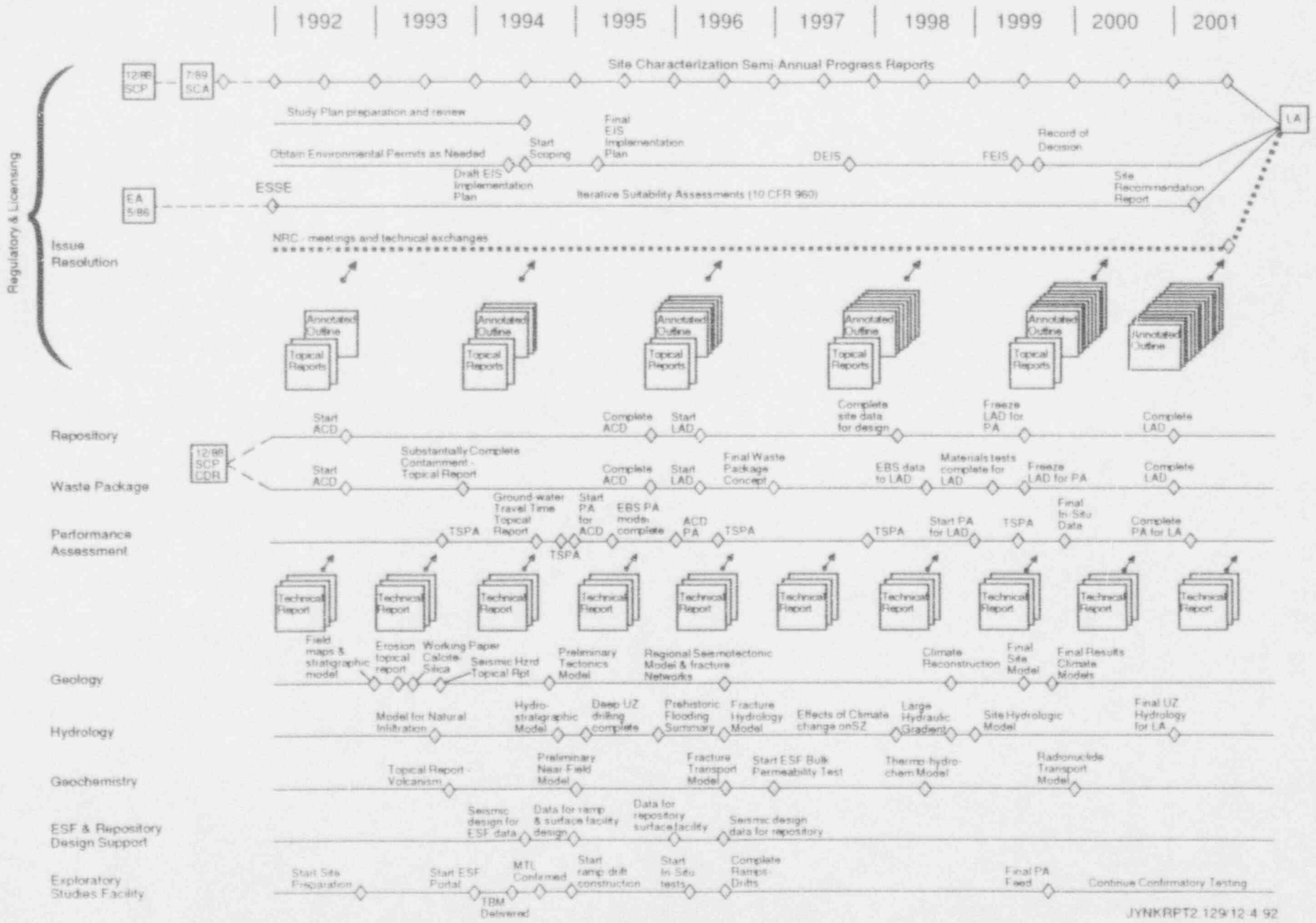
2

DECEMBER 8,1993
WASHINGTON, D.C.

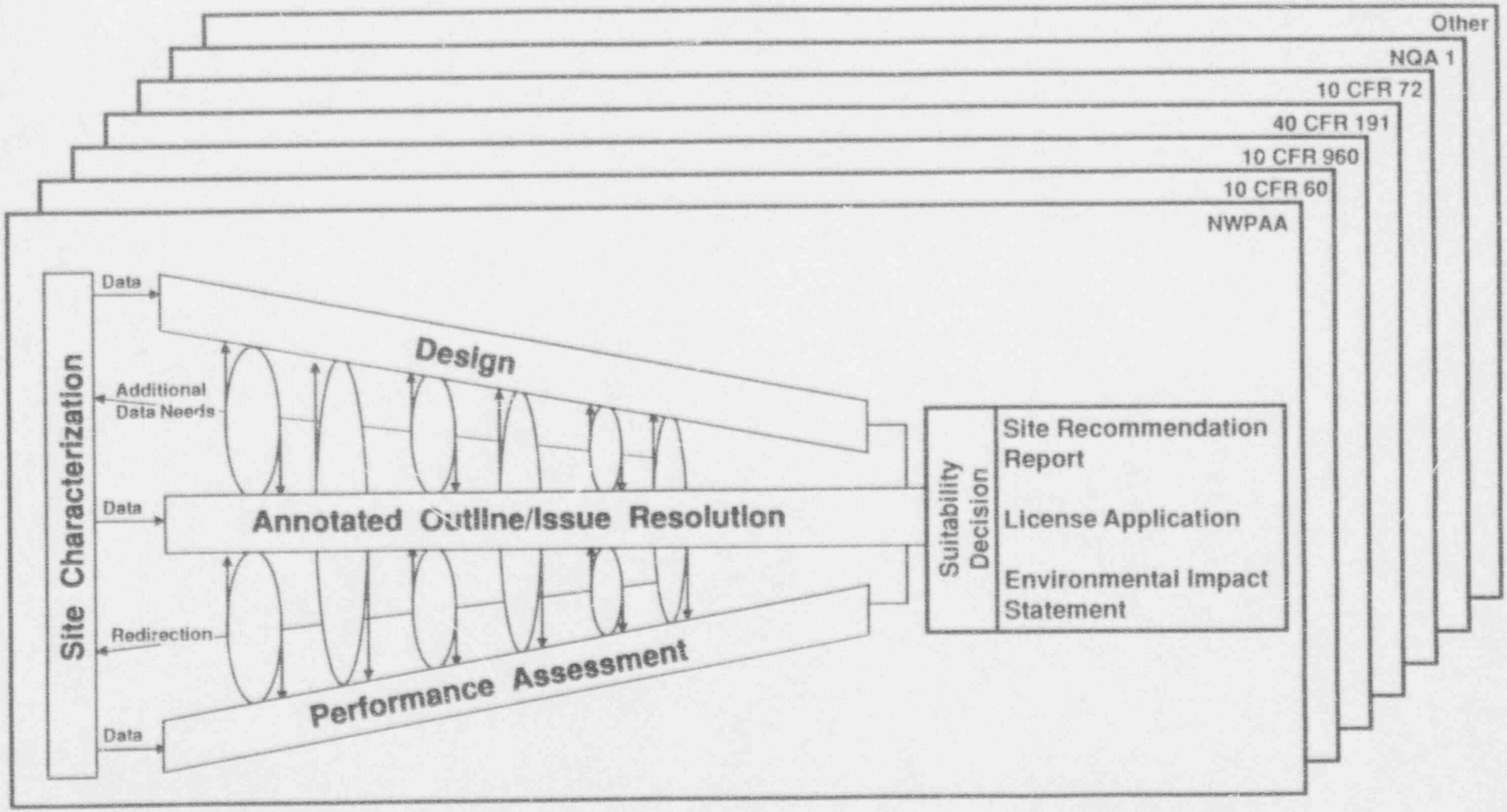
OVERVIEW

- What is the overall concept for managing the Site Characterization Program?
- What are the applicable requirements?
- What parts of the Program need to be controlled and what is the Technical Baseline?
- How important is quality assurance at this phase of site characterization?
- What process is being used to conduct and control site characterization testing and design?

SITE CHARACTERIZATION PHASE OF MGDS PROGRAM



MANAGING CONVERGENCE



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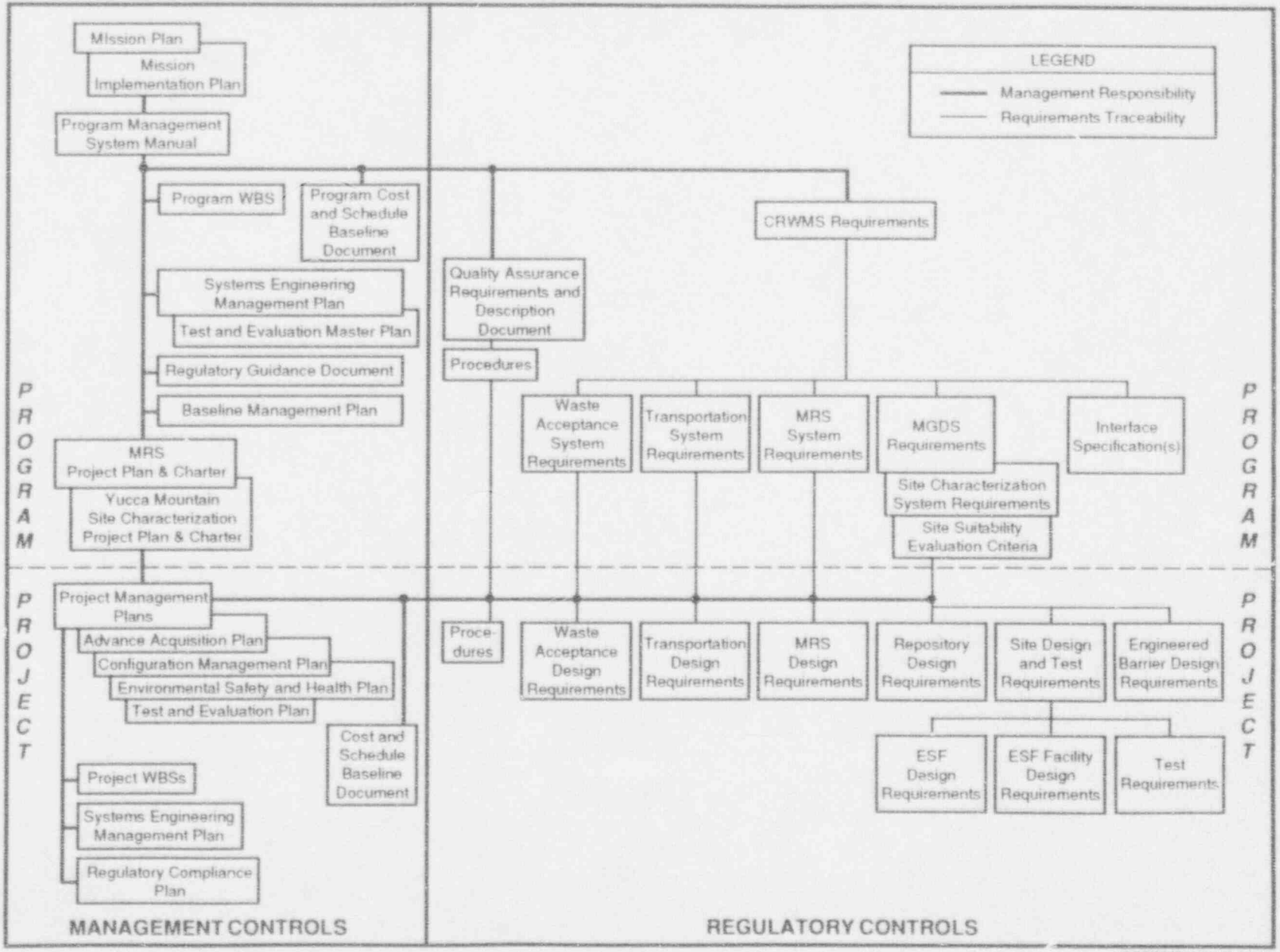
OCRWM DOCUMENT HIERARCHY



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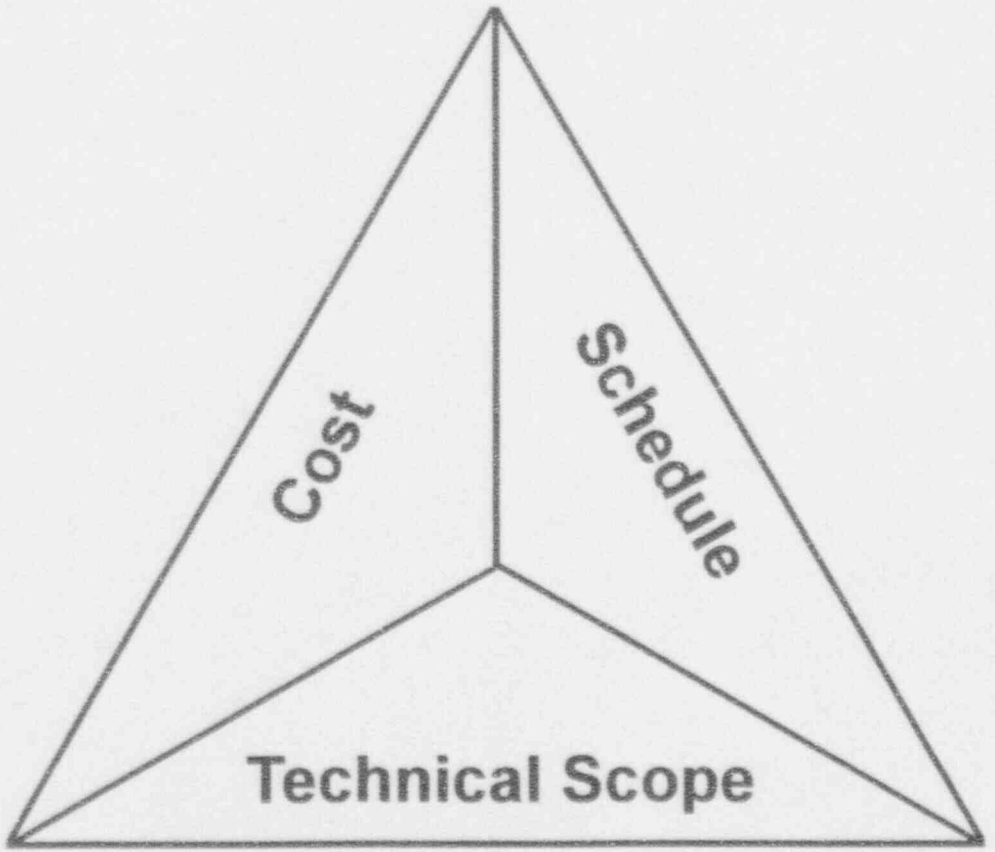
What parts of the Program need to be controlled and what is the Technical Baseline?

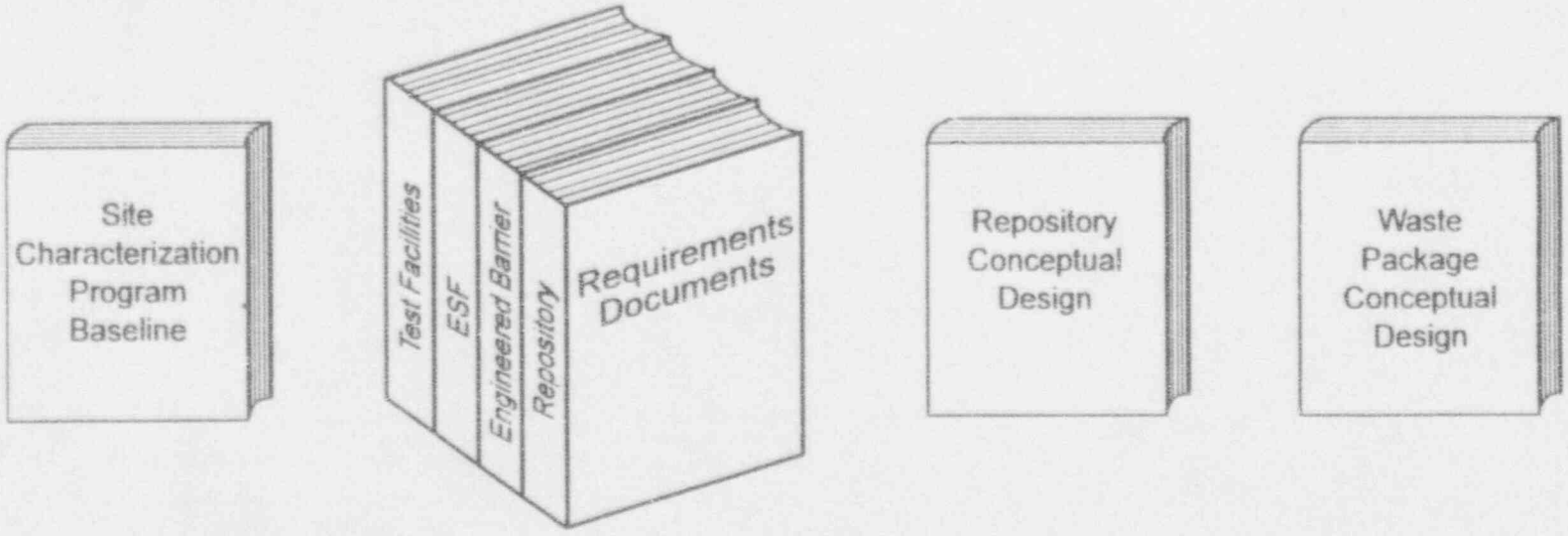
ELEMENTS OF THE BASELINE



What is the Technical Baseline?

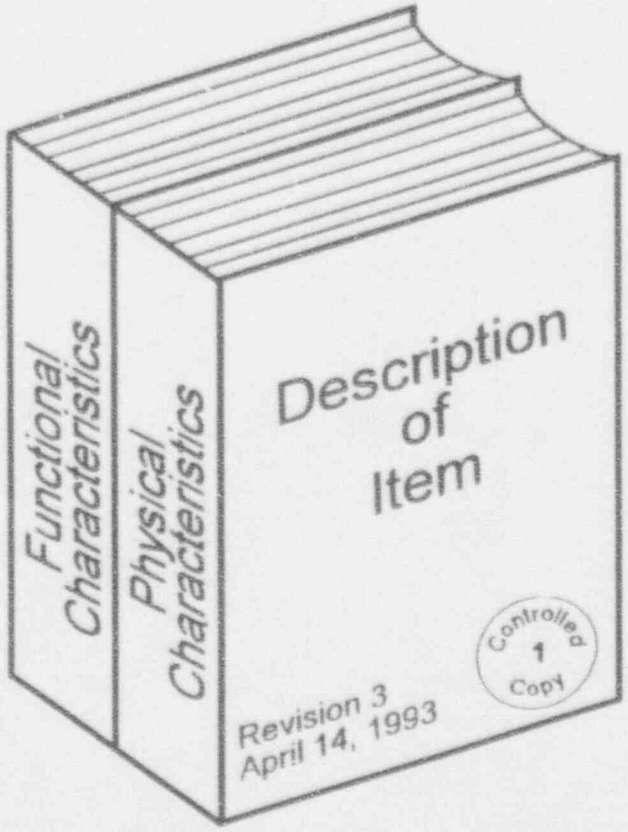
The set of documents systematically developed and formally approved that contain the

- **Objectives of the site characterization program**
- **Descriptions of the engineered system designs**
- **Requirements placed on the engineered and natural systems**



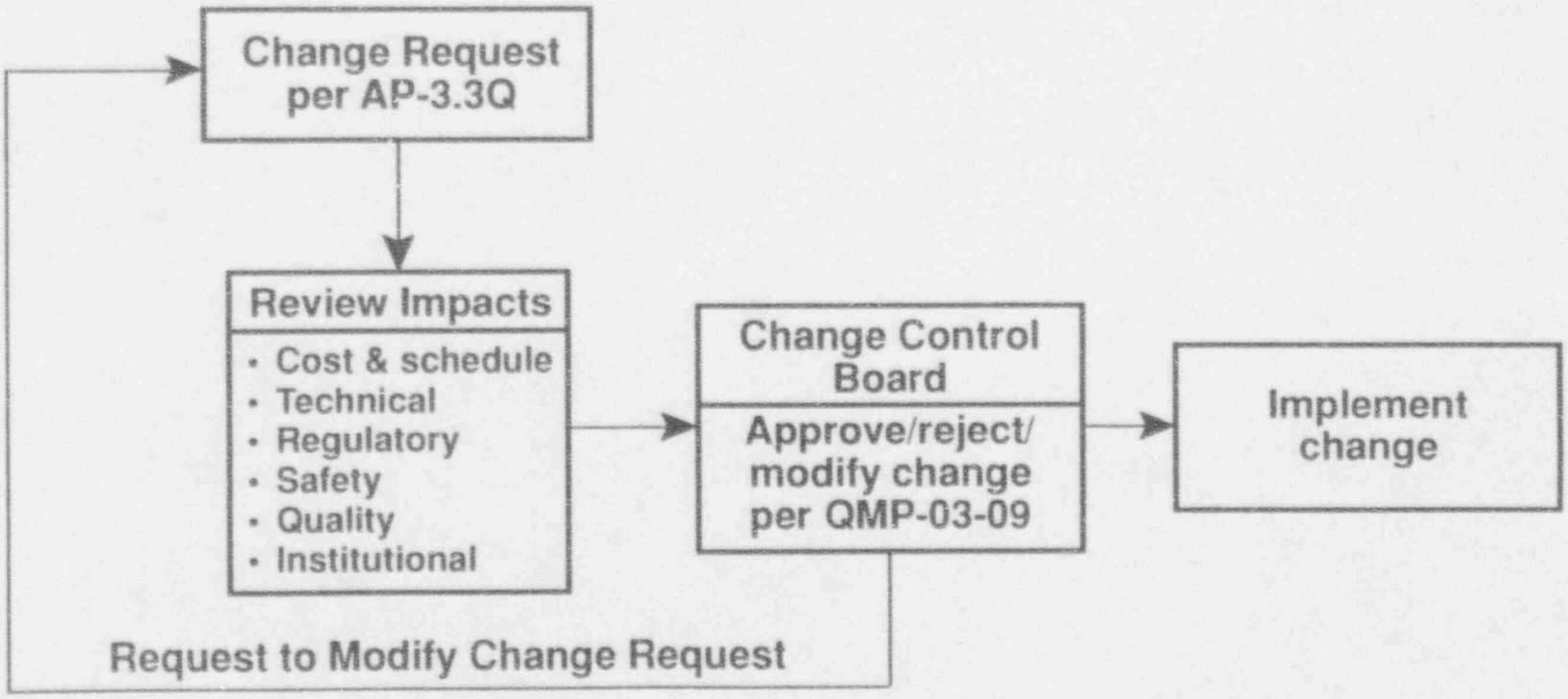
HOW IS THE TECHNICAL BASELINE CONTROLLED?

Configuration Management and Change Control



- Identify and document the functional and physical characteristics of the item to be controlled
- Make changes only through a controlled review-and-approval process
- Record and report status of changes

CHANGE CONTROL PROCESS



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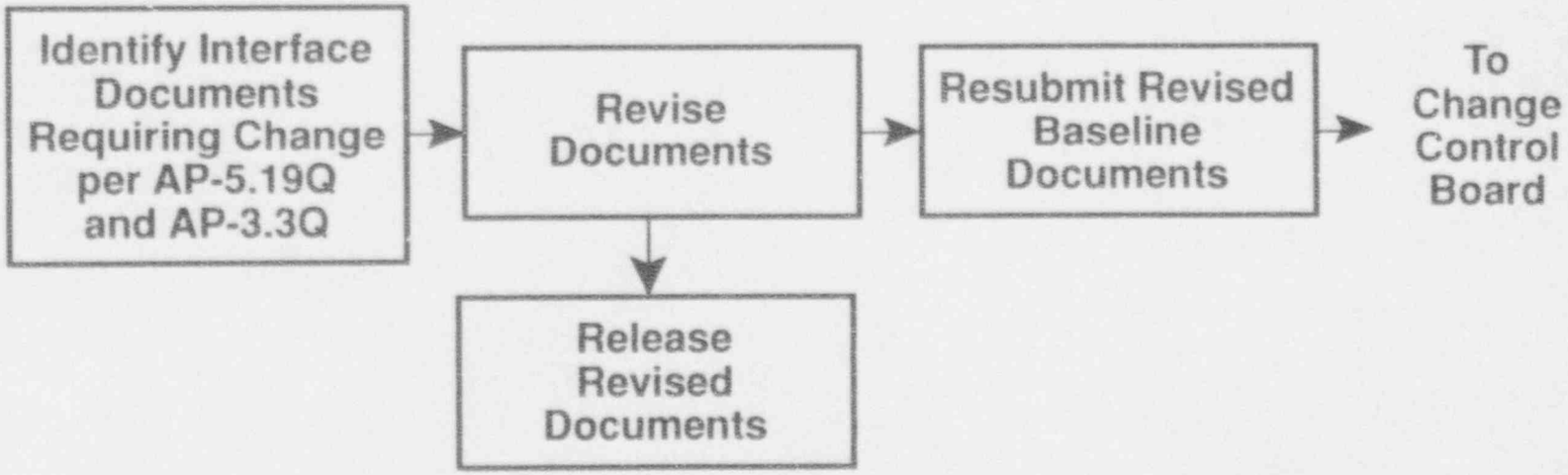
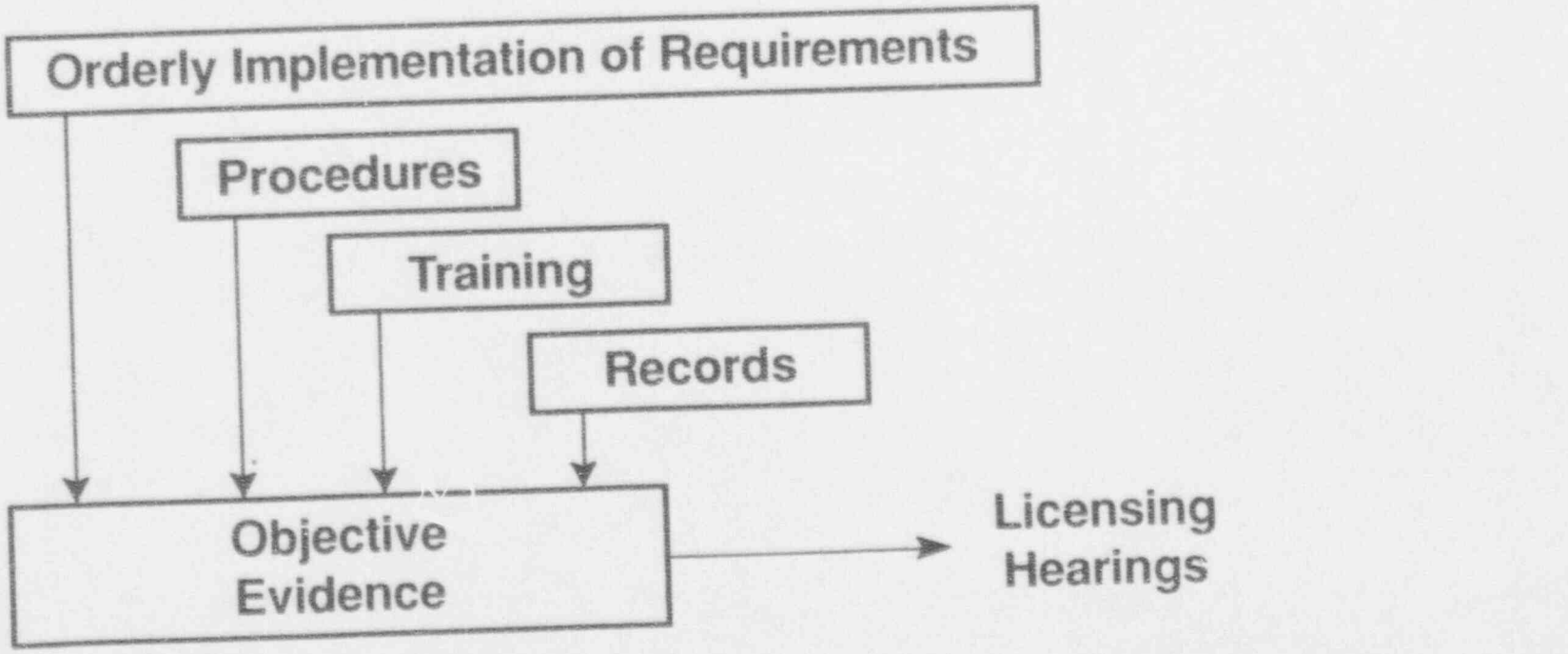
IMPLEMENTING THE CHANGE

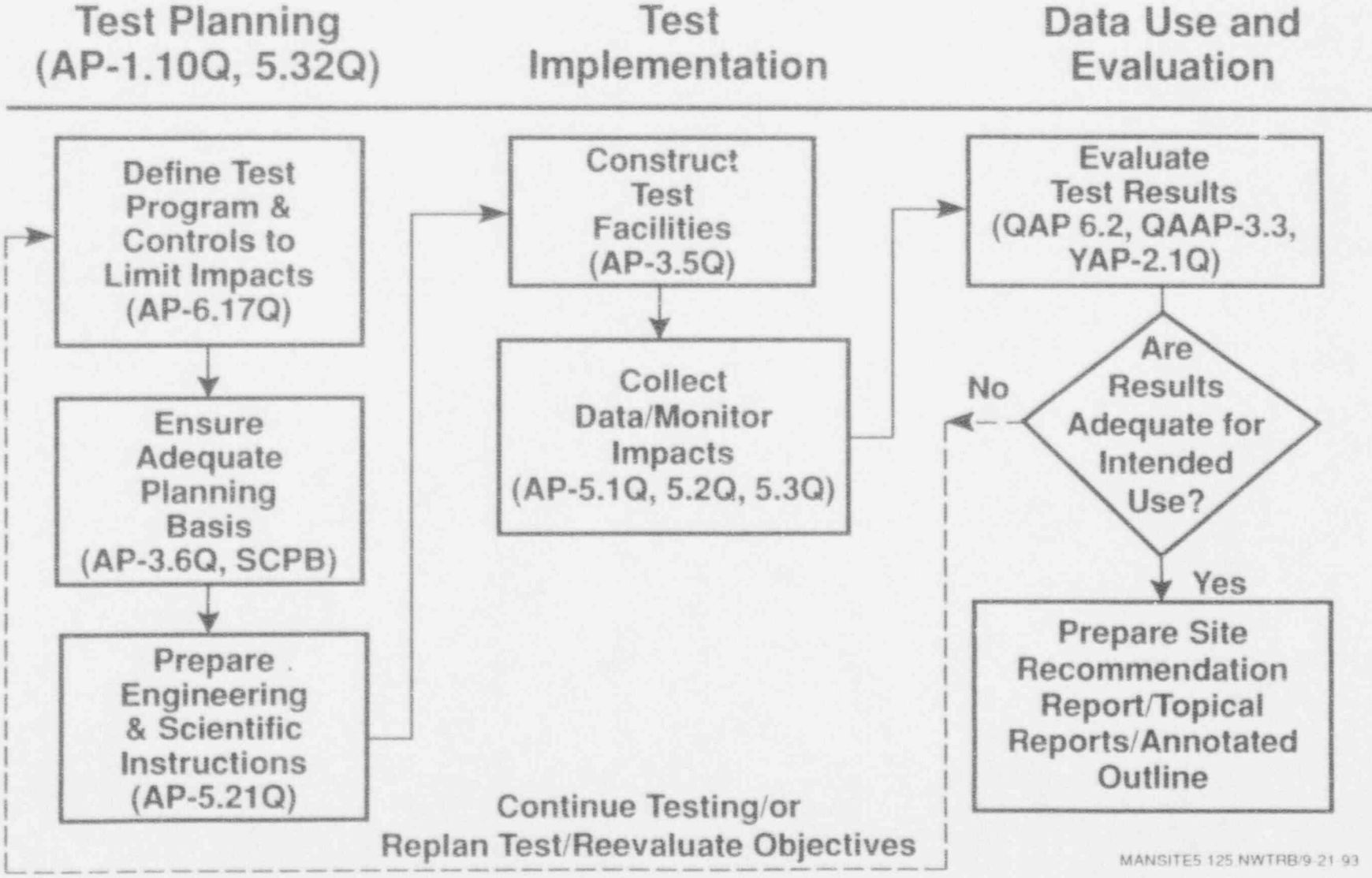


HOW IMPORTANT IS QA AT THIS PHASE OF SITE CHARACTERIZATION?

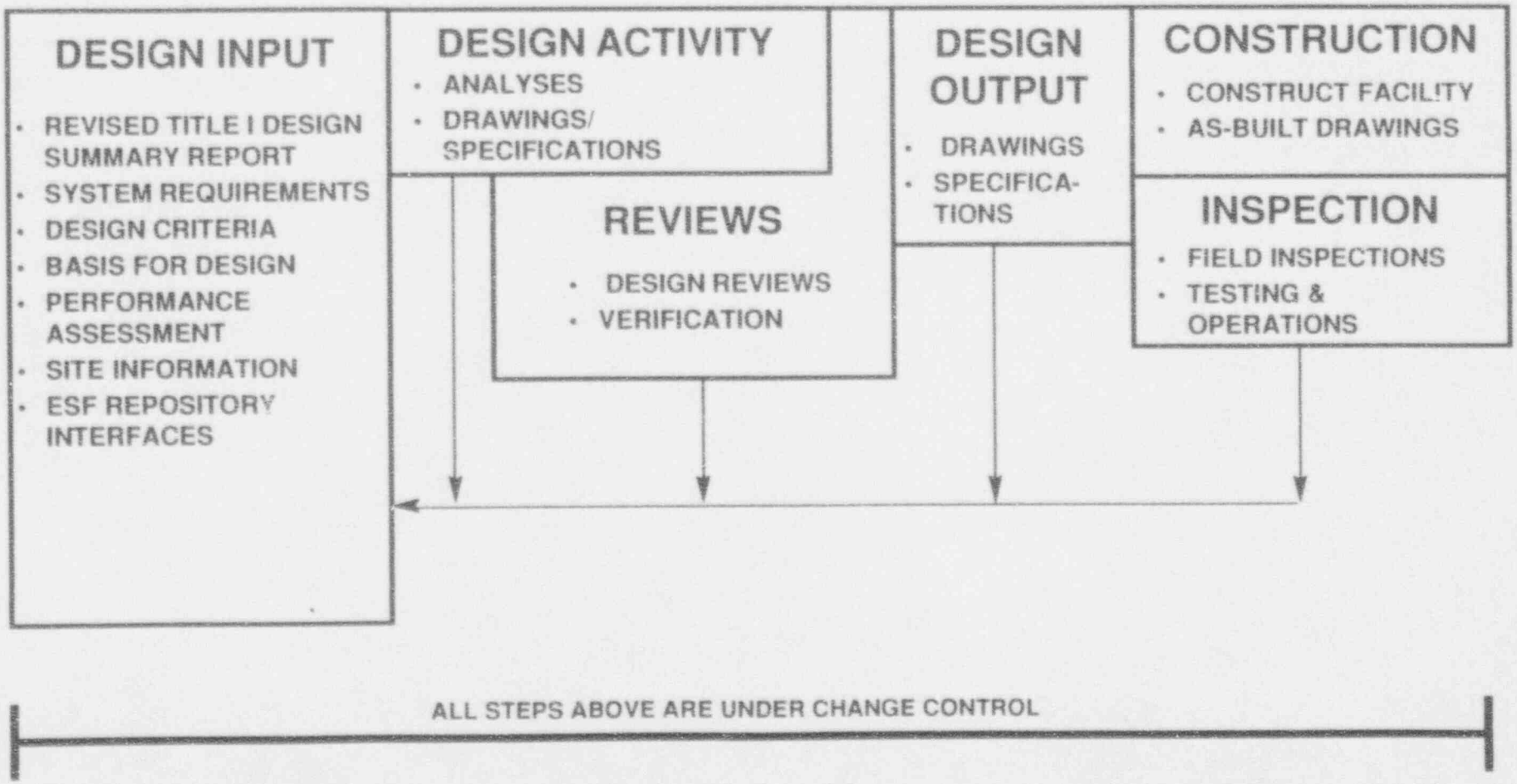
NRC requires a nuclear QA program be in place during the site characterization phase of the repository program



WHAT PROCESS IS BEING USED TO PLAN, IMPLEMENT, AND EVALUATE TESTING?



ESF TITLE II DESIGN PROCESS



CHNESFP35 DOE BLANCH/10-4-93

SUMMARY OF DOE PROCESS

- DOE has an established baseline, and it is continually being updated
- Program must be executed in a controlled environment
  - Quality assurance
  - Configuration management
  - Change control
- Management process in place to plan, implement and evaluate site characterization testing and design program

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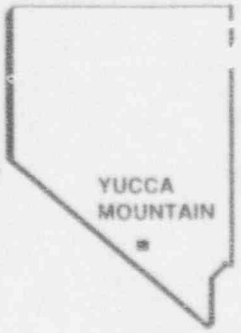


YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

KEEPING THE NRC INFORMED OF ESF DESIGN CHANGES

9

PRESENTED BY

EDGAR H. PETRIE
DEPUTY DIRECTOR

DECEMBER 8,1993
WASHINGTON, D.C.

DOE WILL KEEP NRC INFORMED OF ESF DESIGN CHANGES AS FOLLOWS

- Progress Report will be updated with ESF progress
- Revisions to SCPB will be submitted to NRC in the form of a revised document
- Continue telephone communications with NRC's engineering section per DOE-NRC Procedural and Site-Specific Agreements
- Continue bi-monthly ESF meetings with NRC
- Continued NRC participation in ESF design reviews

DOE ESF DESIGN REVIEW

DOE holds major design reviews at the 50% and 90% points of the design. Packages will be mailed approximately two weeks prior to the design review meeting

Day 1	Mail design package to reviewers containing overview and instructions for reviewing the package
Day 2-14	Reviewers familiarize themselves with package
Day 15-17	Design review meeting - Complete review of package and process (1 day) - Formal presentation of package (2 days)
Day 17-20	Reviewers submit comments
Day 17-31	Responses to comments prepared - Prepare redlines to documents as needed
Day 31	Responses transmitted to reviewers
Day 31-38	Reviewers review modified documents and responses
Day 38-39	Comment resolution meeting, if needed

This process implements QAP 3-14, Technical and Management Reviews. The comment resolution process is conducted per QAP 3-1, Technical Document Reviews.
Note: The times above are typical

OBSERVER PARTICIPATION IN ESF DESIGN REVIEWS

- Day 1 — Design packages to observers (NRC, State, NWTRB, Counties)
- Day 2-14 — Observers review package
- Day 15-17 — Design review meeting
- Day 17 — Observations due (Observers provide to M&O observer liaison)
- Day 17-31 — Prepare responses to observations
- Day 31 — Discuss responses with observers
- Day 38-39 — Observers attend comment resolution meeting at their discretion

Note: Observations may relate to the process or the technical content

LIST OF DESIGN REVIEWS

Date	Subject
6/9/88	Title I 50% Technical Assessment Review
8/8/88	Title I 90% Technical Assessment Review
6/17/91	North Access Independent Technical Review of Design Study to Revise Title I DSR
8/12/91	South Access Independent Technical Review of Design Study to Revise Title I DSR
3/30/92	Package 1A Title II Design 50% Independent Technical Review
7/27/92	Package 1A Title II Design 90% Independent Technical Review
8/17/92	Design Verification for Design Package 1A Highwall and Starter Tunnel with Classification Analyses
4/12/93	Package 1B Title II Design 50% Independent Technical Review
4/19/93	Package 2A Title II Design 50% Independent Technical Review
7/19/93	Package 2A Title II Design 90% Independent Technical Review
8/2/93	Package 1B Title II Design 90% Independent Technical Review

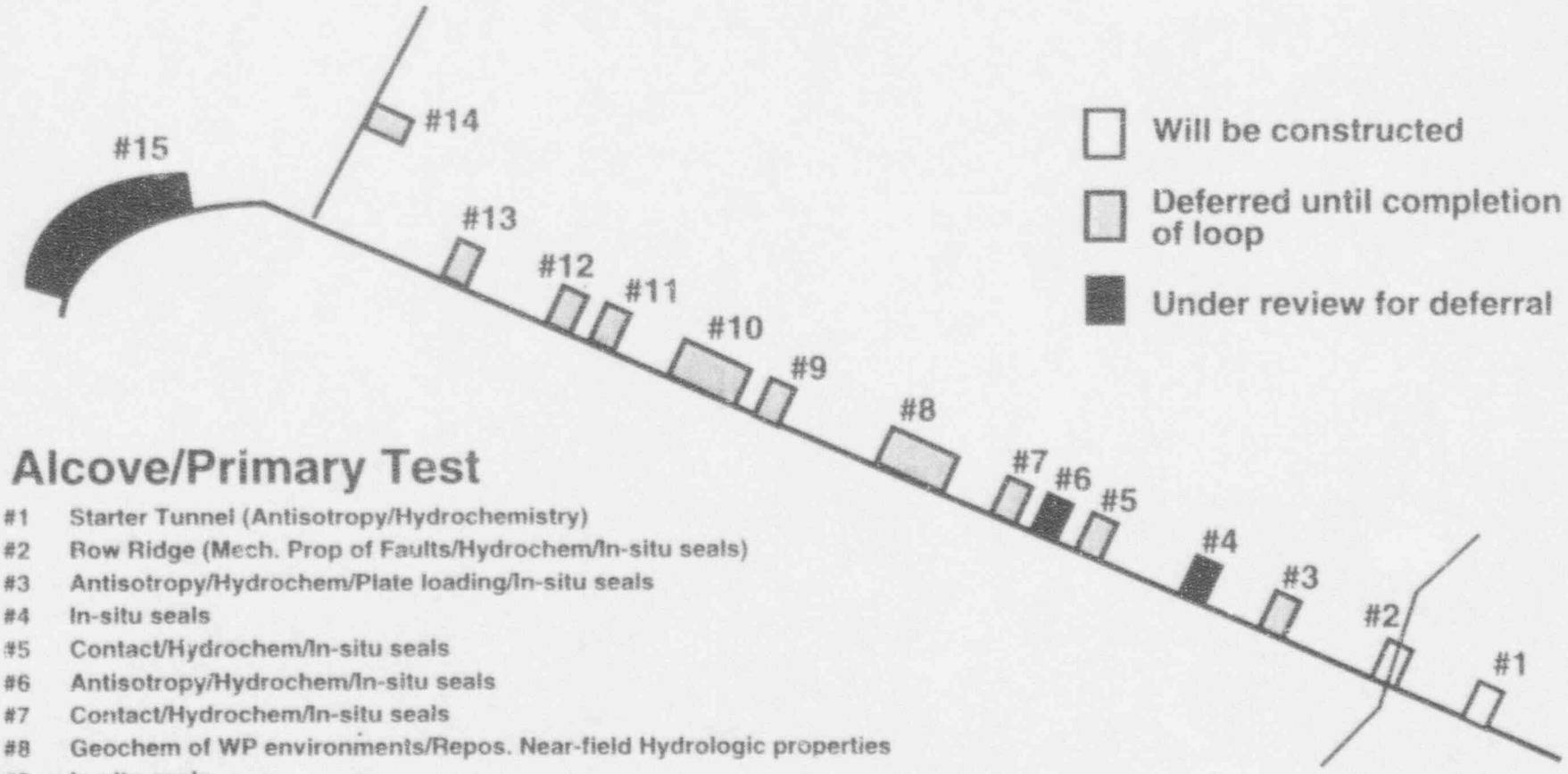
PROGRESS REPORT #9 INFORMATION

- Summary of changes reported in previous PRs
- Baseline changes (4 to 2 TBM)
- Content of Package 1A, 1B, 1C, 1D, 2B, 2C
- Proposed enhancement to current ESF configuration
  - Factors contributing to proposed enhancement
  - Descriptions of current concepts and proposed enhancement
  - Description of enhanced ESF
  - Advantages of enhancement
- ESF construction progress

CONSIDERATIONS IN-PROCESS

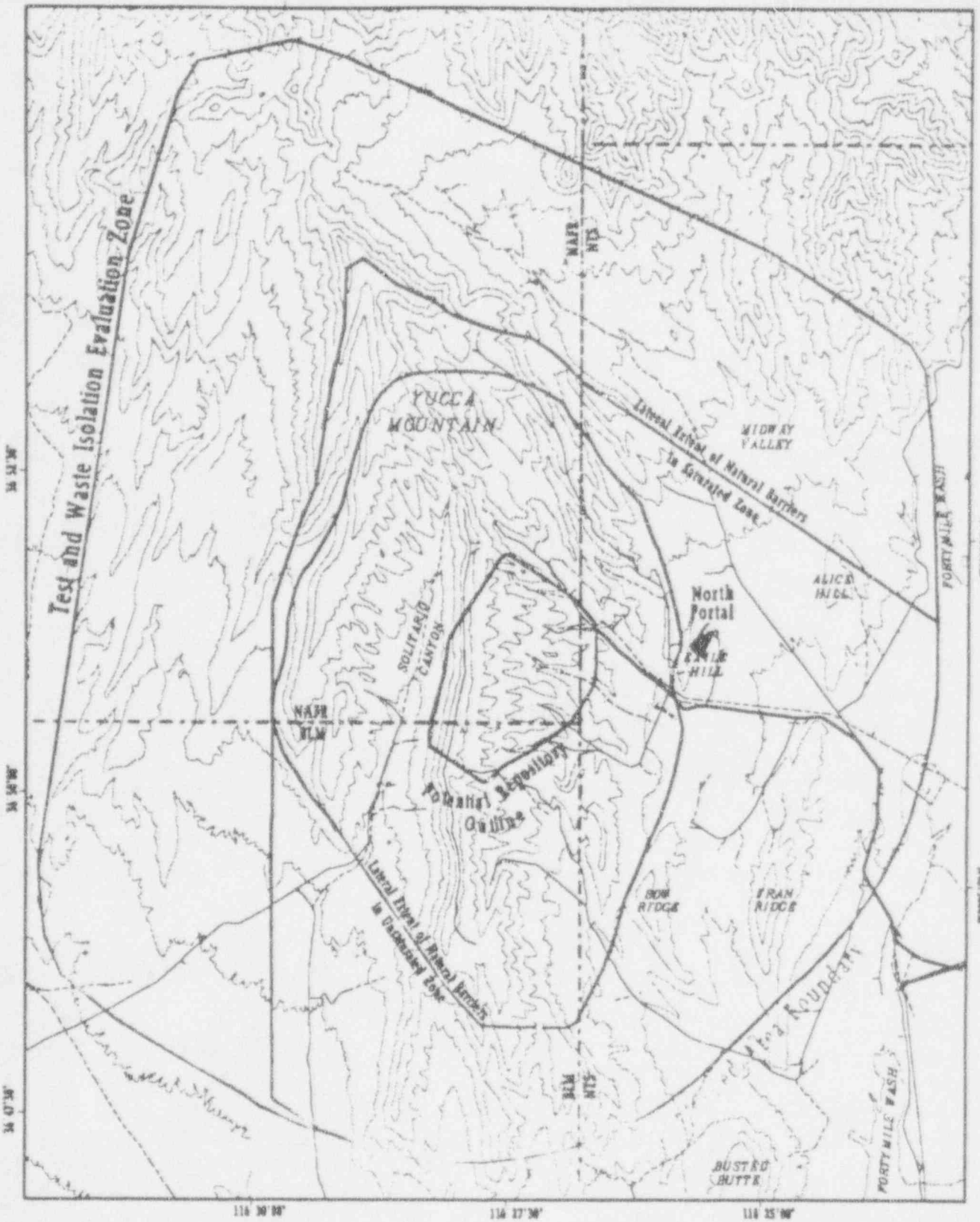
- Rubber tire vs. rail vehicles
- Electric vs. diesel power
- Portal design
- Muck storage location
- Pad expansion (total area of 6.57 hectares)
- 69kV vs. 138kV power source

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



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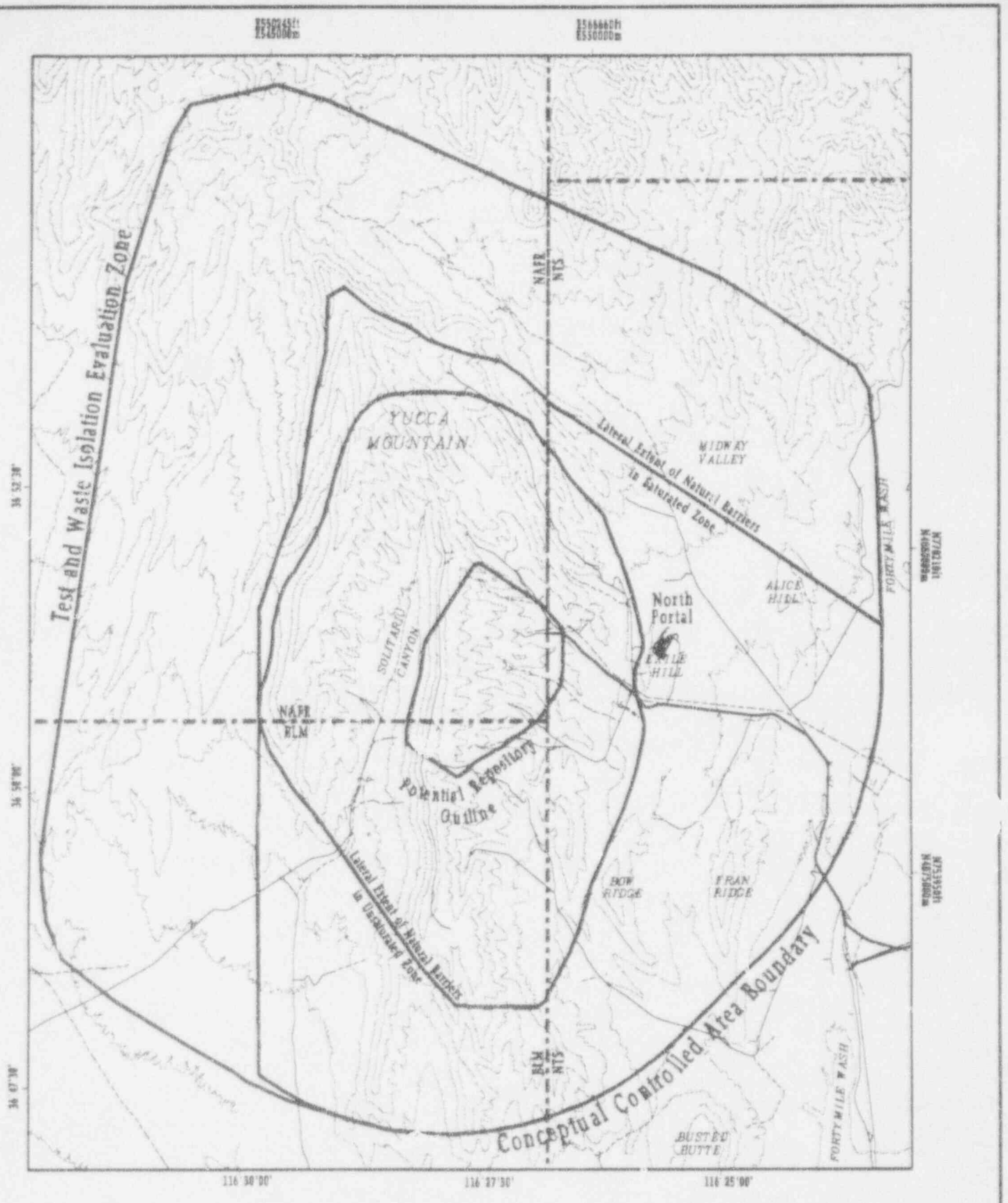
Contour Interval 200 Feet

YUCCA MOUNTAIN
SITE CHARACTERIZATION PROJECT
LATERAL EXTENT OF NATURAL BARRIERS

EG&G YMP-93-331.0



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SITE CHARACTERIZATION PROJECT
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YUCCA MOUNTAIN
SITE CHARACTERIZATION PROJECT
NORTH PORTAL

EG&G YMP-93-332.1

THE FOLLOWING BACKGROUND MATERIALS ARE PROVIDED FOR INFORMATION

NRC/OCRWM COMMUNICATIONS

Site Characterization Plan (SCP)

- Established plan for scientific investigations
- Presented conceptual designs of repository, waste package, and ESF
- Was accepted by NRC staff with comments

Semi-annual Site Characterization Progress Report (PR) [Required by NWPA, Section 113 (b)(3) and 10 CFR 60.18 (g)]

- Progress of Site Characterization Activities and Changes to SCP
- Includes ESF Activities
  - PR No. 1, section 2.1.2
  - PR No. 2, section 2.1.2
  - PR No. 3, section 2.1.2
  - PR No. 4, section 2.1.2 and 2.1.10
  - PR No. 5, section 2.1.2 and 2.1.10
  - PR No. 6, section 2.1.2 and 2.1.9
  - PR No. 7, section 2.1.2 and 2.1.8
  - PR No. 8, section 2.1.2 and 2.1.8

NRC/OCRWM COMMUNICATIONS

(CONTINUED)

Site Characterization Program Baseline (SCPB)

- Identifies DOE's baselined Site Characterization Program
- Provides means to demonstrate traceability of changes to the baseline
- ESF described in section 8.4
- Revision No. 9 submitted to NRC March 1993

Direct Transmittals to NRC

- Plan for Phased Approach to ESF Design, Development, and Implementation - December 1991
- ESF Alternate Studies: Final Report - March 1992
- ESF Design Requirements - October 1993
- ESF Technical Baseline - May 1993

NRC/OCRWM COMMUNICATIONS

(CONTINUED)

NRC On-Site Representatives (or)

- Periodic meetings with Engineering and Development Division Deputy Director on status of:
  - ESF Design / Design Changes
  - ESF Design Controls
  - ESF Construction
- Open Door Policy

NRC/OCRWM COMMUNICATIONS

(CONTINUED)

Technical Exchanges (TE)/Site Visits/Meetings

- Conducted for DOE-NRC Technical/Licensing Staff
- Promote Mutual Understanding of Topics
- Interactions related to ESF
  - 10/93 TE on ESF Design & Design Control
  - 09/93 Management Meeting on NRC concerns relative to ESF
  - 05/93 Site Visit on ESF Construction Status/Progress/Mapping
  - 09/92 Site Visit on Midway Valley Studies
  - 09/91 TE on ESF Design Control Status
  - 01/91 TE on ESF Alternatives Studies
  - 04/90 TE on ESF Alternatives
  - 10/89 TE on 10 CFR Part 60 Flow Down and Integration with repository

NRC/OCRWM COMMUNICATIONS

(CONTINUED)

- Interactions related to ESF (continued)
  - 07/89 TE on Design Control Process
  - 12/88 Meeting on Design Control Process
  - 11/88 Meeting on Design Control Process
  - 10/88 Meeting on ESF Open Items
  - 09/87 Appendix 7 Meeting on ESF Design Studies
  - 09/85 Appendix 7 Meeting on ESF Test Plan
  - 08/85 Meeting on ESF Design
  - 07/85 Meeting on ESF Design

DOE-NRC Technical Meeting

On

Exploratory Studies Facility

Process for DOE Acceptance of the ESF

10

Keith W. Roberts
Washington, D.C.
December 8, 1993

B&W Fuel Company
Duke Engineering & Services, Inc.
Fluor Daniel, Inc.

INTERA Inc.
JK Research Associates, Inc.
E. R. Johnson Associates, Inc.

Logicon RDA
Morrison Knudsen Corporation
Woodward-Clyde Federal Services

Issue

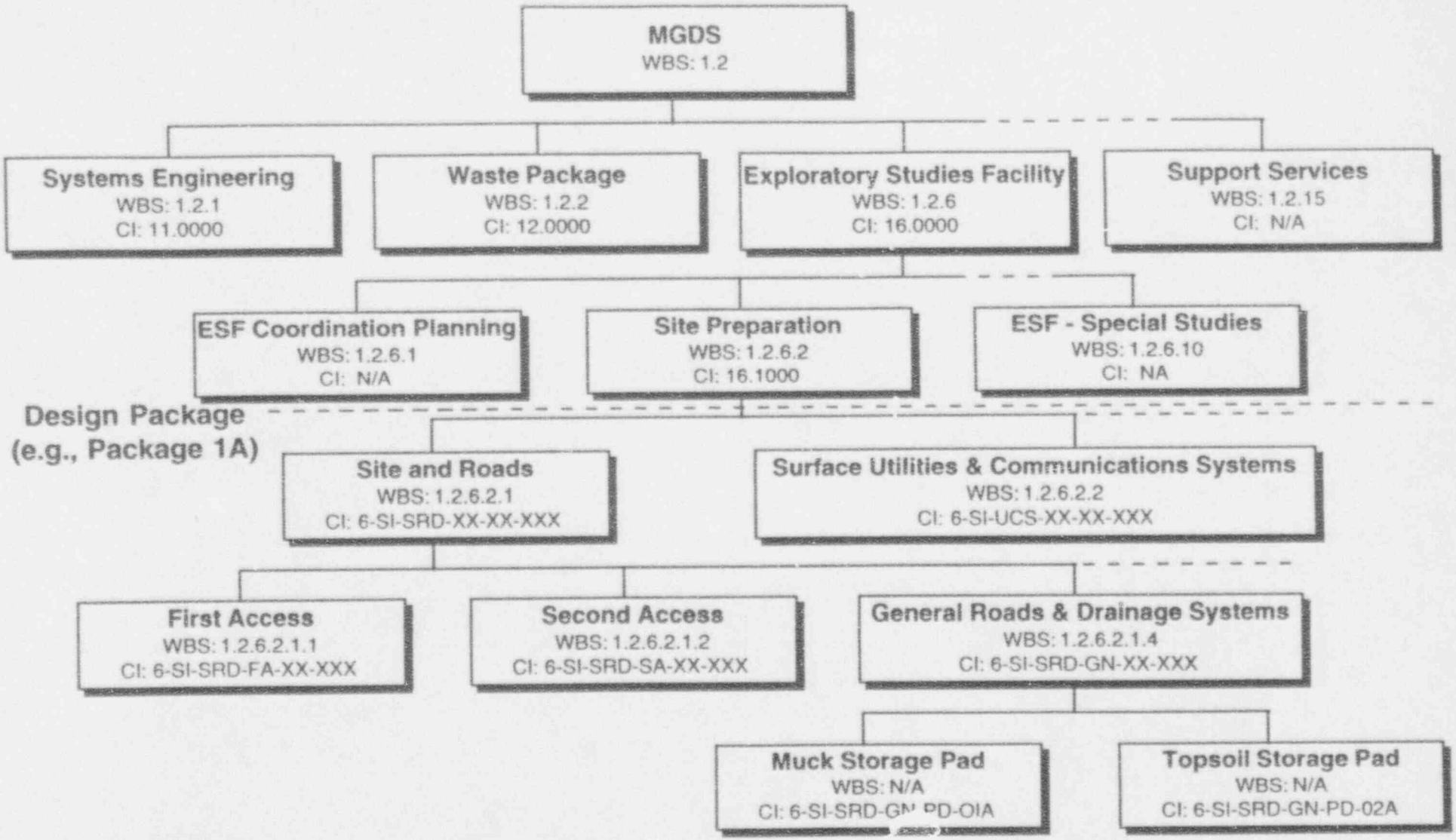
Method required to formally inspect and accept completed ESF Configuration Items through a documented and controlled process that provides objective evidence of completion and traceability to accepted designs.

Process

Procedire YAP 6.1Q, *Final Inspection and Acceptance of Configuration Items*, in development to define the criteria, process, and documentation required for notification, inspection, and acceptance of completed ESF configuration items.

Preliminary Predecisional Draft Material

WBS/Configuration Item (CI) Breakdown



Note: WBS/CI numbering represents current system for Package 1A. WBS/CI numbering systems currently under revision to conform to OCRWM procedure for CI Identifiers.

Controls

- Inspection Plan required for completed configuration items or portion of a configuration item
  - Defines Inspection Team
  - Defines specific inspection and acceptance criteria
  - Requires DOE review and approval
- Acceptance criteria includes accepted design documents and related baselined regulatory, test interference, and waste isolation requirements.
  - Drawings
  - Specifications
  - Submittals
  - NCR's
  - Baselined requirements
- Final acceptance not granted until all CAR's, NCR's, and required documentation are complete and submitted in accordance with records management procedures.

Preliminary Predicisional Draft Material

Acceptance Process

- Constructor notifies DOE of the item(s) ready for final inspection and acceptance and submits appropriate records package.
- DOE/Title III prepares Inspection Plan in accordance with AP6.1Q, *Project Office Document Development, Review, Approval, and revision control*
- DOE/Title III evaluates constructor's record package to ensure appropriate documentation is included.
- DOE/Title III evaluates applicable CAR's for impact on acceptance.
- DOE/Title III reviews applicable traceability between ESFDR and BFD.
- DOE/Title III reviews applicable traceability between BFD and accepted design.
- DOE/Title III evaluates applicable NCR's for impact on accepted design.

Preliminary Predecisional Draft Material

Acceptance Process (Cont'd)

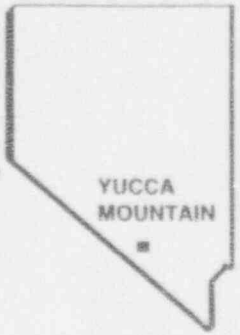
- DOE/Title III reviews incorporation of applicable FCR's and CR's
- DOE/Title III evaluates Title III inspection documents including constructor submittals for impact on acceptance criteria.
- DOE/Title III evaluates selected physical architecture for compliance with acceptance criteria.
- DOE/Title III documents any noncompliance with a NCR or CAR.
- Constructor/DOE/Title III disposition NCR's and/or CAR's and reevaluate records package for impact.
- DOE accepts completed item.
- Title III submits completed records package for accepted item.

Traceability

- Acceptance of completed configuration items is based on documented compliance with baselined requirements.

U.S. DEPARTMENT OF ENERGY

OCRWM



YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON THE EXPLORATORY STUDIES FACILITY

GENERIC SCIENTIFIC INVESTIGATION CONTROL PROCESS

PRESENTED BY

EDGAR H. PETRIE
DEPUTY DIRECTOR

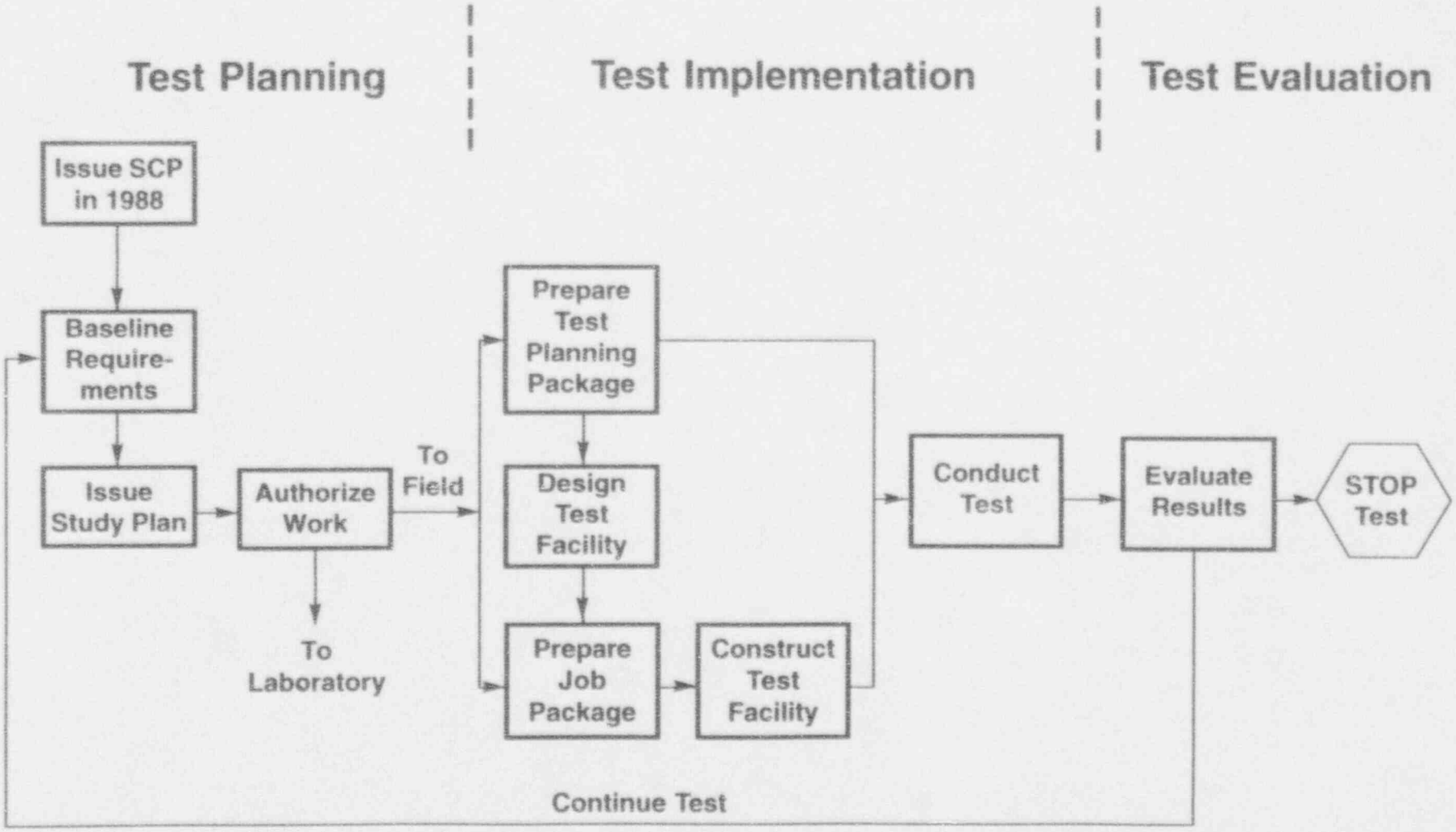
DECEMBER 8,1993
WASHINGTON, D.C.

TEST & EVALUATION PLAN

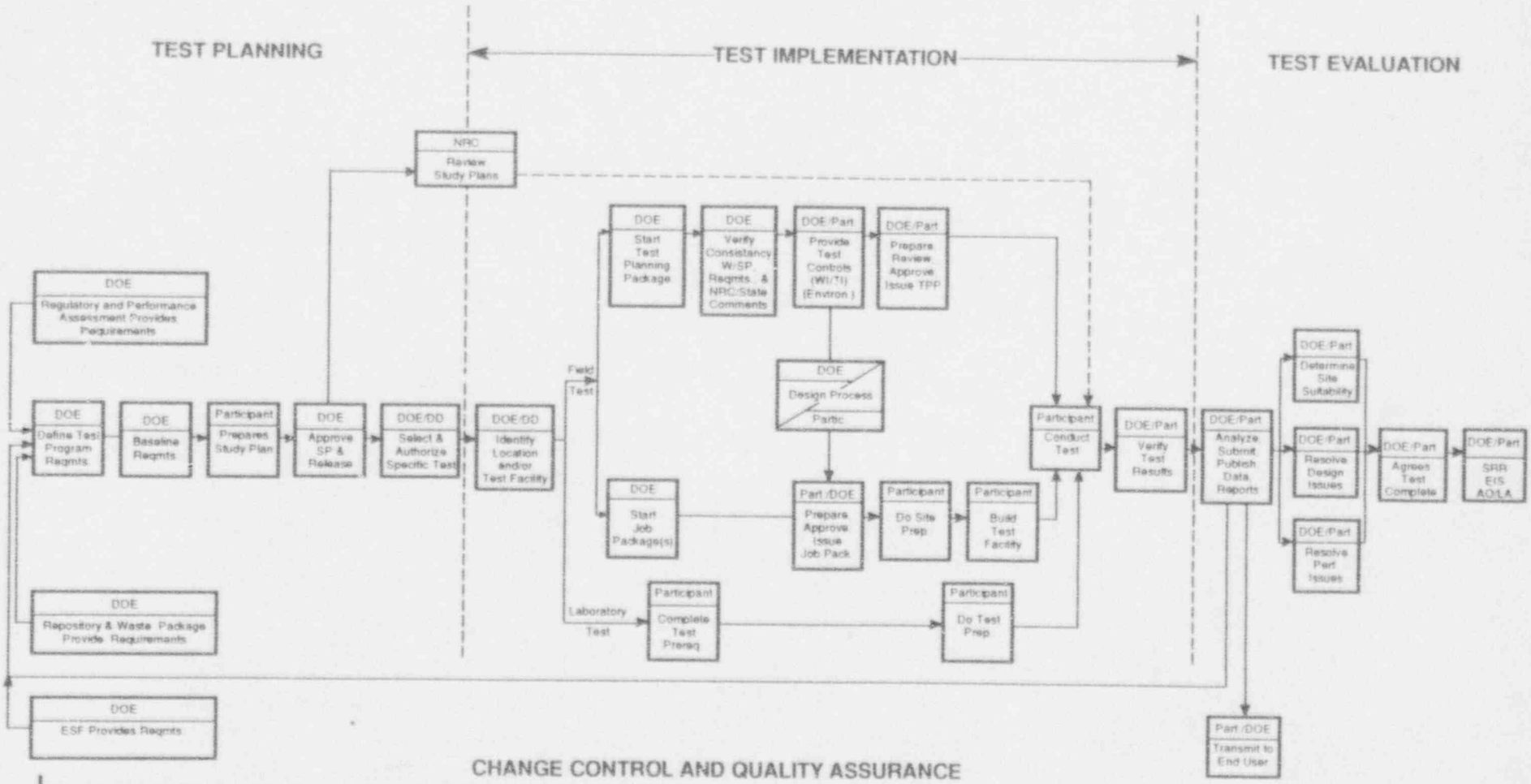
Scientific Investigation Control Philosophy is described in the T&EP (YMP/90-22)

- Plan the work
- Implement the tests
- Evaluate results

Testing Phases



SCIENTIFIC INVESTIGATION CONTROL PROCESS (SITE CHARACTERIZATION)

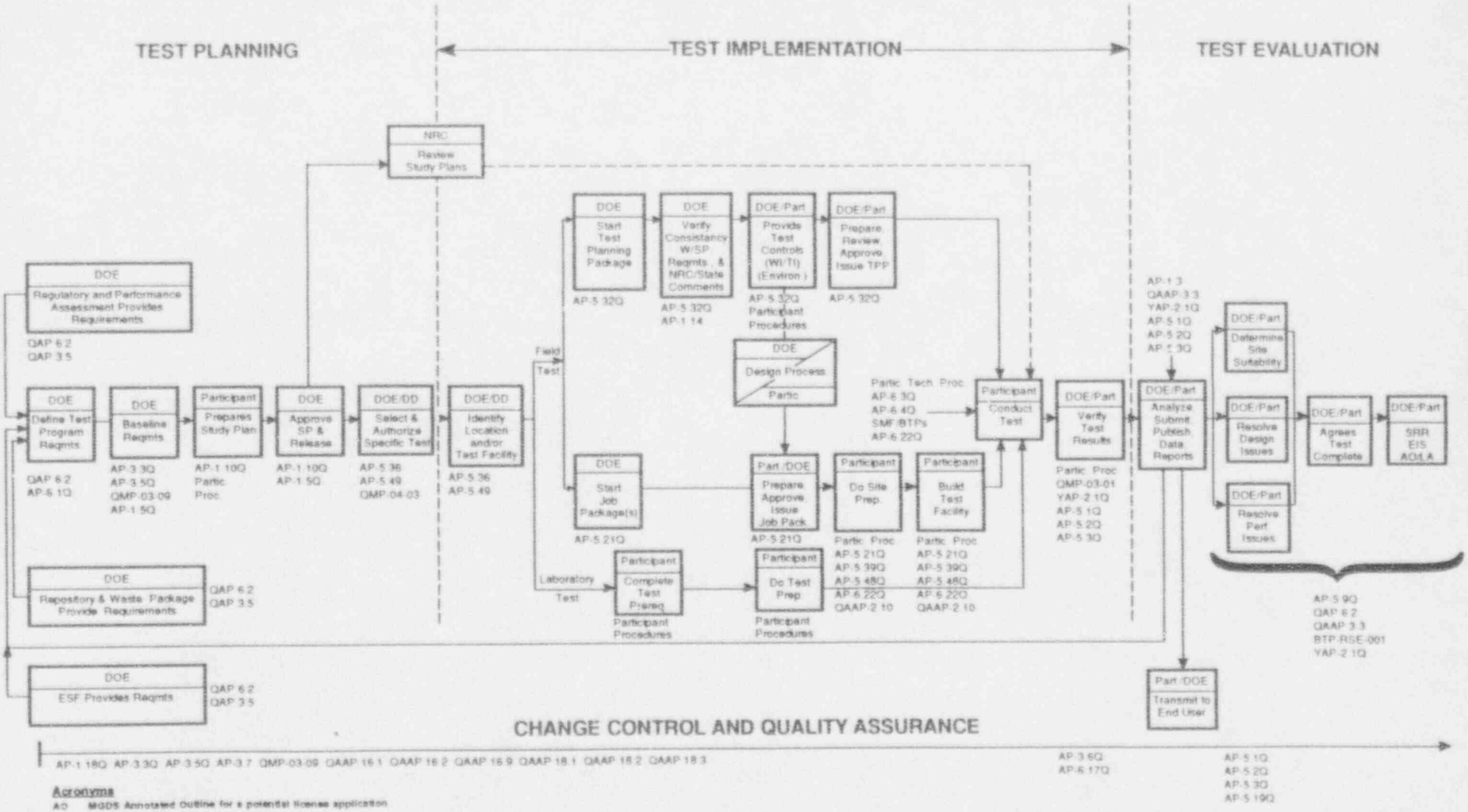


Acronyms

AO	MGDS Annotated Outline for a potential license application
SRR	Site Recommendation Report
EIS	Environmental Impact Statement
LA	License application
WI/TI	Waste Isolation/Test Interference
SP	Study Plan

SINVCTRL3 125-6 10-93

SCIENTIFIC INVESTIGATION CONTROL PROCESS (SITE CHARACTERIZATION)

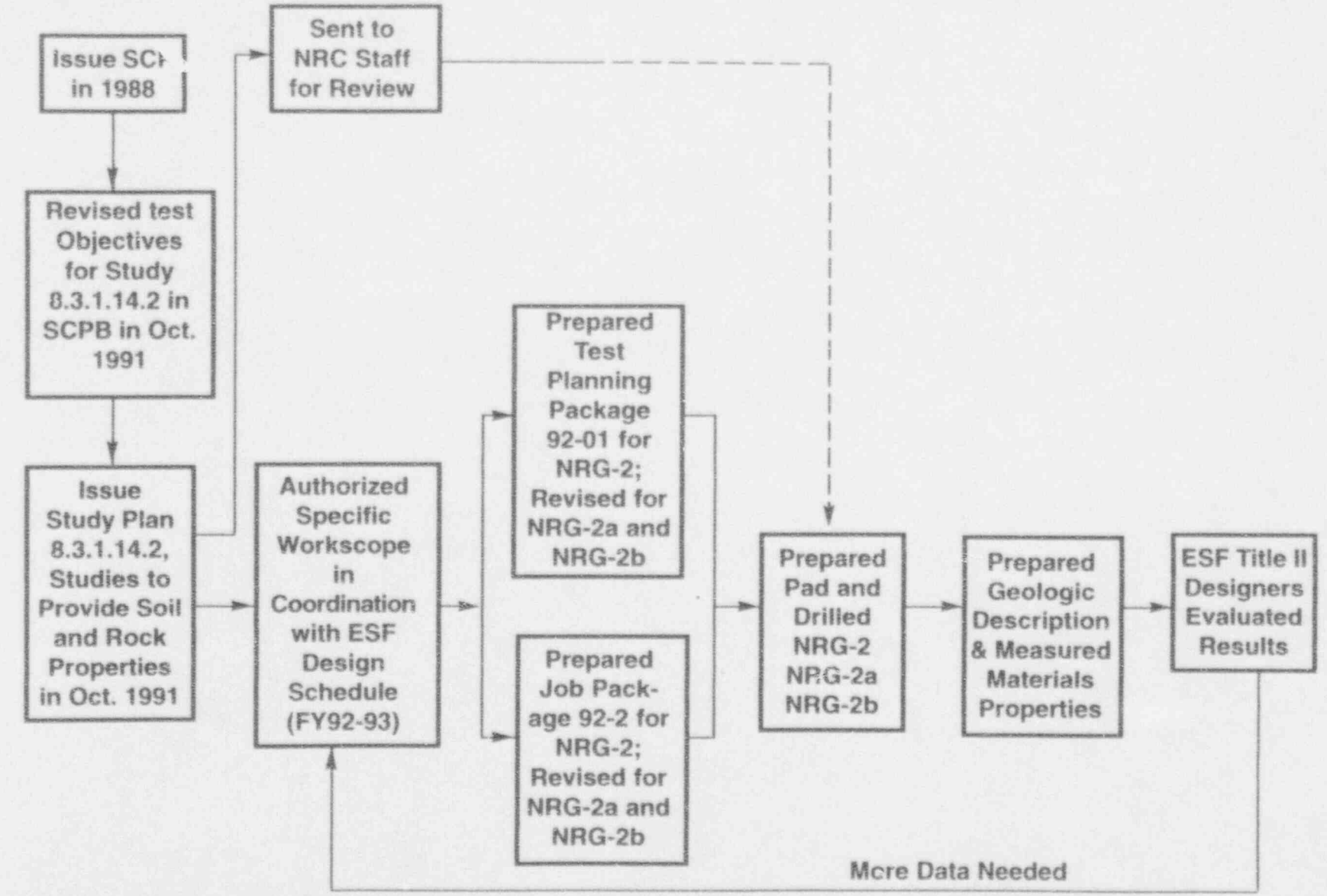


Acronyms

AO	MGDS Annotated Outline for a potential license application
SRR	Site Recommendation Report
EIS	Environmental Impact Statement
LA	License application
WI/TI	Waste Isolation/Test Interference
SP	Study Plan
AP	Administrative Procedure
QMP	Quality Management Procedure
QAP	Quality Assurance Procedure
QAAP	Quality Assurance Administrative Procedure
BTP	Branch Technical Procedure
YAP	Yucca Mountain Administrative Procedure

SINVCTRL4 125/9 30 93

Example: Soil and Rock Properties



SCPB = Site Characterization Program Baseline
NRG = North Ramp Geologic (drillhole)

GESICPS2.125/10-19-93

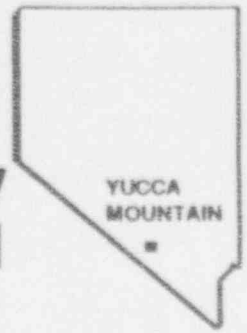
SCIENTIFIC INVESTIGATION CONTROL

AP-1.3	Publication Review, Approval, & Distribution
AP-1.5Q	Distribution, Maintenance, & Use of Controlled & Managed Documents
AP-1.10Q	Preparation, Review, Approval & Revision of Site Characterization Plan Study Plans
AP-1.14	Disposition of Comments on the SCP
AP-1.18Q	Records Management: LV Record Source Responsibility
AP-3.3Q	Change Control Process
AP-3.5Q	Field Change Control Process
AP-3.6Q	Configuration Management
AP-3.7	Cost & Schedule Baseline Maintenance & Change Control
AP-5.1Q	Control & Transfer of Technical Data on the YMP
AP-5.2Q	Technical Information Flow To & From the YMP Technical Data Base
AP-5.3	Information Flow Into the Project Reference Information Base
AP-5.9Q	Qualification of Existing Data
AP-5.19Q	Interface Control
AP-5.21Q	Field Work Activation
AP-5.32Q	Test Planning & Implementation Requirements
AP-5.36	Project Planning, Budgeting, Scheduling & Work Authorization System
AP-5.39Q	Technical Field Work Request
AP-5.48Q	Management of Field Activities Using Travelers
AP-5.49	Approved Funding Program Changes
AP-6.1Q	Project Office Document Development, Review, Approval, & Revision Control
AP-6.3Q	Procedure for Requesting Samples for Examination at YMP SMF
AP-6.4Q	Procedure for the Submittal, Review, and approval of requests for Yucca Mountain Project Geologic Specimens
AP-6.17Q	Classification of Items Important to Safety & Waste Isolation
BTP-RSE-001	Evaluation of Ongoing Activities
QAAP 2.6	Readiness Review (Project Office Integrated Procedure)
QAAP 2.10	Hold Points
QAAP 3.3	Peer Review (Project Office Integrated Procedure)
QAAP 16.1	Corrective Action (Project Office Integrated Procedure)
QAAP 16.2	Stop Work (Project Office Integrated Procedure)
QAAP 16.9	Corrective Action Process (For OCRWM/HQ Deficiency Reports & Corrective Action Reports Issued Prior to 10/15/90)
QAAP 18.1	Qualification of Audit Personnel (Project Office Integrated Procedure)
QAAP 18.2	Audit program (Project Office Integrated Procedure)
QAP 3.5	Technical Document Preparation
QAP 6.2	Document Review
QMP-03-09	Project Change Control Board Process
QMP-04-03	Technical Directives
YAP-2.1	Technical Assessment

Borehole	TPP	JP	Drill Start
NRG-2	92-01, Revision 0 "Soil and Rock Properties of Potential Locations of Surface and Subsurface Access Facilities" (Signed off 2/24/92) 92-01, Revision 6 (Borehole deepening)	92-19 "Drilling of Borehole UE-25 NRG-2" (signed off on 12/17/92) (Notice to Proceed issued 12/22/92) (Authorization issued 12/23/92)	CME 850 Drill rig mobilized 1/8/93 Drilling initiated 1/12/93 Drilling completed 1/28/93 Ending core depth 215.5 feet Ending ream depth 172.93 feet Total shifts: 12 Borehole Deepening CME 850 drill rig mobilized 5/11/93 Drilling initiated 5/12/93 Drilling completed 6/8/93 Ending core depth: 294.06 feet Ending ream depth: 172.93 feet Total shifts: 7
NRG-2A	92-01, Revision 5 "Soil and Rock Properties of Potential Locations of Surface and Subsurface Access Facilities" (Signed off 4/6/93) 92-01, Revision 6 (Borehole deepening)	93-05 "Drilling of Borehole UE-25 NRG-2A" (signed off on 4/28/93) (Notice to Proceed issued 4/23/93) (Authorization issued 5/3/93)	CME 850 Drill rig mobilized 5/11/93 Drilling initiated 512/93 Drilling completed 5/19/93 Ending core depth 220.0 feet Ending ream depth 159.69 feet Total shifts: 5 Borehole Deepening CME 850 over hole on standby Drilling initiated 5/20/93 Drilling completed 5/24/93 Ending core depth: 265.74 feet Ending ream depth: 159.69 feet Total shifts: 4
NRG-2B	92-01, Revision 6 "Soil and Rock Properties of Potential Locations of Surface and Subsurface Access Facilities" (Signed off 6/28/93)	93-09 "Construction of Access Drilling and Testing of Borehole UE-25 NRG-2B" (Notice to Proceed issued 7/2/93) (Authorization issued 7/7/93)	CME 850 Drill rig mobilized 7/29/93 Drilling initiated 7/30/93 Drilling completed 8/17/93 Ending core depth 130.84 feet Ending ream depth 130.84 feet Total shifts: 11 Borehole Continuation CME 850 remobilized 8/27/93 Drilling initiated 8/30/93 Drilling completed 9/15/93 Ending core depth: 329.46 feet Ending ream depth: 263.60 feet Total shifts: 12

U.S. DEPARTMENT OF ENERGY

OCRWM



YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON EXPLORATORY STUDIES FACILITY

THE DESIGN CONSTRUCTION PROCESS

Presented by:
Robert M. SANDIFER
Manager
MGDS DEVELOPMENT
M&O, Las Vegas,

4

December 8, 1993

MGDS DESIGN PROCESS

- Integrated, disciplined approach to design for:
  - Exploratory Studies Facility (ESF)
  - Repository
  - Waste Package
- Structured and governed by:
  - Technical requirements hierarchy
  - Baseline control process
  - QARD

MGDS DESIGN PROCESS
(continued)

- Insures orderly, systematic flowdown of requirements

- Provides for requirements verification

TITLE II - DEFINITIVE DESIGN

- Restudy and redesign work resulting from changes as may be required from the preliminary design
- Development of final drawings and specifications for procurement and construction
- Development of detailed estimates of the cost of construction, procurement and construction schedules, methods of performance, and identification of work packages

TITLE II - DEFINITIVE DESIGN (continued)

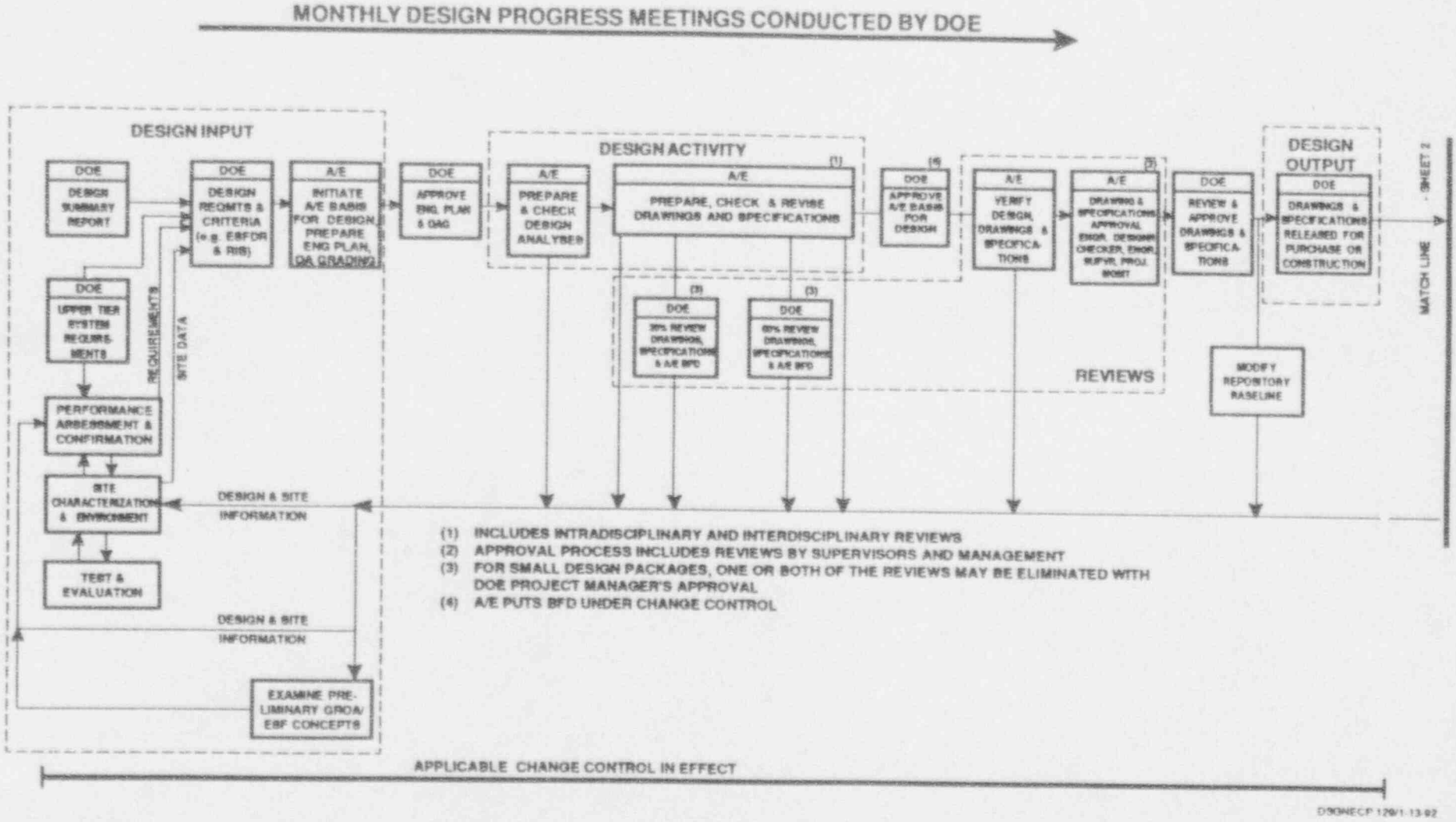
- Preparation of analyses of health, safety, environmental, and other project aspects
- Identification of test plan and permit requirements, preparation of procurement plan, determination of utility service requirements
- Other work as required

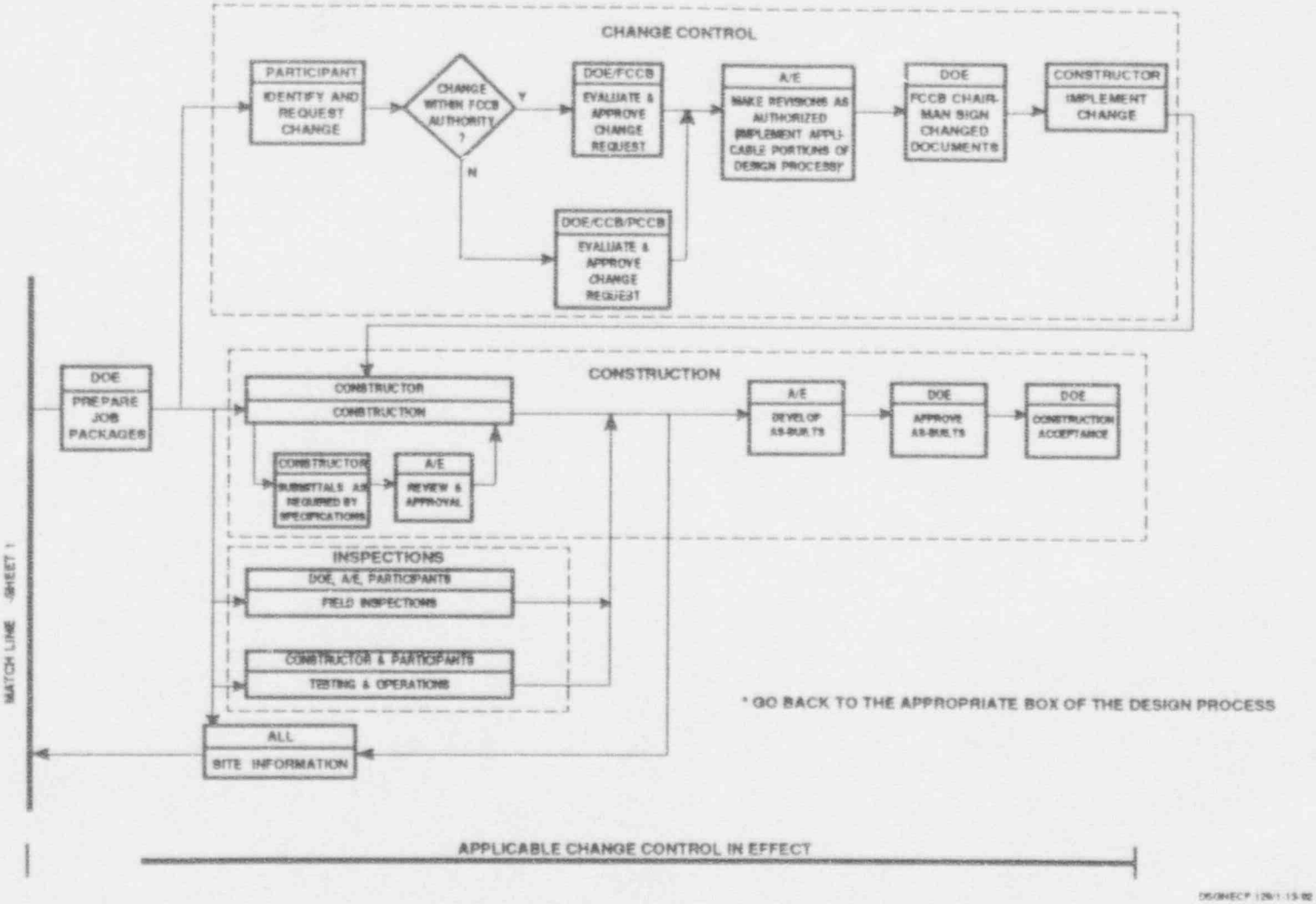
TITLE III - INSPECTION SERVICES

- Verifiy vendor's shop drawings to assure conformity with the approved design and working drawings and specifications
- Inspect construction workmanship, materials, and equipment, and report on conformity or nonconformity to the approved drawings and specifications
- Resolve constructability problems via FCRs and CRs

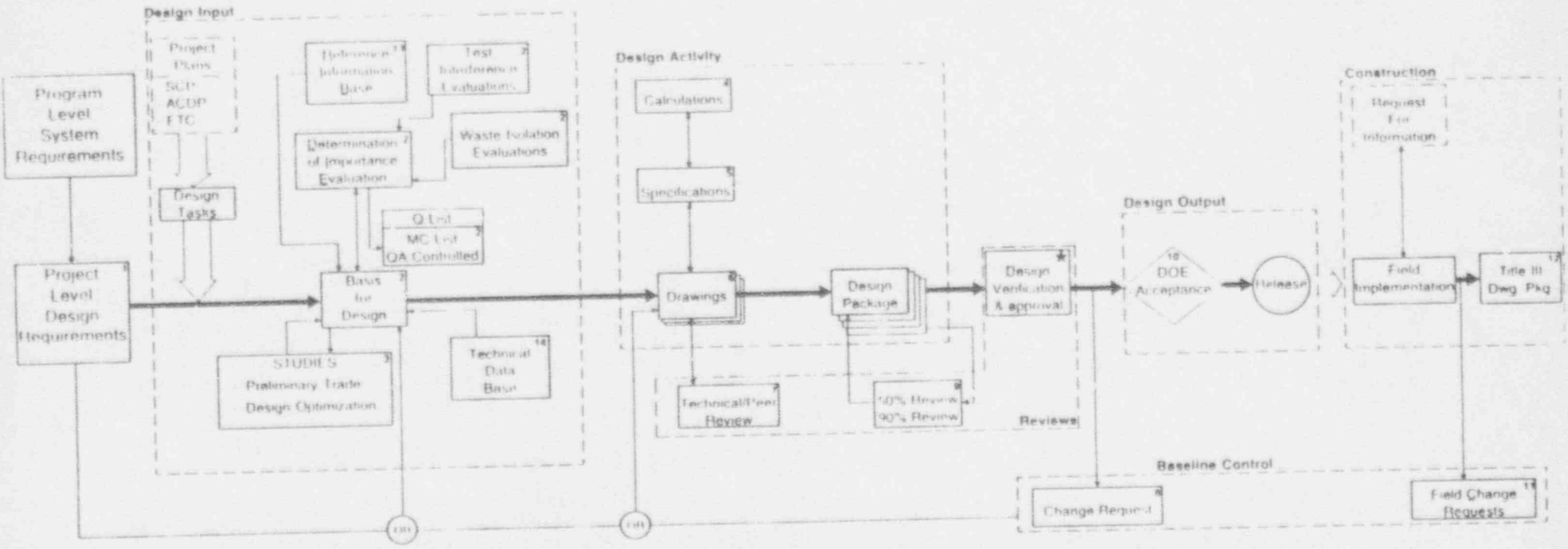
TITLE III - INSPECTION SERVICES (continued)

- Prepare estimates of reasonable amounts of increase or decrease in contract price and/or schedule for contract modifications
- Prepare reports of the progress of construction, as required
- Furnish reproducile "as built" record drawings and marked-up specifications showing construtions as actually accomplished


MONTHLY DESIGN PROGRESS MEETINGS CONDUCTED BY DOE
DESIGN INPUT
DESIGN ACTIVITY
DESIGN OUTPUT
DOE
DESIGN SUMMARY REPORT
DESIGN REQMTS & CRITERIA (e.g. ESFDR & RIB)
A/E
INITIATE A/E BASIS FOR DESIGN, PREPARE ENG PLAN, QA GRADING
APPROVE ENG PLAN & QAG
PREPARE & CHECK DESIGN ANALYSES
PREPARE, CHECK & REVISE DRAWINGS AND SPECIFICATIONS
(1)
APPROVE A/E BASIS FOR DESIGN
(4)
VERIFY DESIGN, DRAWINGS & SPECIFICATIONS
DRAWINGS & SPECIFICATIONS APPROVAL ENGR, DESIGNR, CHECKER, ENGR SUPVR, PROJ MGMT
(2)
REVIEW & APPROVE DRAWINGS & SPECIFICATIONS
DRAWINGS & SPECIFICATIONS RELEASED FOR PURCHASE OR CONSTRUCTION
UPPER TIER SYSTEM REQUIREMENTS
REQUIREMENTS
SITE DATA
PERFORMANCE ASSESSMENT & CONFIRMATION
SITE CHARACTERIZATION & ENVIRONMENT
TEST & EVALUATION
EXAMINE PRELIMINARY GROA/ EBF CONCEPTS
(3)
35% REVIEW DRAWINGS, SPECIFICATIONS & A/E BFD
90% REVIEW DRAWINGS, SPECIFICATIONS & A/E BFD
REVIEWS
MODIFY REPOSITORY BASELINE
DESIGN & SITE INFORMATION
DESIGN & SITE INFORMATION
MATCH LINE - SHEET 2
(1) INCLUDES INTRADISCIPLINARY AND INTERDISCIPLINARY REVIEWS
(2) APPROVAL PROCESS INCLUDES REVIEWS BY SUPERVISORS AND MANAGEMENT
(3) FOR SMALL DESIGN PACKAGES, ONE OR BOTH OF THE REVIEWS MAY BE ELIMINATED WITH DOE PROJECT MANAGER'S APPROVAL
(4) A/E PUTS BFD UNDER CHANGE CONTROL
APPLICABLE CHANGE CONTROL IN EFFECT
D9DNECP 129/1 13-92


CHANGE CONTROL
PARTICIPANT
IDENTIFY AND REQUEST CHANGE
CHANGE WITHIN FCCB AUTHORITY ?
Y
N
DOE/FCCB
EVALUATE & APPROVE CHANGE REQUEST
A/E
MAKE REVISIONS AS AUTHORIZED (IMPLEMENT APPLICABLE PORTIONS OF DESIGN PROCESS)*
DOE
FCCB CHAIRMAN SIGN CHANGED DOCUMENTS
CONSTRUCTOR
IMPLEMENT CHANGE
DOE/CCB/PCCB
EVALUATE & APPROVE CHANGE REQUEST
CONSTRUCTION
DOE
PREPARE JOB PACKAGES
CONSTRUCTOR
CONSTRUCTION
CONSTRUCTOR
SUBMITTALS AS REQUIRED BY SPECIFICATIONS
A/E
REVIEW & APPROVAL
A/E
DEVELOP AS-BUILTS
DOE
APPROVE AS-BUILTS
DOE
CONSTRUCTION ACCEPTANCE
INSPECTIONS
DOE, A/E, PARTICIPANTS
FIELD INSPECTIONS
CONSTRUCTOR & PARTICIPANTS
TESTING & OPERATIONS
ALL
SITE INFORMATION
* GO BACK TO THE APPROPRIATE BOX OF THE DESIGN PROCESS
MATCH LINE -SHEET 1
APPLICABLE CHANGE CONTROL IN EFFECT

MGDS DESIGN PROCESS



GOVERNING DOCUMENTS

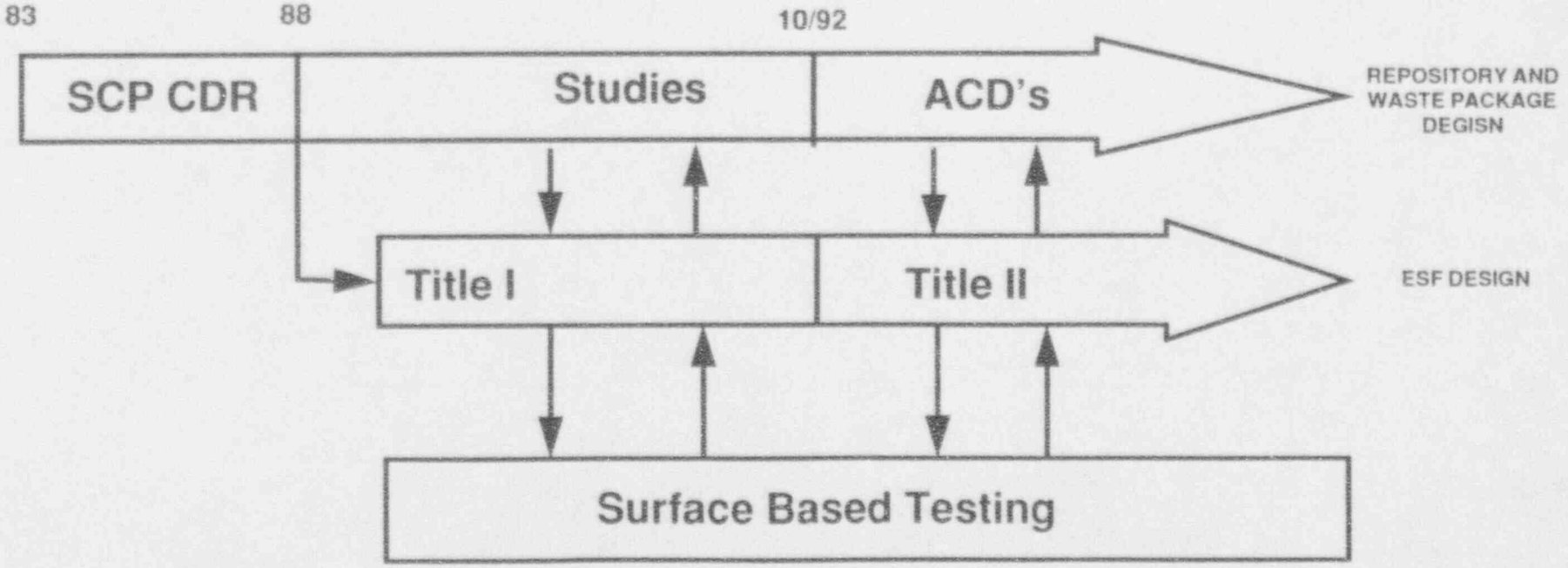
(1)	QAP 3-1, QAP 3-5, AP 6.1Q	(8)	QAP 3-4
(2)	QAP 2-3, QAP 3-5, QAP 3-9, QAP 3-11, QAP 3-12, QAP 17-1, AP 6.17Q, YMP/92-1	(9)	QAP 3-1, QAP 3-14
(3)	QAP 3-5	(10)	AP 3.3Q, AP 6.1Q, BIP-EBD-002, QMP 03.09, YMP/92-06
(4)	QAP 3-9, QAP 6-1, QAP 17-1	(11)	AP 3.5Q, NLP 3-16
(5)	QAP 6-1, QAP 17-1, QAP 3-11	(12)	AP 3.3Q, AP 3.7Q, AP 5.24Q, QMP 03.09, AP 5.21Q
(6)	QAP 3-10, QAP 6-1, QAP 17-1	(13)	AP 5.3
(7)	QAP 3-1, QAP 3-3	(14)	AP 5.2Q

★ Currently QAP's 3-9, 3-10, & 3-11. Will be incorporated in QAP-3-2, October 93.

December 8, 1993

MGDS DESIGN PROCESS

- Current ESF design process also demonstrates a synergistic relationship with:
  - Repository and Waste Package Advanced Conceptual Design (ACD)
  - Surface Based Testing (SBT)



MGDS DESIGN PROCESS
(continued)

- Begins with decomposition of requirements in technical requirements document hierarchy

e.g.

CRWMS Requirements Document (CRD)

↳ MGDS Requirements Document (MGDSRD

↳ Site Design & Test Requirements Document (SDTRD)

↳ ESF Design Requirements (ESFDR)

M□DS DESIGN PROCESS (continued)

- Basis for Design (BFD)
  - Key to requirements traceability

  - Incorporate Determination of Importance Evaluations (DIE
  - Studies: Preliminary trade/Design optimization
  - Living document resulting from interactive process of review and change

HOW DOES YMP DIFFER FROM OTHER DOE PROJECTS?

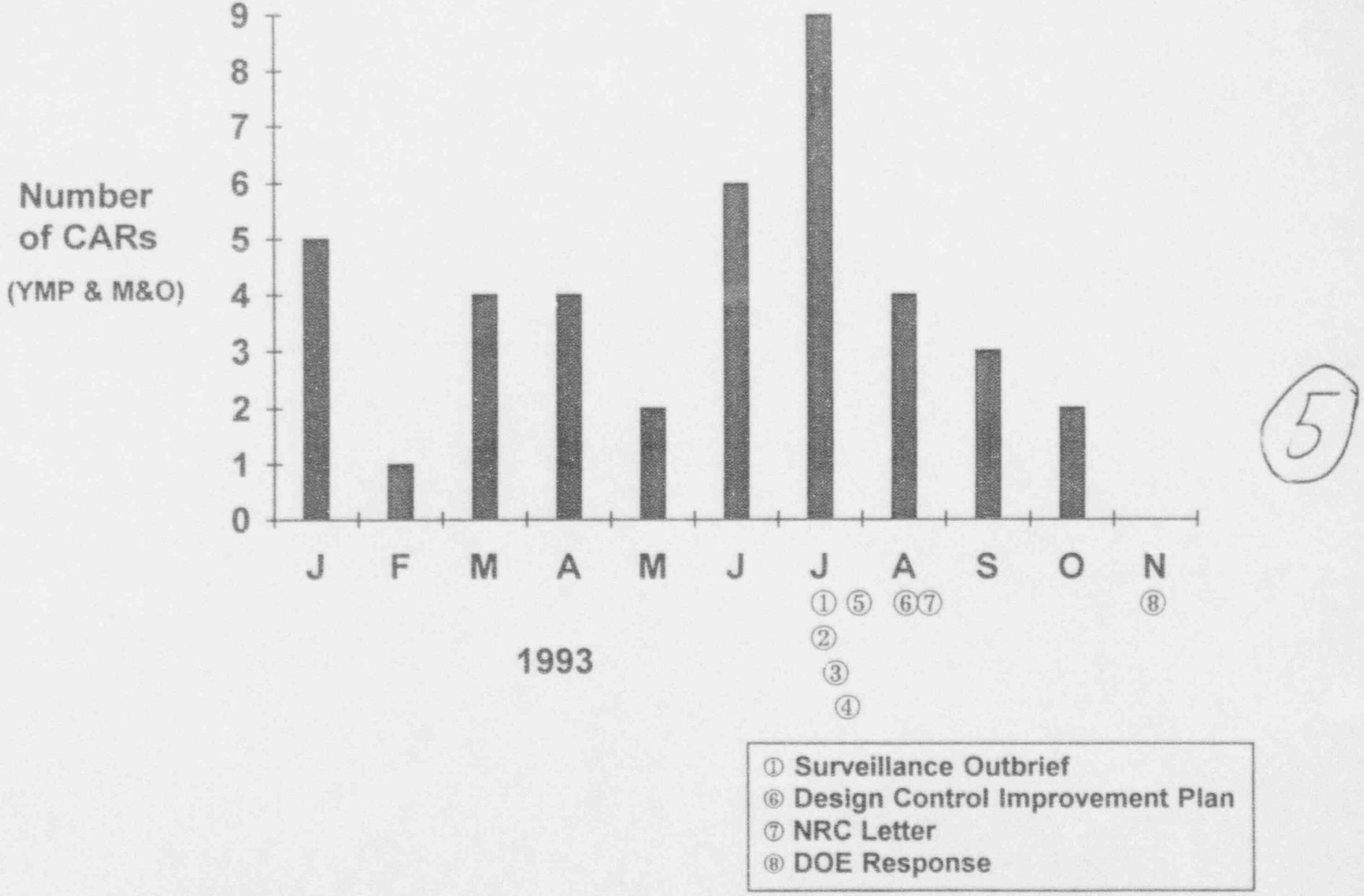
- Licensed by NRC
- License Application Design Concept
- Science Driven Project
- Extraordinary Oversight
- Unclassified Project

HOW DOES YMP DIFFER FROM STANDARD INDUSTRY PRACTICE?

- Additional regulatory requirements
  - Waste Isolation
- NQA-1
- Extent of overview

SUMMARY

- Integrated, disciplined approach
- Structured and governed by DOE/M&O directives and procedures
- Offers flexibility to accommodate design evolution which conform to baseline change control process
- Assures program requirements flowdown as well as traceability for requirements verification


Number of CARs (YMP & M&O)
9
8
7
6
5
4
3
2
1
0
J F M A M J J A S O N
1993
① ⑤ ⑥⑦ ⑧
② ③ ④
① Surveillance Outbrief
⑥ Design Control Improvement Plan
⑦ NRC Letter
⑧ DOE Response

5

Chronology of Events

① 7/15/93	Outbrief for YMP Surveillance 93/405 indicated five potential CARs (70,72-75)
② 7/15/93	M&O initiated the Design Control Improvement Plan (DCIP) development
③ 7/16/93	Nevada Site Manager all-hands briefing stressing importance of QA compliance
④ 7/19/93	Comments received on first draft of DCIP
⑤ 7/29/93	Informal DOE comments and M&O comments to DCIP incorporated
⑥ 8/13/93	DCIP, Revision 0, distributed to DOE
⑦ 8/20/93	NRC letter expressing concern about ESF design and design control process
⑧ 11/15/93	DOE response to NRC letter

Stop Work Impact - July 1993

- The following configuration items were complete:
  - North Portal Pad (Non-Q)
  - Access Road for North Portal (Non-Q)

- The following configuration items were in-process:
  - Muck Storage Pad (Non-Q)
  - Topsoil Storage Pad including Rock Storage Area (Non-Q)
  - North Portal Launch Chamber (Starter Tunnel) (Q)
  - Tunnel Boring Machine procurement (Non-Q)

Q Classification in Parenthesis

U.S. DEPARTMENT OF ENERGY

OCRWM

YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON EXPLORATORY STUDIES FACILITY

M&O DESIGN IMPROVEMENT PLAN

Presented by:
Robert M. SANDIFER
Manager
MGDS DEVELOPMENT
M&O, Las Vegas,

6

December 8, 1993

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN

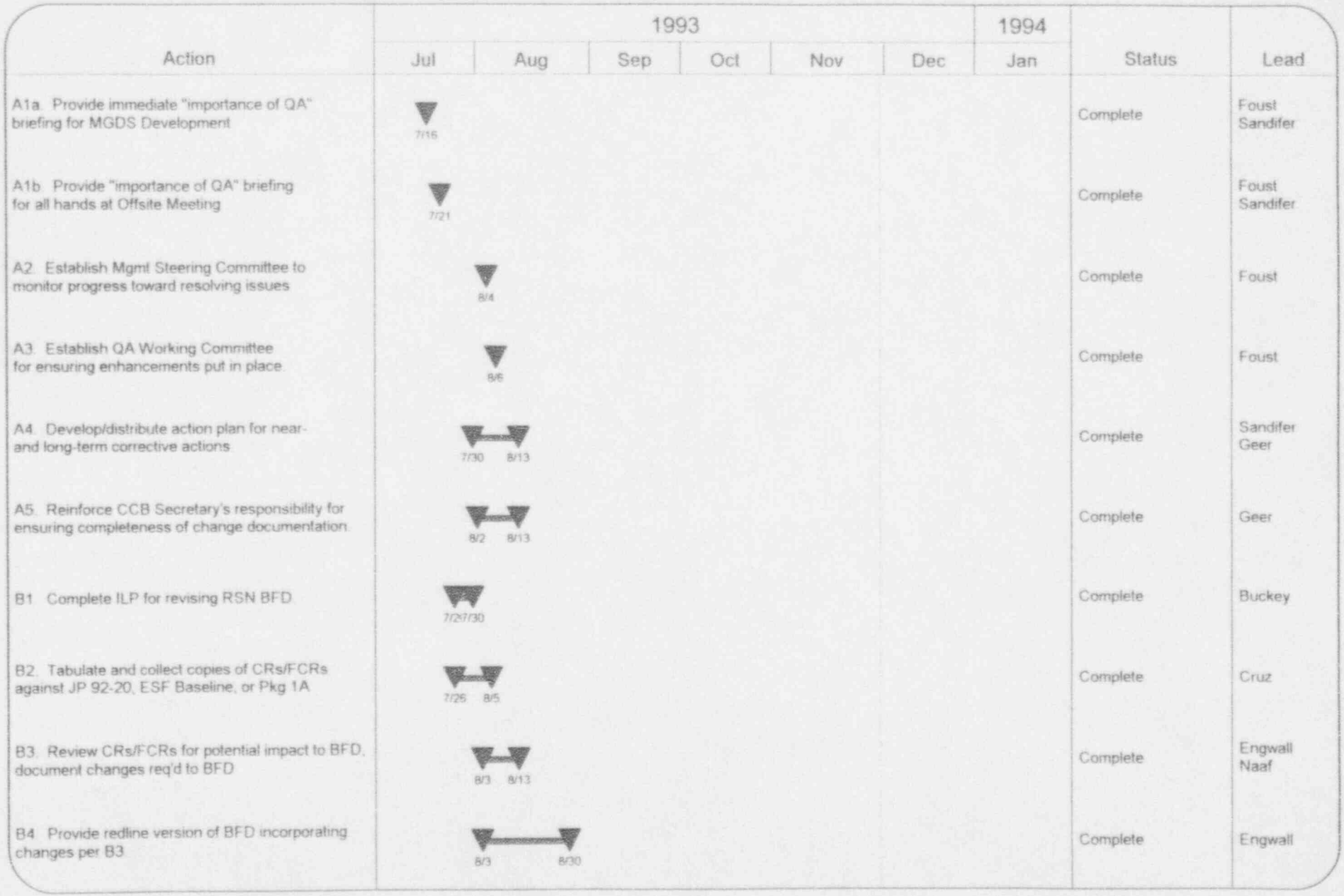
- M&O has committed to developing action plan in response to CARs and self-examination
- Plan is referenced in response to CAR YM-93-070
- Ensure any conditions adverse to quality are identified, evaluated, and corrected
- Commit to development of a series of improvements to the design control process

M&O MGDS DESIGN CONTROL IMPROVEMENT PLAN

- Increase confidence of external agencies and DOE in M&O's ability to properly control our design procedures and processes
- Provides for review of design-control-related issues to coordinate resolution within framework of integrated effort to arrest long-term problems (whether identified through CARs or by self-inspection)
- Allow for a thorough review of our design control process in general, to identify any weaknesses or shortcomings

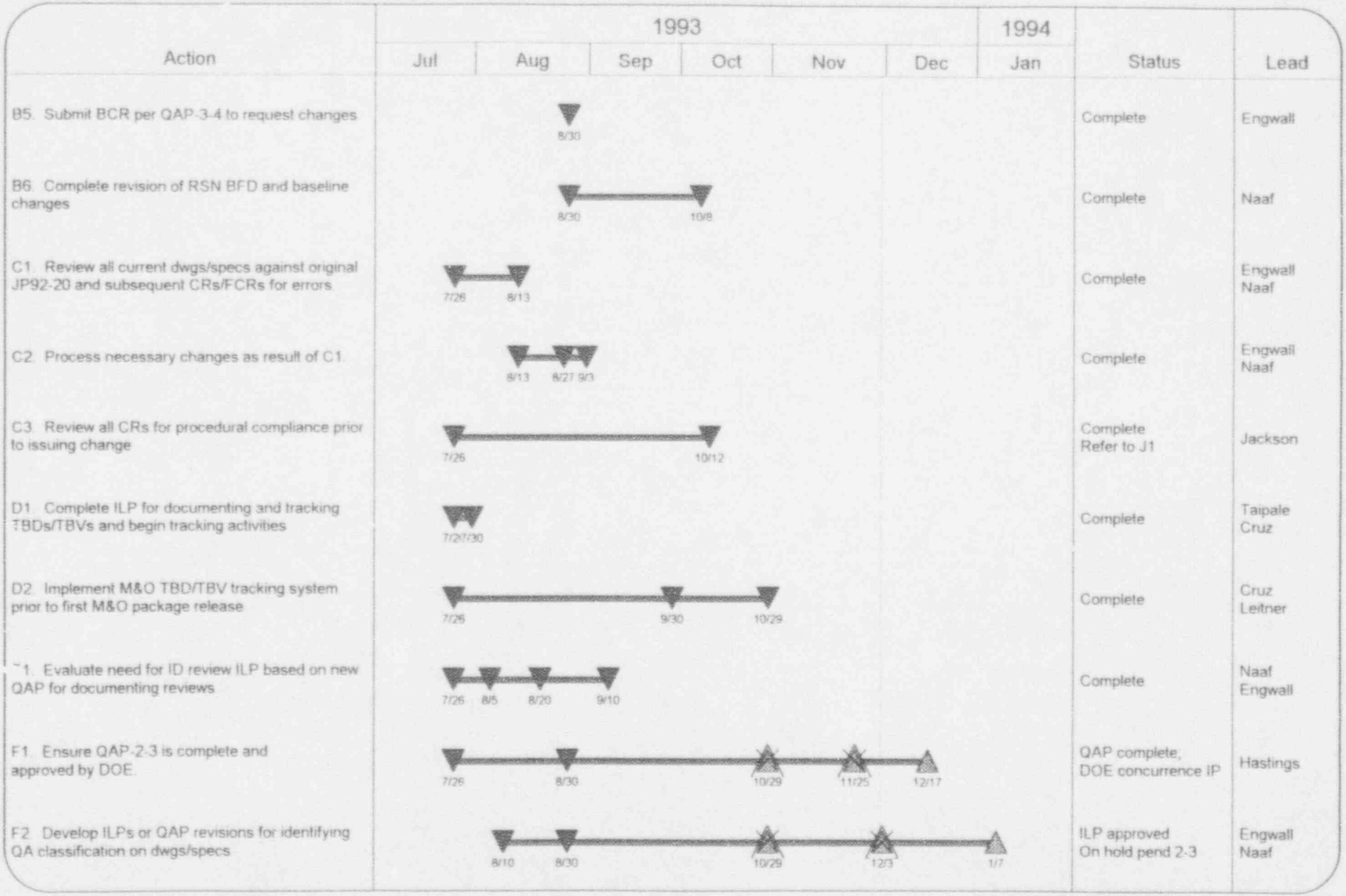
MGDS Design Control Improvement Plan

12/2/1993



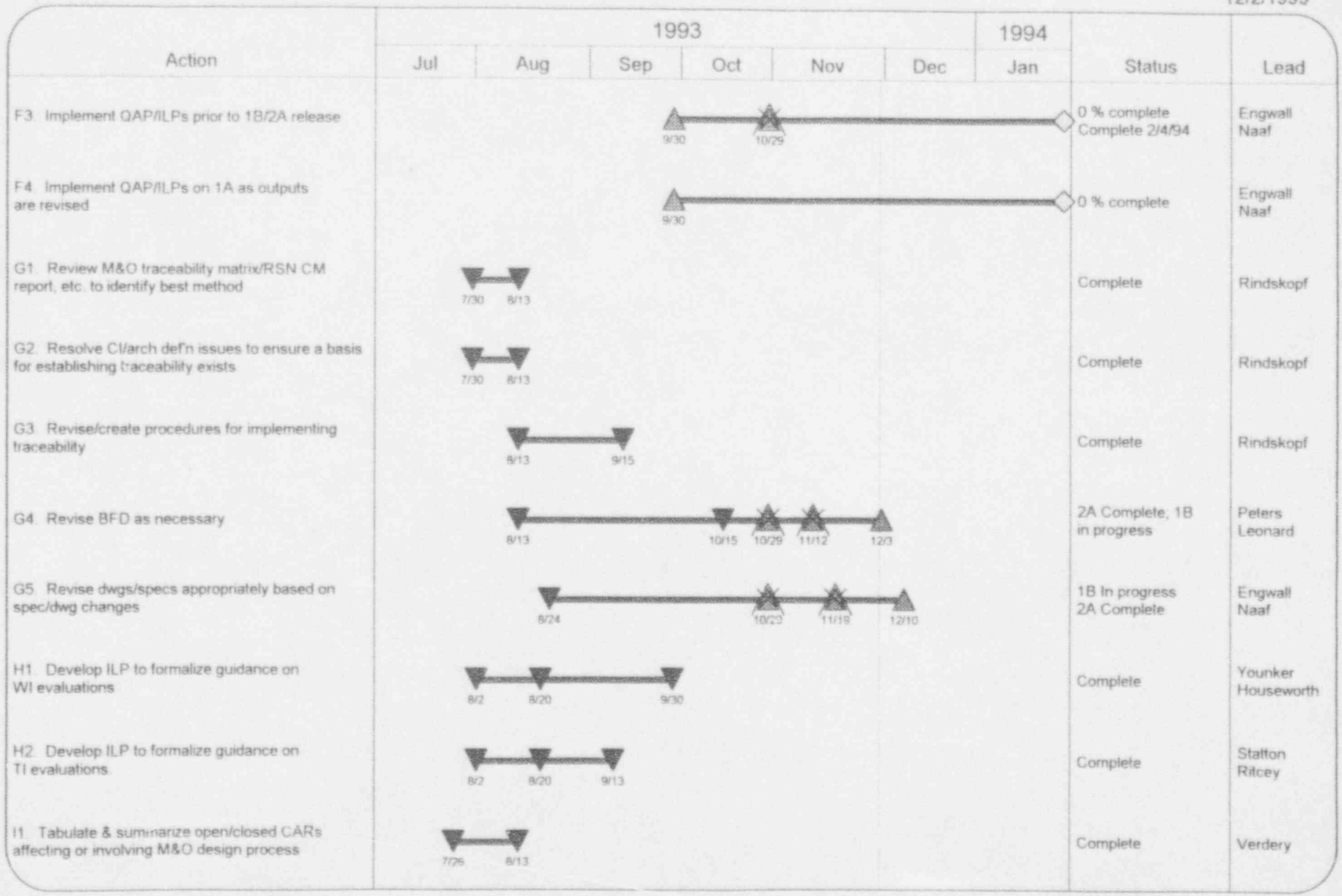
MGDS Design Control Improvement Plan

12/2/1993



MGDS Design Control Improvement Plan

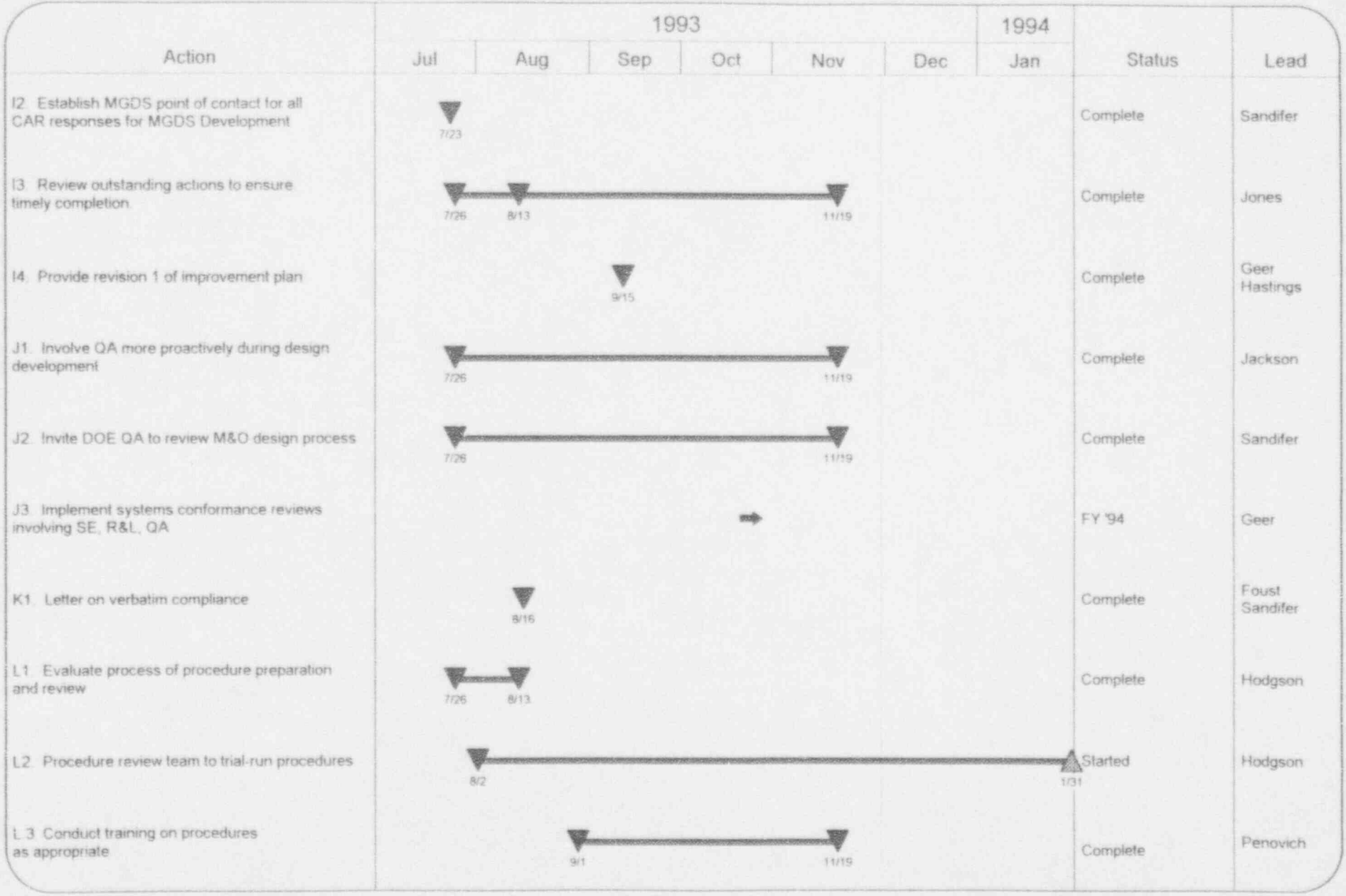
12/2/1993



▲ Pending ▼ Complete ◇ Ongoing

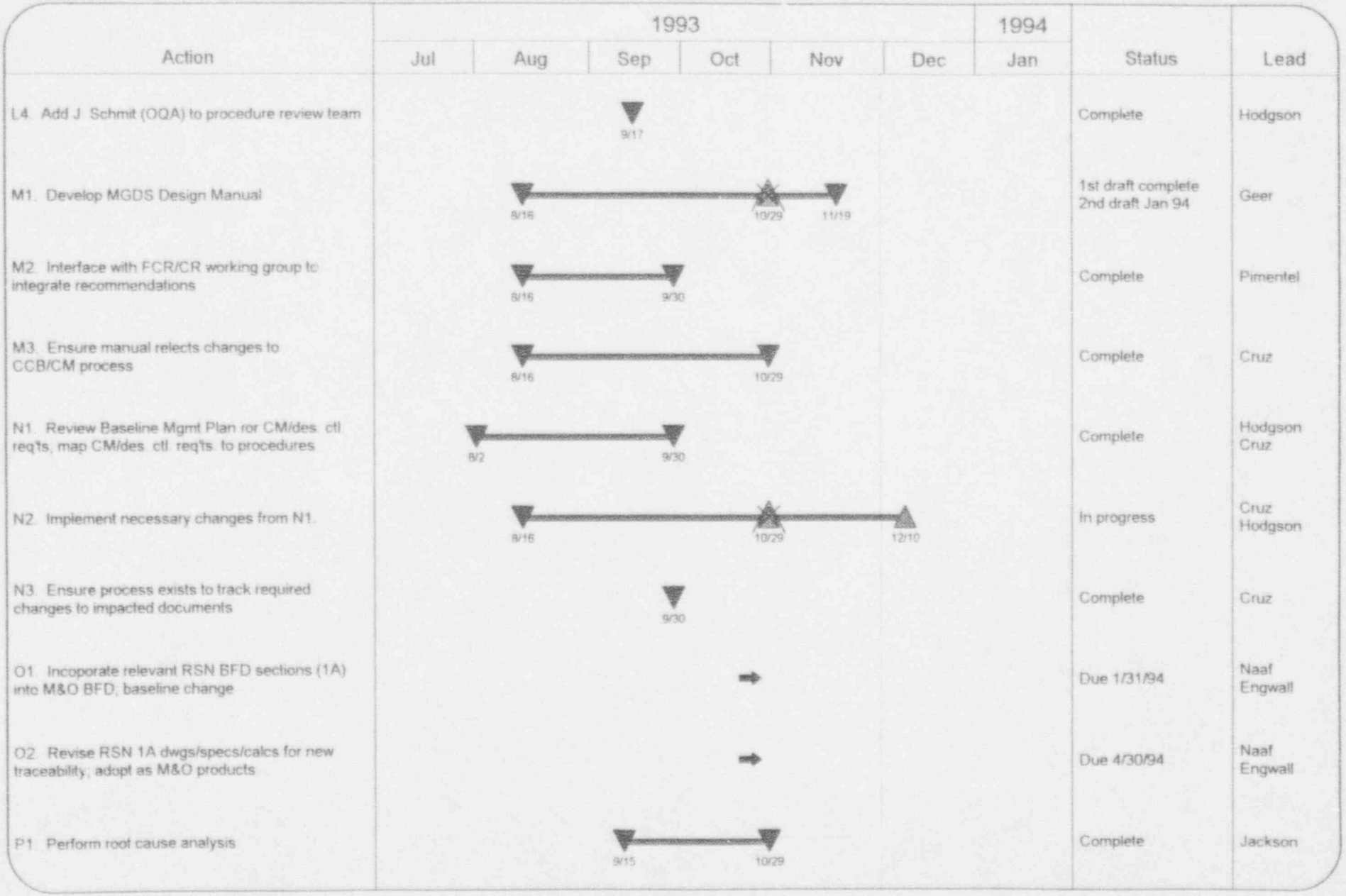
MGDS Design Control Improvement Plan

12/2/1993



MGDS Design Control Improvement Plan

12/2/1993

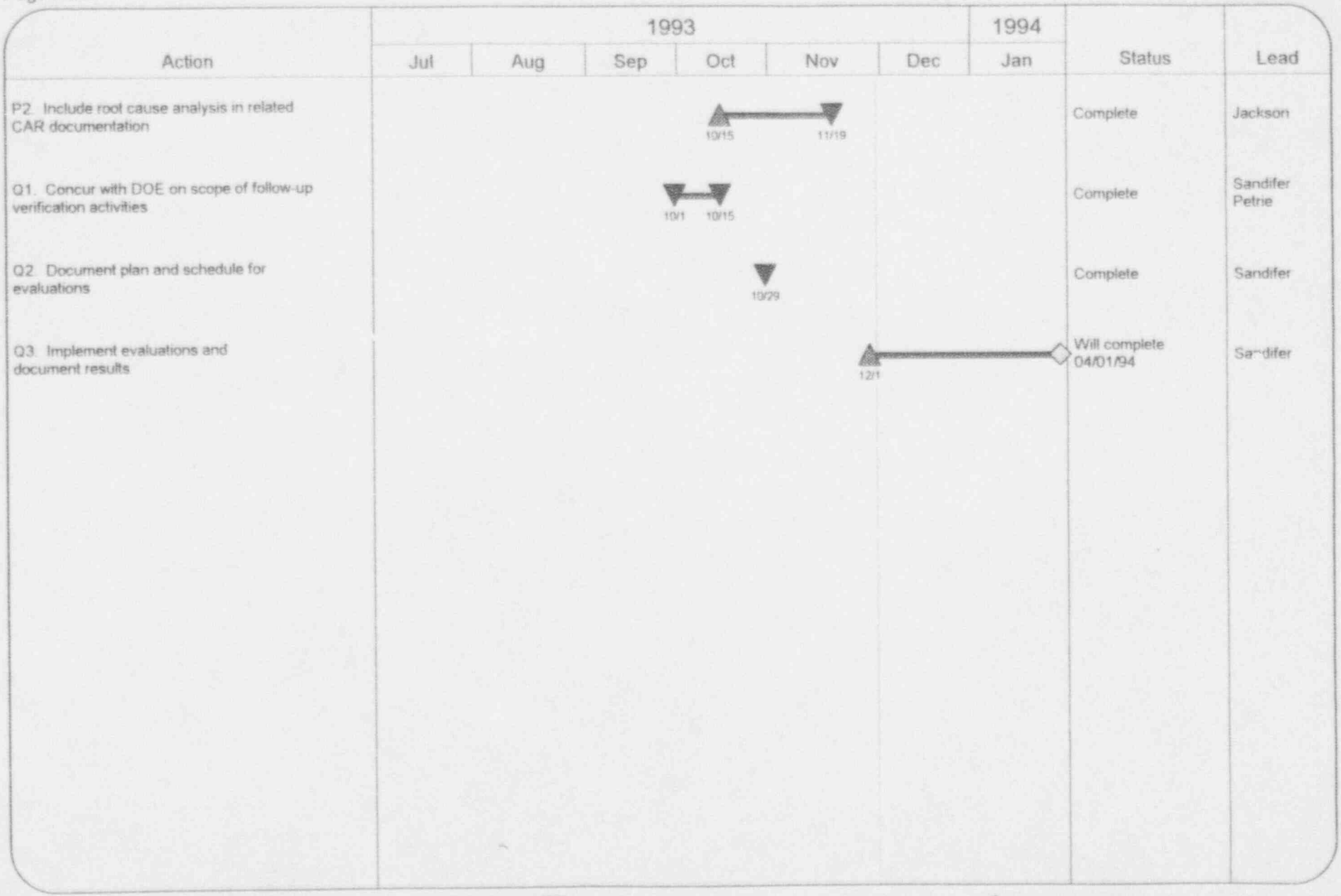


Action	Status	Lead
L4. Add J. Schmit (OQA) to procedure review team	Complete	Hodgson
M1. Develop MGDS Design Manual	1st draft complete 2nd draft Jan 94	Geer
M2. Interface with FCR/CR working group to integrate recommendations	Complete	Pimentel
M3. Ensure manual relects changes to CCB/CM process	Complete	Cruz
N1. Review Baseline Mgmt Plan ror CM/des. ctl. req'ts, map CM/des. ctl. req'ts. to procedures	Complete	Hodgson Cruz
N2. Implement necessary changes from N1.	In progress	Cruz Hodgson
N3. Ensure process exists to track required changes to impacted documents	Complete	Cruz
O1. Incoporate relevant RSN BFD sections (1A) into M&O BFD; baseline change	Due 1/31/94	Naaf Engwall
O2. Revise RSN 1A dwgs/specs/calcs for new traceability; adopt as M&O products	Due 4/30/94	Naaf Engwall
P1. Perform root cause analysis	Complete	Jackson

▲ Pending ▼ Complete ◇ Ongoing

MGDS Design Control Improvement Plan

12/2/1993



▲ Pending ▼ Complete ◇ Ongoing

ACTION ITEM TOTALS

- Open Action Items 8
- Closed Action Items 43
- Additional Action Items To Be Scheduled 3
- Total Action Items 54

OPEN CORRECTIVE ACTIONS

- Ensure QAP-2-3 completed and approved for use at MGDS (OQA acceptance required per contract. QAP-2 -3 approved by the M&O and currently in QAP 6.2 review by DOE OQA)
- Develop ILPs or QAP revisions for identifying QA classification on design outputs (including drawings/specs with QA and Non-QA components).
- Implement QAP/ILPs prior to final verification for 1B & 2A.
- Begin incorporating into 1A as outputs are revised.

OPEN CORRECTIVE ACTIONS

- Revise drawings/specs appropriately based on BFD changes.
- Implement systems conformance reviews involving Systems Engineering, Regulatory & Licensing, QA.
- Procedure review team to trial run the existing procedures and revisions to ensure procedures are adequate (subcommittee to the QA Working Committee).

OPEN CORRECTIVE ACTIONS

- Implement changes required after review of BMPand DOE Order 4700.1
- Incorporate relevant RSN BFD sections for 1A into M&O BFD; prepare baseline change for combined BFD.
- Revise drawings, specifications, calculations for new traceability; adopt fully as M&O products.
- Implement evaluation(s) and document results in final follow-up report.

DOE-NRC Technical Meeting

On

Exploratory Studies Facility

ESF Design and Construction Progress

1

Keith W. Roberts
Washington, D.C.
December 8, 1993

B&W Fuel Company
Duke Engineering & Services, Inc.
Fluor Daniel, Inc.

INTERA Inc.
JK Research Associates, Inc.
E. R. Johnson Associates, Inc.

Logicon RDA
Morrison Knudsen Corporation
Woodward-Clyde Federal Services

Presentation Parameters

- ESF Design and Construction progress information based on projected budgets of:

  FY94 = $55M

  FY95 = $110M

  FY96 = $110M

  FY97 = $110M

- ESF Packages are described either by configuration items (where defined) or projected scope

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 Top Soil Storage Area, Test Alcove 1

Design Status: All items complete and Accepted for Construction

Construction Status: Complete

- TBM Starter Tunnel
- Pad and Access Road
- Rock and Top Soil Storage Area

In Process

- TBM
- Switchgear Building
- Pad Water System
- Test Alcove #1

Acceptance Status: TBD

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

Design Status: In process, complete early FY94

Construction Status: Complete FY94

- 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:

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 FY94

- Compressed Air Systems
- Standby Power

Acceptance Status: TBD

Preliminary Predecisional Draft Material

Package 1D: North Portal Surface Facilities and Utilities

Design Scope: Operations Building, Warehouse Building, Steam Cleaning System, 138kV Power, Pad and Access Roads, Covered Storage, Fuel Storage System, Pad Electrical System, IDS Subsurface Safety and Alarm System

Design Status: In Process - Complete late FY95

Construction Status: Start FY95 - Complete FY96

Acceptance Status: TBD

Package 2A: Underground Transportation and Conveyor Systems

Configuration Items: Conveyor System

Design Status In Process - Complete Early FY94

Construction Status: Start FY94 - Complete FY95

Acceptance Status: TBD

Preliminary Predecisional Draft Material

Package 2B:

Configuration Items:	**None. Trade Studies and Analysis**
Design Status:	**In Process - Complete FY94**
Construction Status:	**N/A**
Acceptance Status:	**N/A**

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 mid-FY94

Construction Status: Start FY94 - Complete FY95

Acceptance Status: TBD

Preliminary Predecisional Draft Material

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 FY96 - Complete FY96

Acceptance Status: TBD

Preliminary Predecisional Draft Materal

Package 3B: South Portal Surface 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 FY96 - Complete FY96

Acceptance Status: TBD

Preliminary Predecisional Draft Material

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 FY95

Construction Status: Start FY95 - Complete FY96

Acceptance Status: TBD

Preliminary Predecisonal Draft Material

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: TBD

Preliminary Predecisional Draft Material

Package 6: South Ramp to Calico Hills 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: TBD

Preliminary Predecisional Draft Material

Package 7: Calico Hills (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: TBD

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 mid-FY94 - Complete FY95

Construction Status: Start FY95 - Complete FY95

Acceptance Status: TBD

Package 8B: Topopah Spring Level (TSL) Exploratory Drifting

Design Scope: TSL Exploratory 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 FY95 - Complete FY96

Construction Status: Start FY97 - Complete FY98

Acceptance Status: TBD

Preliminary Predecisional Draft Material

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 FY96 - Complete FY96

Construction Status: Start FY97 - Complete FY98

Acceptance Status: TBD

Package 10: Optional Shaft

Design Scope: Optional Shaft Excavation, Linings and Ground Support, Support Utilities, Site and Pad Preparation

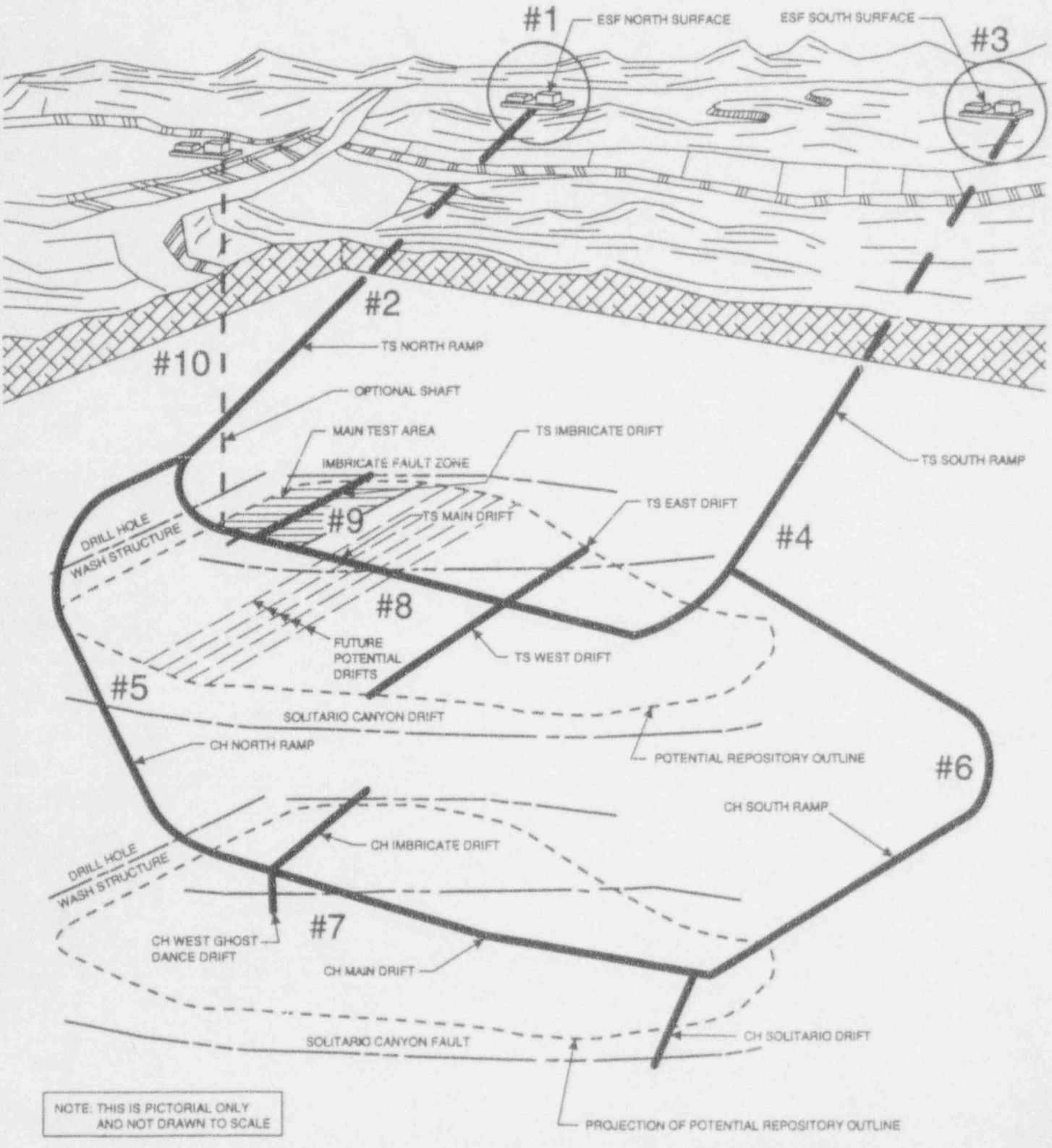
Design Status: Start FY97 - Complete FY98

Construction Status: Start FY98 - Complete FY00

Acceptance Status: TBD

Preliminary Predecisional Draft Material

EXPLORATORY STUDIES FACILITY



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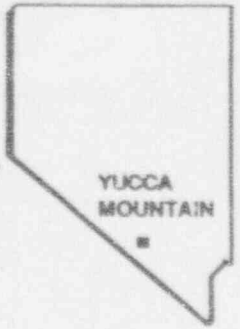


YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON EXPLORATORY STUDIES FACILITY

ESF ENHANCEMENTS

Presented by:
Robert M. SANDIFER
Manager
MGDS DEVELOPMENT
M&O, Las Vegas,

8

December 8, 1993

WHY DO WE NEED TO ADJUST THE ESF CONFIGURATION?

- New Information
  - Recent drilling results indicate the TSw1 - TSw2 contact is higher at the North end of the block than previously thought
  - Current waste package work is considering a much heavier waste package than before
  - Preliminary indications are that the Ghost Dance Fault may be a more significant feature than previously thought
- Preserve Repository Design Flexibility

WHAT DOES THE NEW INFORMATION PROVIDE?

- A higher TSw1 - TSw2 contact in the North allows the development of a flatter layout. (i.e: one which allows the use of conventional rail haulage) Also allows the distance from emplacement area to water table to be increased
- A heavier waste package means that rail haulage in a potential repository would be much more desirable than preveiously thought
- A wide and highly fractured Ghost Dance Fault would put a premium on potential repository layouts which minimize the number of Ghost Dance penetrations

HOW DO WE PRESERVE REPOSITORY DESIGN FLEXIBILITY?

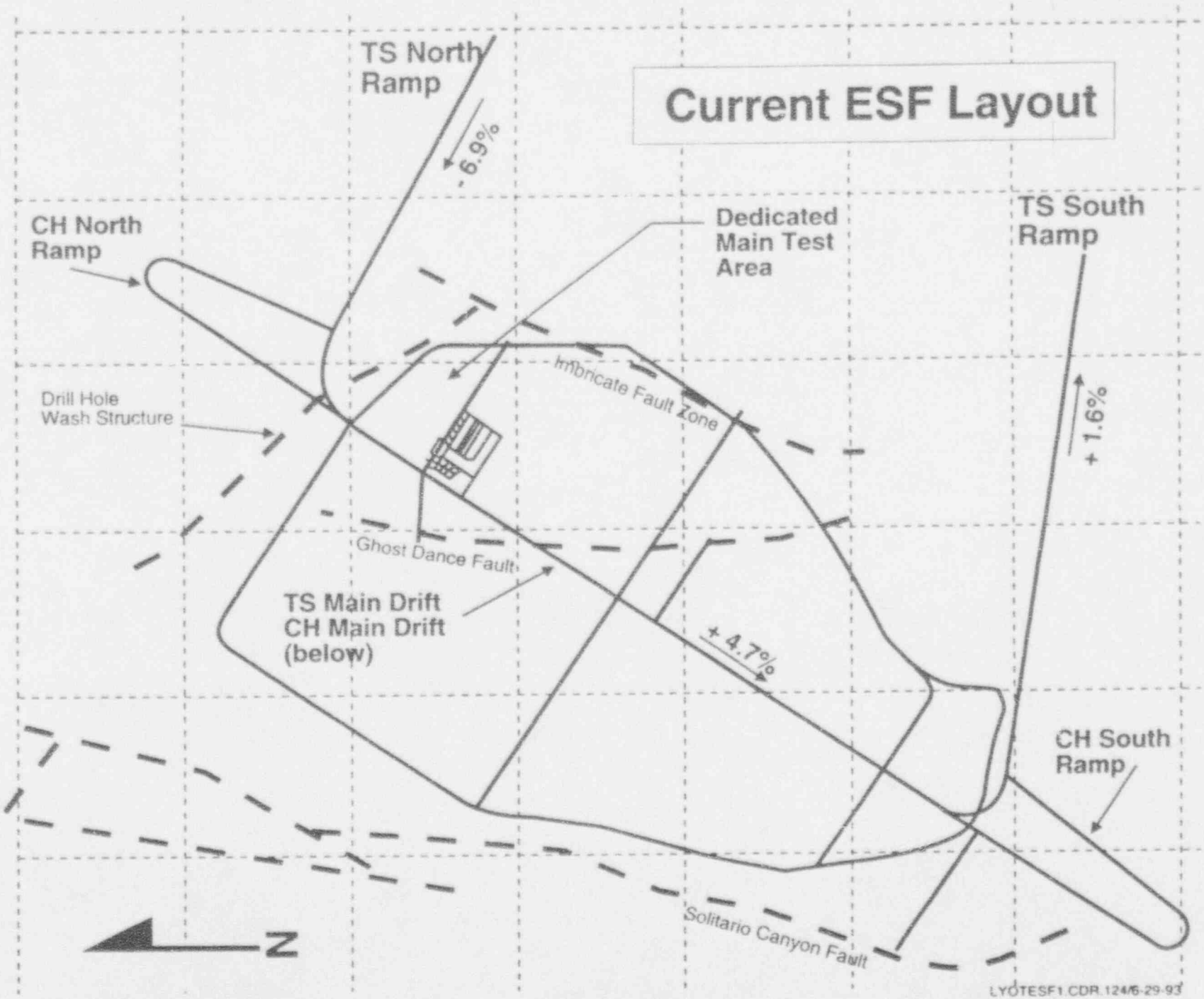
- Develop an ESF configuration which can accommodate various underground repository layout and transportation concepts while accomplishing the objective of properly characterizing the site

AN ENHANCEMENT TO THE CURRENT ESF LAYOUT HAS BEEN DEVELOPED WHICH WOULD:

- Maintain the portal location and azimuth of the North Ramp
- Result in having no grade in excess of 2.7% in the North Ramp, Main TSL drift, and South Ramp
- Preserve repository design flexibility to a much greater degree than the current configuration, including concepts which increase the distance from emplacement drifts to the water table

ENHANCEMENT
(continued)

- Better accommodate repository layouts having flat emplacement drifts, and layouts which seek to avoid having emplacement drifts across the Ghost Dance Fault
- Maintain the full scope of site suitability and characterization testing provided by Option 30, and significantly enhance the characaterization of the Ghost Dance without affecting repository layout flexibility



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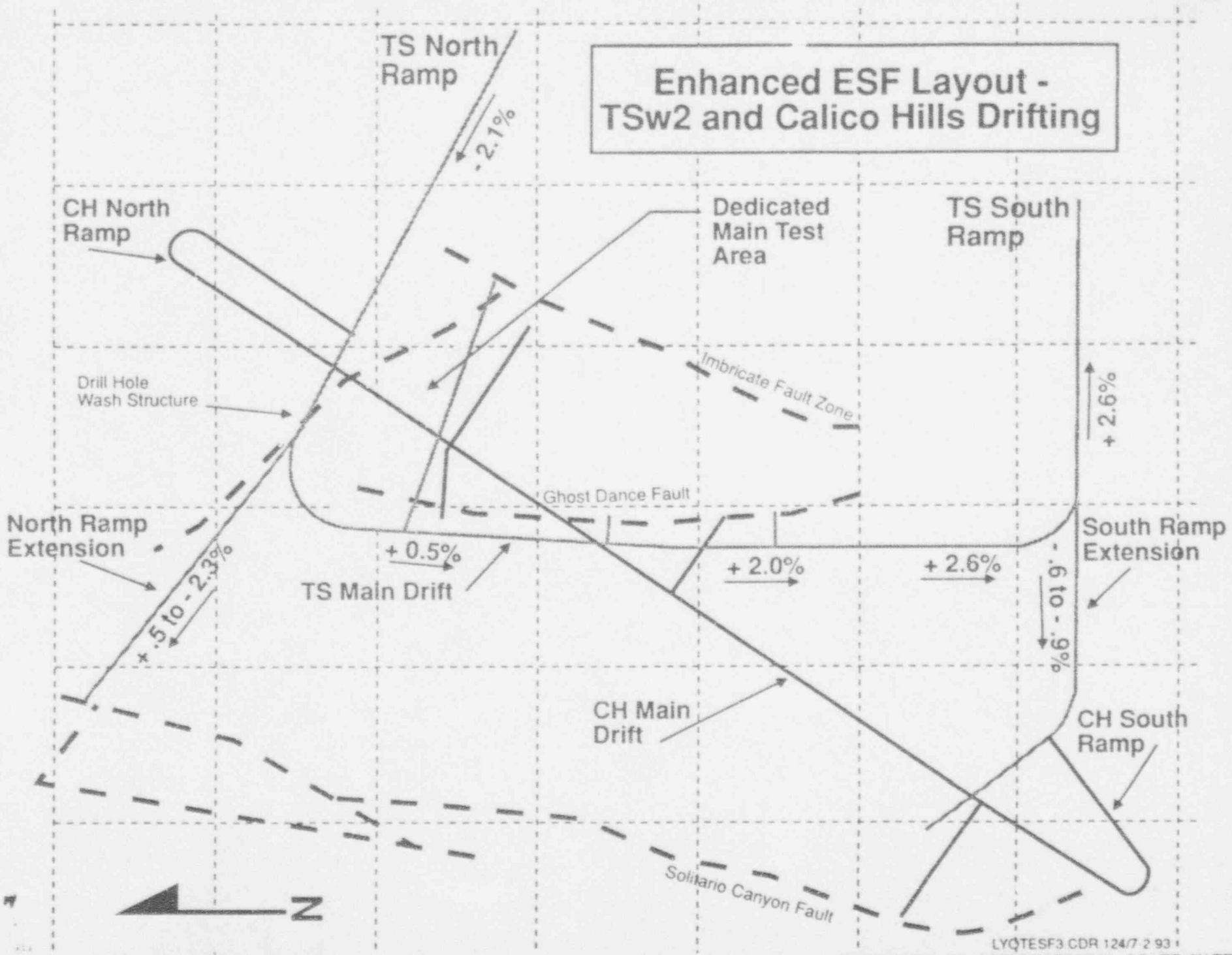
December 8, 1993


Enhanced ESF Layout -
TSw2 and Calico Hills Drifting
TS North Ramp
-2.1%
CH North Ramp
Dedicated Main Test Area
TS South Ramp
Drill Hole Wash Structure
Imbricate Fault Zone
+2.6%
Ghost Dance Fault
North Ramp Extension
+.5 to -2.3%
+0.5%
TS Main Drift
+2.0%
+2.6%
-.6 to -.9%
South Ramp Extension
CH Main Drift
CH South Ramp
Solitario Canyon Fault
N
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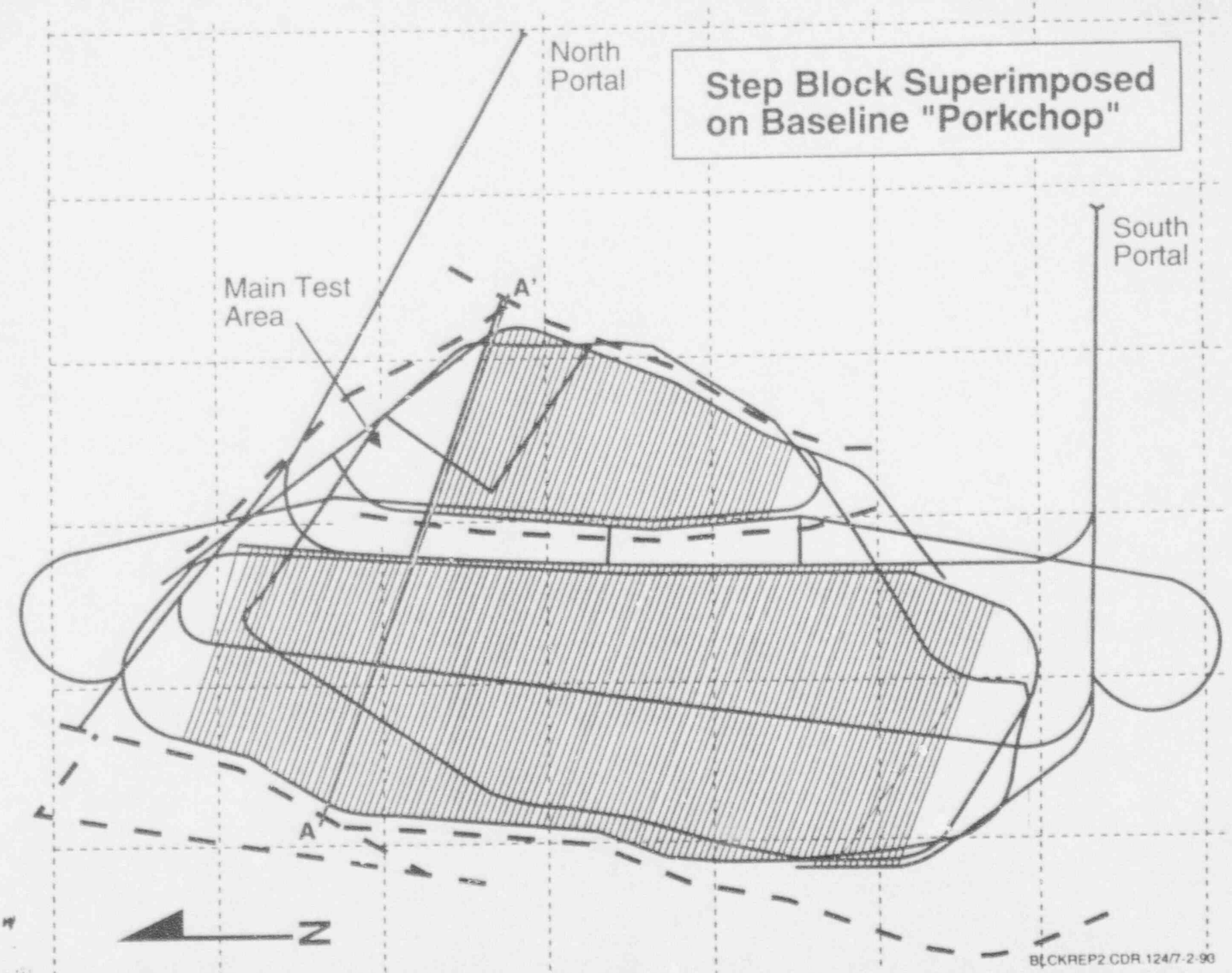
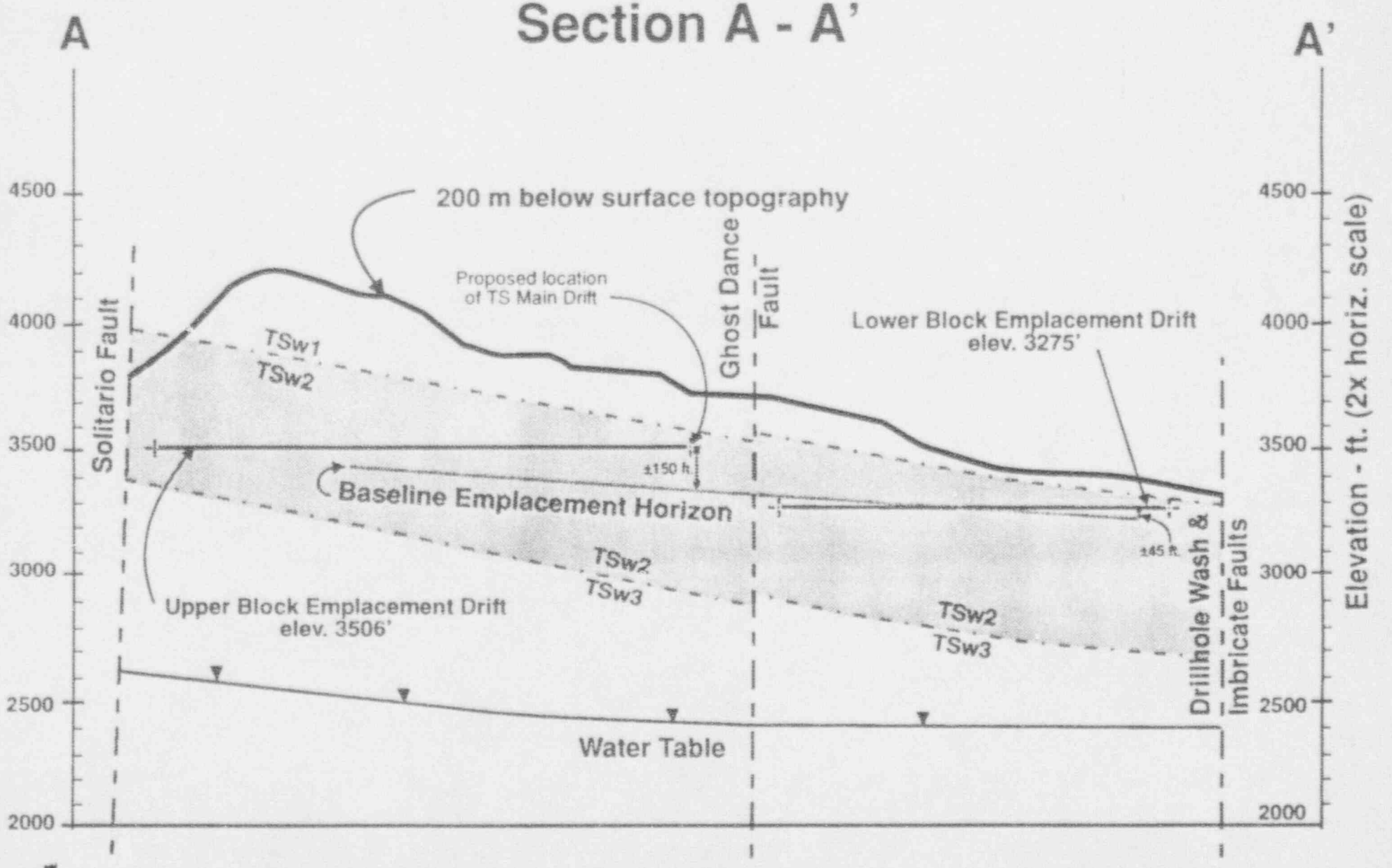
"PRELIMINARY PREDECISIONAL DRAFT MATERIAL"



Section A - A'



Note: Plane of section cuts through lowest emplacement drift in step-block layout.

SECTA AR CDR 12/6 29 93
"PRELIMINARY PREDECISIONAL DRAFT MATERIAL"
December 8, 1993

LINK TO PREVIOUS WORK

- The need for changes of this nature was foreseen at the end of the ESFAS, and was accounted for in YMP/91-28. This document provides the "bridge" between the selection of Option 30 during the ESFAS and the slightly modified "reference design concept" which was used to begin Title I Design

SUMMARY CHART FROM ESFAS

RANK	TOP-RANKED OPTIONS	1 NUMBER OF RAMP(S)	2 NUMBER OF SHAFT(S)	3 NUMBER OF ACCESSES	4 MTL LOCATION FLEXIBILITY	5 MECHANICAL MINED ACCESSES	6 NO GRAVITY FLOW PATHWAY FROM TS UNIT TO CHs	7 MAXIMIZE DISTANCE FROM EMPLACEMENT LEVEL TO WATER TABLE	8 AVOID EMPLACEMENT DRIFTS CROSSING GHOST DANCE FAULT	9 MAXIMIZE EXPOSED ROCK – ON AND OFF BLOCK	10 FLEXIBILITY FOR EARLY DRIFTING IN TS OR CH OR BOTH	11 2 INTERCEPTS OF GHOST DANCE FAULT IN TS	12 E-W DRIFT IN TS	13 LARGER MTL AREA TO AVOID INTERFERENCES
1	30	2	0	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	23	2	0	4		✓						✓	✓	✓
3	24	1	1	5		✓					✓	✓	✓	✓
4	13	2	0	4	✓	✓				✓	✓	✓	✓	✓
5	6	2	0	4		✓						✓	✓	✓
6	7	1	1	5		✓						✓	✓	✓
7	2	1	1	5								✓	✓	✓
8	19	1	1	5								✓	✓	✓
9	25	1	1	5		✓					✓	✓	✓	✓
10	4	1	2	5						✓	✓	✓	✓	✓
.	.													
.	.													
.	.													
20	15	1	1	4				✓	✓			✓	✓	✓

ADVANTAGES OF THE ENHANCED ESF LAYOUT

- Enhances Site Characterization ability
  - Multiple Ghost Dance Fault contacts can be made with relative ease
  - Two Solitario Canyon Fault contacts are planned instead of one
  - Ramp extensions give a good look at a large percentage of the vertical extent of the TSw2 interval
- Enhances Repository Design Flexibility
  - Preserves option for conventional rail haulage
  - Preserves option to increase distance from emplacement drifts to water table

ADVANTAGES OF THE ENHANCED ESF LAYOUT (continued)

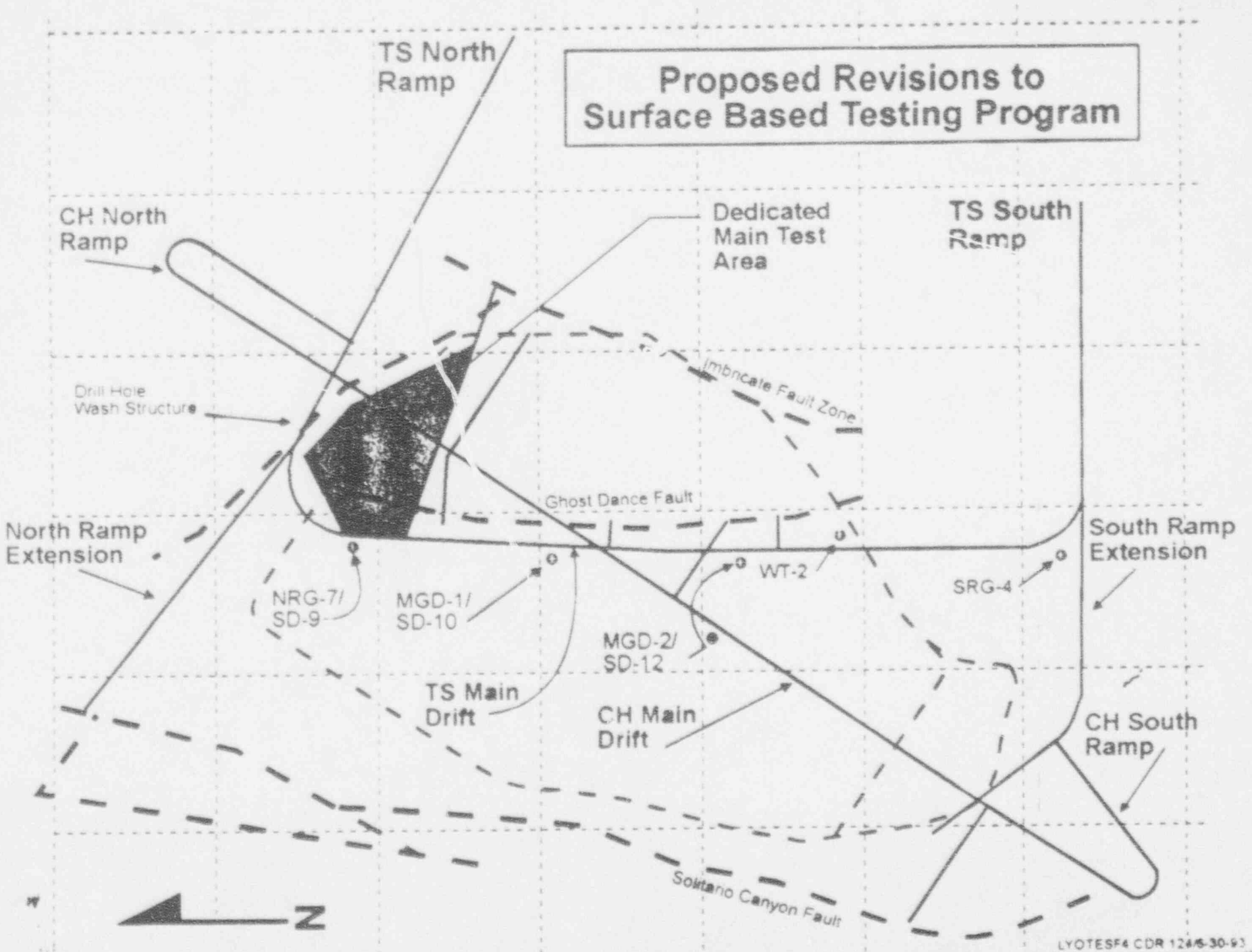
  - Preserves option to avoid multiple crossings of Ghost Dance Fault with emplacement drifts
  - Does not preclude any conceivable repository layout option
- Enhances ESF Constructability
  - Flatter slopes significantly improve safety aspects of underground operations
  - Flatter slopes allow servicing the TBM using conventional rail haulage--as is the norm in virtually all TBM tunnels of comparable length

DISADVANTAGES OF THE ENHANCED ESF LAYOUT

- Requires redirection of SBT program
- Delays gathering of drill hole data regarding water table gradient and unsaturated zone conditions
- Potential programmatic impacts (NRC, TRB, State)

SBT ADJUSTMENTS TO SUPPORT ESF RECONFIGURATION

December 8, 1993



LYOTESF4 CDR 12/6-30-93

"PRELIMINARY PREDECISIONAL DRAFT MATERIAL"

December 8, 1993

CURRENT STATUS

- Design analysis describing the change is in the Change Control Review/Acceptance Process
- Baselineing expected in early December

IMPLEMENTATION PLAN

- Baseline the change within Level 3 (M&O)
- Submit Change Request to Level 2 (Project) CCB
- Adjust Surface Based Drilling program to provide needed data along proposed alignment
- Update Affected Documents

FUTURE ESF CONCEPTS

- Main test area
  - Develop excavation concept
- Access to Calico Ramp
  - Current slope is 10%

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SITE CHARACTERIZATION
PROJECT

DOE-NRC TECHNICAL MEETING ON EXPLORATORY STUDIES FACILITY

SELECTED ITEMS FROM NRC's OCTOBER 1, 1993, LETTER

Presented by:
Robert M. SANDIFER
Manager
MGDS DEVELOPMENT
M&O, Las Vegas,

December 8, 1993

Overview

- This briefing addresses concerns in NRC's October 1, 1993 letter.
- The selected areas of concern are:
  - Determinations of Importance Evaluations (DIEs)
  - Use of Continuum Modeling
  - Level of Conservatism
  - Implementation of the Design Package

Overview

- A common root cause could not be found for the four areas of concern expressed.
- The common thread identified in the letter (there may have been insufficient information presented and/or sampled in the design package) has been addressed.
- The design review process was revised to incorporate several suggestions in the letter. These improvements include:
  - Mailing the design package two weeks prior to the design review meeting.
  - A thorough, page-by-page format, presentation of the design package by the design organization.

Determinations of Importance Evaluations

- NRC Concern:
  - The DIEs seem to rely more on judgment than on data or analyses.
- Response:
  - When quantitative data are not yet available, scientific and engineering judgment are relied upon.
  - In these cases, certain criteria are applied:
    - assumptions must be conservative, and
    - limit impacts to the potential repository "to the extent practical."

Determinations of Importance Evaluations
(continued)

- NRC Example #1
  - During the construction of the tunnel, rock is removed that contains water in the matrix. If the total volume introduced is less than the volume of water removed , then effects on waste isolation are expected to be insignificant.

Determinations of Importance Evaluations (continued)

- Response to Example #1:
  - Assumption that water in equals water out with no significant impact did not account for water mobility or local saturation differences.
  - Discussion was intended to indicate that such local differences in saturation would be insignificant owing to the substantial distance to the potential repository.
  - The technical reviewer commented the analyses could be more conservative by taking into account the possibility for fracture flow.
  - This additional conservatism, along with others as developed during the 90% design review, was incorporated into a revised analysis.
  - Revision as a result of this and similar comments in the design review led to revision of methodology and application of limits to linear distribution.

Determinations of Importance Evaluations
(continued)

- NRC Example #2
  - ... drill and blast excavation will not cause sufficient damage to create preferential pathways. The statement does not seem to be based on data or analyses, and appropriately qualified people might take exception to the statement, because of the lack of supporting data and analyses.

Determinations of Importance Evaluations

(continued)

- Response to Example #2:
  - This judgment was based on the following:
  - The affected area in conventional controlled blasting is typically twenty diameters of the drill hole (drill hole diameters in the ESF are 2 in). The affected area is then on the order of 1 meter.
  - This judgment was additionally backed by a supporting appendix which stated "... it is unlikely that the permeability of the rock adjacent to the blasting area will be affected to the large distances (10 to 100m) that would be required to possibly enhance water movement in the area." [1]

Note 1: Appendix 4 - Bullock to Blehwas, Nov 3, 1992

Modeling

- NRC Concern:
  - Relates to modeling a fractured rock mass such as Yucca Mountain with computer codes that are based on the assumption that what is being modeled is a continuum.
- Response:
  - It's recognized that a fractured rock mass cannot be properly modeled with a continuum model. When applicable, a continuum model is used. When what being modeled can't be accurately modeled by a continuum model, other types of analyses are used.

Modeling
(continued)

- NRC Example #1:
  - Modeling fluid flow. In the Importance To Waste Isolation determination, the volume of water in the rock is determined by calculating the volume in the matrix continuum. Yet, it is further stated ... "the only plausible mechanism for significant water movement in 10,000 years ... is through fracture flow.

Modeling

(continued)

- Response to Example #1:
  - No continuum modeling was used in this determination.
  - Instead, the worst case scenario was assumed: All water left behind in the starter tunnel would migrate through fractures.
  - The analysis was based on the quantity of water that can be absorbed by the Paintbrush nonwelded hydrogeologic unit that underlies the current excavation activities. The Paintbrush nonwelded hydrogeologic unit is believed to be a barrier to fracture flow unless a sufficient quantity of water enters the unit to saturate the remaining air-filled pore space. Construction water that enters the surrounding rock must be limited below the saturation level.

Modeling
(continued)

- NRC Example #2:
  - Stability of the ramp roof. In Volume 2 of the Mining Calculations, it is acknowledged that blocks of rock could be a source of instability by falling from the roof, yet analyses are not presented to examine such discrete rock block failures. Instead, the analyses presented for ramp stability utilize a continuum code that cannot model a block fall.

Modeling
(continued)

- Response to Example #2:
  - Continuum model was not used.
  - Stability of the ramp roof is analyzed and control of rock blocks is provided for by the empirical/ numerical analyses. In certain cases, such as the north ramp portal, where the stability of large rock surfaces is of particular concern, kinematic analysis (based on joint data from ground surface mapping and from boreholes) of potential rock blocks or wedges is used in the evaluation (orientation and spacing) of rock bolts.

Conservatism of Design

- NRC Concern:
  - Appearance that designers are relying upon prior experience with mines or tunnels, yet there does not seem to be an acknowledgment that the ESF/repository is neither a mine nor a highway tunnel, and that greater conservatism may be warranted.

Conservatism of Design

(continued)

- Response:
  - The ESF is neither a mining operation nor a tunneling project. However, tunnel boring machines make tunnels and the best starting source for this type of personnel is the tunneling/mining field. Unique program requirements and controls are instilled in the appropriate personnel through intensive training to assure that the program is not compromised.
  - Greater conservatism is warranted. Examples of this include strict seismic requirements and special controls on water utilization.

Conservatism of Design

(continued)

- NRC Example #1:
  - The issue of dynamic versus static analyses for the ramp. Volume 2 of the Mining Calculations states that dynamic analyses are not generally done for the design of underground facilities. While this may generally be true for mines and highway tunnels, dynamic analyses are not unprecedented and have been performed for underground designs. The design package does not seem to acknowledge that the design methods used for other underground structures may not be sufficient for the ESF.

Conservatism of Design

(continued)

- Response to Example #1:
  - The design of the ESF underground openings include dynamic geotechnical analyses for Package 2A. UDEC and DYNA3D were used for this purpose. The balance of the ESF design will also include dynamic geomechanical analyses. At this time, these analyses will support ESF design.

Conservatism of Design

(continued)

- NRC Example #2:
  - In the design of the ramp roof and walls, a parameter called the Excavation Support Ratio (ESR) must be chosen - the smaller the ESR, the more support for the ramp. Volume 1 of the Mining Calculations indicate an ESR of 1.3 is used for the ramp. Yet it is also acknowledged a value of 1.0 is used for highway tunnels. This implies a typical highway tunnel would have a more conservative roof support system than the ESF excavation, everything else being equal. The design package does not explain the basis for the appropriateness of this ESR.

Conservatism of Design

(continued)

- Response to Example #2:
  - An ESR of 1.0 was used for the design of the ESF North Portal and Starter Tunnel, as recommended by the Norwegian Geotechnical Institute (NGI) method. An ESR of 1.3 was used for Package 2A in error. The mistake was caught during the design review and the problem was corrected. The correction did not change the support categories or support recommendations. Future design will use an ESR of 1.0.

Implementation of the Design

- NRC Concern:
  - ... is related to the implementation of the design in construction, and the stipulations in the DIE that will require monitoring of materials and/or activities in construction.
- Response:
  - The requirements which result from the DIEs are placed into existing specifications.
  - The constructed design is then inspected and signed off to ensure conformity with specifications.

Implementation of the Design

(continued)

- NRC Example #1:
  - One stipulation of the DIE states "... no pressure grouting be done within 50 feet of the two contacts ..." and later it's recommended no pressure grouting be done within 100 feet of a fault zone. When the ESF construction site was visited by NRC staff, a discussion with a REECo engineer led to the observation that without a clear definition of "pressure grouting", it is unclear to the construction crew what the stipulations means.

Implementation of the Design

(continued)

- Response to Example #1:
  - In Package 2A, there is no pressure grouting. When/if pressure grouting would be required, the A/E provides on-site field engineers, whose tasks include providing interpretation of the design to the construction forces.

Implementation of the Design

(continued)

- NRC Example #2:
  - The DIE stipulates less than 325,000 gallons of water be used in construction of package 2A, not counting the water used in the shotcrete and grout. In a discussion with an SAIC engineer, it was determined that although water use is being metered presently, there is only one water meter and there may not be a method to separate the water used in construction (not counting that used in shotcrete and grout) from the total amount used, which presently does include that used for shotcrete and grout.

Implementation of the Design

(continued)

- Response to Example #2:
  - There are two water meters in use. One for water going to grout equipment and one at the outlet of the 10,000 gallon traced water supply tank. The amount of water used for shotcreting is calculated by taking meter reading before and after the event. Therefore, from the total water being used, the amount used for grout and shotcrete is being accounted for and logged.